V CONGRESO LATINOAMERICANO DE MATEMÁTICOS

11 al 15 de Julio de 2016, Barranquilla, Colombia

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Introduction

The Latin American Congress of Mathematicians (CLAM) is an initiative of the Unión Matemática de Latinoamerica y el Caribe (UMALCA) whose objectives are to foster the development of mathematical research in Latin America and the Caribbean, to make visible the mathematical outcome of the region, and to foster the professional partnerships among the mathematicians of the region and the rest of the world. This Congress takes place every four years, and during each Congress the UMALCA Prizes are delivered as a recognition to the most talented young mathematicians working in the region.

The previous four congresses have taken place in Rio de Janeiro 2000, Cancún 2004, Santiago de Chile 2009 and Córdoba 2012. In this opportunity we have the privilege of having the V CLAM at the campus of the Universidad del Norte in the Caribbean city of Barranquilla, Colombia.

In order to highlight some of the most important and recent developments in mathematics, the Scientific Committee invited prominent mathematicians to deliver plenary talks, invited talks and mini courses. Our invited speakers have accepted the invitation and have prepared lectures that will show the latest advances in mathematics, their relevance and the challenges ahead.

The Congress is also meant to be the venue on which the mathematicians of the region which are interested in specific common areas get together, share their results and interchange ideas. The Thematic Sessions are designed to highlight the latest results of a specific subject and to gather the scientists of the region working in such specific subject. In this occasion the Scientific Committee, following a directive of the Executive Committee of the UMALCA, opened last year a call for proposals for Thematic Sessions to the mathematical community of the region. The call was very well received in the community and 27 Thematic Sessions were accepted, 6 in algebra, 9 in analysis, 2 in dynamical systems, 3 in logic, 6 in geometry and topology and 1 in probability. The size and diversity of these Thematic Sessions reflect the level of development of mathematics in the region and at the same time permit us to distinguish the subjects on which we are robust. The Thematic Sessions are the core of the Congress and comprises a total of 230 talks.

The Proceedings of the Congress will be published in a special issue of the Revista Colombiana de Matemáticas. An Ad-hoc editorial board for this issue has been appointed and the submissions will be handled according to the editorial policy of the Revista. The submissions should include results that were presented at the Congress and they must include the person who presented the results as an author.

The Congress also includes a Poster Session designed to give the younger generations the opportunity to present their results to the mathematical community. An open call for proposals for poster presentation was open last year, on which only proposals to present previously published results, either in articles, books or thesis, were allowed to be submitted. The call was a success and 58 poster proposals were accepted.

One of the highlights of the Congress is the UMALCA Prize Award Ceremony. The UMALCA awards in every CLAM the UMALCA Prize to up to four young mathematicians who have excelled in mathematical research and whose permanent address is in one of the countries of Latin America and the Caribbean. To ensure that awardees are young, the awardees must be 45 years old or younger by the 31st of December of 2016. The Scientific Committee opened the call for nominations last year and several outstanding young mathematicians were nominated. The Scientific Committee selected the UMALCA Prize winners

and their names will be presented at the Award Ceremony, together with a Laudatio for each one of them. The Award Ceremony will be followed by a Welcome Reception honoring the award winners and the participants of the Congress.

The UMALCA, recognizing the importance of gender issues in the mathematical community in the region, has embraced the initiative "Women Mathematicians in Latin America" conceived by prominent women mathematicians of Latin America and aimed at establishing a network of women working in mathematical sciences in the region, which would develop activities and material to encourage and support women in their careers. The initiative will be presented to the participants of the Congress on wednesday afternoon, and will be followed by the Poster Session.

The Assembly General of the UMALCA meets at each of the CLAMs and the authorities of the UMALCA are elected in this Assembly. The meeting will take place at the Restaurant 1966 of the Universidad del Norte on tuesday the 12th at 4:00pm, and the representatives of the mathematical societies members of UMALCA are invited to join.

Last but not least, the social events. Apart from the Welcome Reception that will take place on monday evening at the Coliseo, there will be another reception on thursday evening. This second reception will have for theme "Noche Barranquillera", featuring the presentation of some "comparsas" of the Carnaval de Barranquilla, including snacks and drinks typical from the Caribbean coast and taking place outdoors just outside of the Coliseo. The Congress will also host the presentation of the film "Derivadas" from director María Campaña Ramia. Director Campaña, who will be present at the Congress, has very kindly agreed to share with us her work and moreover has agreed to host a Q&A session right after the presentation of the film. The film will be presented on wednesday evening.

This Congress has been possible only through the sustained and diligent support of the authorities of the organizing institutions. We express our deep gratitude to the UMALCA through its President Servet Matínez and its Secretary General Carlos di Prisco, to the Colombian Mathematical Society through its President Carlos Montenegro, and to the Universidad del Norte through its Rector Jesús Ferro and its Academic Vicerrector Alberto Roa. We thank the Centro de Educación Continuada of the Universidad del Norte for providing the logistics support for the Congress and in particular we express our deepest gratitude to Nathaly Otero for her superb work organizing all the logistics of the Congress.

We wish you all a successful mathematical week at the Congress and we hope that you all enjoy your visit to Barranquilla.

Enjoy the Congress!

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Venue and local information

2.1 Universidad del Norte

The V Latin American Congress of Mathematicians will take place in the campus of the Universidad del Norte in Barranquilla. The University is located in the north west of the city of Barranquilla and is easily accessible by public transport.

The Universidad del Norte is a private university founded fifty years ago and today is ranked among the best ten universities in Colombia and is ranked number one in the Colombian Caribbean.

2.2 Registration

Registration to the congress is mandatory to all participants. The registration has a fee of $470.000 COP for professors and researchers and of $150.000 COP for students.

2.3 Lecture rooms

The Congress will be inaugurated at the Coliseo of the University, and the plenary lectures, as well as the initiative "Women Mathematicians in Latin America", will also take place at the Coliseo. The courses and the invited lectures will run simultaneously at the Coliseo and at the Auditorio. The Thematic Sessions will meet in the class rooms of the G building, located at the north of the campus, and in the C building, located at the north west of the central building of the University. The Poster Session will take place in the Coliseo.

2.4 Transport

The organization will provide transportation at the end of each day from the University to the hotels. Follow the directions of the Staff with regard of the location of the buses and their time of departure. The participants of the Congress are expected to arrive to the University by their own means. The hotel clerks can provide the necessary help in order to arrange taxis from the hotels to the university.

2.5 Internet access

The University has an open access wireless internet called "Uninorte". All guests are welcome to use this wireless internet.

2.6 Money exchange and ATMs

The bank Bancolombia has a branch at the Universidad del Norte. In this branch dollars may be exchanged to colombian pesos and vice versa. There are two ATMs of Bancolombia close to to the Auditorio and another ATM by the south entrance of the University. Visa, Mastercard and EC cards are welcome on those ATMs.

2.7 Medical assistance

The Medical Center of the Universidad del Norte may provide medical assistance to the participants of the Congress. Ask the staff in case that you need medical assistance.

2.8 Campus map

A map of the campus may be found at the end of this booklet.

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Scientific and Organizing Committees

3.1 Scientific Committee

The Scientific Committee of the V Latin American Congress of Mathematicians has been in charge of the academic programme of the Congress. Its members are:

- Renato Iturriaga -Chair- (CIMAT, México)
- Alejandro Adem (University of British Columbia, Canada; MITACS)
- Hugo Aimar (Universidad del Litoral, Argentina)
- Joao Lucas Barbosa (Universidade Federal do Ceará, Brazil)
- Xavier Caicedo (Universidad de los Andes, Colombia)
- Jorge Cossio (Universidad Nacional de Colombia, Colombia)
- Alicia Dickenstein (Universidad de Buenos Aires, Argentina)
- Alejandro Jofre (Universidad de Chile, Chile)
- Carlos Kenig (University of Chicago, USA)
- Roberto Markarian (Universidad de la República, Uruguay)
- Consuelo Martinez (Universidad de Oviedo, España)
- Carlos Gustavo Moreira (IMPA, Brazil)
- Victor Perez Abreu (CIMAT, México)
- Paolo Piccione (Universidadade de Sao Paulo, Brazil)
- Carlos Di Prisco (Universidad de los Andes, Colombia; Secretary General, UMALCA)

3.2 Organizing Committee

The organizing committee has been in charge of all the logistics relative to the congress. Its members are:

- Bernardo Uribe -Chair- (Vicepresidente Sociedad Colombiana de Matemáticas, Universidad del Norte)
- Agustín Barrios (Universidad del Norte)
- Jesús Alonso Cabrera (Universidad del Norte)
- Guillermo Cervantes (Universidad del Norte)
- Javier de la Cruz (Universidad del Norte)
- Jairo Hernandez (Universidad del Norte)
- Carlos Montenegro (Presidente, Sociedad Colombiana de Matemáticas)

- Nathaly Otero (Universidad del Norte)
- Florent Schaffhauser (Universidad de los Andes)
- Laura Schaposnik (University of Illinois at Chicago)

3.3 Liaison with the Universities in Colombia

The following persons have served as Liaison with the Universities in Colombia:

- Jaime Arango (Universidad del Valle)
- Erik Backelin (Universidad de los Andes)
- Alexander Cardona (Universidad de los Andes)
- Hernán Giraldo (Universidad de Antioquia)
- José Manuel Gómez (Universidad Nacional sede Medellín)
- Carlos Mejía (Universidad Nacional sede Medellín)
- Alf Onshuus (Universidad de los Andes)
- Eddy Pariguan (Pontificia Universidad Javeriana)
- Sofía Pinzón (Universidad Industrial de Santander)
- José Raúl Quintero (Universidad del Valle)
- Fabián Serrano (Universidad Nacional sede Manizales)
- Carlos Trujillo (Universidad del Cauca)
- Andrés Villaveces (Universidad Nacional de Colombia)

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Schedule

4.1 Monday

8:00-10:30 **Registration** (Coliseo)

10:30 - 11:45 **Opening Ceremony** (Coliseo)

11:45 - 12:45 **Renormalization and Area of Julia sets** (Coliseo)
Mikhail Lyubich, Stony Brook University, USA

12:45 - 14:30 Lunch

14:30 - 15:30 **Stable Lévy processes, Lamperti's representations and generalizations** (Auditorio)
Maria Emilia Caballero, Universidad Nacional Autónoma de México UNAM, México

Moving robots efficiently using the combinatorics of CAT(0) cubical complexes (Coliseo)
Federico Ardila, San Francisco State University, USA

15:30 - 15:45 Coffee Break

15:45 - 16:25 ALG1-4 **Differential Galois Theory and Darboux Transformations for Integrable Systems** (32C)
Juan J. Morales-Ruiz, Universidad Politécnica de Madrid, España

ALG2-1 **Arithmetics and combinatorics of tropical Severi varieties of univariate polynomials** (33C)
Alicia Dickenstein, Universidad de Buenos Aires, Argentina

ALG5-8 **Efficient ZHFE Key Generation** (35C)
Jaiberth Porras Barrera, Universidad Nacional de Colombia, Colombia

LOG2-3 **On the Model Theory of Sheaves** (37C)
Xavier Caicedo, Universidad de los Andes, Colombia

ANA1-7 **Fractional Laplacians and extension problems: the higher rank case** (21G1)
Mariel Saez, Pontificia Universidad Católica de Chile, Chile

ANA2-1 **Controllability and stability to some beams and plates systems (24G1)**
Fágner Araruna, Universidade Federal da Paraíba, Brazil

ANA3-1 **Convergencia de un método espectral totalmente discreto para algunos sistemas de tipo Boussinesq** (25G1)
Daniel Alfaro, Universidade Federal do Rio de Janeiro, Brazil

ANA7-6 **Sharp weighted estimates and further improvements via Reverse Hölder Inequalities** (31G1)
Ezequiel Rela, Universidad de Buenos Aires e IMAS-CONICET, Argentina

DINSIS1-1 **On the Kolmogorov typicality of dynamics displaying infinitely many coexisting sinks** (35G1)
Pierre Berger, University of Paris, France

DINSIS2-10 **Frames and direction mappings on surfaces** (31G2)
Farid Tari, Universidad de Sao Paulo ICMC, Brazil

GEOM1-6 **Integration of Structure Equations of G-Structures** (32G2)
Ivan Struchiner, Universidad de São Paulo, Brazil

GEOM3-3 **Smooth bundles with nonpositively curved fibers** (34G2)
Mauricio Bustamante, Binghamton University, USA

GEOM5-1 **Conformal killing 2-forms on low dimensional Lie groups** (35G2)
María Laura Barberis, Universidad Nacional de Córdoba, Argentina

GEOM6-1 **Homotopy Group Actions and an Exotic Example** (36G2)
Alejandro Adem, University of British Columbia, Canada

PROB1-1 **Additive and Multiplicative Limit Theorems in Free probability** (38C)
Octavio Arizmendi, Centro de Investigación en Matemáticas, México

16:35 - 17:15 ALG1-3 **Computing differential Galois group of difference equations, applications to discrete systems** (32C)
Thierry Combot, Université de Bourgogne, France

ALG2-4 **Local Zeta Functions at Infinity** (33C)
Edwin Leon Cardenal, Centro de Investigación en Matemáticas, México

ALG5-1 **Higher Auslander Reiten theory and tilting modules** (35C)
Erik Backelin, Universidad de los Andes, Colombia

LOG2-6 **Descriptive set theoretic properties of partial actions of Polish groups** (37C)
Carlos Uzcátegui, Universidad Industrial de Santander, Colombia

ANA1-12 **Exponential propagation for fractional reaction-diffusion cooperative systems with fast decaying initial conditions** (21G1)
Miguel Yangari, Escuela Politécnica, Ecuador

ANA2-2 **Stackelberg-Nash exact controllabillity for the Kuramoto-Sivashinsky equation** (24G1)
Nicolás Carreño, Universidad Técnica Federico Santa María. Chile

ANA3-6 **Quantitative unique continuation, intensity of waves in the shadow of obstacle and approximate control** (25G1)
Camille Laurent, Université Pierre et Marie Curie, France

ANA7-4 L^2 **estimates for t-Haar Multipliers on spaces of homogeneous type** (31G1)
Jean Moraes, Universidade Federal do Rio Grande do Sul, Brazil

DINSIS1-2 **Sensitive dependence of Gibbs measures in quasi-quadratic families** (35G1)
Daniel Coronel, Universidad Andrés Bello, Chile

DINSIS2-8 **Limit cycles in perturbations of planar vector fields with curves of singularities** (31G2)
Salomón Rebollo Perdomo, Universidad del Bío-Bío, Chile

GEOM1-8 **Conformal symmetries of Distributions in Riemannian manifolds** (32G2)
Andrés Vargas, Pontificia Universidad Javeriana, Colombia

GEOM3-4 **Borel regulator and K-theory of group algebras** (34G2)
Guillermo Cortiñas, Universidad de Buenos Aires, Argentina

GEOM5-2 **Lie theory of vector bundles and related double structures** (35G2)
Henrique Bursztyn, Instituto Nacional de Matemática Pura e Aplicada, Brazil

GEOM6-2 **Homotopy type and the fixed simplex property** (36G2)
Jonathan A. Barmak, Universidad de Buenos Aires, Argentina

PROB1-2 **Fractional stochastic differential equation with discontinuous diffusion** (38C)
Margaret Johanna Garzón Merchán, Universidad Nacional de Colombia, Colombia

17:15 - 17:45 Coffee Break

17:45 - 18:45 **UMALCA Award Ceremony** (Coliseo)

18:45 - 19:00 Break

19:00 - 20:30 **Welcome Reception** (Coliseo)

4.2 Tuesday

8:00 - 9:30 **Intersección de cuádricas en $\mathbb{C}^n$, variedades ángulo-momento, variedades complejas y tóricas y politopos convexos** (Coliseo)
Alberto Verjovsky, Universidad Nacional Autónoma de México UNAM, México

Active scalars with singular incompressible velocities (Auditorio)
Diego Córdoba, Instituto de Ciencias Matemáticas, España

9:30 - 10:00 Coffee Break

10:00 - 11:00 **Fan of characteristics and TASEP hydrodynamics** (Coliseo)
Pablo Augusto Ferrari, Universidad de Buenos Aires, Argentina

11:00 - 11:15 Coffee Break

11:15 - 11:55 ALG1-5 **Thomas Decomposition and Nonlinear Control Systems** (31C)
Daniel Robertz, Plymouth University, United Kingdom

ALG2-2 **Some aspects of the Euler-Chow series and how it is related with Cox rings** (32C)
Javier Elizondo, Universidad Autonoma de México, México

ALG5-2 **Strong minimum distance of abelian codes** (33C)
Diana Bueno-Carreño, Pontificia Universidad Javeriana Cali, Colombia

LOG2-5 **Admissible trees and homogeneous sets** (21G1)
Claribet Piña, Universidad de los Andes, Colombia

ANA1-2 **Hölder estimates for solutions of a MEMS equation** (31G1)
Juan Dávila, Universidad de Chile, Chile

ANA2-3 **On the control of the improved Boussinesq equation** (32G1)
Eduardo Cerpa, Universidad Técnica Federico Santa María, Chile

ANA3-3 **Recents results for SQG sharp front and the Muskat problem** (35G1)
Francisco Gancedo, Universidad de Sevilla, Spain

ANA7-1 **BMO, weights and the Schrödinger operator** (32G2)
Bruno Bongioanni, Universidad Nacional del Litoral e IMAL-CONICET, Argentina

DINSIS1-3 **Topological full groups and continuous orbit equivalence** (23G1)
Maria Isabel Cortez, Universidad de Santiago de Chile, Chile

DINSIS2-12 **The Goldfish problem, homogeneous foliations and billiard dynamics** (24G1)
Ferrán Valdez Lorenzo, Centro de Ciencias Matemáticas UNAM, México

GEOM1-1 **Geometric Quantization of Twisted Dirac Structures** (33G2)
Alexander Cardona, Universidad de Los Andes, Colombia

GEOM3-5 **Cohomology of Profinite Groups** (35G2)
Germán Combariza, Pontificia Universidad Javeriana, Colombia

GEOM5-3 **Principal Series Representations for Direct Limit Groups** (36G2)
Matthew Dawson, Centro de Investigación en Matemáticas, México

GEOM6-3 **Constructing equivariant spectra** (37G2)
Anna Marie Bohmann, Vanderbilt University, USA

PROB1-3 **Negative top Lyapunov exponents for gradient SDE driven by small Lévy noise** (25G1)
Michael A. Hoegele, Universidad de los Andes, Colombia

12:05 - 12:45 ALG1-7 **Non-Integrability of AGK Quartic Hamiltonian through Morales-Ramis Theory** (31C)
Teresa Stuchi, Universidad Federal de Rio de Janeiro, Brazil

ALG2-8 **How to identify Milnor fibers of smoothings of quotient sigularities** (32C)
Giancarlo Urzua, Universidad Católica de Chile, Chile

ALG5-3 **Generalized star configurations and Hamming weights** (33C)
Mehdi Garrousian, Universidad de los Andes, Colombia

ALG6-9 **Levels of distribution in arithmetic statistics** (34C)
Frank Thorne, University of South Carolina, USA

LOG2-8 **Injectivity in tests for separability by potentially Lavrentieff sets** (21G1)
Rafael Zamora, Institut Mathematique de Jussieu, France

ANA1-6 **On the behavior of a singular positive solution to a nonlocal elliptic equation** (31G1)
Olivaine Queiroz, Universidade stadual de Campinas, Brazil

ANA2-4 **On a set of bounded solutions of the null approximate control wave equation problem** (32G1)
Abdón Choque, Universidad Michoacana de San Nicolás de Hidalgo, México

ANA3-4 **Global smooth solutions for the inviscid SQG equations** (35G1)
Javier Gomez Serrrano, Princeton University, USA

ANA7-5 **Structure and frame properties of noncommutative shift-invariant spaces** (32G2)
Victoria Paternostro, Universidad de Buenos Aires e IMAS-CONICET, Argentina

DINSIS1-4 **Finiteness of measures maximizing the entropy for surface diffeomorphisms** (23G1)
Sylvain Crovisier, Université de Paris, France

DINSIS2-1 **Some results on parallelisms of algebraic varieties by means of differential Galois theory** (24G1)
David Blázquez-Sanz, Universidad Nacional de Colombia, Colombia

GEOM1-5 **Higher-Dirac structures and their foliated geometry** (33G2)
Roberto Rubio, Instituto de Matemática Pura e Aplicada, Brazil

GEOM3-7 **Cohomology and point-counting over finite fields** (35G2)
Rita Jiménez-Rolland, Centro de Ciencias Matemáticas UNAM, México

GEOM5-6 **The algebra of differential operators associated to a weight matrix** (36G2)
Juan Tirao, Universidad Nacional de Córdoba, Argentina

GEOM6-4 **Representations of fusion systems** (37G2)
José María Cantarero, Centro de Investigación en Matemáticas, México

PROB1-4 **A singular stochastic control problem** (25G1)
Harold Moreno Franco, Centro de Investigación en Matemáticas, México

12:45 - 14:30 Lunch

14:30 - 15:30 **UMALCA Prize Winner Plenary Talk** (Coliseo)

15:30 - 15:45 Coffee Break

15:45 - 16:25 ALG1-1 **Projectively integrable linear difference equations and their Galois groups** (32C)
Carlos E. Arreche, North Carolina State University, USA

ALG3-3 **Branes in the moduli space of framed sheaves** (33C)
Marcos Jardim, Universidade Estadual de Campinas, Brazil

ALG4-1 **Polytopes with algebraic and combinatorial structure** (35C)
Federico Ardila, San Francisco State University, USA

ALG6-4 **The Equidistribution of Lattice Shapes of Rings of Integers in Cubic, Quartic, and Quintic Number Fields** (37C)
Piper Harron, The liberated mathematician, USA

LOG2-4 **Shelah's classification theory and pseudo real closed fields** (21G1)
Samaria Montenegro, Universidad de los Andes - Universidad de Costa Rica, Colombia - Costa Rica

LOG3-4 **Exponentially closed fields** (25G1)
Jonathan Kirby, University of East Anglia - Norwich, United Kingdom

ANA1-3 **Concentrating solutions for a Hénon-type problem on general domains** (31G2)
Jorge Faya, Universidad de Chile, Chile

ANA4-5 **Fractional derivatives, inverse problems and discrete mollification** (32G2)
Carlos Mejía Salazar, Universidad Nacional de Colombia, Colombia

ANA5-1 **Discrete and continuous games reviewed from the perspective of dynamic programming** (33G2)
Eduardo Espinosa, Universidad Nacional Autónoma de México, México

ANA8-1 **Stability of peak solutions for NLS equations on a star graph** (34G2)
Jaime Angulo, Universidade de Sao Paulo, Brazil

ANA9-2 **From self-expanded to snake-like curves** (35G2)
Aris Daniilidis, Centro de Modelamiento Matemático, Universidad de Chile, Chile

DINSIS1-6 **Rotation Theory of annular continua** (36G2)
Alejandro Passeggi, Universidad de la República, Uruguay

GEOM1-3 **A geometrical viewpoint of the equation of motion in classical field theory** (37G2)
Nicolás Martinez, Instituto de Matemática Pura e Aplicada - Pontificia Universidad Javeriana, Brazil - Colombia

GEOM3-8 **Classifying spaces for mapping class groups** (31G1)
Daniel Juan Pineda, Centro de Ciencias Matemáticas UNAM, México

GEOM5-4 **Transforming unitary representations from one real form to another** (35G1)
Gestur Ólafsson, Louisiana State University, USA

PROB1-5 **On the Dyson-Brownian motion and fractional Brownian motion analogous** (38C)
Víctor Manuel Pérez Abreu, Centro de Investigación en Matemáticas, México

16:35 - 17:15 ALG1-6 **LODEs with algebraic solutions** (32C)
Camilo Sanabria, Universidad de los Andes, Colombia

ALG3-2 **Moduli Spaces of Contact Instantons** (33C)
Pedram Hekmati, Instituto Nacional de Matemática Pura e Aplicada, Brazil

ALG4-2 **Hopf algebras, antipodes and orientations** (35C)
Carolina Benedetti, Fields Institute-York University, Canadá

ALG6-8 **Quantitative equidistribution of Galois orbits of points of small heght on the algebraic torus** (37C)
Marta Narváez-Clauss, Universitat Barcelona, Spain

LOG2-1 **Supersimple theories expanded with a predicate for a forking independent subset** (21G1)
Alexander Berenstein, Universidad de los Andes, Colombia

LOG3-5 **Towards a model theoretic framework for Real Multiplication** (25G1)
Jorge Plazas, Pontificia Universidad Javeriana, Colombia

ANA1-8 **Multi-clustered solutions for a forced pendulum equation** (31G2)
Dora Salazar, Universidad de Chile, Chile

ANA4-7 **On the Calderón's problem for quasilinear conductivities** (32G2)
Claudio Muñoz, Universidad de Chile, Chile

ANA5-2 **Continuous-Time Distributed Consensus Algorithms with Random Noises** (33G2)
Tao Li, Shanghai University, China

ANA8-2 **On the decay and support of the Zakharov-Kuznetsov equation and the well-posedness of the initial value problem associated to it** (34G2)
Eddy Bustamante, Universidad Nacional de Colombia, Colombia

ANA9-5 **On the choice of special Pareto points** (35G2)
Luis Mauricio Graña Drummond, Universidade Federal de Rio de Janeiro, Brazil.

DINSIS1-5 **On the fractal geometry of horseshoes in arbitrary dimensions** (36G2)
Carlos Gustavo Moreira, Instituto de Matemática Pura e Aplicada, Brazil

GEOM1-7 **Algebroides de Lie y operadores de cohomología en Física y Matemáticas** (37G2)
Jose Vallejo, Universidad Autónoma de San Luis Potosí, Mexico

GEOM3-9 **On the rational homology and assembly maps of generalized Thompson groups** (31G1)
Conchita Martínez, Universidad de Zaragoza, Spain

GEOM5-5 **Contact Lie algebras** (35G1)
Gil Salgado, Universidad Autónoma de San Luis Potosí, México

17:15 - 17:45 Coffee Break

17:45 - 18:45 **Asymptotic behavior of solutions to a nonlocal dffusion equation on manifolds** (Coliseo)
Noemi Wolanski, Universidad de Buenos Aires, Argentina

On the large-scale geometry of tilings (Auditorio)
Andrés Navas, Universidad de Santiago de Chile, Chile

4.3 Wednesday

8:00 - 9:30 **Topological quantum field theories in homotopy theory** (Coliseo)
Ulrike Tillmann, Oxford University, United Kingdom

The fine structure of the Lagrange and Markov spectra (Auditorio)
Carlos Matheus Silva Santos, Instituto de Matemática Pura e Aplicada IMPA, Brazil

9:30 - 10:00 Coffee Break

10:00 - 11:00 **Partial actions and the Banach-Tarski paradox** (Coliseo)
Ruy Exel, Universidade Federal de Santa Catarina, Brazil

11:00 - 11:15 Coffee Break

11:15 - 11:55 ALG1-8 **Darboux Transformations for Tensor Products** (22C)
Jacques-Arthur Weil, Université de Limoges, France

ALG3-4 **Self-dual connections on Taub-NUT space** (24C)
Andrés Larraín-Hubach, University of Arizona, USA

ALG4-9 **Symmetric group characters as symmetric functions** (25C)
Rosa Orellana, Darmouth College, USA

ALG6-2 **Torsion for abelian varieties of type III** (26C)
Victoria Cantoral Farfán, Institut de Mathématiques de Jussieu, France

LOG2-7 **Undecidable fields of algebraic numbers** (31C)
Carlos Videla, Mount Royal University, Canadá

LOG3-3 **Ultraschemes and the Universal Modular Invariant** (32C)
Timothy Gendron, Instituto de Matemáticas UNAM, México

ANA1-10 **On a fractional version of a conjecture by De Giorgi** (33G2)
Yannick Sire, John Hopkins University, USA

ANA4-1 **On the identification of piecewise constant coefficients in optical diffusion tomography by level set** (34G2)
Juan Pablo Agnelli, Universidad de Córdoba, Argentina

ANA5-3 **Stochastic Stability of Snowdrift Based Evolutionary Dynamics** (35G2)
Haili Liang, Shanghai University, China

ANA8-3 **Fractional Schrodinger operators in external fields: improved dispersion, local smoothing and weighted Strichartz estimates** (36G2)
Luca Fanelli, Università di Roma, Italy

DINSIS1-7 **A Law of Large Permanents and Applications to Random Graphs** (33C)
Mario Ponce, Pontificia Universidad Católica de Chile, Chile

GEOM1-2 **Morita equivalences of vector bundles** (34C)
Matías del Hoyo, Instituto de Matemática Pura e Aplicada, Brazil

GEOM3-10 **A new asphericity test for group presentations and some applications** (35C)
Gabriel Minian, Universidad de Buenos Aires, Argentina

GEOM4-1 **C-Algebras of Operators on Free Banach Spaces** (36C)
José Aguayo, Universidad de Concepción, Chile

12:05 - 12:45 ALG1-2 **Joint and differential invariants of Lie group actions** (22C)
David Blázquez-Sanz, Universidad Nacional de Colombia, Colombia

ALG3-7 **Stratifications on the Moduli Space of Higgs Bundles** (24C)
Ronald Zúñiga Rojas, Universidad de Costa Rica, Costa Rica

ALG4-11 **A categorification of the chromatic symmetric function** (25C)
Martha Yip, University of Kentucky, USA

ALG6-3 **One-parameter families of elliptic curves with non-zero average root number** (26C)
Chantal David, Concordia University, Canada

LOG2-2 **Generalized Schreier families and large Banach spaces with no indiscernible sequences** (31C)
Christina Brech, Universidade de Sao Paulo, Brazil

LOG3-4 **Exponentially closed fields** (32C)
Jonathan Kirby, University of East Anglia - Norwich, United Kingdom

ANA1-9 **A priori bounds for elliptic inequalities via regularity estimates** (33G2)
Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

ANA4-3 **Stabilization of lower order derivatives using higher order derivatives** (34G2)
Doris Hinestroza, Universidad del Valle, Colombia

ANA5-4 **From Voronoi patterns to Hamilton-Jacobi equations** (35G2)
Pablo Padilla, Universidad Nacional Autónoma de México, México

ANA8-4 **Polynomial decay of the solutions for some nonlinear dispersive equations** (36G2)
José Manuel Jiménez, Universidad Nacional de Colombia, Colombia

ANA9-4 **Integration formulas without convexity** (37G2)
Yboon Victoria García Ramos, Universidad del Pacífico, Perú.

DINSIS1-8 **Stable Ergodicity** (33C)
Martin Sambarino, Universidad de la República, Uruguay

GEOM1-4 **Aspectos algebraicos de las ecuaciones diferenciales parciales no lineales** (34C)
Alexander Quintero, Universidad del Valle, Colombia

GEOM3-11 **Orderable groups: some open questions** (35C)
Andrés Navas, Universidad de Santiago de Chile, Chile

GEOM4-4 **Sobolev spaces on groups** (36C)
Tomasz Kostrzewa, Warsaw University of Technology, Poland

12:45 - 14:30 Lunch

14:30 - 15:30 **UMALCA Prize Winner Plenary Talk** (Coliseo)

15:30 - 15:45 Coffee Break

15:45 - 16:45 **Women Mathematicians in Latin America** (Coliseo)

16:45 - 17:45 **Poster Session** (Coliseo)

17:45 - 18:45 **The Amalgan Balian Low Theorem and time-frequency shift invariance** (Coliseo)
Ursula Molter, Universidad de Buenos Aires, Argentina

Arithmetic hyperbolic reflection groups (Auditorio)
Mikhail Belolipetsky, Instituto Nacional de Matematica Pura e Aplicada IMPA, Brazil

18:45 - 19:00 Coffee Break

19:00 - 20:30 **Film: DERIVADAS** (Auditorio)
María Campaña Ramia

4.4 Thursday

8:00 - 9:30 **Intersección de cuádricas en $\mathbb{C}^n$, variedades ángulo-momento, variedades complejas y tóricas y politopos convexos** (Coliseo)
Alberto Verjovsky, Universidad Nacional Autónoma de México UNAM, México

Active scalars with singular incompressible velocities (Auditorio)
Diego Córdoba, Instituto de Ciencias Matemáticas, Spain

9:30 - 10:00 Coffee Break

10:00 - 11:00 **Algebraic operads and combinatorial Hopf algebras** (Coliseo)
María Ronco, Universidad de Talca, Chile

11:00 - 11:15 Coffee Break

11:15 - 11:55 ALG2-6 **Derived symmetries of moduli spaces of sheaves on K3 surfaces** (35C)
Sukhendu Mehrotra, Universidad Catolica de Chile, Chile

ALG3-6 **The Toledo invariant and the Cayley correspondence for Higgs bundles** (36C)
Roberto Rubio, Instituto Nacional de Matemática Pura e Aplicada IMPA, Brazil

ALG4-6 **The natural Hopf algebra associated of a set operad** (37C)
Miguel Mendez, Instituto Venezolano de Investigación Científica, Venezuela

ALG5-4 **Evaluation codes** (38C)
Hiram López, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional, México

LOG1-8 **Natural Objects in Computability Theory** (25C)
Antonio Montalbán, University of California at Berkeley, USA

LOG3-2 **Towards a model theoretic approach to F_1- geometry** (26C)
John Alexander Cruz, Max Planck Institut fuer Mathematik, Germany

ANA1-5 **Continuous viscosity solutions for nonlocal Dirichlet problems with coercive gradient terms** (34G1)
Alexander Quaas, Universidad Técnica Federico Santa María, Chile

ANA3-5 **Singular optimal control / a 1-D Parabolic-Hyperbolic Degenerate example** (35G1)
Mamadou Gueye, Universidad Técnica Federico Santa María, Chile

ANA4-8 **Identification of a coefficient in a two-dimensional nonlinear inverse problem through regularization and Lagrangian methods** (32G2)
Luis Eduardo Olivar, Universidad del Tolima, Colombia

ANA5-5 **Estimates for a class of slowly non-dissipative reaction-diffusion equations** (33G2)
Juliana Pimentel, Universidade Federal do ABC, Brazil

ANA6-7 **Two families of orthogonal polynomials on the unit circle from basic hypergeometric functions** (34G2)
Sri Ranga, Universidade Estadual Paulista, Brazil

ANA7-2 **Muckenhoupt weights with singularities on lower dimensional sets** (35G2)
Marilina Carena, Universidad Nacional del Litoral e IMAL-CONICET, Argentina

ANA9-3 **Stationarity conditions for optimization problems with variational inequality constraints** (36G2)
Juan Carlos de los Reyes, Escuela Politécnica Nacional, Ecuador.

DINSIS2-5 **Lines of Curvature on Quadric Hypersurfaces of $\mathbb{R}^4$** (34C)
Ronaldo García, Universidad Federal de Goiás, Brazil

GEOM2-5 **TQFT in the context of homotopical algebra** (31C)
Dmitry Kaledin, Steklov Mathematical Institute, Rusia

GEOM4-9 **Poincaré theory for the adéle class group A / Q and compact Abelian one–dimensional solenoidal groups** (32C)
Alberto Verjovsky, Universidad Nacional Autónoma de México UNAM, México

GEOM6-5 **Topological Data Analysis** (33C)
Jesús Espinoza, Universidad de Papaloapán, México

12:05 - 12:45 ALG2-3 **¿Soñó Mori con el espacio de curvas racionales marcadas?** (35C)
José Luis González, Yale University, USA

ALG3-5 **Hyperpolygons and Parabolic Higgs bundles** (36C)
Alessia Mandini, Pontificia Universidade Católica do Rio de Janeiro, Brazil

ALG4-4 **The colored symmetric and exterior algebras** (37C)
Rafael González, University of Kentucky, USA

ALG5-5 **TBA** (38C)
Edgar Martinez-Moro, Universidad de Valladolid, España

LOG1-2 **Game Semantics and Normalization by Evaluation** (25C)
Peter Dybjer, Universidad de Chalmers, Sweden

LOG3-1 **Basic aspects of the geometric rigidity of the j function on complex elliptic curves** (26C)
Leonardo Cano, Universidad Sergio Arboleda, Colombia

ANA1-11 **Lipschitz regularity for elliptic integro-differential problems and application to homogeneization** (34G1)
Erwin Topp, Universidad de Chile, Chile

ANA3-2 **Mixing solutions for the Muskat problem** (35G1)
Ángel Castro, Instituto de Ciencias Matemáticas, Spain

ANA4-6 **Inverse problems for dispersive equations** (32G2)
Alberto Mercado, Universidad Federico Santa María, Chile

ANA5-6 **Mean-field games with mild singularities** (33G2)
Héctor Sánchez-Morgado, Universidad Nacional Autónoma de México, México

ANA6-1 **Para-orthogonal polynomials on the unit circle associated with periodic Verblunsky coefficients** (34G2)
Cleonice Fátima Bracciali, Universidade Estadual Paulista, Brazil

ANA7-7 **Distance sets, box-counting and Ahlfors-regular sets** (35G2)
Pablo Schmerkin, Universidad Torcuato Di Tella y CONICET, Argentina

ANA9-7 **Exact and convex relaxations of non-convex, non-local, homogeneous, two-dimensional variational problems with low-degree, polynomial structure** (36G2)
René Meziat Vélez, Universidad del Rosario, Colombia.

DINSIS2-7 **Stability of periodic orbits by Conley-Zehnder index theory** (34C)
Daniel Offin, Queen's University, Canada

GEOM2-6 **Quasi-additive estimates on the Hamiltonian for the One-dimensional Long Range Ising Model and its consequences** (31C)
Jorge Littin, Universidad Católica del Norte, Chile

GEOM4-5 **Non canonical metrics on Diff (S^1)** (32C)
Daniel Pons, Universidad Andrés Bello, Chile

GEOM6-6 **Sandpiles, quantum gravity and non-commutative geometry** (33C)
Ernesto Lupercio, Centro de Investigaciones y de Estudios Avanzados del Instituto Politécnico Nacional, México

12:45 - 14:30 Lunch

14:30 - 15:30 **UMALCA Prize Winner Plenary Talk** (Coliseo)

15:30 - 15:45 Coffee Break

15:45 - 16:25 ALG2-5 **Additive group actions on algebraic varieties** (32C)
Álvaro Liendo, Universidad de Talca, Chile

ALG3-1 **Higgs bundles, spectral data, and fiber products of curves** (33C)
Steve Bradlow, University of Illinois at Urbana-Champaign, Chicago, USA

ALG4-10 B_∞**-algebras and separable permutations** (34C)
María Ronco, Universidad de Talca, Chile

ALG5-6 **The weight hierarchy of Castle codes** (35C)
Wilson Olaya, Universidad Industrial de Santander, Colombia

LOG1-4 **Model Theory of XPath with data tests** (37C)
Santiago Figueira, Universidad de Buenos Aires, Argentina

LOG3-6 **Modular invariants and model theory** (38C)
Andrés Villaveces, Universidad Nacional de Colombia, Colombia

ANA1-1 **Tartar's method in nonlocal homogenization** (31G2)
Julian Bónder, Universidad de Buenos Aires, Argentina

ANA3-12 **Lower Regularity Solutions of a Class of Non-homogeneous Boundary Value Problems of the Korteweg-de Vries Equation on a Finite Domain** (33G2)
Ivonne Rivas, Universidad del Valle, Colombia

ANA4-4 **Retos y Perspectivas de los Problemas Inversos en la Caracterización Dinámica de Materiales** (34G2)
Alejandro Marañon, Universidad de los Andes, Colombia

ANA5-7 **TBA** (35G2)
Olivâine Santana de Queiroz, Universidade Estadual de Campinas, Brazil

ANA6-6 **New families of matrix-valued orthogonal polynomials related to Gelfand pairs of rank one** (36G2)
Pablo Román, Universidad Nacional de Córdoba, Argentina

ANA7-3 **Band-Limited Approximations and Interpolation Formulas** (37G2)
Felipe Gonçalvez, Instituto de Matemática Pura e Aplicada IMPA, Brazil

ANA9-1 **On maximality of quasimonotone operators** (38G2)
Orestes Bueno Tangoa, Universidad del Pacífico, Perú.

DINSIS2-11 **Principal Poincaré Pontryagin function associated to some families of Morse real polynomials** (31G1)
Marco Uribe, Universidad Católica de la Santísima Concepción, Chile

GEOM2-8 **Topological String Partition Function on Generalised Conifolds** (33G1)
Bruno Suzuki, Universidad Católica del Norte, Chile

GEOM4-6 **Some Non-Archimedean tools in Integrable Systems** (34G1)
Enrique Reyes, Universidad de Santiago de Chile, Chile

GEOM6-7 **Planar braids and configuration spaces of points with multiplicity at most 2** (35G1)
Jacob Mostovoy, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México

16:35 - 17:15 ALG2-7 **Classification of elliptic fibrations on certain K3 surfaces** (32C)
Cecilia Salgado, Universidade Federal de Rio de Janeiro, Brazil

ALG4-7 **Group actions on 2-categories** (34C)
Martín Mombelli, Universidad Nacional de Córdoba, Argentina

ALG5-7 **Asymptotically good quasi-transitive AG-codes over prime fields** (35C)
Ricardo Podestá, Universidad de Córdoba, Argentina

LOG1-1 **Towards a quantum lambda calculus with quantum control** (37C)
Alejandro Díaz-Caro, Universidad Nacional de Quilmes, Argentina

ANA1-4 **Existence, compactness and non-compactness for the fractional Yamabe problem** (31G2)
Monica Musso, Pontificia Universidad Católica de Chile, Chile

ANA3-8 **An ADER-type scheme for a class of equations arising from the water-wave theory** (32G2)
Gino Montecinos, Centro de Modelamiento Matemático, Chile

ANA4-2 **On the Choice of the Tikhonov Regularization Parameter and the Discretization Level: A Discrepancy-Based Strategy** (34G2)
Adriano De Cezaro, Universidade Federal do Rio Grande, Brazil

ANA5-8 **Stationary states of reaction-diffusion and Schrodinger systems with inhomogeneous or controlled diffusion** (35G2)
Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

ANA6-2 **On a multiplicative representation of the orthogonal matrix polynomials via Dyukarev-Stieltjes matrix parameters** (36G2)
Abdón Choque, Universidad Michoacana de San Nicolás de Hidalgo, México

ANA7-8 **Transference results from the L^p continuity of operators in the Jacobi case to the L^p continuity of operators in the Hermite and Laguerre case** (37G2)
Wilfredo Urbina, Roosevelt University, USA

ANA9-6 **On the Quadratic Eigenvalue Complementarity Problem** (38G2)
Alfredo Iusem, Instituto Nacional de Matemática Pura e Aplicada IMPA, Brazil.

DINSIS2-2 **Index theory and global pseudo-differential calculus on Lie groups** (31G1)
Alexander Cardona, Universidad de los Andes, Colombia

GEOM2-7 **Higher spins and topological strings** (33G1)
Per Sundell, Universidad Andrés Bello, Chile

GEOM4-3 **Quantum j-Invariant in Positive Characteristic and Hilbert's 12th Problem** (34G1)
Timothy Gendron, Universidad Nacional Autónoma de México, México

GEOM6-8 **An explicit integration of Lie algebroids** (35G1)
María Amelia Salazar, Instituto de Matematica Pura e Aplicada, Brazil

17:15 - 17:45 Coffee Break

17:45 - 18:45 **Dynamics in the study of discrete subgroups of Lie groups** (Coliseo)
Rafael Potrie, Universidad de la República, Uruguay

Recent results on the proper dimension of certain groups (Auditorio)
Conchita Martínez, Universidad de Zaragoza, Spain

18:45 - 19:00 Coffee Break

19:00 - 22:00 **Noche Barranquillera** (Café DuNord)

4.5 Friday

8:00 - 9:30 **Topological quantum field theories in homotopy theory** (Coliseo)
Ulrike Tillmann, Oxford University, United Kingdom

The fine structure of the Lagrange and Markov spectra (Auditorio)
Carlos Matheus Silva Santos, Instituto de Matemática Pura e Aplicada IMPA, Brazil

9:30 - 10:00 Coffee Break

10:00 - 11:00 **Journey to the Center of the Earth** (Coliseo)
Gunther Uhlmann, University of Washington, USA

11:00 - 11:15 Coffee Break

11:15 - 11:55 ALG4-3 **On Hopf Algebras over quantum subgroups** (31C)
Gastón García, Universidad Nacional de la Plata, Argentina

ALG5-9 **Two-point AG Codes on the GK Maximal Curves** (32C)
Alonso Sepúlveda Castellanos, Universidade Federal de Uberlándia, Brazil

ALG6-6 **On twists of smooth plane curves** (33C)
Elisa Lorenzo, Leiden University, Holland

LOG1-6 **A proof-theoretical approach to satisfiability solving** (37C)
Stéphane Graham-Lengrand, Centre National de la Recherche Scientifique, France

ANA2-6 **Some stabilization problem with time-varying feedback law** (32G2)
Ivonne Rivas, Universidad del Valle, Colombia

ANA3-9 **Well-posedness and computation of travelling wave solutions of a regularized Benjamin-Ono system** (33G2)
Juan Carlos Muñoz, Universidad del Valle, Colombia

ANA6-4 **Convergent interpolatory quadrature schemes** (34G2)
Ulises Fidalgo, University of Mississippi, USA

ANA8-5 **Kink dynamics in the ϕ^4 model: asymptotic stability in the odd space** (35G2)
Michal Kowalczyk, Universidad de Chile, Chile

DINSIS2-4 **On the global bifurcation diagram of the Gray-Scott model of reaction diffusion** (36G2)
Joaquín Delgado Fernández, Universidad Autónoma Metropolitana, México

GEOM2-1 **Quantization of Systems Reduced by Commuting Hamiltonian Flows, a Decomposable Weyl Calculus and Commutation of Quantization and Reduction** (34C)
Fabián Belmonte, Universidad Católica del Norte, Chile

GEOM3-6 **Discrete dynamics and stacks** (35C)
Matías del Hoyo, Instituto de Matemática Pura e Aplicada, Brazil

GEOM4-10 **Non-Archimedean Reaction-Ultradiffusion Equations and Complex Hierarchic Systems** (36C)
Wilson A. Zúñiga-Galindo, Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional, México

12:05 - 12:45 ALG4-5 **Quantum subgroups of simple twisted quantum groups at roots of one** (31C)
Javier Gutiérrez, Universidad Nacional de Córdoba, Argentina

ALG5-10 **Duality for group codes** (32C)
Wolfgang Willems, Universität Magdeburg, Germany

ALG6-7 **p-adic uniformization of Shimura curves through Mumford curves** (33C)
Piermarco Milione, Universitat de Barcelona, Spain

ANA2-5 **Stabilization of a Boussinesq system with generalized damping** (32G2)
Ademir Pazoto, Universidade Federal do Rio de Janeiro, Brazil

ANA3-10 **A survey of recent results on the characterization of decay of solutions to dissipative equations** (33G2)
Cesar J. Niche, Universidade Federal do Rio de Janeiro, Brazil

ANA6-5 **On Linearly Related Sequences of Difference Derivatives of Discrete Orthogonal Polynomials** (34G2)
Natalia Pinzón Cortés, Universidad Nacional de Colombia, Colombia

ANA8-6 **The scattering problem for unstable solitons: collision, decay and blow-up for critical inhomogeneous NLS equations** (35G2)
Claudio Muñoz, Universidad de Chile, Chile

DINSIS2-3 **The surprising behavior of the Ricci flow in a cylinder** (36G2)
Jean Carlos Cortissoz, Universidad de los Andes, Colombia

GEOM2-2 **Deformations of Calabi–Yau varieties and their moduli of vector bundles** (34C)
Elizabeth Gasparim, Universidad Católica del Norte, Chile

GEOM3-12 **The Whitehead Group of the Hilbert Modular group** (35C)
Luis Jorge Sánchez Saldaña, Centro de Ciencias Matemáticas UNAM, Morelia, México

GEOM4-8 **Ultrametric diffusion, exponential landscapes, and the first passage time problem** (36C)
Anselmo Torresblanca, Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional, México

LOG1-5 **Classical realizability and implicit computational complexity** (37C)
Jonas Frey, University of Copenhagen, Denmark

12:45 - 14:30 Lunch

14:30 - 15:30 **UMALCA Prize Winner Plenary Talk** (Coliseo)

15:30 - 15:45 Coffee Break

15:45 - 16:25 ALG4-8 **The five-term exact sequence for Kac cohomology** (31C)
Yiby Morales, Universidad de Los Andes, Colombia

ALG6-1 **Bad reduction of Hilbert modular varieties** (32C)
Francesca Bergamaschi, Concordia University, Canada

LOG1-7 **Implicative algebras for generalizing forcing** (33C)
Alexandre Miquel, Universidad de la República, Uruguay

ANA3-11 **Solitons for a Higher order KP model - On the existence of solitons for a generalized KP equation of higher order** (33G2)
José Raul Quintero, Universidad del Valle, Colombia

ANA6-3 **Branching formulas for symmetric hypergeometric polynomials in several variables** (34G2)
Erdal Emsiz, Pontificia Universidad Católica de Chile, Chile

ANA8-7 **Construction of a minimal mass blow up solution of the modified Benjamin-Ono equation** (35G2)
Didier Pilod, Universidade Federal do Rio de Janeiro, Brazil

DINSIS2-6 **3-webs with singularities: topological and differential invariants** (36G2)
Mikhail Malakhaltsev, Universidad de los Andes, Colombia

GEOM2-3 **Gaussian ensembles from an information geometric approach** (34C)
Ignacio Sebastián Gómez, Universidad Nacional de la Plata, Argentina

GEOM3-2 **Evasiveness of graph properties and graphs on 2p vertices** (35C)
Jerson Borja, Universidad de los Andes, Bogotá, Colombia

GEOM4-2 **Heat Traces and Spectral Zeta Functions for p-adic Laplacians** (36C)
Leonardo Chacón Cortés, Pontificia Universidad Javeriana, Colombia

16:35 - 17:15 ALG6-5 **Equidistribution of shapes of cubic fields of fixed quadratic resolvent** (32C)
Robert Harron, University of Hawai'i, USA

LOG1-3 **Ordered Combinatory Algebras and Realizability** (33C)
Walter Ferrer Santos, Universidad de la República, Uruguay

ANA2-8 **Optimal Control of 1D Non linear Schrödinger equation** (32G2)
Constanza Sánchez de la Vega, Universidad de Buenos Aires, Argentina

ANA3-7 **Control of underwater vehicles in inviscid fluids** (32G2)
Rodrigo Lecaros, Centro de Modelamiento Matemático, Chile

ANA8-8 **Dispersive equations involving the fractional laplacian** (35G2)
Yannick Sire, John Hopkins University, USA

DINSIS2-9 **Essential singularities of complex analytic vector fields** (36G2)
Jesús Muciño Raymundo, Centro de Ciencias Matemáticas UNAM, México

GEOM2-4 **Brane involutions and irreducible holomorphic symplectic manifolds** (34C)
Marcos Jardim, Universidade Estadual de Campinas, Brazil

GEOM3-1 **The fundamental group of a two-dimensional complex with the fixed point property** (35C)
Jonathan Barmak, Universidad de Buenos Aires, Argentina

GEOM4-7 **Ecuaciones de tipo parabólico sobre bolas p-ádicas** (36C)
John Jaime Rodriguez Vega, Universidad Nacional de Colombia, Colombia

17:15 - 17:45 Coffee Break

17:45 - 18:45 **Morse index and multiplicity of min-max minimal hypersurfaces** (Coliseo)
Fernardo Codá Marques, Princeton University, USA

5

Programme

5.1 Plenary talks

PT1 Fernando Codá Marques, Princeton University, USA
Morse index and multiplicity of min-max minimal hypersurfaces

PT2 Ruy Exel, Universidade Federal de Santa Catarina, Brazil
Partial actions and the Banach-Tarski paradox

PT3 Pablo Augusto Ferrari, Universidad de Buenos Aires, Argentina
Fan of characteristics and TASEP hydrodynamics

PT4 Mikhail Lyubich, Stony Brook University, USA
Renormalization and Area of Julia sets

PT5 María Ronco, Universidad de Talca, Chile
Algebraic operads and combinatorial Hopf algebras

PT6 Gunther Uhlmann, University of Washington, USA
Journey to the Center of the Earth

	Mo.	Tu.	We.	Th.	Fr.
10:00 - 11:00		Ferrari (Coliseo)	Exel (Coliseo)	Ronco (Coliseo)	Uhlmann (Coliseo)
11:55 - 12:45	Lyubich (Coliseo)				
17:45 - 18:45					Codá (Coliseo)

5.2 Invited Talks

IT1 Federico Ardila, San Francisco State University, USA
Moving robots efficiently using the combinatorics of CAT(0) cubical complexes

IT2 Mikhail Belolipetsky, Instituto de Matemática Pura e Aplicada IMPA, Brazil
Arithmetic hyperbolic reflection groups

IT3 Maria Emilia Caballero, Universidad Nacional Autónoma de México UNAM, México
Stable Lévy processes, Lamperti's representations and generalizations

IT4 Conchita Martínez, Universidad de Zaragoza, Spain
Recent results on the proper dimension of certain groups

IT5 Ursula Molter, Universidad de Buenos Aires, Argentina
The Amalgan Balian Low Theorem and time-frequency shift invariance

IT6 Andrés Navas, Universidad de Santiago de Chile, Chile
On the large-scale geometry of tilings

IT7 Rafael Potrie, Universidad de la República, Uruguay
Dynamics in the study of discrete subgroups of Lie groups

IT8 Noemi Wolanski, Universidad de Buenos Aires, Argentina
Asymptotic behavior of solutions to a nonlocal dffusion equation on manifolds

	Mo.	Tu.	We.	Th.	Fr.
14:30 - 15:30	Ardila (Coliseo)				
	Caballero (Auditorio)				
17:45 - 18:45		Wolansky (Coliseo)	Molter (Coliseo)	Potrie (Coliseo)	
		Navas (Auditorio)	Belolipetsky (Auditorio)	Martinez (Auditorio)	

5.3 Courses

C1 Diego Córdoba, Instituto de Ciencias Matemáticas, Spain
Active scalars with singular incompressible velocities

C2 Carlos Matheus Silva Santos, Instituto de Matematica Pura e Aplicada IMPA, Brazil
The fine structure of the Lagrange and Markov spectra

C3 Ulrike Tillmann, Oxford University, United Kingdom
Topological quantum field theories in homotopy theory

C4 Alberto Verjovsky, Universidad Nacional Autónoma de México UNAM, México
Intersección de cuádricas en $\mathbb{C}^n$, variedades ángulo-momento, variedades complejas y tóricas y politopos convexos

	Mo.	Tu.	We.	Th.	Fr.
8:00 - 9:30		Verjovsky (Coliseo)	Tillmann (Coliseo)	Verjovsky (Coliseo)	Tillmann (Coliseo)
		Córdoba (Auditorio)	Matheus (Auditorio)	Córdoba (Auditorio)	Matheus (Auditorio)

5.4 Thematic Sessions

5.4.1 ALG1 - COMPUTATIONAL DIFFERENTIAL AND DIFFERENCE ALGEBRA

ORGANIZERS

Primitivo Acosta-Humánez, Intelectual.co, Colombia
Sonia L. Rueda, Universidad Politécnica de Madrid, Spain

SPEAKERS / TITLES

ALG1-1 Carlos E. Arreche, North Carolina State University, USA
Projectively integrable linear difference equations and their Galois groups

ALG1-2 David Blázquez-Sanz, Universidad Nacional de Colombia, Colombia
Joint and differential invariants of Lie group actions

ALG1-3 Thierry Combot, Université de Bourgogne, France
Computing differential Galois group of difference equations, applications to discrete systems

ALG1-4 Juan J. Morales-Ruiz, Universidad Politécnica de Madrid, Spain
Differential Galois Theory and Darboux Transformations for Integrable Systems

ALG1-5 Daniel Robertz, Plymouth University, United Kingdom
Thomas Decomposition and Nonlinear Control Systems

ALG1-6 Camilo Sanabria, Universidad de los Andes, Colombia
LODEs with algebraic solutions

ALG1-7 Teresa Stuchi, Universidad Federal de Rio de Janeiro, Brazil
Non-Integrability of AGK Quartic Hamiltonian through Morales-Ramis Theory

ALG1-8 Jacques-Arthur Weil, Université de Limoges, France
Darboux Transformations for Tensor Products

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Robertz (31C)	Weil (22C)		
12:05 - 12:45		Stuchi (31C)	Blásquez-Sanz (22C)		
15:45 - 16:25	Morales-Ruiz (32C)	Arreche (32C)			
16:35 - 17:15	Combot (32C)	Sanabria (32C)			

5.4.2 ALG2 - ALGEBRAIC GEOMETRY AND ARITHMETIC GEOMETRY

ORGANIZERS
Yamidt Bermudez, Colombia
Pedro Hernandez Rizzo, Universidad de Antioquia, Colombia
Cecilia Salgado, Universidade Federal de Rio de Janeiro, Brazil
Giancarlo Urzúa, Universidad Católica de Chile, Chile

SPEAKERS / TITLES

ALG2-1 Alicia Dickenstein, Universidad de Buenos Aires, Argentina
Arithmetics and combinatorics of tropical Severi varieties of univariate polynomials

ALG2-2 Javier Elizondo, Universidad Autonoma de México, México
Some aspects of the Euler-Chow series and how it is related with Cox rings

ALG2-3 José Luis González, Yale University, USA
¿Soñó Mori con el espacio de curvas racionales marcadas?

ALG2-4 Edwin Leon Cardenal, Centro de Investigación en Matemáticas, México
Local Zeta Functions at Infinity

ALG2-5 Álvaro Liendo, Universidad de Talca, Chile
Additive group actions on algebraic varieties

ALG2-6 Sukhendu Mehrotra, Universidad Catolica de Chile, Chile
Derived symmetries of moduli spaces of sheaves on K3 surfaces

ALG2-7 Cecilia Salgado, Universidade Federal de Rio de Janeiro, Brazil
Classification of elliptic fibrations on certain K3 surfaces

ALG2-8 Giancarlo Urzua, Universidad Católica de Chile, Chile
How to identify Milnor fibers of smoothings of quotient sigularities

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Elizondo (32C)		Mehrotra (35C)	
12:05 - 12:45		Urzua (32C)		González (35C)	
15:45 - 16:25	Dickenstein (33C)			Liendo (32C)	
16:35 - 17:15	León (33C)			Salgado (32C)	

5.4.3 ALG3 - HIGGS BUNDLES, INSTANTONS AND REAL CHARACTER VARIETIES

ORGANIZERS

Florent Schaffhauser, Universidad de los Andes, Colombia
Laura Schaposnik, University of Illinois at Chicago, USA

SPEAKERS / TITLES

ALG3-1 Steve Bradlow, University of Illinois at Urbana-Champaign, Chicago, USA
Higgs bundles, spectral data, and fiber products of curves

ALG3-2 Pedram Hekmati, Instituto de Matemática Pura e Aplicada IMPA, Brazil
Moduli Spaces of Contact Instantons

ALG3-3 Marcos Jardim, Universidade Estadual de Campinas, Brazil
Branes in the moduli space of framed sheaves

ALG3-4 Andrés Larraín-Hubach, University of Arizona, USA
Self-dual connections on Taub-NUT space

ALG3-5 Alessia Mandini, Pontificia Universidade Católica do Rio de Janeiro, Brazil
Hyperpolygons and Parabolic Higgs bundles

ALG3-6 Roberto Rubio, Instituto de Matemática Pura e Aplicada IMPA, Brazil
The Toledo invariant and the Cayley correspondence for Higgs bundles

ALG3-7 Ronald Zúñiga Rojas, Universidad de Costa Rica, Costa Rica
Stratifications on the Moduli Space of Higgs Bundles

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Larraín (24C)	Rubio (36C)	
12:05 - 12:45			Zúñiga (24C)	Manidini (36C)	
15:45 - 16:25		Jardim (33C)		Bradlow (33C)	
16:35 - 17:15		Hekmati (33C)			

5.4.4 ALG4 - ALGEBRAIC COMBINATORICS, HOPF ALGEBRAS AND TENSOR CATEGORIES

ORGANIZERS

Carolina Benedetti, Fields Institute, Canadá
Bojana Femic, Universidad de la República, Uruguay

Walter Ferrer, Universidad de la República, Uruguay
Rafael Gonzalez, University of Kentucky, USA

SPEAKERS / TITLES

ALG4-1 Federico Ardila, San Francisco State University, USA
Polytopes with algebraic and combinatorial structure

ALG4-2 Carolina Benedetti, Fields Institute-York University, Canada
On Hopf Algebras over quantum subgroups

ALG4-3 Gastón García, Universidad Nacional de la Plata, Argentina
Pointed and copointed Hopf algebras over dihedral groups

ALG4-4 Rafael González, University of Kentucky, USA
The colored symmetric and exterior algebras

ALG4-5 Javier Gutiérrez, Universidad Nacional de Córdoba, Argentina
Quantum subgroups of simple twisted quantum groups at roots of one

ALG4-6 Miguel Mendez, Instituto Venezolano de Investigación Científica, Venezuela
The natural Hopf algebra associated of a set operad

ALG4-7 Martín Mombelli, Universidad Nacional de Córdoba, Argentina
Group actions on 2-categories

ALG4-8 Yiby Morales, Universidad de Los Andes, Colombia
The five-term exact sequence for Kac cohomology

ALG4-9 Rosa Orellana, Darmouth College, USA
Symmetric group characters as symmetric functions

ALG4-10 María Ronco, Universidad de Talca, Chile
B_∞-algebras and separable permutations

ALG4-11 Martha Yip, University of Kentucky, USA
A categorification of the chromatic symmetric function

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Orellana (25C)	Mendez (37C)	García (31C)
12:05 - 12:45			Yip (25C)	González (37C)	Gutiérrez (31C)
15:45 - 16:25		Ardila (35C)		Ronco (34C)	Morales (31C)
16:35 - 17:15		Benedetti (35C)		Mombelli (34C)	

5.4.5 ALG5 - CODING THEORY AND RELATED TOPICS

ORGANIZERS
Javier de la Cruz, Universidad del Norte, Colombia
Edgar Martinez-Moro, Universidad de Valladolid, Spain

SPEAKERS / TITLES

ALG5-1 Erik Backelin, Universidad de los Andes, Colombia
Higher Auslander Reiten theory and tilting modules

ALG5-2 Diana Bueno-Carreño, Pontificia Universidad Javeriana Cali, Colombia
Strong minimum distance of abelian codes

ALG5-3 Mehdi Garrousian, Universidad de los Andes, Colombia
Generalized star configurations and Hamming weights

ALG5-4 Hiram López, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México
Evaluation codes

ALG5-5 Edgar Martinez-Moro, Universidad de Valladolid, Spain
TBA

ALG5-6 Wilson Olaya, Universidad Industrial de Santander, Colombia
The weight hierarchy of Castle codes

ALG5-7 Ricardo Podestá, Universidad de Córdoba, Argentina
Asymptotically good quasi-transitive AG-codes over prime fields

ALG5-8 Jaiberth Porras Barrera, Universidad Nacional de Colombia, Colombia
Efficient ZHFE Key Generation

ALG5-9 Alonso Sepúlveda Castellanos, Universidade Federal de Uberlándia, Brazil
Two-point AG Codes on the GK Maximal Curves

ALG5-10 Wolfgang Willems, Universität Magdeburg, Alemania
Duality for group codes

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Bueno-Carreño (33C)		López (38C)	Sepúlveda (32C)
12:05 - 12:45		Garrousian (33C)		Martínez-Moro (38C)	Willems (32C)
15:45 - 16:25	Porras (35C)			Olaya (35C)	
16:35 - 17:15	Backelin (35C)			Podestá (35C)	

5.4.6 ALG6 - ALGEBRAIC NUMBER THEORY AND RELATED TOPICS

ORGANIZERS

Elisa Lorenzo, Leiden University, Holland
Guillermo Mantilla, Universidad de los Andes, Colombia

SPEAKERS / TITLES

ALG6-1 Francesca Bergamaschi, Concordia University, Canada
Bad reduction of Hilbert modular varieties

ALG6-2 Victoria Cantoral Farfán, Institut de Mathématiques de Jussieu, France
Torsion for abelian varieties of type III

ALG6-3 Chantal David, Concordial University, Canada
One-parameter families of elliptic curves with non-zero average root number

ALG6-4 Piper Harron, The liberated mathematician, USA
The Equidistribution of Lattice Shapes of Rings of Integers in Cubic, Quartic, and Quintic Number Fields

ALG6-5 Robert Harron, University of Hawai'i, USA
Equidistribution of shapes of cubic fields of fixed quadratic resolvent

ALG6-6 Elisa Lorenzo, Leiden University, Holland
On twists of smooth plane curves

ALG6-7 Piermarco Milione, Universitat de Barcelona, Spain
p-adic uniformization of Shimura curves through Mumford curves

ALG6-8 Marta Narváez-Clauss, Universitat Barcelona, Spain
Quantitative equidistribution of Galois orbits of points of small heght on the algebraic torus

ALG6-9 Frank Thorne, University of South Carolina, USA
Levels of distribution in arithmetic statistics

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Cantoral (26C)		Lorenzo (33C)
12:05 - 12:45		Thorne (34C)	David (26C)		Milione (33C)
15:45 - 16:25		Harron P. (37C)			Bergamaschi (32C)
16:35 - 17:15		Narváez-Claus (37C)			Harron R. (32C)

5.4.7 ANA1 - ADVANCES IN NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS - ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS

ORGANIZERS

Monica Musso, Pontificia Universidad Católica de Chile, Chile
Juliana Pimentel, Universidade de Sao Paulo, Brazil
Alexander Quaas, Universidad Técnica Federico Santa María, Chile
Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

SPEAKERS / TITLES

ANA1-1 Julian Bónder, Universidad de Buenos Aires, Argentina
Tartar's method in nonlocal homogenization

ANA1-2 Juan Dávila, Universidad de Chile, Chile
Hölder estimates for solutions of a MEMS equation

ANA1-3 Jorge Faya, Universidad de Chile, Chile
Concentrating solutions for a Hénon-type problem on general domains

ANA1-4 Monica Musso, Universidad Técnica Federico Santa María, Chile
Existence, compactness and non-compactness for the fractional Yamabe problem

ANA1-5 Alexander Quaas, Universidad Técnica Federico Santa María, Chile
Continuous viscosity solutions for nonlocal Dirichlet problems with coercive gradient terms

ANA1-6 Olivaine Queiroz, Universidade Estadual de Campinas, Brazil
On the behavior of a singular positive solution to a nonlocal elliptic equation

ANA1-7 Mariel Saez, Pontificia Universidad Católica de Chile, Chile
Fractional Laplacians and extension problems: the higher rank case

ANA1-8 Dora Salazar, Universidad de Chile, Chile
Multi-clustered solutions for a forced pendulum equation

ANA1-9 Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil
A priori bounds for elliptic inequalities via regularity estimates

ANA1-10 Yannick Sire, John Hopkins University, USA
On a fractional version of a conjecture by De Giorgi

ANA1-11 Erwin Topp, Universidad de Chile, Chile
Lipschitz regularity for elliptic integro-differential problems and application to homogeneization

ANA1-12 Miguel Yangari, Escuela Politécnica, Ecuador
Exponential propagation for fractional reaction-diffusion cooperative systems with fast decaying initial conditions

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Dávila (31G1)	Sire (33G2)	Quaas (34G1)	
12:05 - 12:45		Queiroz (31G1)	Sirakov (33G2)	Topp (34G1)	
15:45 - 16:25	Sáez (21G1)	Faya (31G2)		Bonder (31G2)	
16:35 - 17:15	Yangari (21G1)	Salazar (31G2)		Musso (31G2)	

5.4.8 ANA2 - CONTROL AND STABILIZATION OF PARTIAL DIFFERENTIAL EQUATIONS

ORGANIZERS

Luz de Teresa de Oteyza, Instituto de Matemáticas UNAM, México
Alberto Mercado Saucedo, Universidad Técnica Federico Santa María, Chile

SPEAKERS / TITLES

ANA2-1 Fágner Araruna, Universidade Federal da Paraíba, Brazil
Controllability and stability to some beams and plates systems

ANA2-2 Nicolás Carreño, Universidad Técnica Federico Santa María, Chile
Stackelberg-Nash exact controllabillity for the Kuramoto-Sivashinsky equation

ANA2-3 Eduardo Cerpa, Universidad Técnica Federico Santa María, Chile
On the control of the improved Boussinesq equation

ANA2-4 Abdón Choque, Universidad Michoacana de San Nicolás de Hidalgo, México
On a set of bounded solutions of the null approximate control wave equation problem

ANA2-5 Ademir Pazoto, Universidade Federal do Rio de Janeiro, Brazil
Stabilization of a Boussinesq system with generalized damping

ANA2-6 Ivonne Rivas, Universidad del Valle, Colombia
Some stabilization problem with time-varying feedback law

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Cerpa (32G1)			Rivas (32G2)
12:05 - 12:45		Choque (32G1)			Pazoto (32G2)
15:45 - 16:25	Araruna (24G1)				
16:35 - 17:15	Carreño (24G1)				

5.4.9 ANA3 - FLUID DYNAMICS, NON LINEAR AND DISPERSIVE PDES - FREE BOUNDARY VALUE PROBLEMS AND HYPERBOLIC GEOMETRY

ORGANIZERS
Daniel Alfaro, Universidade Federal de Rio de Janeiro, Brazil
Juan Carlos Muñoz, Universidade del Valle, Colombia
Rafael Orive Illera, Universidad Autónoma de Madrid, Spain
Jaime Ortega, Centro de Modelamiento Matemático, Chile

SPEAKERS / TITLES

ANA3-1 Daniel Alfaro, Universidade Federal do Rio de Janeiro, Brazil
Convergencia de un método espectral totalmente discreto para algunos sistemas de tipo Boussinesq

ANA3-2 Ángel Castro, Instituto de Ciencias Matemáticas, Spain
Mixing solutions for the Muskat problem

ANA3-3 Francisco Gancedo, Universidad de Sevilla, Spain
Recents results for SQG sharp front and the Muskat problem

ANA3-4 Javier Gomez Serrrano, Princeton University, USA
Global smooth solutions for the inviscid SQG equations

ANA3-5 Mamadou Gueye, Universidad Técnica Federico Santa, Chile
Singular optimal control / a 1-D Parabolic-Hyperbolic Degenerate example

ANA3-6 Camille Laurent, Université Pierre et Marie Curie, France
Quantitative unique continuation, intensity of waves in the shadow of obstacle and approximate control

ANA3-7 Rodrigo Lecaros, Centro de Modelamiento Matemático, Chile
Control of underwater vehicles in inviscid fluids

ANA3-8 Gino Montecinos, Centro de Modelamiento Matemático, Chile
An ADER-type scheme for a class of equations arising from the water-wave theory

ANA3-9 Juan Carlos Muñoz, Universidad del Valle, Colombia
Well-posedness and computation of travelling wave solutions of a regularized Benjamin-Ono system

ANA3-10 Cesar J. Niche, Universidade Federal do Rio de Janeiro, Brazil
A survey of recent results on the characterization of decay of solutions to dissipative equations

ANA3-11 José Raul Quintero, Universidad del Valle, Colombia
Solitons for a Higher order KP model - On the existence of solitons for a generalized KP equation of higher order

ANA3-12 Ivonne Ricas, Universidad del Valle, Colombia
Lower Regularity Solutions of a Class of Non-homogeneous Boundary Value Problems of the Korteweg-de Vries Equation on a Finite Domain

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Gancedo (35G1)		Gueye (35G1)	Muñoz (33G2)
12:05 - 12:45		Gómez (35G1)		Castro (35G1)	Niche (33G2)
15:45 - 16:25	Alfaro (25G1)			Rivas (33G2)	Quintero (33G2)
16:35 - 17:15	Laurent (25G1)			Montecinos (32G2)	Lecaros (33G2)

5.4.10 ANA4 - INVERSE PROBLEMS: THEORY, METHODS AND APPLICATIONS

ORGANIZERS

Adriano De Cezaro, Universidade Federal do Rio Grande, Brazil
Doris Hinestroza, Universida del Valle, Colombia
Luis Eduardo Olivar, Universidad del Tolima, Colombia

SPEAKERS / TITLES

ANA4-1 Juan Pablo Agnelli, Universidad de Córdoba, Argentina
On the identification of piecewise constant coefficients in optical diffusion tomography by level set

ANA4-2 Adriano De Cezaro, Universidade Federal do Rio Grande, Brazil
On the Choice of the Tikhonov Regularization Parameter and the Discretization Level: A Discrepancy-Based Strategy

ANA4-3 Doris Hinestroza, Universida del Valle, Colombia
Stabilization of lower order derivatives using higher order derivatives

ANA4-4 Alejandro Marañon, Universidad de los Andes, Colombia
Retos y Perspectivas de los Problemas Inversos en la Caracterización Dinámica de Materiales

ANA4-5 Carlos Mejía Salazar, Universidad Nacional de Colombia, Colombia
Fractional derivatives, inverse problems and discrete mollification

ANA4-6 Alberto Mercado, Universidad Federico Santa María, Chile
Inverse problems for dispersive equations

ANA4-7 Claudio Muñoz, Universidad de Chile, Chile
On the Calderón's problem for quasilinear conductivities

ANA4-8 Luis Eduardo Olivar, Universidad del Tolima, Colombia
Identification of a coefficient in a two-dimensional nonlinear inverse problem through regularization and Lagrangian methods

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Agnelli (34G2)	Olivar (32G2)	
12:05 - 12:45			Hinestroza (34G2)	Mercado (32G2)	
15:45 - 16:25		Mejía (32G2)		Marañon (34G2)	
16:35 - 17:15		Muñoz (32G2)		De Cezaro (34G2)	

5.4.11 ANA5 - HAMILTON-JACOBI EQUATIONS: REGULARITY THEORY AND APPLICATIONS TO LIFE AND SOCIAL SCIENCES

ORGANIZERS

Pablo Padilla, Universidad Nacional Autónoma de México, México
Edgard Pimentel, Universidade Federal de São Carlos, Brazil
Hector Sanchez, Universidad Nacional Autónoma de México, México

SPEAKERS / TITLES

ANA5-1 Eduardo Espinosa, Universidad Nacional Autónoma de México, México
Discrete and continuous games reviewed from the perspective of dynamic programming

ANA5-2 Tao Li, Shanghai University, China
Continuous-Time Distributed Consensus Algorithms with Random Noises

ANA5-3 Haili Liang, Shanghai University, China
Stochastic Stability of Snowdrift Based Evolutionary Dynamics

ANA5-4 Pablo Padilla, Universidad Nacional Autónoma de México, México
From Voronoi patterns to Hamilton-Jacobi equations

ANA5-5 Juliana Pimentel, Universidade Federal do ABC, Brazil
Estimates for a class of slowly non-dissipative reaction-diffusion equations

ANA5-6 Héctor Sánchez-Morado, Universidad Nacional Autónoma de México, México
Mean-field games with mild singularities

ANA5-7 Olivâine Santana de Queiroz, Universidade Estadual de Campinas, Brazil
TBA

ANA5-8 Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil
Stationary states of reaction-diffusion and Schrodinger systems with inhomogeneous or controlled diffusion

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Liang (35G2)	Pimentel (33G2)	
12:05 - 12:45			Padilla (35G2)	Sánchez-Morgado (33G2)	
15:45 - 16:25		Espinosa (32G2)		Santana (35G2)	
16:35 - 17:15		Li (32G2)		Sirakov (35G2)	

5.4.12 ANA6 - SPECIAL FUNCTIONS, ORTHOGONAL POLYNOMIALS AND APPROXIMATION THEORY

ORGANIZERS

Manuel Dominguez de la Iglesia, Instituto de Matemáticas UNAM, México
Herbert Alonso Dueñas, Universidad Nacional de Colombia, Colombia
Luis Enrique Garza, Universidad de Colima, México

SPEAKERS / TITLES

ANA6-1 Cleonice Fátima Bracciali, Universidade Estadual Paulista, Brazil
Para-orthogonal polynomials on the unit circle associated with periodic Verblunsky coefficients

ANA6-2 Abdón Choque, Universidad Michoacana de San Nicolás de Hidalgo, México
On a multiplicative representation of the orthogonal matrix polynomials via Dyukarev-Stieltjes matrix parameters

ANA6-3 Erdal Emsiz, Pontificia Universidad Católica de Chile, Chile
Branching formulas for symmetric hypergeometric polynomials in several variables

ANA6-4 Ulises Fidalgo, University of Mississippi, USA
Convergent interpolatory quadrature schemes

ANA6-5 Natalia Pinzón Cortés, Universidad Nacional de Colombia, Colombia
On Linearly Related Sequences of Difference Derivatives of Discrete Orthogonal Polynomials

ANA6-6 Pablo Román, Universidad Nacional de Córdoba, Argentina
New families of matrix-valued orthogonal polynomials related to Gelfand pairs of rank one

ANA6-7 Sri Ranga, Universidade Estadual Paulista, Brazil
Two families of orthogonal polynomials on the unit circle from basic hypergeometric functions

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55				Ranga (34G2)	Fidalgo (34G2)
12:05 - 12:45				Bracciali (34G2)	Pinzón (34G2)
15:45 - 16:25				Román (36G2)	Emsiz (34G2)
16:35 - 17:15				Choque (36G2)	

5.4.13 ANA7 - HARMONIC ANALYSIS AND GEOMETRIC MEASURE THEORY WITH APPLICATIONS

ORGANIZERS

Carlos Cabrelli, Universidad de Buenos Aires e IMAS-CONICET, Argentina
Emanuel Carneiro, Instituto de Matemática Pura e Aplicada IMPA, Brazil
Ursula Molter, Universidad de Buenos Aires e IMAS-CONICET, Argentina

SPEAKERS / TITLES

ANA7-1 Bruno Bongioanni, Universidad Nacional del Litoral e IMAL-CONICET, Argentina
BMO, weights and the Schrödinger operator

ANA7-2 Marilina Carena, Universidad Nacional del Litoral e IMAL-CONICET, Argentina
Muckenhoupt weights with singularities on lower dimensional sets

ANA7-3 Felipe Gonçalvez, Instituto de Matemática Pura e Aplicada IMPA, Brazil
Band-Limited Approximations and Interpolation Formulas

ANA7-4 Jean Moraes, Universidade Federal do Rio Grande do Sul, Brazil
L^2 estimates for t-Haar Multipliers on spaces of homogeneous type

ANA7-5 Victoria Paternostro, Universidad de Buenos Aires e IMAS-CONICET, Argentina
Structure and frame properties of noncommutative shift-invariant spaces

ANA7-6 Ezequiel Rela, Universidad de Buenos Aires e IMAS-CONICET, Argentina
Sharp weighted estimates and further improvements via Reverse Hölder Inequalities

ANA7-7 Pablo Schmerkin, Universidad Torcuato Di Tella y CONICET, Argentina
Distance sets, box-counting and Ahlfors-regular sets

ANA7-8 Wilfredo Urbina, Roosevelt University, USA
Transference results from the L^p continuity of operators in the Jacobi case to the L^p continuity of operators in the Hermite and Laguerre case

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Bongioanni (32G2)		Carena (35G2)	
12:05 - 12:45		Paternostro (32G2)		Shmerkin (35G2)	
15:45 - 16:25	Rela (31G1)			Gonçalvez (37G2)	
16:35 - 17:15	Moraes (31G1)			Urbina (37G2)	

5.4.14 ANA8 - NONLINEAR DISPERSIVE EQUATIONS

ORGANIZERS

Jaime Angulo, Universidad de Sao Paulo, Brazil
Germán Fonseca, Universidad Nacional de Colombia, Colombia
Pedro Isaza, Universidad Nacional de Colombia, Colombia
Felipe Linares, Instituto Nacional de Matemática Pura e Aplicada IMPA, Brazil
Claudio Muñoz, Universidad de Chile, Chile

SPEAKERS / TITLES

ANA8-1 Jaime Angulo, Universidade de Sao Paulo, Brazil
Stability of peak solutions for NLS equations on a star graph

ANA8-2 Eddy Bustamante, Universidad Nacional de Colombia, Colombia
On the decay and support of the Zakharov-Kuznetsov equation and the well-posedness of the initial value problem associated to it

ANA8-3 Luca Fanelli, Università di Roma, Italy
Fractional Schrodinger operators in external fields: improved dispersion, local smoothing and weighted Strichartz estimates

ANA8-4 José Manuel Jiménez, Universidad Nacional de Colombia, Colombia
Polynomial decay of the solutions for some nonlinear dispersive equations

ANA8-5 Michal Kowalczyk, Universidad de Chile, Chile
Kink dynamics in the ϕ^4 model: asymptotic stability in the odd space

ANA8-6 Claudio Muñoz, Universidad de Chile, Chile
The scattering problem for unstable solitons: collision, decay and blow-up for critical inhomogeneous NLS equations

ANA8-7 Didier Pilod, Universidade Federal do Rio de Janeiro, Brazil
Construction of a minimal mass blow up solution of the modified Benjamin-Ono equation

ANA8-8 Yannick Sire, John Hopkins University, USA
Dispersive equations involving the fractional laplacian

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Fanelli (36G2)		Kowalczyk (35G2)
12:05 - 12:45			Jiménez (36G2)		Muñoz (35G2)
15:45 - 16:25		Angulo (34G2)			Pilod (35G2)
16:35 - 17:15		Bustamante (34G2)			Sire (35G2)

5.4.15 ANA9 - CONTINUOUS OPTIMIZATION AND OPTIMAL CONTROL

ORGANIZERS

Aris Daniilidis, Centro de Modelamiento Matemático, Universidad de Chile, Chile
Alfredo Iusem, Instituto de Matemática Pura e Aplicada IMPA, Brazil

SPEAKERS / TITLES

ANA9-1 Orestes Bueno Tangoa, Universidad del Pacífico, Perú
On maximality of quasimonotone operators

ANA9-2 Aris Daniilidis, Centro de Modelamiento Matemático, Universidad de Chile, Chile
From self-expanded to snake-like curves

ANA9-3 Juan Carlos de los Reyes, Escuela Politécnica Nacional, Ecuador
Stationarity conditions for optimization problems with variational inequality constraints

ANA9-4 Yboon Victoria García Ramos, Universidad del Pacífico, Perú
Integration formulas without convexity

ANA9-5 Luis Mauricio Graña Drummond, Universidade Federal de Rio de Janeiro, Brazil
On the choice of special Pareto points

ANA9-6 Alfredo Iusem, Instituto de Matemática Pura e Aplicada IMPA, Brazil
On the Quadratic Eigenvalue Complementarity Problem

ANA9-7 René Meziat Vélez, Universidad del Rosario, Colombia
Exact and convex relaxations of non-convex, non-local, homogeneous, two-dimensional variational problems with low-degree, polynomial structure

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55				De los Reyes (36G2)	
12:05 - 12:45			García (37G2)	Meziat (36G2)	
15:45 - 16:25		Daniilidis (35G2)		Bueno (38G2)	
16:35 - 17:15		Graña (35G2)		Iusem (38G2)	

5.4.16 DINSIS1 - DYNAMICAL SYSTEMS AND ERGODIC THEORY

ORGANIZERS

Vilton Pinheiro, Universidade Federal da Bahía, Brazil
Carlos Vasquez, Pontificia Universidad Católica de Valparaíso, Chile

SPEAKERS / TITLES

DINSIS1-1 Pierre Berger, Université de París, France
On the Kolmogorov typicality of dynamics displaying infinitely many coexisting sinks

DINSIS1-2 Daniel Coronel, Universidad Andrés Bello, Chile
Sensitive dependence of Gibbs measures in quasi-quadratic families

DINSIS1-3 Maria Isabel Cortez, Universidad de Santiago de Chile, Chile
Topological full groups and continuous orbit equivalence

DINSIS1-4 Sylvain Crovisier, Université de París, Francia
Finiteness of measures maximizing the entropy for surface diffeomorphisms

DINSIS1-5 Carlos Gustavo Moreira, Instituto de Matemática Pura e Aplicada, Brazil
On the fractal geometry of horseshoes in arbitrary dimensions

DINSIS1-6 Alejandro Passeggi, Universidad de la República, Urugay
Rotation Theory of annular continua

DINSIS1-7 Mario Ponce, Pontificia Universidad Católica de Chile, Chile
A Law of Large Permanents and Applications to Random Graphs

DINSIS1-8 Martin Sambarino, Universidad de la República, Uruguay
Stable Ergodicity

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Cortez (23G1)	Ponce (33C)		
12:05 - 12:45		Crovisier (23G1)	Sambarino (33C)		
15:45 - 16:25	Berger (35G1)	Passeggi (36G2)			
16:35 - 17:15	Coronel (35G1)	Tamm (36G2)			

5.4.17 DINSIS2 - GEOMETRY OF DIFFERENTIAL EQUATIONS AND THEIR SINGULARITIES

ORGANIZERS

John Alexander Arredondo, Fundación Universitaria Konrad Lorenz, Colombia
Jesús Muciño Raymundo, Centro de Ciencias Matemáticas UNAM, México
Salomón Rebollo Perdomo, Universidad del Bío Bío, Chile
Jorge Sotomayor, Universidad de Sao Paulo, Brazil
Mikhail Malakhaltsev, Universidad de los Andes, Colombia
Ronaldo García, Universidade Federal de Goiás, Brazil

SPEAKERS / TITLES

DINSIS2-1 David Blázquez-Sanz, Universidad Nacional de Colombia, Colombia
Some results on parallelisms of algebraic varieties by means of differential Galois theory

DINSIS2-2 Alexander Cardona, Universidad de los Andes, Colombia
Index theory and global pseudo-differential calculus on Lie groups

DINSIS2-3 Jean Carlos Cortissoz, Universidad de los Andes, Colombia
The surprising behavior of the Ricci flow in a cylinder

DINSIS2-4 Joaquín Delgado Fernández, Universidad Autónoma Metropolitana, México
On the global bifurcation diagram of the Gray-Scott model of reaction diffusion

DINSIS2-5 Ronaldo García, Universidad Federal de Goiás, Brazil
Lines of Curvature on Quadric Hypersurfaces of R^4

DINSIS2-6 Mikhail Malakhaltsev, Universidad de los Andes, Colombia
3-webs with singularities: topological and differential invariants

DINSIS2-7 Daniel Offin, Queen's University, Canada
Stability of periodic orbits by Conley-Zehnder index theory

DINSIS2-8 Salomón Rebollo Perdomo, Universidad del Bío-Bío, Chile
Limit cycles in perturbations of planar vector fields with curves of singularities

DINSIS2-9 Jesús Muciño Raymundo, Centro de Ciencias Matemáticas UNAM, México
Essential singularities of complex analytic vector fields

DINSIS2-10 Farid Tari, Universidad de Sao Paulo ICMC, Brazil
Frames and direction mappings on surfaces

DINSIS2-11 Marco Uribe, Universidad Católica de la Santísima Concepción, Chile
Principal Poincaré Pontryagin function associated to some families of Morse real polynomials

DINSIS2-12 Ferrán Valdez Lorenzo, Centro de Ciencias Matemáticas UNAM, México
The Goldfish problem, homogeneous foliations and billiard dynamics

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Valdez (24G1)		García (34C)	Delgado (36G2)
12:05 - 12:45		Blázquez-Sanz (24G1)		Offin (34C)	Cortissoz (36G2)
15:45 - 16:25	Tari (31G2)			Uribe (31G1)	Malakhaltsev (36G2)
16:35 - 17:15	Rebollo (31G2)			Cardona (31G1)	Muciño (36G2)

5.4.18 GEOM1 - GEOMETRIC STRUCTURES IN MATHEMATICAL PHYSICS

ORGANIZERS

Iván Contreras, University of California, USA
Nicolás Martínez, Instituto de Matemática Pura e Aplicada - Pontificia Universidad Javeriana, Brazil - Colombia
Andrés Vargas, Pontificia Universidad Javeriana, Colombia

SPEAKERS / TITLES

GEOM1-1 Alexander Cardona, Universidad de Los Andes, Colombia
Geometric Quantization of Twisted Dirac Structures

GEOM1-2 Matías del Hoyo, Instituto de Matemática Pura e Aplicada, Brazil
Morita equivalences of vector bundles

GEOM1-3 Nicolás Martinez, Instituto de Matemática Pura e Aplicada - Pontificia Universidad Javeriana, Brazil - Colombia
A geometrical viewpoint of the equation of motion in classical field theory

GEOM1-4 Alexander Quintero, Universidad del Valle, Colombia
Aspectos algebraicos de las ecuaciones diferenciales parciales no lineales

GEOM1-5 Roberto Rubio, Instituto de Matemática Pura e Aplicada, Brazil
Higher-Dirac structures and their foliated geometry

GEOM1-6 Ivan Struchiner, Universidad de São Paulo, Brazil
Integration of Structure Equations of G-Structures

GEOM1-7 Jose Vallejo, Universidad Autónoma de San Luis Potosí, Mexico
Algebroides de Lie y operadores de cohomología en Física y Matemáticas

GEOM1-8 Andrés Vargas, Pontificia Universidad Javeriana, Colombia
Conformal symmetries of Distributions in Riemannian manifolds

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Cardona (33G2)	Del Hoyo (34C)		
12:05 - 12:45		Rubio (33G2)	Quintero (34C)		
15:45 - 16:25	Struchiner (32G2)	Martínez (37G2)			
16:35 - 17:15	Vargas (32G2)	Vallejo (37G2)			

5.4.19 GEOM2 - GEOMETRY AND PHYSICS

ORGANIZERS

Elizabeth Gasparim, Universidad Católica del Norte, Chile
Lino Grama, Universidade Estadual de Campinas, Brazil

SPEAKERS / TITLES

GEOM2-1 Fabián Belmonte, Universidad Católica del Norte, Chile
Quantization of Systems Reduced by Commuting Hamiltonian Flows, a Decomposable Weyl Calculus and Commutation of Quantization and Reduction

GEOM2-2 Elizabeth Gasparim, Universidad Católica del Norte, Chile
Deformations of Calabi–Yau varieties and their moduli of vector bundles

GEOM2-3 Ignacio Sebastián Gómez, Universidad Nacional de la Plata, Argentina
Gaussian ensembles from an information geometric approach

GEOM2-4 Marcos Jardim, Universidade Estadual de Campinas, Brazil
Brane involutions and irreducible holomorphic symplectic manifolds

GEOM2-5 Dmitry Kaledin, Steklov Mathematical Institute, Rusia
TQFT in the context of homotopical algebra

GEOM2-6 Jorge Littin, Universidad Católica del Norte, Chile
Quasi-additive estimates on the Hamiltonian for the One-dimensional Long Range Ising Model and its consequences

GEOM2-7 Per Sundell, Universidad Andrés Bello, Chile
Higher spins and topological strings

GEOM2-8 Bruno Suzuki, Universidad Católica del Norte, Chile
Topological String Partition Function on Generalised Conifolds

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55				Kaledin (31C)	Belmonte (34C)
12:05 - 12:45				Littin (31C)	Gasparim (34C)
15:45 - 16:25				Suzuki (33G1)	Gómez (34C)
16:35 - 17:15				Sundell (33G1)	Jardim (34C)

5.4.20 GEOM3 - GEOMETRY AND TOPOLOGY / INTERACTIONS OF ALGEBRAIC TOPOLOGY AND GEOMETRIC GROUP THEORY

ORGANIZERS

Andrés Ángel, Universidad de los Andes, Colombia
Noé Barcenas Centro de Ciencias Matemáticas UNAM, México
Eduardo Martínez-Pedroza, Memorial University of Newfoundland, Canada
Mario Velásquez, Pontificia Universidad Javeriana, Colombia

SPEAKERS / TITLES

GEOM3-1 Jonathan Barmak, Universidad de Buenos Aires, Argentina
The fundamental group of a two-dimensional complex with the fixed point property

GEOM3-2 Jerson Borja, Universidad de los Andes, Bogotá, Colombia
Evasiveness of graph properties and graphs on 2p vertices

GEOM3-3 Mauricio Bustamante, Binghamton University, USA
Smooth bundles with nonpositively curved fibers

GEOM3-4 Guillermo Cortiñas, Universidad de Buenos Aires, Argentina
Borel regulator and K-theory of group algebras

GEOM3-5 Germán, Combariza, Pontificia Universidad Javeriana, Bogotá, Colombia
Cohomology of Profinite Groups

GEOM3-6 Matías del Hoyo, Instituto de Matemática Pura e Aplicada, Brazil
Discrete dynamics and stacks

GEOM3-7 Rita Jiménez-Rolland, Centro de Ciencias Matemáticas UNAM, México
Cohomology and point-counting over finite fields

GEOM3-8 Daniel Juan Pineda, Centro de Ciencias Matemáticas UNAM, México
Classifying spaces for mapping class groups

GEOM3-9 Conchita Martínez, Universidad de Zaragoza, Spain
On the rational homology and assembly maps of generalized Thompson groups

GEOM3-10 Gabriel Minian, Universidad de Buenos Aires, Argentina
A new asphericity test for group presentations and some applications

GEOM3-11 Andrés Navas, Universidad de Santiago de Chile, Chile
Orderable groups: some open questions

GEOM3-12 Luis Jorge Sánchez Saldaña, Centro de Ciencias Matemáticas UNAM, México
The Whitehead Group of the Hilbert Modular group

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Combariza (35G2)	Minian (35C)		Del Hoyo (35C)
12:05 - 12:45		Jiménez-Rolland (35G2)	Navas (35C)		Sánchez (35C)
15:45 - 16:25	Bustamante (34G2)	Pineda (31G1)			Borja (35C)
16:35 - 17:15	Cortiñas (34G2)	Martínez (31G1)			Barmak (35C)

5.4.21 GEOM4 - NON-ARCHIMEDEAN ANALYSIS AND PHYSICS

ORGANIZERS

Przemyslaw Górka, Warsaw University of Technology, Poland
Alexander Quintero, Universidad del Valle, Colombia
Enrique Reyes García, Universidad de Santiago de Chile, Chile
Wilson A. Zúñiga-Galindo, Centro de Investigación y Estudios Avanzados del Insituto Politécnico Nacional CINVESTAV, México

SPEAKERS / TITLES

GEOM4-1 José Aguayo, Universidad de Concepción, Chile
C-Algebras of Operators on Free Banach Spaces

GEOM4-2 Leonardo Chacón Cortés, Pontificia Universidad Javeriana, Colombia
Heat Traces and Spectral Zeta Functions for p-adic Laplacians

GEOM4-3 Timothy Gendron, Universidad Nacional Autónoma de México, México
Quantum j-Invariant in Positive Characteristic and Hilbert's 12th Problem

GEOM4-4 Tomasz Kostrzewa, Warsaw University of Technology, Poland
Sobolev spaces on groups

GEOM4-5 Daniel Pons, Universidad Andrés Bello, Chile
Non canonical metrics on Diff (S^1)

GEOM4-6 Enrique Reyes, Universidad de Santiago de Chile, Chile
Some Non-Archimedean tools in Integrable Systems

GEOM4-7 John Jaime Rodriguez Vega, Universidad Nacional de Colombia, Colombia
Ecuaciones de tipo parabólico sobre bolas p-ádicas

GEOM4-8 Anselmo Torresblanca, Centro de Investigación y Estudios Avanzados del Instituto Plitécnico Nacional, México
Ultrametric diffusion, exponential landscapes, and the first passage time problem

GEOM4-9 Alberto Verjovsky, Instituto de Matemáticas UNAM, México
Poincaré theory for the adéle class group A / Q and compact Abelian one-dimensional solenoidal groups

GEOM4-10 Wilson A. Zúñiga-Galindo, Centro de Investigación y Estudios Avanzados del Instituto Plitécnico Nacional, México
Non-Archimedean Reaction-Ultradiffusion Equations and Complex Hierarchic Systems

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Aguayo (36C)	Verjovsky (32C)	Zuñiga-Galindo (36C)
12:05 - 12:45			Kostrzewa (36C)	Pons (32C)	Torresblanca (36C)
15:45 - 16:25				Reyes (34G1)	Chacón (36C)
16:35 - 17:15				Gendron (34G1)	Rodríguez (36C)

5.4.22 GEOM5 - LIE THEORY

ORGANIZERS

Raul Quiroga, Centro de Investigación en Matemáticas, México
Jorge Antonio Vargas, Universidad Nacional de Córdoba, Argentina

SPEAKERS / TITLES

GEOM5-1 María Laura Barberis, Universidad Nacional de Córdoba, Argentina
Conformal killing 2-forms on low dimensional Lie groups

GEOM5-2 Henrique Bursztyn, Instituto de Matemática Pura e Aplicada, Brazil
Lie theory of vector bundles and related double structures

GEOM5-3 Matthew Dawson, Centro de Investigación en Matemáticas, México
Principal Series Representations for Direct Limit Groups

GEOM5-4 Gestur Ólafsson, Louisiana State University, Estados Unidos
Transforming unitary representations from one real form to another

GEOM5-5 Gil Salgado, Universidad Autónoma de San Luis Potosí, México
Contact Lie algebras

GEOM5-6 Juan Tirao, Universidad Nacional de Córdoba, Argentina
The algebra of differential operators associated to a weight matrix

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Dawson (36G2)			
12:05 - 12:45		Tirao (36G2)			
15:45 - 16:25	Barberis (35G2)	Ólafsson (35G1)			
16:35 - 17:15	Bursztyn (35G2)	Salgado (35G1)			

5.4.23 GEOM6 - ALGEBRAIC AND GEOMETRIC TOPOLOGY

ORGANIZERS

José Manuel Gómez, Universidad Nacional de Colombia, Colombia
Angélica Osorno, Reed College, USA

SPEAKERS / TITLES

GEOM6-1 Alejandro Adem, University of British Columbia, Canada
Homotopy Group Actions and an Exotic Example

GEOM6-2 Jonathan A. Barmak, Universidad de Buenos Aires, Argentina
Homotopy type and the fixed simplex property

GEOM6-3 Anna Marie Bohmann, Vanderbilt University, USA
Constructing equivariant spectra

GEOM6-4 José María Cantarero, Centro de Investigación en Matemáticas CIMAT, México
Representations of fusion systems

GEOM6-5 Jesús Espinoza, Universidad de Papaloapán, México
Topological Data Analysis

GEOM6-6 Ernesto Lupercio, Centro de Investigaciones y de Estudios Avanzados del Instituto Politécnico Nacional, México
Sandpiles, quantum gravity and non-commutative geometry

GEOM6-7 Jacob Mostovoy, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México
Planar braids and configuration spaces of points with multiplicity at most 2

GEOM6-8 María Amelia Salazar, Instituto de Matematica Pura e Aplicada, Brazil
An explicit integration of Lie algebroids

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Bohmann (37G2)		Espinoza (33C)	
12:05 - 12:45		Cantarero (37G2)		Lupercio (33C)	
15:45 - 16:25	Adem (36G2)			Mostovoy (35G1)	
16:35 - 17:15	Barmak (36G2)			Salazar (35G1)	

5.4.24 LOG1 - LOGIC AND COMPUTABILITY

ORGANIZERS

Mauricio Guillermo, Universidad de la República, Uruguay
Martin Hyland, University of Cambridge, United Kingdom

SPEAKERS / TITLES

LOG1-1 Alejandro Díaz-Caro, Universidad Nacional de Quilmes, Argentina
Towards a quantum lambda calculus with quantum control

LOG1-2 Peter Dybjer, Universidad de Chalmers, Sweden
Game Semantics and Normalization by Evaluation

LOG1-3 Walter Ferrer Santos, Universidad de la República, Uruguay
Ordered Combinatory Algebras and Realizability

LOG1-4 Santiago Figueira, Universidad de Buenos Aires, Argentina
Model Theory of XPath with data tests

LOG1-5 Jonas Frey, University of Copenhagen, Denmark
Classical realizability and implicit computational complexity

LOG1-6 Stéphane Graham-Lengrand, Centre National de la Recherche Scientifique, France
A proof-theoretical approach to satisfiability solving

LOG1-7 Alexandre Miquel, Universidad de la República, Uruguay
Implicative algebras for generalizing forcing

LOG1-8 Antonio Montalbán, University of California at Berkeley, USA
Natural Objects in Computability Theory

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55				Montalbán (25C)	Graham-Lengrand (37C)
12:05 - 12:45				Dybjer (25C)	Frey (37C)
15:45 - 16:25				Figueira (37C)	Miquel (33C)
16:35 - 17:15				Diaz-Caro (37C)	Ferrer (33C)

5.4.25 LOG2 - SET THEORY AND MODEL THEORY

ORGANIZERS
Andrés Eduardo Caicedo, Boise State University, USA
Alf Onshuus, Universidad de los Andes, Colombia

SPEAKERS / TITLES

LOG2-1 Alexander Berenstein, Universidad de los Andes, Colombia
Supersimple theories expanded with a predicate for a forking independent subset

LOG2-2 Christina Brech, Universidad de Sao Paulo, Brazil
Generalized Schreier families and large Banach spaces with no indiscernible sequences

LOG2-3 Xavier Caicedo, Universidad de los Andes, Colombia
On the Model Theory of Sheaves

LOG2-4 Samaria Montenegro, Universidad de los Andes - Universidad de Costa Rica, Colombia - Costa Rica
Shelah's classification theory and pseudo real closed fields

LOG2-5 Claribet Piña, Universidad de los Andes, Colombia
Admissible trees and homogeneous sets

LOG2-6 Carlos Uzcátegui, Universidad Industrial de Santander, Colombia
Descriptive set theoretic properties of partial actions of Polish groups

LOG2-7 Carlos Videla, Mount Royal University, Canadá
Undecidable fields of algebraic numbers

LOG2-8 Rafael Zamora, Institut Mathematique de Jussieu, Francia
Injectivity in tests for separability by potentially Lavrentieff sets

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Piña (21G1)	Videla (31C)		
12:05 - 12:45		Zamora (21G1)	Brech (31C)		
15:45 - 16:25	Caicedo (37C)	Montenegro (21G1)			
16:35 - 17:15	Uzcátegui (37C)	Berenstein (21G1)			

5.4.26 LOG3 - MODEL THEORY AND GEOMETRY: RECENT INTERACTIONS

ORGANIZERS

John Alexander Cruz, Max Planck Institut fuer Mathematik, Germany
Timothy Gendron, Instituto de Matemáticas UNAM, México
Andrés Villaveces, Universidad Nacional de Colombia, Colombia

SPEAKERS / TITLES

LOG3-1 Leonardo Cano, Universidad Sergio Arboleda, Colombia
Basic aspects of the geometric rigidity of the j function on complex elliptic curves

LOG3-2 John Alexander Cruz, Max Planck Institut fuer Mathematik, Germany
Towards a model theoretic approach to F_1-geometry

LOG3-3 Timothy Gendron, Instituto de Matemáticas UNAM, México
Ultraschemes and the Universal Modular Invariant

LOG3-4 Jonathan Kirby, University of East Anglia - Norwich, United Kingdom
Exponentially closed fields

LOG3-5 Jorge Plazas, Pontificia Universidad Javeriana, Colombia
Towards a model theoretic framework for Real Multiplication

LOG3-6 Andrés Villaveces, Universidad Nacional de Colombia, Colombia
Modular invariants and model theory

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55			Gendron (32C)	Cruz (26C)	
12:05 - 12:45			Kirby (32C)	Cano (26C)	
15:45 - 16:25		Kirby (25G1)		Villaveces (38C)	
16:35 - 17:15		Plazas (25G1)			

5.4.27 PROB1 - TRENDS IN PROBABILITY

ORGANIZERS

Joaquin Fontbona, Universidad de Chile, Chile
José Luis Perez Garmendia, Centro de Investigación en Matemáticas, México
Victor Rivero, Centro de Investigación en Matemáticas, México

SPEAKERS / TITLES

PROB1-1 Octavio Arizmendi, Centro de Investigación en Matemáticas, México
Additive and Multiplicative Limit Theorems in Free probability

PROB1-2 Margaret Johanna Garzón Merchán, Universidad Nacional de Colombia, Colombia
Fractional stochastic differential equation with discontinuous diffusion

PROB1-3 Michael A. Hoegele, Universidad de los Andes, Colombia
Negative top Lyapunov exponents for gradient SDE driven by small Lévy noise

PROB1-4 Harold Moreno Franco, Centro de Investigación en Matemáticas, México
A singular stochastic control problem

PROB1-5 Víctor Manuel Pérez Abreu, Centro de Investigación en Matemáticas, México
On the Dyson-Brownian motion and fractional Brownian motion analogous

	Mo.	Tu.	We.	Th.	Fr.
11:15 - 11:55		Hoegele (25G1)			
12:05 - 12:45		Moreno (25G1)			
15:45 - 16:25	Arizmendi (38C)	Pérez (38C)			
16:35 - 17:15	Garzón (38C)				

5.5 Poster Session

The V CLAM will include a space for the presentation of posters on research results that have been previously published in journals, proceedings, books or thesis. The proposals for posters were evaluated and selected by the Scientific Committee and the accepted posters are ones that appear in the list that follows.

1. Marcelo Actis, Instituto de Matemática Aplicada del Litoral, Argentina.
Numerical approximation of nonlocal diffusions on fractals

2. Rafael José Alvarez Bilbao, Universidad del Atlántico, Colombia.
Maximizing measure for random dynamical systems

3. Natella Antonyan, Tecnologico de Monterrey, México.
Universal metric proper G-spaces

4. Rocío Balderrama, Universidad de Buenos Aires, Argentina.
Almost periodic solutions and global exponential stability of a generalized hematopoiesis model

5. Martín Barajas Sichacá, Universidad de Sao Paulo, Brazil.
Projections of the crosscap

6. María José Benac, Universidad Nacional de La Plata, Argentina.
Convex potentials in shift invariant spaces

7. Luis Benítez, Universidad del Sinú, Colombia.
Fixed point property for nonexpansive mappings and nonexpansive semigroups on the unit disk.

8. Juan Pablo Berón Valencia, Pontificia Universidad Javeriana, Colombia.
On the number and linear stability of periodic solutions in a nonlinear oscillator under resonance.

9. Jennyffer Smith Bohorquez, Universidade Federal Do Rio de Janeiro, Brazil.
Shadowing and Topological Entropy in Hyperspace

10. Jhone Caldeira, Universidade Federal de Goiás, Brazil.
On groups and Lie algebras admitting a Frobenius group of automorphisms.

11. Duván Cardona, Universidad de los Andes, Colombia.
Fourier multipliers on Besov spaces defined on compact Lie groups

12. Juan Carmona, Universidad Antonio Nariño, Colombia.
Ampleness in theories with a dense predicate.

13. Sergio Alejandro Carrillo-Torres, Universidad Sergio Arboleda, Colombia.
How can we sum divergent series using monomials?

14. Jairo Castellanos, Universidad de Antioquia, Colombia.
Applications of the new Frequency Domain Method in the fourth order non-linear differential equation for uniform dissipativity

15. Victor Castellanos, Universidad Juarez Autónoma de Tabasco, México.
Hopf and Zero Hopf bifurcation in a tritrophic food chain models.

16. Tovias Enrique Castro Polo, Colombia.
Espectro de Ondas Internas en Paralelepipedos

17. Freddy Pablo Castro Vicente, Universidade Federal Do Rio de Janeiro, Brazil.
Generic properties for magnetic flows.

18. Ana Paula Chaves, Universidade Federal de Goiás, Brazil.
On the sum of powers of terms of a linear recurrence sequence.

19. Harold Contreras, Universidad de Sucre, Colombia.
Solución numérica de un modelo de Black-Scholes no lineal no local por molificación discreta

20. Luis Fernando Contreras Hernandez, Universidad Nacional de Colombia, Colombia.
Sobre operadores diferenciales con dominios fractales

21. Arnaldo De La Barrera, Universidad De Pamplona, Colombia.
On Positive Denite Kernels - Related Problems and Applications.

22. Juan Pablo Díaz González, Universidad Nacional Autónoma de México, México.
Grupos y orbidades modulares cuaterniónicas

23. Kevin Esmeral, Universidad de Sucre, Colombia.
Horizontal Toeplitz operators on the Fock space.

24. Liliana Esquivel, Universidad Nacionál Autónoma de México, México.
Neumann problem for nonlinear schrodinger equation with the riezs fractional derivate operator.

25. Fernando Gallego, Universidad Federal de Rio de Janeiro, Brazil.
On the controllability of the Gear-Grimshaw system with critical size restrictions.

26. Sandra Carolina Garcia Martinez, Universidad Nacional de Colombia, Colombia.
Rigidity and Bifurcation Results for Schwarzschild spacetimes

27. Fernando Ricardo González Diaz, Escuela Agricola Panamericana, Honduras.
Fibrados Vectoriales Equivariantes

28. Pedro Luis Hernández Llanos, Universidad de Concepción, Chile.
Sobre extensiones de los polinomios tipo Apostol generalizados y sus propiedades.

29. Rodney Jaramillo, Universidad Nacional de Colombia, Colombia.
Implementación de un método híbrido Prony-Varpro para la clasificación de tejidos cerebrales a partir de imágenes potenciadas en T2 de resonancia magnética.

30. Alcides Junior, Universidade Estadual de Campinas, Brazil.
As equações de Seiber-Witten.

31. Emerson Julián León Guerrero, Universidad de los Andes, Colombia.
Spaces of convex n-partitions.

32. Juliana Honda Lopes, Universidade Estadual de Campinas, Brazil.
A study of a non-isothermal phase-field model for two incompressible fluids

33. Irla Mantilla Núñez, Universidad Nacional de Ingeniería, Perú.
A Finite Element Method for solving viscous compressible ow and gas-solid.

34. María Pía Mazzoleni, Universidad Nacional de La Plata, Argentina.
Circular-arc graphs as edge intersection graphs of paths on a grid

35. Maria Luisa Mendoza, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional, México.
Motion planning in tori revisited.

36. Francisco Javier Mendoza Torres, Benemérita Universidad Autónoma de Puebla, México.
On the Convolution Theorem for the Fourier Transform of BVo Functions.

37. Fernando Mesa, Universidad Tecnológica de Pereira, Colombia.
A Special Case of Fourier Spectral Solution for Constant and Variable Coefficient Poisson Equations in 1D and 2D.

38. Alejandro Meson, Facultad de Ingeniería CONICET - Universidad de La Plata, Argentina.
Multifratcal Analysis for the barycentric spectrum in CAT(0) spaces.

39. Francisca Miguel García, University of Málaga, Spain.
Efficient Sets of Multiobjective Composite Systems

40. Andres Julian Moreno Ospina, Universidade Estadual de Campinas, Brazil.
The Fueter operator and deformation of associative submanifolds.

41. Diego Alejandro Muñoz, Universidad Pontificia Bolivariana, Colombia.
Manifold of critical points and the normal vector approach to solve semi-infinite programs

42. Abraham Muñoz Flores, Universidade Federal do Rio de Janeiro, Brazil.
The isoperimetric problem of a complete Riemannian manifold with a finite number of C^0-asymptotically Schwarzschild ends

43. Diana Ximena Narváez Naspirán, Colombia.
Funciones multivaluadas y topolog ias en el conjunto de partes de un espacio topológico.

44. Carolina Neira Jimenez, Universidad Nacional de Colombia, Colombia.
Traces and Determinants on Algebras of Pseudodifferential Operators

45. Maria Beatriz Pintarelli, Universidad Nacional de la Plata, Argentina.
Parabolic partial differential equations as inverse moments problem.

46. Luis Germán Polanco Contreras, Universidad de los Andes, Colombia.
Estimaciones en persistencia homológica

47. Yuri Alexander Poveda Quiñones, Universidad Tecnológica de Pereira, Colombia.
On the Equivalence Between MV-Algebras and l-Groups with Strong Unit

48. Hector Fabián Ramírez Ospina, Universidad Nacional de Colombia, Colombia.
Hypersurfaces in S^4 that are of L_k-2-type

49. Carlos Ernesto Ramírez Ovalle, Universidad Del Valle, Colombia.
Extensiones a la semántica categórica y generalización de tipos(al estilo Curry-Howard) para lógica lineal con subexponenciales.

50. Camilo Rengifo, Universidad de los Andes, Colombia.
Higher dimensional exact Courant algebroids

51. Sonia L. Rueda, Universidad Politécnica de Madrid, Spain.
Differential elimination by differential resultant formulas

52. Andrés Salazar, Universidad Javeriana Cali, Colombia.
Curvatura y puntos criticos en placas empotradas

53. Andres Felipe Saldana Torres, Universidad del Valle, Colombia.
On eulerian partitions of medial graphs.

54. Marcos Salvai, Universidad Nacional de Córdoba, Argentina.
Interpolation of geometric structures on complex and symplectic manifold

55. Henry Mauricio Sánchez Sanabria, Universidade Federal do Rio de Janeiro, Brazil.
Existence of Venice Masks with two singularities

56. Jean Eduardo Sebold, Instituto Federal Catarinense, Brazil.
Dispersion discrete analysis for Edge Finite Elements problems in Maxwell Equations.

57. John Taborda, Universidad del Magdalena, Colombia.
Application of Fixed-Point Inducting Control (FPIC) in Multistability Scenarios.

58. Cesar Fernando Venegas Ramírez, Universidad de los Andes, Colombia.
Automorphisms for Skew PBW Extensions and Skew Quantum Polynomial Rings

The Session will take place at the Coliseo on wednesday afternoon. The posters need to be prepared on monday and left on display until thrusday. The authors of the posters must be present at the Poster Session and should stand in front of their respective work.

The posters must not exceed the dimensions of of the paper size A0 (1189x841 mm).

The store DuNord Graphique, located inside the Universidad de Norte, has plotters where the posters may be printed. The impression of a poster in the paper size A0 costs $38.520 colombian pesos at this store.

5.6 Assembly General of UMALCA

The Assembly General of the UMALCA meets at each of the CLAMs and the authorities of the UMALCA are elected in this Assembly. The meeting will take place at the Restaurant 1966 of the Universidad del Norte on tuesday the 12th at 4:00pm, and all the representatives of the mathematical societies members of UMALACA are invited to join.

5.7 Women Mathematicians in Latin America

The UMALCA, recognizing the importance of gender issues in the mathematical community in the region, has embraced the initiative "Women Mathematicians in Latin America" conceived by prominent women mathematicians of Latin America and aimed at establishing a network of women working in mathematical sciences in the region, which would develop activities and material to encourage and support women in their careers. The initiative will be presented to the participants of the Congress on wednesday afternoon, and will be followed by the Poster Session.

5.8 Social Events

Welcome reception

On monday the 11th at 7:00pm, after the UMALCA Prize award's ceremony, there will be a welcome reception honoring the participants of the event and the UMALCA Prize awardees. This reception will finish at 9:00pm.

Film "Derivadas"

The Congress will host the presentation of the film "Derivadas" from director María Campaña Ramia. Director Campaña, who will be present at the Congress, has very kindly agreed to share with us her work and moreover has agreed to host a Q&A session right after the presentation of the film is finished. The film will be presented on wednesday evening at the auditorio.

Noche Barranquillera

On thursday the 14th at 7:00pm there will be a second reception in front of the Café du Nord. The theme for this reception will be the Carnaval de Barranquilla and we will enjoy the presentation of the folk dance group of the Universidad del Norte. This reception will finish at 10:00pm.

5.9 Proceedings

The Proceedings of the V CLAM will be published on a special issue of the Revista Colombiana de Matemáticas.

The editorial work of this special issue will be in charge of and Ad-hoc Editorial Committee whose members are:

- Nicolás Andruskiewitsch (Executive Committee UMALCA)
- Juan Carlos Galvis (Editor in Chief Revista Colombiana de Matemáticas)
- Renato Iturriaga (President Scientific Committee V CLAM)
- José Seade (Executive Committee UMALCA)
- Bernardo Uribe Jongbloed (Editor Revista Colombiana de Matemáticas)

What will be published?

The special issue will contain articles with research results that were presented at the V CLAM by invited speakers or speakers of the Thematic Sessions of the V CLAM. The articles must comply with the conditions and rules that the Revista Colombiana de Matemáticas has for its publications: they must be original articles in pure or applied mathematics that have not been published before and that are not being reviewed anywhere else. The articles must be written in English, though in exceptional cases articles in Spanish might be accepted.

The information regarding the conditions and rules for the Revista Colombiana de Matemáticas can be read at the Code of Conduct and Editorial Policy of the Revista Colombiana de Matemáticas availbale on its webpage.

The articles must be prepared in Latex following the Instructions for Authors of the Revista Colombiana de Matemáticas. The articles must be sent per e-mail in PDF format to the editors Juan Carlos Galvis (jcgalvisa@unal.edu.co) and Bernardo Uribe (buribe@gmail.com). The deadline for submissions is December 31st 2016.

5.10 Satellite Activities

- UN Encuentro de Matemáticas 4, June 7-10, 2016, Universidad Nacional de Colombia, Bogotá.
- 5to Encuentro Colombiano de Combinatoria, CIMPA Research School: Algebraic, Enumerative and Geometric Combinatorics - ECCO 2016, June 13-24, 2016, Universidad de Antioquia, Medellín.
- Noncommutative Geometry 2016, School and Conference on Noncommutative Geometry, June 20-July 1 2016, Villa de Leyva, Boyacá.
- Crypto-Co Cryptology, June 29-July 9 2016, Universidad del Rosario, Bogotá
- ALTENCOA 7, Algebra, Number Thoery, Combinatorics y Applications, July 18-22, 2016, Universidad Industria de Santander, Bucaramanga.
- Topology, Geometry and Representation Theory Meeting, July 18-22, 2016, Universidad Nacional sede Medellín, Medellín

6

Abstracts

6.1 Plenary Talks

PT1. Fernando Codá Marques, Princeton University, USA

Morse index and multiplicity of min-max minimal hypersurfaces

The Min-max Theory for the area functional, started by Almgren in the early 1960s and greatly improved by Pitts in 1981, was left incomplete because it gave no Morse index estimate for the min-max minimal hypersurface. Nothing was said also about the fundamental problem of multiplicity. In this talk I will describe our current efforts to develop the theory further. I will discuss the first general Morse index bounds for minimal hypersurfaces produced by the theory. We also settle the multiplicity problem for the classical case of one-parameter sweepouts. If time permits I will mention some conjectures for the field. This is based on joint work with Andre Neves.

PT2. Ruy Exel, Universidade Federal de Santa Catarina, Brazil

Partial actions and the Banach-Tarski paradox

In 1924, Banach and Tarski showed that a solid ball in $\mathbb{R}^3$ can be broken into finitely many pieces which, in turn, can be used as a puzzle to form two balls identical to the original one. This result is so striking that it bacame known as the *Banach-Tarski paradox*, despite being a theorem, proven with full mathematical rigor.

The Banach-Tarski paradox has important consequences in Mathematics, one of which is the impossibility of defining a notion of "volume", applicable to any subset of $\mathbb{R}^3$. Otherwise the volume of the initial ball, which is $\frac{4}{3}\pi R^3$, would coincide with the sum of the volumes of the pieces in our puzzle, which in turn is $2 \times \frac{4}{3}\pi R^3$.

Tarski later found a reciprocal of this *paradox*, proving that, under the action of a group of symmetries, the only obstruction to the existence of an invariant measure is the presence of *paradoxical* sets, namely those which can be doubled in size, as the ball in $\mathbb{R}^3$

In this lecture I plan to take the ideas of Banach and Tarski into the realm of totally disconnected topological spaces, by restricting the notion of measure to the boolean algebra of clopen (closed and open) sets. We will see that the theory of partial group actions, with which I have been involved for the past 25 years, provides an example forbidding the generalization of Tarski's Theorem to this context. This example was found in collaboration with Pere Ara, from the Universitat Autónoma de Barcelona.

PT3. Pablo Augusto Ferrari, Universidad de Buenos Aires, Argentina

Fan of characteristics and TASEP hydrodynamics

The totally asymmetric simple exclusion process, TASEP, is a stochastic model of particles jumping in the integers subject to a exclusion rule. Rescaling space and time, the density of particles converges to

the solution of the Burgers equation, this is called hydrodynamic limit. We couple the TASEP starting with ordered initial configurations, one for each density R in [0,1] and a second class particle for each of these configurations. We show that the rescaled positions of those particles converge to a fan which coincides with the rarefaction fan of characteristics of the Burgers equation starting with a Heaviside configuration. We use this fact to prove the hydrodynamic limit without using subadditivity.

PT4. Mikhail Lyubich, Stony Brook University, USA

Renormalization and Area of Julia sets

Renormalization is a central idea of contemporary Dynamical Systems Theory. It allows one to control small scale structure of certain classes of systems, which leads to universal features of the phase and parameter spaces. We will review several occurancies of Renormalization in Holomorphic Dynamics (especially, for quadratic-like and Siegel maps) that enlighten the structure of many Julia sets and the Mandelbrot set. In particular, these ideas helped to construct examples of Julia sets of positive area (resolving a classical problem in this field). First examples were constructed by Buff and Cheritat about 10 years ago, and more recently a different class, with many new features, was produced by Artur Avila and the author. In the talk, we will describe these developments.

PT5. María Ronco, Universidad de Talca, Chile

Algebraic operads and combinatorial Hopf algebras

We want to motivate the study of underlying algebraic structures on combinatorial Hopf algebras.

The subspace of primitive elements of any bialgebra has a natural structure of Lie algebra. If the base field has characteristic zero and the bialgebra H is cocommutative and conilpotent, the Cartier-Milnor-Moore Theorem states that the Lie algebra of primitive elements of H determines the whole bialgebra structure of H. When H is not cocommutative, the Lie bracket does not suffice to reconstruct H, but in some cases there exist finer structure on the subspace of primitive elements which completely determine the bialgebra structure.

Probably the most well-known example of non cocommutative bialgebras is the Connes-Kreimer Hopf algebra, appearing in the context of renormalisation theory. Its subspace of primitive elements is the free pre-Lie algebra on one element.

Higher non-commutative versions of this bialgebra, led us to introduce algebraic theories (operads) satisfying that:

1. the algebras over these operads are associative algebras equipped with some additional products,
2. there exist in all cases a natural notion of bialgebra,
3. the Lie bracket on the subspace of primitive elements comes from finer structures like multibrace algebras.

There exist in literature many examples of these types of structures coming from physics, as the Faá di Bruno bialgebra and the Baxter algebras, as well as from algebraic topology, as the cacti algebras and the Gerstenhaber algebras.

In all the examples, combinatorics provide an important tool in the study of free objects for these new algebraic theories, as well as in the understanding of the relations between them. In the last years, an important amount of work has been done on generalisations of associahedra, on one hand, and on combinatorial descriptions of operads related to higher structures on cohomology on the other side. Our goal is to give a brief account of the state of art on the subject.

PT6. Gunther Uhlmann, University of Washington, USA

Journey to the Center of the Earth

We will consider the inverse problem of determining the sound speed or index of refraction of a medium by measuring the travel times of waves going through the medium. This problem arises in global seismology in an attempt to determine the inner structure of the Earth by measuring travel times of earthquakes. It has also several applications in optics and medical imaging among others.

The problem can be recast as a geometric problem: Can one determine a Riemannian metric of a Riemannian manifold with boundary by measuring the distance function between boundary points? This is the boundary rigidity problem. We will also consider the problem of determining the metric from the scattering relation, the so-called lens rigidity problem. The linearization of these problems involve the integration of a tensor along geodesics, similar to the X-ray transform.

We will also describe some recent results, join with Plamen Stefanov and Andras Vasy, on the partial data case, where you are making measurements on a subset of the boundary. No previous knowledge of Riemannian geometry will be assumed.

6.2 Invited Talks

IT1. Federico Ardila, San Francisco State University, USA

Moving robots efficiently using the combinatorics of CAT(0) cubical complexes

In this talk we will use tools from geometric group theory and combinatorics to plan the motion of a robot. Given a reconfigurable system X, such as a robot moving on a grid or a set of particles moving around a graph without colliding, the moduli space of all possible positions of X is a cubical complex S(X). When S(X) is non-positively curved (CAT(0)), we can explicitly construct the shortest path between any two points.

We show that CAT(0) cubical complexes are in bijection with posets with inconsistent pairs (PIPs); therefore we can prove that a state complex S(X) is CAT(0) by identifying the corresponding PIP. In applications, the PIP serves as a combinatorial "remote control" to move robots efficiently from one position to another. We use this very general framework to solve the problem of efficiently moving a robotic arm in a tunnel. Along the way we encounter lots of interesting combinatorics.

This talk is based on a series of papers with Tia Baker, Hanner Bastidas, Cesar Ceballos, John Guo, Megan Owen, Seth Sullivant, and Rika Yatchak. It will assume no previous knowledge of the subject.

IT2. Mikhail Belolipetsky, Instituto Nacional de Matematica Pura e Aplicada IMPA, Brazil

Arithmetic hyperbolic reflection groups

A hyperbolic reflection group is a discrete group generated by reflections in the faces of an n-dimensional hyperbolic polyhedron. The study of higher dimensional hyperbolic reflection groups has a long and remarkable history which goes back to the pioneering papers of Makarov and Vinberg. In the recent years there has been a new wave of activity in this area which led to the solution of an important open problem about finiteness of the number of commensurability classes of arithmetic hyperbolic reflection groups. On the talk I will review some of the recent results and discuss some other related open problems.

IT3. María Emilia Caballero, Universidad Nacional Autónoma de México UNAM, México

Stable Lévy processes, Lamperti's representations and generalizations

The relations discovered by Lamperti (1967, 1972) between Lévy processes (LP) and other interesting Markov processes have been widely studied, in part because he announced some interesting results without proof and also because all the possibilities they offer. In the past ten years, and continuing the work done by serval authors (Jirina, Grimwall, Helland, Ethier, Kurtz, Carmona, Petit, Yor, Bertoin), two of these relations have been widely exploited, and this has been very fruitful on several directions:

- Construction of a great range of useful processes, some of which are very good models in different applications.
- An answer to the question raised by Lamperti on the entrance law of Positive Self Similar Markov Processes (PSSMP).
- The use of known facts of LP to obtain properties of their transformed processes (asymptotic results, overshoots, exit laws....) and reciprocally.
- Enrich the cases where the Wiener-Hopf factorization can be explicitly given.
- Generalizations of the Lamperti transformation.
- Characterization of Continuous State Branching Processes (CSBP), with or without immigration, and affine processes.
- Methods via Stochastic Differential Equations (SDE).

In this talk I shall give a panorama of these surprising developments, focusing first on the brownian case and then on the stable case. This will allow us to give the main ideas behind the wide range of new results and grasp the main methods, without treating the general case of all Lévy processes, which would be a task beyond the possibilities of a 50 minutes talk. We will also explain, how the SDE enter in this picture, in part inspired by Doeblin's ideas (re-)discovered in 2000.

Until 2014-15 all known results were for the one dimensional case, due to the nature of the Lamperti's transformations. The main issue is that in recent months [7] and [10] a breakthrough has been achieved in this line of research by constructing them in several dimensions. In both cases the generalization is not trivial and offers a whole new perspective on this subject.

Some references appear here, but the list is much longer, this is just an example of the different lines of development that are in course. (**The slides will be in spanish and the talk in english).

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IT4. Conchita Martínez, Universidad de Zaragoza, Spain

Recent results on the proper dimension of certain groups

The proper dimension of an arbitrary group is the smallest possible dimension of a classifying space for proper actions. In this talk we will review the relevance of this notion and some recent results that allow us to determine this invariant for certain well known families of groups. Parts of this talk correspond to joint work with Javier Aramayona, Dieter Degrijse, Peter Kropholler, Brita Nucinkis and Juan Souto.

IT5. Ursula Molter, Universidad de Buenos Aires and IMAS-CONICET, Argentina

The Amalgan Balian Low Theorem and time-frequency shift invariance

The *Balian-Low Theorem* expresses the fact that time-frequency concentration and non redundancy are essentially incompatible. Specifically, if $\varphi \in L^2(\mathbb{R})$, $\Lambda \subset \mathbb{R}^2$ is a lattice and the system $(\varphi, \Lambda) = \{e^{2\pi i \eta x}\varphi(x-u) : (u,\eta) \in \Lambda\}$ is a Riesz basis for $L^2(\mathbb{R})$, then φ satisfies

$$\Big(\int (x-a)^2 |\varphi(x)|^2\, dx\Big) \cdot \Big(\int (\omega - b)^2 |\widehat{\varphi}(\omega)|^2\, d\omega\Big) = \infty, \quad a, b \in \mathbb{R}.$$

The *Amalgam Balian-Low Theorem* states that if $(\varphi, \alpha\mathbb{Z}\times\beta\mathbb{Z})$ is a Riesz basis for $L^2(\mathbb{R})$, then φ cannot belong to the Feichtinger algebra $S_0(\mathbb{R})$, a class of functions decaying well in time and frequency. Precisely,

$$S_0(\mathbb{R}) = \left\{ f \in L^2(\mathbb{R}) : Vf(t,\nu) = \int f(x) e^{-(x-t)^2} e^{2\pi i x\nu}\, dx \in L^1(t,\nu) \right\}.$$

Note that $Vf(t,\nu) \in L^2(t,\nu) \cap L^\infty(t,\nu)$ for all $f \in L^2(\mathbb{R})$ and the requirement $Vf(t,\nu) \in L^1(t,\nu)$ essentially necessitates L^1 decay of f and of its Fourier transform $\widehat{f}$. This space is called the *Feichtinger algebra*.

Let $T_u f(x) = f(x-u)$, and $M_\eta f(x) = e^{2\pi i \eta x} f(x)$, denote the usual translation and modulation operators, and let $\pi(u,\eta) = M_\eta T_u$, (with $u \in \mathbb{R}$ and $\eta \in \widehat{\mathbb{R}}$ the dual group of $\mathbb{R}$) denote the time-frequency shift. For $\varphi \in L^2(\mathbb{R})$ and a lattice $\Lambda \subset \mathbb{R}\times\widehat{\mathbb{R}}$, let $\mathcal{G}(\varphi,\Lambda)$ denote the *Gabor spaces*, $\mathcal{G}(\varphi,\Lambda) := \overline{\mathrm{span}\{\pi(\lambda)\varphi\}}$, where $\overline{V}$ is the closure of V in $L^2(\mathbb{R})$.

In this talk we address the question whether there may exist a $\mu \in \mathbb{R}\times\widehat{\mathbb{R}} \setminus \Lambda$ with $\pi(\mu)\varphi \in \mathcal{G}(\varphi,\Lambda)$. The result relates the existence of such μ, to the fact that φ belongs (or does not belong) to the *smoothness space* $S_0(\mathbb{R})$. We have

Theorem. *If (φ,Λ) is a Riesz basis for its closed linear span $\mathcal{G}(\varphi,\Lambda)$ with $\varphi \in S_0(\mathbb{R})$ and the density of the lattice Λ is rational, then for any $(u,\eta) \notin \Lambda$ $\pi(u,\eta)\varphi \notin \mathcal{G}(\varphi,\Lambda)$.*

Note that (φ,Λ) being a Riesz basis for $L^2(\mathbb{R})$ implies that the density of Λ equals $1 \in \mathbb{Q}$; and $\mathcal{G}(\varphi,\Lambda) = L^2(\mathbb{R})$ implies that $\pi(u,\eta)\varphi \in \mathcal{G}(\varphi,\Lambda)$ for all $(u,\eta) \in \mathbb{R}\times\widehat{\mathbb{R}}$. Therefore the theorem implies that $\varphi \notin S_0(\mathbb{R})$.

Joint work with:

- Carlos Cabrelli, University of Buenos Aires and IMAS-CONICET, Argentina
- Götz Pfander, Philipps-Universität Marburg, Germany
- Dae Gwan Lee, Philipps-Universität Marburg, Germany

IT6. Andrés Navas, Universidad de Santiago de Chile, Chile

On the large-scale geometry of tilings

We consider tilings of the plane by polygons, and we discuss the question of whether this is equivalent, in the Lipschitz sense, to the standard tiling by unit squares. As an example, we will show that this is the case for the famous Penrose tiling, but not for “most" tilings.

IT7. Rafael Potrie, Universidad de la República, Uruguay

Dynamics in the study of discrete subgroups of Lie groups

We are interested in two problems regarding representations of discrete groups in Lie groups. The first one is related with the description of open subsets of faithful representations whose image is discrete. The second one is related with understanding conditions under which one can ensure that the image of the representation is contained in a proper Lie subgroup. We shall explain some results in those directions, in particular, how to use dominated splittings to obtain open sets of quasi-isometric representations and a result regarding entropy rigidity for Hitchin representations. Both problems will be looked from a dynamical point of view and are related with Labourie's notion of Anosov representations. We hope to make evident the relation with the theory of linear cocycles and thermodynamical formalism for Anosov flows and pose natural questions which arise from this point of view.

IT8. Noemi Wolanski, Universidad de Buenos Aires, Argentina

Asymptotic behavior of solutions to a nonlocal dffusion equation on manifolds

I will present joint work with C. Bandle, M. del Mar Gonzalez and M. Fontelos on different asymptotic questions for a nonlocal diffusion problem determined by a smooth kernel of compact support. The main questions are if and how does the geometry of the manifold influence different kinds of asymptotic problems such as the infinitesimal limit as the support of the kernel contracts to 0 or the large time asymptotic behavior of the solution for a fixed kernel.

6.3 Courses

C1. Diego Córdoba. Instituto de Ciencias Matemáticas, Spain

Active scalars with singular incompressible velocities

The goal of these lectures is to present the main ideas and arguments of recent results concerning global solutions and finite time singularities for a family of incompressible fluids. In particular, we study the Surface Quasi-Geostrophic equation (SQG) and the Incompressible Porous Media equation (IPM). SQG and IPM are the two simplest possible physical models that capture the conservative quantities and the non-local structure of the incompressible 3D Euler equations.

C2. Carlos Matheus Silva Santos. Instituto Nacional de Matematica Pura e Aplicada IMPA, Brazil

The fine structure of the Lagrange and Markov spectra

The Lagrange and Markov spectra are two subsets L and M of the real line related to classical Diophantine approximation problems in Number Theory.

The structure of L and M attracted the interest of several mathematicians:

a) Hurwitz showed in 1891 that $\sqrt{5}$ is the smallest number in L;

b) Markov showed in 1879 that $L \cap (-\infty, 3) = M \cap (-\infty, 3)$ consists of an explicit increasing sequence k_n of quadratic surds converging to 3 (e.g., $k_1 = \sqrt{5} < k_2 = 2\sqrt{2} < k_3 = \sqrt{221}/5 < \dots$);

b) Hall proved in 1947 that L and M contain an infinite half-line $[c, +\infty)$ and Freiman determined in 1975 the biggest half-line contained in L, namely $[c_F, +\infty)$ where $c_F = \frac{2221564096+283748\sqrt{462}}{491993569} \simeq 4.52782956...$

The goal of our course is to explain how the interplay between L, M and the dynamics of the continued fraction algorithm led C. G. Moreira to prove that the transition from the discrete set $L \cap (-\infty, 3) = M \cap (-\infty, 3)$ to the half-line $L \cap [c_F, +\infty) = M \cap [c_F, +\infty) = [c_F, +\infty)$ occurs in a highly non-trivial way: for example, the Hausdorff dimension of $L \cap (-\infty, t)$ varies continuously with the parameter t.

C3. Ulrike Tillmann. Oxford University, UK

Topological quantum field theories in homotopy theory

Topological quantum field theories (TQFT) were axiomatized by Atiyah and Segal in the late 1980s. Motivated by physics, they provided a new framework in which invariants of manifolds arise naturally. From this axiomatic point of view, a TQFT is a functor from a category of closed manifolds and cobordisms to a suitable category of vector spaces.

Prior to this, cobordism was also an important concept for the classification of manifolds in the work of Thom and others in the 1950s. There seemed however to be no relation between the two appearances of cobordisms.

In this lecture I will explain how a homotopy theoretic approach to TQFTs brought these together and how recent results shed light on both, TQFTs and classical cobordism theory, and has contributed to our understanding of manifolds.

I will explain what TQFTs are, recall the classical theory of Thom, discuss the work of Lurie on the Baez-Dolan cobordism hypothesis and interpret a refined version of the theorem of Galatius-Madsen-Tillmann-Weiss in this context. Time permitting, we will relate this to the Madsen-Weiss theorem solving the Mumford conjecture and the recent work of Galatius and Randal-Williams on a higher dimensional analogue of that

C4. Alberto Verjovsky. Universidad Nacional Autónoma de México UNAM, México

Intersección de cuádricas en $\mathbb{C}^n$, variedades ángulo-momento, variedades complejas y tóricas y politopos convexos

El curso trata sobre la construcción y estudio de estructuras geométricas de variedades *ángulo-momento.* Estas son variedades que admiten la acción de un toro real $\mathbb{T}^n = \mathbb{S}^1 \times \cdots \times \mathbb{S}^1$ de tal suerte que el espacio de órbitas es un politopo convexo simple [3]. Las variedades que se describirán y estudiarán principalmente son las las llamadas *variedades LV-M* o *LVMB* ([1], [2], [4], [5], [6]). Estas variedades compactas de dimensión impar M^{2n+1} se obtienen como intersección de hipersuperficies cuadráticas en posición general en $\mathbb{C}^{n+2}$ y la esfera $\mathbb{S}^{2n+3}$. Las variedades admiten una acción localmente libre del círculo de tal suerte que el cociente es una variedad compleja N^n ($dim_{\mathbb{C}} N = n$) que en general no es de tipo Kähler. La variedad N admite una fibración holomorfa $\pi : N \to V$ de tipo Seifert sobre una variedad tórica V y con fibra un toro compacto complejo. Las posibles singularidades de V son de tipo *orbifold* (singularidades simples). Toda variedad compacta tórica con singularidades simples se obtiene por este proceso. Las variedades ángulo momento M^{2n+1} admiten la acción del toro $\mathbb{T}^{n+2}$ cuyo cociente es un politopo convexo K^{n-1}. En analogía con las variedades tóricas la combinatoria de este politopo convexo controla la geometría y topología de M^{2n+1} y N^{2n}. Las variedades M^{2n+1} admiten una estructura de contacto. También admiten una estructura de *libro abierto* que tiene como páginas variedades complejas. Existen muchos problemas abiertos interesantes.

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6.4 Thematic Sessions

6.4.1 ALG1 - COMPUTATIONAL DIFFERENTIAL AND DIFFERENCE ALGEBRA

ALG1-1 Carlos E. Arreche, North Carolina State University, USA

Projectively integrable linear difference equations and their Galois groups

A difference-differential field (of characteristic 0) is a field k equipped with an automorphism σ and a derivation δ that commute with each other. A linear difference equation is integrable if its solutions also satisfy a linear differential system of the same size. The difference equation is projectively integrable if it becomes integrable "after moding out by scalars". Based on recent results of R. Schaefke and M. Singer, we show that when $k = C(x)$ and σ is either a shift, q, or Mahler operator, the difference-differential Galois group G attached to a projectively integrable difference equation has a very special form. These results have applications for the direct problem of computing G for a given linear difference equation, as well as for the inverse problem of deciding which linear differential groups occur as difference-differential Galois groups for such equations. This is joint work with Michael Singer.

ALG1-2 David Blázquez-Sanz, Universidad Nacional de Colombia, Colombia

Joint and differential invariants of Lie group actions

We discuss the general properties of the theory of joint invariants of a smooth Lie group action in a manifold. Many of the known results about differential invariants, including Lie's finiteness theorem, have simpler versions in the context of joint invariants. We explore the relation between joint and differential invariants, and we expose a general method that allows to compute differential invariants from joint invariants

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ALG1-3 Thierry Combot, Université de Bourgogne, Francia

Computing differential Galois group of difference equations, applications to discrete systems

We present an algorithm to compute Liouvillian solutions of linear difference equations with polynomial coefficients, which runs in polynomial time with respect to the coefficients degrees and dispersion. The core of the approach is the factorization of the difference operator in an extended base ring, the ring of interlaced polynomials. The difficulty of interlacements in the solutions is thus limited to the ability of dealing with ring of interlaced polynomials, an non integral domain. We will focus in particular on the questions of testing the solvability or the virtual abelianity of the Galois group. Thanks to a Casale-Roques discrete analog of Morales Ramis Simo theorem, we can apply this algorithm to study integrability of birational discrete systems with a zero genus invariant curve.

ALG1-4 Juan J. Morales-Ruiz, Universidad Politécnica de Madrid, España

Differential Galois Theory and Darboux Transformations for Integrable Systems

We apply the Differential Galois Theory of linear partial differential systems to the Bäcklund–Darboux transformations of the AKNS solitonic partial differential equations. We prove that the Galois group of the transformed system is isomorphic to a subgroup of the Galois group of the initial system. As an example, we study the integrability in closed form of the linear systems corresponding to the solitonic solutions of KdV equation. Joint work with Sonia Jiménez, Raquel Sánchez–Cauce, Maria– A. Zurro.

ALG1-5 Daniel Robertz, Plymouth University, UK

Thomas Decomposition and Nonlinear Control Systems

This talk presents joint work with Markus Lange-Hegermann. We apply the Thomas decomposition technique to nonlinear control systems, in particular to the study of the dependence of the system behavior on parameters. Thomas' algorithm is a symbolic method which splits a given system of nonlinear partial differential equations into a finite family of so-called simple systems which are formally integrable and define a partition of the solution set of the original differential system. Different simple systems of a Thomas decomposition describe different structural behavior of the control system in general. We give a short introduction to the Thomas decomposition method and show how notions such as invertibility, observability and flat outputs can be studied. A Maple implementation of Thomas' algorithm is used to illustrate the techniques on explicit examples.

ALG1-6 Camilo Sanabria, Universidad de los Andes, Colombia

LODEs with algebraic solutions

Families of linear ordinary differential equations with finite primitive projective Galois group G can be generated via dynamical systems with G invariant solutions.

ALG1-7 Teresa Stuchi, Universidad Federal de Rio de Janeiro, Brazil

Non-Integrability of AGK Quartic Hamiltonian through Morales-Ramis Theory

In this talk we present our recent results about the application of Morales-Ramis Theory to a quartic Hamiltonian system with D_4 symmetry known as AGK Hamiltonian. Poincaré section for special values of the parameters are shown, which give evidence of non-integrability, thus we obtain obstructions to integrability of AGK Hamiltonian through the study of the variational equation equation in differential Galois theory sense. This is a joint work with P.B. Acosta-Humánez and M. Álvarez-Ramírez

ALG1-8 Jacques-Arthur Weil, Université de Limoges, Francia

Darboux Transformations for Tensor Products

Darboux developed an algebraic mechanism to construct an infinite chain of "integrable" second order differential equations as well their solutions. Surprisingly, after a long time, Darboux result's had important features in the analytic context and for instance in quantum mechanics, giving rising to Supersymmetric Quantum Mechanics. Today, there are a lot of papers concerning to Darboux transformation being used in different contexts, not only in mathematical physics. In this talk following the same Darboux's philosophy, we analyze the Darboux transformations for tensor product. This is a joint work with P.B. Acosta-Humánez and M. Barkatou.

6.4.2 ALG2 - ALGEBRAIC GEOMETRY AND ARITHMETIC GEOMETRY

ALG2-1 Alicia Dickenstein, Universidad de Buenos Aires Argentina

Arithmetics and combinatorics of tropical Severi varieties of univariate polynomials

Severi varieties are classical objects in algebraic geometry which give parameter spaces for nodal hypersurfaces. Mikhalkin's correspondence theorem from 2005 allows to compute tropically the degree of the Severi varieties of nodal curves with a fixed number of nodes defined by polynomials with support in a given lattice polygon. The tropical curves appearing in Mikhalkin's correspondence theorem can be described by the associated regular subdivision of the support. That is, the set of tropical curves with a specified combinatorial type counted in Mikhalkin's formula, correspond to polyhedral cones in the associated secondary fan associated with the lattice points in the polygon. However, these cones are a fraction of all possible cones in the associated tropical Severi variety. E. Katz noted in 2009 that there are

maximal cones that are not supported in cones of the secondary fan. Thus, the combinatorial description of the curves is not enough in many cases to decide if a tropical curve given by a tropical polynomial lies in the corresponding Severi variety. This behavior was also observed by J. J. Yang, who gave a partial description of the tropicalization of the Severi varieties in 2013 and 2016. We explore this phenomenon and give a full characterization in the univariate setting, that is, we describe all the cones in the tropical Severi variety defined by the tropicalization of the variety of univariate polynomials with fixed degree and two double roots. Besides the combinatorial constraints, we describe nontrivial arithmetic restrictions. This is joint work with Maria Isabel Herrero and Luis Felipe Tabera. In my talk, I will make a gentle introduction to the tropical setting.

ALG2-2 Javier Elizondo, Universidad Autonoma de México, México

Some aspects of the Euler-Chow series and how it is related with Cox rings

We would like to give a short summary of what is the Euler-Chow series and how it is related to other important series in algebraic geometry, such as Hilbert series, the Zeta series of Weil or Zeta series of Kapranov. We will also talk about the rationality of the Euler–Chow series of codimension one cycles on a projective variety X and its relation with the effective cone and the Cox ring of X.

ALG2-3 José Luis González, Yale University, USA

Soñó Mori con el espacio de curvas racionales marcadas?

El anillo de coordenadas total de una variedad algebraica generaliza el anillo de coordenadas homogéneo de los espacios proyectivos a las variedades cuyo grupo de Picard es finitamente generado. En esta charla hablaremos del anillo de coordenadas total del espacio de curvas racionales marcadas y discutiremos progreso reciente en la conjetura del "espacio de ensueño de Mori".

ALG2-4 Edwin Leon Cardenal, Centro de Investigación en Matemáticas, México

Local Zeta Functions at Infinity

Local zeta functions play a relevant role in mathematics. They are related with several mathematical theories as PDE's, number theory, singularity theory, among many others. They are complex valued functions that can be defined, for instance, over Archimedean and non-Archimedean (or p-adic) local fields. As functions of the complex parameter s, the zeta functions are holomorphic on the half plane Re (s) > 0, furthermore, in the case of characteristic zero they admit a meromorphic continuation to the whole complex plane, which follows by using Hironaka's resolution of singularities theorem.

In this talk we plan to introduce briefly Igusa's zeta functions and some classical results about them, then we will present a 'generalization to infinity' and some preliminary results about local zeta functions at infinity.

ALG2-5 Álvaro Liendo, Universidad de Talca, Chile

Additive group actions on algebraic varieties

In this talk we present some recent results about additive group actions on non-necessarily affine algebraic varieties that generalize the usual description of additive group actions on affine varieties via locally nilpotent derivations. In particular, we provide a characterization of additive group actions on a wide class of algebraic varieties in terms of a certain type of integrable vector fields.

This is a joint work with A. Dubouloz.

ALG2-6 Sukhendu Mehrotra, Universidad Catolica de Chile, Chile

Derived symmetries of moduli spaces of sheaves on K3 surfaces

Let X be a K3 surface, and Y the Hilbert scheme of g points on it. It follows from results of Addington and Markman-Mehrotra that the derived category D(Y) carries an exotic auto-equivalence constructed from the universal ideal sheaf. Addington has conjectured that any moduli space of sheaves on X should carry such a derived symmetry; in fact, it should arise from the same construction using the universal (twisted) sheaf. This was confirmed by him for a class of moduli spaces in recent work with Donovan and Meachan. Here, we discuss another class of moduli spaces which was worked out jointly with Eyal Markman.

ALG2-7 Cecilia Salgado, Universidade Federal de Rio de Janeiro, Brazil

Classification of elliptic fibrations on certain K3 surfaces

Let X be an algebraic K3 surface endowed with a non-symplectic involution. We classify all elliptic fibrations on X under some hypothesis on the non-symplectic involution. The idea behind it involves transferring the classification problem to a "simpler" surface from the geometric point of view.

This is work in progress with Alice Garbagnati (Milano).

ALG2-8 Giancarlo Urzua, Universidad Católica de Chile, Chile

How to identify Milnor fibers of smoothings of quotient sigularities

This is part of my joint paper "Milnor fibers and symplectic fillings of quotient surface singularities" (arXiv:1507.06756) with Heesang Park, Dongsoo Shin and Jongil Park. I will explain how MMP is used to identify the Milnor fiber of a smoothing of a 2-dimensional quotient singularity. This is used to give a geometrical one-to-one correspondence between Milnor fibers and certain zero continued fractions, for the case of cyclic quotient singularities, which recovers the correspondence of Kollár-Shepherd-Barron, Christophersen-Stevens, and Lisca (connecting Milnor fibers with symplectic fillings). The MMP used is a small part of a bigger explicit MMP for families of surfaces described in my joint paper "Flipping surfaces" with Paul Hacking and Jenia Tevelev.

6.4.3 ALG3 - HIGGS BUNDLES, INSTANTONS AND REAL CHARACTER VARIETIES

ALG3-1 Steve Bradlow, University of Illinois at Urbana-Champaign, Chicago, USA

Higgs bundles, spectral data, and fiber products of curves

I will discuss some interesting relations among Higgs bundles, especially from the point of view of spectral data, that result from isogenies among low dimensional Lie groups.

ALG3-2 Pedram Hekmati, Instituto Nacional de Matemática Pura e Aplicada IMPA, Brazil

Moduli Spaces of Contact Instantons

The Yang-Mills instantons admit several natural extensions to higher dimensions. In this talk I will first review a few examples and then focus on contact instantons, which arise as critical points of a super Yang-Mills theory on 5-dimensional contact manifolds. The moduli space depends highly on the geometry transverse to the Reeb foliation and in particular, the dimension is given by the index of a transverse elliptic complex. This is joint work with David Baraglia.

ALG3-3 Marcos Jardim, Universidade Estadual de Campinas, Brazil

Branes in the moduli space of framed sheaves

By considering the fixed loci of certain involutions, we describe branes in Nakajima quiver varieties of all possible types. We then focus on the moduli space of framed torsion free sheaves on the projective plane, showing how the involutions considered act on sheaves, and proving the existence of branes in some cases. Joint work with Emilio Franco and Simone Marchesi.

ALG3-4 Andrés Larraín-Hubach, University of Arizona, USA

Self-dual connections on Taub-NUT space

Yang-Mills Equations are a nonlinear system of PDE, defined over smooth four-manifolds, with a deep geometric meaning. The properties of solutions to these equations have been studied since the sixties, producing several important results in mathematics and physics. Solutions over non-compact manifolds have not been analyzed as much, and there are still many important unanswered questions. In this talk, based on joint work with Sergey Cherkis and Mark Stern, I will explain several properties of solutions to Yang Mills equations, defined over an important open four-manifold called Taub-NUT space.

ALG3-5 Alessia Mandini, Pontificia Universidade Católica do Rio de Janeiro, Brazil

Hyperpolygons and Parabolic Higgs bundles

Hyperpolygons spaces are a family of (finite dimensional, non-compact) hyperkaehler spaces, that can be obtained from coadjoint orbits by hyperkaehler reduction. In joint work with L. Godinho, we show that these space are diffeomorphic (in fact, symplectomorphic) to certain families of parabolic Higgs bundles. In this talk I will describe this relation and use it to analyse the fixed points locus of a natural involution on the moduli space of parabolic Higgs bundles. The fixed point locus of this involution is identified with the moduli spaces of polygons in Minkowski 3-space and the identification yields information on the connected components of the fixed point locus.

This is based on joint works with Leonor Godinho and with Indranil Biswas, Carlos Florentino and Leonor Godinho.

ALG3-6 Roberto Rubio, Instituto Nacional de Matemática Pura e Aplicada IMPA, Brazil

The Toledo invariant and the Cayley correspondence for Higgs bundles

We will start by redefining the Toledo invariant for G-Higgs bundles over a compact Riemann surface, with G a Hermitian group. The proof of the Milnor-Wood inequality for this Toledo invariant, which relies on Jordan algebra theory, will take us to a rigidity result known as the Cayley correspondence. Namely, for G of tube type, by choosing a |Z(G)|-root of the canonical bundle, the moduli space of polystable maximal G-Higgs bundles is isomorphic to the moduli space of polystable K^2-twisted H*-Higgs bundles, where H* is a non-compact dual of the maximal compact subgroup H of G. (Joint work with O. Biquard and O. Garcia-Prada.)

ALG3-7 Ronald Zúñiga Rojas, Universidad de Costa Rica, Costa Rica

Stratifications on the Moduli Space of Higgs Bundles

The work of Hausel proves that the Bialynicki-Birula stratification of the moduli space of rank two Higgs bundles coincides with its Shatz stratification. These two stratifications do not coincide in general. Here, we give an approach for the rank three case of the classification of the Shatz stratification in terms of the Bialynicki-Birula stratification.

6.4.4 ALG4 - ALGEBRAIC COMBINATORICS, HOPF ALGEBRAS AND TENSOR CATEGORIES

ALG4-1 Federico Ardila, San Francisco State University, USA

Polytopes with algebraic and combinatorial structure

Generalized permutahedra are a beautiful family of polytopes with a rich combinatorial structure. We explore the Hopf algebraic structure of this family. We use this structure to unify old results, prove new results, and solve open problems in algebra and combinatorics.

The talk is based on joint work with Marcelo Aguiar and will assume no previous knowledge of Hopf algebras or generalized permutahedra.

ALG4-2 Carolina Benedetti, Fields Institute-York University, Canadá

Hopf algebras, antipodes and orientations

We will show how a Hopf algebra structure on graphs can be lifted to abstract simplicial complexes. We make use of this Hopf structure to study the antipode map of several families of Combinatorial Hopf algebras arising this way. We will see how these antipodes extend and recover Stanley's (-1)-color theorem, namely, the number of acyclic orientations in a graph can be obtained by evaluating its chromatic polynomial at -1. We study a q-analog of the chromatic symmetric polynomial, by means of principal specializations. This q-analog has been used recently by V. Grujic as a way of recovering f-vectors of graphical zonotopes.

This is joint work with J. Hallam and J. Machacek.

ALG4-3 Gastón García, Universidad Nacional de la Plata, Argentina

On Hopf Algebras over quantum subgroups

Let k be an algebraically closed field of characteristic zero. The question of classification of all Hopf algebras over k of a given dimension up to isomorphism was posed by Kaplansky in 1975. Some progress has been made but, in general, it is a difficult question where there are no standard methods.

One of the few general techniques is the so-called Lifting Method [AS], under the assumption that the coradical is a subalgebra. More recently, Andruskiewitsch and Cuadra [AC] proposed to extend this technique by considering the subalgebra generated by the coradical and the related filtration, called the standard filtration.

Using the standard filtration associated to a generalized lifting method, we determine all finite-dimensional Hopf algebras whose coradical generates a Hopf subalgebra isomorphic to the smallest non-semisimple non-pointed Hopf algebra K of dimension 8 and the corresponding infinitesimal module is an indecomposable object in the category of Yetter-Drinfeld modules over K. As a byproduct we obtain new Hopf algebras of dimension 64.

This talk will be based on joint work with J. M. Jury Giraldi [GJG]

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ALG4-4 Rafael González D'León, University of Kentucky, USA

The colored symmetric and exterior algebras

We present colored generalizations of the symmetric algebra and its Koszul dual, the exterior algebra. The symmetric group $\mathfrak{S}_n$ acts on the multilinear components of these algebras. While $\mathfrak{S}_n$ acts trivially on the multilinear components of the colored symmetric algebra, we use poset topology techniques to describe the representation on its Koszul dual. We introduce an $\mathfrak{S}_n$-poset of weighted subsets that we call the weighted boolean algebra and we prove that the multilinear components of the colored exterior algebra are $\mathfrak{S}_n$-isomorphic to the top cohomology modules of its maximal intervals. We show that the two colored Koszul dual algebras are Koszul in the sense of Priddy et al.

ALG4-5 Javier Gutiérrez, Universidad Nacional de Córdoba, Argentina

Quantum subgroups of simple twisted quantum groups at roots of one

In the talk, we present a contribution to the Hopf algebras classification problem over a closed algebraic field of characteristic zero. Andruskiewitsch y García classificated all quantum subgroups of the non twisted case, we show a generalization of this one. In particular, all quantum subgroups of the twisted quantum group defined by Costantini and Varagnolo were classified. Also, we show new Hopf algebra examples in two ways, those that appear as a 2-cocycle deformation of the non twisted case and those that no necessarily.

This talk is based in the paper the same title of this talk, it was made with Gastón Andrés García available arxiv.org/abs/1601.00897.

ALG4-6 Miguel Mendez, Instituto Venezolano de Investigación Científica, Venezuela

The natural Hopf algebra associated of a set operad

From a symmetric set operad, we give a simple construction of a commutative and non-co-commutative Hopf algebra, that we call the natural Hopf algebra of the operad. We obtain a combinatorial formula for its antipode in terms of Schröder trees, generalizing the Haiman–Schmitt formula for the Faà di Bruno Hopf algebra. We derive antipode formulas for specific operads. The classical Lagrange inversion formula is obtained in this way from the set operad of pointed sets. A similar construction for non-symmetric operads leads to the world of non-commutative Hopf algebras. We recover from our general formula the Novelli–Thibon combinatorial form of the antipode for the non-commutative Hopf algebra of formal diffeomorphisms.

ALG4-7 Martín Mombelli, Universidad Nacional de Córdoba, Argentina

Group actions on 2-categories

In this talk I will present how a finite group acts on a 2-category. Associated to this action there is a new 2-category: the equivariantization. This new 2-category generalizes several constructions in tensor category theory. I will present some examples and possible applications.

ALG4-8 Yiby Morales, Universidad de Los Andes, Colombia

The five-term exact sequence for Kac cohomology

The group of equivalence classes of abelian extensions of Hopf algebras associated to a matched pair of finite groups was described by Kac in the 60's as the second cohomology group of a double complex, whose total cohomology is known as the Kac cohomology. Masuoka generalized this result and used it to construct and classify semisimple Hopf algebra extensions. Since Kac cohomology is defined as the total cohomology of a double complex, there is an associated spectral sequence. We compute the second page of this spectral sequence and the associated five-term exact sequence. Through some examples we show how this new exact sequence is useful to compute groups of abelian extensions.

This is a joint work with César Galindo.

ALG4-9 Rosa Orellana, Darmouth College, USA

Symmetric group characters as symmetric functions

The characters of the general linear group are symmetric functions. The irreducible characters are found by evaluating Schur polynomials at eigenvalues of matrices. In this talk I will introduce a new basis for symmetric functions such that when evaluated at the eigenvalues of a permutation matrix we get the irreducible characters of the symmetric group. This basis has as structure coefficients the stable (reduced) Kronecker coefficients.

This is joint work with Mike Zabrocki.

ALG4-10 María Ronco, Universidad de Talca, Chile

B_∞-algebras and separable permutations

B -infinity algebras were introduced by H. Baues (see [1]) as formal deformations of the differential commutative algebra structure on the bar construction of a vector space, which does not modify the deconcatenation coproduct (only the product and the differential map). In [3], we proved that the non-differential structure of a B-infinity algebra, spanned by the multibrace operations admits a natural notion of enveloping bialgebra, given by a coalgebra C equipped with two associative products $*$ and $\cdot$ satisfying that $(C, *)$ is a bialgebra and $(C, \cdot)$ is an infinitesimal unital bialgebra. This type of algebra is called a 2-associative bialgebras. So, the subspace of primitive elements of a 2-associative bialgebra is a multibracealgebra, and there existes an equivalence between the category of connilpotent 2-associative bialgebras and the category of multibrace algebras.

The aim of our work is to provide a notion of enveloping algebra for any B-infinity algebra, in its full definition. In order to do that, we need to introduce some algebraic structures on the set of floorplants (see [2]) on a square, which are in bijection with separable permutations.

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ALG4-11 Martha Yip, University of Kentucky, USA

A categorification of the chromatic symmetric function

The Stanley chromatic symmetric function X_G of a graph G is a symmetric function generalization of the chromatic polynomial, and has interesting combinatorial properties. We apply the ideas of Khovanov homology to construct a homology of graded S_n-modules, whose graded Frobenius series reduces to the chromatic symmetric function at q=t=1. This homology can be thought of as a categorification of the chromatic symmetric function, and provides a homological analogue of several familiar properties of X_G. In particular, the decomposition formula for X_G discovered recently by Orellana and Scott, and Guay-Paquet is lifted to a long exact sequence in homology.

6.4.5 ALG5 - CODING THEORY AND RELATED TOPICS

ALG5-1 Erik Backelin, Universidad de los Andes, Colombia

Higher Auslander Reiten theory and tilting modules

I will discuss a triangulated category theoretic approach to (higher) Auslander-Reiten theory invented by myself and Juan Camilo Arias. I will then consider the example of tilting modules over a quantum group at a root of unity.

ALG5-2 Diana Bueno-Carreño, Pontificia Universidad Javeriana Cali, Colombia

Strong minimum distance of abelian codes

The BCH bound is the oldest lower bound for the minimum distance of a cyclic code. The study of this bound and its generalizations are classical topics, which includes the study of the very well-known family of BCH codes. In 1970, P. Camion [3] extended the notion of BCH bound to the family of abelian codes by introducing the apparent distance of polynomials. Camion showed that the minimum value of the apparent distance of certain polynomials associated to codewords is less than or equal to the minimum distance of the code. The mentioned minimum value is known as the apparent distance of an abelian code. We strengthen the notion of apparent distance by introducing the notion of strong apparent distance; then, we present an algorithm to compute the strong apparent distance of an abelian code, based on some manipulations of hypermatrices associated to its generating idempotent.

Joint work with:
José Joaquín Bernal, Universidad de Murcia, España
Juan Jacobo Simón, Universidad de Murcia, España

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ALG5-3 Mehdi Garrousian, Universidad de los Andes, Colombia

Generalized star configurations and Hamming weights

From the generating matrix of a linear code one can construct a sequence of generalized star configurations which are strongly connected to the generalized Hamming weights and the underlying matroid of the code. When the code is MDS, the matrix is generic and we obtain the usual star configurations. We use the techniques of combinatorial commutative algebra to study the connection between ideals generated by products of linear forms and the generalized Hamming weights. The main result is a formula for the degree of a generalized star configuration as a projective scheme in terms of the Tutte polynomial of the linear code.

ALG5-4 Hiram López, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional, México

Evaluation codes

In this talk we introduce the linear codes known as evaluation codes. This family of codes mainly depends on an affine or a projective set. We will see that the length and the dimension of these codes can be computed using tools of commutative algebra. We also give examples using different affine and projective sets, and we try to compute the parameters of the codes they originate.

ALG5-4 Edgar Martinez-Moro, Universidad de Valladolid, España

TBA

ALG5-6 Wilson Olaya-León, Universidad Industrial de Santander, Colombia

The weight hierarchy of Castle codes

Let $\mathbb{F}_q$ be the finite fields with q elements. For a vector $x \in \mathbb{F}_q^n$, the support of x is the set $\mathrm{supp}(x) = \{i : 1 \leq i \leq n, x_i \neq 0\}$. If $C \subset \mathbb{F}_q^n$ is a linear $[n, k]$ code, the support of C is defined as $\mathrm{supp}(C) = \bigcup_{x \in C} \mathrm{supp}(x)$ and for any r, $1 \leq r \leq k$, the r-th generalized Hamming weight of C is

$$d_r(C) = \min\{\#\mathrm{supp}(V_r) : V_r \text{ is an } r - \text{dimensional subcode of} C\}.$$

The weight hierarchy of the code C is the set of generalized Hamming weights $\{d_1(C), d_2(C), \ldots, d_k(C)\}$. The first generalized Hamming weight of C is the usual minimum distance.

Castle codes are algebraic geometry one-point codes on Castle curves. This family contains some of the most important algebraic geometry codes among those studied in the literature to date. The weight hierarchy of these codes can be bounded by using the orden bound, whose main tools is the notion of well-behaving pairs. This bound is successful and usually gives very good results for the minimum distance (this bound gives the true minimum distance for Hermitian codes) but for weights higher dimension is difficult to compute.

In this talk will present a new way to get the exact value of certain Hamming weights of Castle codes. I will then introduce a notion of regular-behaving pairs and describe your properties in terms of the Weierstrass semigroup associated with the curve. In particular, I will show that for Hermitian codes these Hamming weights are all satisfying the generalized Singleton bound, i.e. are $t-$th rank MDS.

ALG5-7 Ricardo Podestá, Universidad de Córdoba, Argentina

Asymptotically good quasi-transitive AG-codes over prime fields

Whether or not there are families of asymptotically good cyclic codes is a long standing open question in coding theory. Quasi-transitive codes are natural generalizations of transitive and cyclic codes. In [1], by using a Hilbert class field tower, we prove that if there is a polynomial over $\mathbb{F}_q$ satisfying certain conditions, then a sequence of asymptotically good 4-quasi transitive codes over $\mathbb{F}_q$ exists. In particular, we show that there are asymptotically good 4-quasi transitive codes over a prime field $\mathbb{F}_q$, for infinite primes p.

Next, we give conditions for an AG-code to be cyclic and show some examples of cyclic AG-codes produced by using field automorphisms. We show that cyclic AG-codes constructed via automorphisms are essentially given by cyclic extensions of the rational function field. A consequence of this is that towers of function fields may not be adequate to address the problem of asymptotic behavior of cyclic codes, as long as the the sequence of cyclic AG-codes is constructed using automorphisms of the function fields of the tower.

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ALG5-8 Jaiberth Porras Barrera, UUniversidad Nacional de Colombia, Colombia

Efficient ZHFE Key Generation

In this work we present a new algorithm to construct the keys of the multivariate public key encryption scheme ZHFE. Constructing ZHFE's trapdoor involves finding a low degree polynomial of q-Hamming-weight-three, as an aid to invert a pair of q-Hamming-weight-two polynomials of high degree and high rank. This is done by solving a large sparse linear system of equations. We unveil the combinatorial structure of the system in order to reveal the hidden structure of the matrix associated with it. When the system's variables and equations are organized accordingly, an almost block diagonal shape emerges. We then exploit this shape to solve the system much faster than when ZHFE was first proposed. This work presents the theoretical details explaining the structure of the matrix. We also present experimental data that confirms the notable improvement of the key generation complexity, which makes ZHFE more suitable for practical implementations.

ALG5-9 Alonso Sepúlveda Castellanos, Universidade Federal de Uberlándia, Brazil

Two-point AG Codes on the GK Maximal Curves

We determine the Weierstrass semigroup of a pair of certain rational points on the Giulietti-Korchmáros (GK) maximal curve. We use this semigroup to obtain two-point AG codes with better parameters than comparable one-point AG codes arising from these curve. These parameters are new records in the MinT's tables.

ALG5-10 Wolfgang Willems, Universität Magdeburg, Alemania

Duality for group codes

A (right) ideal C in a group algebra KG, where K is a finite field and G a finite group, is called a group code. If we endow KG with the non-degenerate G-invariant bilinear form $\langle \cdot , \cdot \rangle$ defined by $\langle g, h \rangle = \delta_{g,h}$ for $g, h \in G$, then KG becomes a metric space. Thus the orthogonal code $C^{\perp}$ of C is well defined. In the talk we report on two important cases of group codes. First on self-dual codes; i.e. $C^{\perp} = C$, which have many interesting connections to other fields in mathematics; secondly on codes with complementary duals; i.e. $KG = C \oplus C^{\perp}$, which may be used in cryptography for information protection.

6.4.6 ALG6 - ALGEBRAIC NUMBER THEORY AND RELATED TOPICS

ALG6-1 Francesca Bergamaschi, Concordia University, Canada

Bad reduction of Hilbert modular varieties

Hilbert modular varieties can be seen as a generalization of the modular curve; they can be roughly described as spaces parametrizing abelian varieties under the action of a given totally real number field. Their relation to number theory is strong, as Hilbert modular forms can be seen as sections of line bundles over them. In particular, the many interesting phenomena arising in positive characteristic provide us with powerful tools to study their geometry. In this talk we give a description of the Hilbert modular variety $\mathcal{M}_p$ with $\Gamma_0(\mathfrak{p})$-level in ramified characteristic. By classifying the p-torsion of points we will give an understanding of the local geometry of the Hilbert modular variety and define stratifications of the space, which are a natural environment for constructing modular forms, such as generalized Hasse invariants.

ALG6-2 Victoria Cantoral Farfán, Institut de Mathématiques de Jussieu, France

Torsion for abelian varieties of type III

Mordell-Weil's theorem states that for an abelian variety A defined over a number field K the group of rational points over K is finitely generated, i.e. $A(K) = A(K)_{tors} \times \mathbb{Z}^r$ where $A(K)_{tors}$ denotes the finite subgroup of torsion points defined over K. One can wonder if we can get an uniform bound for $|A(L)_{tors}|$, depending on $[L : K]$, when the abelian variety A varies. This question is more commonly known as the "Strong Uniform Boundedness Conjecture". For elliptic curves defined over a number field K, Merel proved in 1994 that we can indeed get a uniform bound using methods developed by Mazur and Kamienny.

A complementary question would be to ask if we can get a bound for $|A(L)_{tors}|$ depending only on the degree $[L : K]$ when the field extension L/K varies and the abelian variety A is fixed? This question had been already answered by Hindry and Ratazzi for certain classes of abelian variety.

In this talk we focus our attention on this last question and extend the previous results. We are going to present some new results on this direction concerning the class of abelian varieties A which are isogenous to a product of simple abelian vari- eties of type I, II or III in Albert classification and is "fully of Lefschetz type" (i.e. whose Mumford-Tate group is the group of symplectic or orthogonal similitudes commuting with endomorphisms and which satisfy the Mumford-Tate conjecture).

After defining all the necessary tools, we show that there is a constant c_A such, as

$$\forall L/K,\ \ |A(L)_{tors}| \leq c_A \cdot [L:K]^{\gamma(A)}$$

The exponent $\gamma(A)$ is the optimal exponent for this bound. Our results give an explicit expression for $\gamma(A)$ in terms of the dimensions of the abelian subvarieties of A and their rings of endomorphisms.

ALG6-3 Chantal David, Concordial University, Canada

One-parameter families of elliptic curves with non-zero average root number

We investigate in this talk the average root number (i.e. sign of the functional equation) of one-parameter families of elliptic curves (i.e elliptic curves over $\mathbb{Q}(t)$, or elliptic surfaces over $\mathbb{Q}$). For most one-parameter families of elliptic curves, the average root number is predicted to be 0. Helfgott showed that under Chowla's conjecture and the square-free conjecture, the average root number is 0 unless the curve has no place of multiplicative reduction over $\mathbb{Q}(t)$. We then build families of elliptic curves with no place of multiplicative reduction, and compute the average root number of the families. Some families have periodic root number, giving a rational average, and some other families have an average root number which is expressed as an infinite Euler product. We also show several density results for the average root number of families of elliptic curves, and exhibit some surprising examples, for example, non-isotrivial families of elliptic curves with rank r over $\mathbb{Q}(t)$ and average root number $-(-1)^r$, which were not found in previous literature.

Joint work with S. Bettin and C. Delaunay.

ALG6-4 Piper Harron, The liberated mathematician, USA

The Equidistribution of Lattice Shapes of Rings of Integers in Cubic, Quartic, and Quintic Number Fields

Piper Harron presents the delightfully mathematical one woman show that answers questions her audience may have never asked itself before now! Such as: What is the shape of a number field? And: How do we show shapes are equidistributed? She will sketch the proof, providing references to old stuff and details to new stuff. Come one, come all (people, including graduate students, interested in number theory)!

ALG6-5 Robert Harron, University of Hawai'i, USA

Equidistribution of shapes of cubic fields of fixed quadratic resolvent

Building upon work of Bhargava, P. Harron, and Shnidman, I will discuss results on the distribution of shapes of cubic fields K of fixed quadratic resolvent. The shapes depend on the trace zero form (that is the projection of the trace form to the trace zero space). For instance, I'll show that the shapes of complex cubic fields lie on the geodesic on the modular surface $SL(2,\mathbb{Z})\backslash H$ determined by their trace zero form and that, in a fixed such geodesic, the shapes are equidistributed with respect to the natural hyperbolic measure. In the case of pure cubic fields (whose quadratic resolvent field is the third cyclotomic field), the corresponding geodesics have infinite length and the equidistribution must be considered in a regularized sense. That these geodesics are of infinite length provides a reason behind the different asymptotic growth rates of pure cubic fields versus other fields of fixed quadratic resolvent seen in the work of Bhargava–Shnidman and Cohen– Morra. I'll also discuss related results such as the fact that the shape is a complete invariant of complex cubic fields.

ALG6-6 Elisa Lorenzo, Leiden University, Holland

On twists of smooth plane curves

Given a smooth curve defined over a field $\mathbf{k}$ that admits a non-singular plane model over $\overline{\mathbf{k}}$, it does not necessarily have a non-singular plane model defined over the field $\mathbf{k}$. We will determine under which conditions this happens and we will show an example of such phenomenon. Even assuming that such

a smooth plane model exists, we will discuss the existence of non-singular plane models over $\mathbf{k}$ for its twists. We characterize twists possessing such models. We also show an example of a twist not admitting such non-singular plane model via a non-trivial Brauer-Severi surface. (This is a joint work with E. Badr and F. Bars)

ALG6-7 Piermarco Milione, Universitat de Barcelona, Spain

p-adic uniformization of Shimura curves through Mumford curves

Shimura curves, and in particular their Jacobians, have been key ingredients in the proof of important results in number theory, such as many relevant cases of Serre's Conjecture and Fermat's Last Theorem. Finally, in more recent years, the study of the p-adic uniformization of Shimura curves has also assumed a fundamental role in the p-adic Birch and Swinnerton-Dayer Conjecture and in geometric realizations of the p-adic Langlands correspondence. In this talk I will give a brief introduction to the theory of p-adic uniformization of Shimura curves and I will present general and explicit results that I have obtained, in a joint work with Laia Amoróos, of such uniformization.

Let $X(pD,N)$ be the Shimura curve associated to an Eichler order of level N in an indefinite quaternion $\mathbb{Q}$- algebra of discriminant pD, where p is a fixed odd prime integer. Thanks to the fundamental works of Cerednik and Drinfel'd (cf. [Cer76] and [Dri76]), we know that the curve $X(pD,N)$ admits a p-adic uniformization which can be expressed, inter alia, as a rigid analytic $\mathbb{Q}_p$-isomorphism

$$\Gamma_p\backslash(\mathcal{H}_p \otimes_{\mathbb{Q}_p} \mathbb{Q}_{p^2}) \simeq (X(pD,N) \otimes_{\mathbb{Q}} \mathbb{Q}_p)^{rig}$$

where $\mathcal{H}_p$ denotes the p-adic upper half-plane over $\mathbb{Q}_p$ and Γ_p is a discrete cocompact subgroup of $PGL2(\mathbb{Q}_p)$. As a consequence, the p-adic Shimura curve $X(D,N) \otimes_{\mathbb{Q}} \mathbb{Q}_p$ is the twist over $\mathbb{Q}_{p^2}$ of a finite quotient of some Mumford curve associated to a cocompact Schottky group $\Gamma_p^{Sch} \subset \Gamma_p$. Moreover the group Γ_p arises as the units group of an Eichler order of level N over $\mathbb{Z}[1/p]$, inside the definite quaternion algebra of discriminant D.

In this talk, I will first present the method we developed in order to find the Schottky group $\Gamma_p^{Sch} \subset \Gamma_p$ together with a free system of generators for this, (at least) in the cases of those definite Eichler orders having ideal class number $h(D,N) = 1$. This generalizes some nice results of Gerritzen and van der Put [GvDP80] on Mumford curves arising from the definite quaternion algebra of discriminant 2. Thanks to this method, we are able to give an explicit description of the rigid analytic structure of the Mumford curve associate to the group Γ_p^{Sch} (such as a good fundamental domain in $\mathcal{H}_p$ and its stable reduction graph), as well as of the the rigidification of the p-adic Shimura curve $X(pD,N) \otimes_{\mathbb{Q}} \mathbb{Q}_p$. As an application we can easily obtain formulas describing the reduction-graphs with lengths of the Shimura curves considered (generalizing some formulas of Kurihara [Kur79]), and also formulas for the genera of the special fibres of these curves.

Eventually, I will also explain how these results can be applied in order to compute the period matrices of the Jacobians of the Shimura curves considered using p-adic multiplicative integrals, which is a work in progress with Iago Giné.

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ALG6-8 Marta Narváez-Clauss, Universitat Barcelona, Spain

Quantitative equidistribution of Galois orbits of points of small heght on the algebraic torus

Bilu's equidistribution theorem establishes that, given a strict sequence of points on the N-dimensional algebraic torus whose Weil height tends to zero, the Galois orbits of the points are equidis- tributed with respect to the Haar probability measure of the unit poly- circle. For the case of dimension one, quantitative versions of this re- sult were independently obtained by Petsche, and by Favre and Rivera- Letelier.

We present a quantitative version of Bilu's result for the case of any dimension. Given a point on the algebraic torus of dimension N and Weil height less than 1, we give a bound for the integral of a suitable test function on $\mathbb{P}^1(\mathbb{C})^N$ with respect to the signed measure defined as the difference of the discrete probability measure associated to the Galois orbit of the point and the probability measure supported on the unit polycircle, where it coincides with the normalized Haar measure. This bound is given in terms of a constant depending only on the test function, the Weil height of the point, and a notion that generalizes to higher dimension the degree of an algebraic number.

For the proof of this result we use Fourier analysis techniques to decompose the problem and we reduce it, via projections, to the one- dimensional case where we apply the quantitative version by Favre and Rivera-Letelier.

Joint work with Carlos D'Andrea and Martín Sombra, both at the Universitat de Barcelona.

ALG6-9 Frank Thorne, University of South Carolina, USA

Levels of distribution in arithmetic statistics

A "level of distribution" is, roughly speaking, a bound on the cumulative error terms made when estimating the distribution of arithmetic sequences. These are an important input in many standard techniques in analytic number theory.

In this talk I will discuss levels of distribution in the context of prehomogeneous vector spaces. After giving an overview of what prehomogeneous vector spaces are and why people care, I will describe what sorts of results one hopes to obtain and how they may be proved. I will also outline a variety of applications in arithmetic statistics.

This is joint work with Takashi Taniguchi.

6.4.7 ANA1 - ADVANCES IN NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS - ELLIPTIC PARTIAL DIFFERENTIAL EQUATIONS

ANA1-1 Julian Bónder, Universidad de Buenos Aires, Argentina

Tartar's method in nonlocal homogenization

In this talk I will discuss some homogenization results for divergence-like nonlocal elliptic operators by means of Tartar's method of oscillating test functions.

This is a joint work with A. Ritorto and A. Salort.

ANA1-2 Juan Dávila, Universidad de Chile, Chile

Hölder estimates for solutions of a MEMS equation

We prove sharp Hölder estimates for sequences of positive solutions of a nonlinear elliptic problem with negative exponent. As a consequence, we prove the existence of solutions with isolated ruptures in a bounded convex domain in two dimensions.

This is joint work with Kelei Wang (Wuhan University) and Juncheng Wei (University of British Columbia).

ANA1-3 Jorge Faya, Universidad de Chile, Chile

Concentrating solutions for a Hénon-type problem on general domains

We consider the problem

$$(\wp_p) \qquad \begin{cases} -\mathrm{div}(a(x)\nabla u) = b(x)|x|^{\alpha}u^p & \text{in } \Omega, \\ u = 0 & \text{on } \partial\Omega, \end{cases}$$

where Ω is a bounded smooth domain in $\mathbb{R}^N$, $N \geq 3$, the functions $a \in C^1(\overline{\Omega})$, $b \in C^1(\overline{\Omega})$ are strictly positive on $\overline{\Omega}$, $p > 1$ and α is a positive real number.

When $a \equiv b \equiv 1$ and Ω is the unit ball in $\mathbb{R}^N$, $(\wp_p)$ is the well known Hénon problem. In a classical paper [1], Ni prove that if $p \in (1, \frac{N+2+2\alpha}{N-2})$ then the Hénon problem possesses a positive radial solution. If Ω has no spherical symmetries the existence of a solution for $p \in (1, \frac{N+2+2\alpha}{N-2})$ remains an open problem.

We shall present some concentration results for particular cases of the problem $(\wp_p)$ when the exponent p is close, to both, the critical exponent $\frac{n+2}{n-2}$ and the α- critical exponent $\frac{N+2+2\alpha}{N-2}$.

This is joint work with professors Angela Pistoia, Massimo Grossi, Juan Dávila and Fethi Mahmoudi

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ANA1-4 Monica Musso, Pontificia Universidad Católica de Chile, Chile

Existence, compactness and non-compactness for the fractional Yamabe problem

In this talk, we present some recent result on the fractional Yamabe problem, on existence of solutions, properties of compactness and non compactness of its solution set. We also compare these results with the ones known for the classical Yamabe problem. These results are obtained in collaboration with S. Kim and J. Wei.

ANA1-5 Alexander Quaas, Universidad Técnica Federico Santa María, Chile

Continuous viscosity solutions for nonlocal Dirichlet problems with coercive gradient terms

In this talk we study existence of solutions of nonlocal Dirichlet problems that include a coercive gradient term, whose scaling strictly dominates the one of the integro-differential operator. For such problems the stronger effect of the gradient term may give rise to solutions not attaining the boundary data or discontinuous solutions on the boundary. Our main result states that under suitable conditions over the right-hand side and boundary data, there is a (unique) Hölder continuous viscosity solution attaining the boundary data in the classical sense. This result is accomplished by the construction of suitable barriers which, as a byproduct, lead to regularity results up to the boundary for the solution.

ANA1-6 Olivaine de Queiroz, Universidade Estadual de Campinas, Brazil

On the behavior of a singular positive solution to a nonlocal elliptic equation

We study the local behavior of positive solutions to a nonlinear nonlocal elliptic equation with a singular set of fractional capacity zero. Then, we give an application of our results in the study of the singular fractional Yamabe problem slightly improving some results in the recent literature.

ANA1-7 Mariel Sáez, Pontificia Universidad Católica de Chile, Chile

Fractional Laplacians and extension problems: the higher rank case

In previous work by A.Chang and M.M. Gonzalez the authors studied the connection between the fractional laplacian defined via the extension problem proposed in a work of Caffarelli and Silvestre and a class of conformally covariant operators in conformal geometry.

In this talk I will describe a new family of fractional operators that arise from extending the work of A.Chang and M.M. Gonzalez to products of manifolds. These fractional operators can be understood from the view point of L.Caffarelli and L.Silvestre as considering extensions into two different directions and studying a Dirichlet to Neumann map type of problem associated to a degenerate elliptic pde system.

This is a joint work with M.M. Gonzalez.

ANA1-8 Dora Salazar, Universidad de Chile, Chile

Multi-clustered solutions for a forced pendulum equation

We consider the singularly perturbed forced pendulum equation

$$\varepsilon^2 u_\varepsilon'' + \sin(u_\varepsilon) = \varepsilon^2 \alpha(t) u_\varepsilon + \varepsilon^2 \beta(t) u_\varepsilon' \qquad \text{in } (-L, L),$$

where $\alpha, \beta \in C^2([-L, L], \mathbb{R})$ and u_ε represents the angle of the pendulum.

We shall present some recent results concerning the asymptotic behaviour of high energy solutions of this equation as the parameter ε approaches zero.

We shall also prove the existence of a family of solutions having a prescribed asymptotic profile and exhibiting a highly rotatory behaviour alternated with a highly oscillatory behaviour in some open subsets of the domain. The proof of these results relies on a combination of the Nehari finite dimensional reduction with the topological degree theory.

This is a joint work with Salomé Martínez (Universidad de Chile).

ANA1-9 Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

A priori bounds for elliptic inequalities via regularity estimates

We show how basic estimates from elliptic regularity theory, such as growth lemmas and half-Harnack inequalities, can be used to obtain new and optimal a priori bounds for positive sub- and super-solutions of nonlinear elliptic equations.

We prove new boundary versions of these regularity estimates, which play an important role in the proofs of the a priori bounds, and are of importance in themselves.

We apply the a priori bounds in order to study the existence and multiplicity of solutions of the Dirichlet problem for a general class of elliptic operators in which the first and the second order terms have the same scaling with respect to dilations.

ANA1-10 Yannick Sire, John Hopkins University, USA

On a fractional version of a conjecture by De Giorgi

I will review some quite recent results on a nonlocal version of a conjecture by De Giorgi about the level sets of solutions to Allen-Cahn equation. I will firstly recall the original conjecture, then introduce results for the fractional laplacian. I will finish with recent results concerning more general nonlocal operators.

ANA1-11 Erwin Topp, Universidad de Chile, Chile

Lipschitz regularity for elliptic integro-differential problems and application to homogeneization

In this talk we discuss Lipschitz estimates for viscosity solutions to degenerate elliptic integro-differential problems in $\mathbb{R}^n$ which are driven by the presence of a coercive gradient term in the equation, together with Lipschitz assumptions on the data. These estimates are accomplished by an exponential change of variables in the spirit of the weak Bernstein method introduced by Barles in [1]. We apply this result on an homogenization problem where the role of the diffusion is played by the square root of the Laplacian. This naturally induces a scale property on the problem that leads to the coexistence of both diffusive and gradient term at the effective level.

This is a joint work with Guy Barles, Olivier Ley, Martino Bardi, and Annalisa Cesaroni.

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ANA1-12 Miguel Yangari, Escuela Politécnica, Ecuador

Exponential propagation for fractional reaction-diffusion cooperative systems with fast decaying initial conditions

We study the time asymptotic propagation of solutions to the reaction-diffusion cooperative systems with fractional diffusion. We prove that the propagation speed is exponential in time, and we find the precise exponent of propagation. This exponent depends on the smallest index of the fractional laplacians and on the principal eigenvalue of the matrix $DF(0)$ where F is the reaction term. More precisely, we focus on the large time behavior of the solution $u = (u_i)_{i=1}^m$, for $m \in \mathbb{N}^*$, to the fractional reaction-diffusion system:

$$\begin{cases} \partial_t u_i + (-\triangle)^{\alpha_i} u_i &= f_i(u), \quad t > 0, x \in \mathbb{R}^d, \\ u_i(0,x) &= u_{0i}(x), \quad x \in \mathbb{R}^d, \end{cases} \tag{6.1}$$

where $\alpha_i \in (0,1]$ and $\alpha := \min_{\{1,\dots,m\}} \alpha_i < 1$. As general assumptions, we impose, for all $i \in \{1,...,m\}$, the initial condition u_{0i} to be nonnegative, non identically equal to 0, continuous and to satisfy

$$u_{0i}(x) = O(\mid x \mid^{-(d+2\alpha_i)}) \quad \text{as} \quad \mid x \mid \to +\infty. \tag{6.2}$$

We also assume that for all $i \in \{1,...,m\}$, the function f_i satisfies $f_i(0) = 0$ and that system (6.1) is cooperative, which means :

$$f_i \in C^1(\mathbb{R}^m) \text{ and } \partial_j f_i > 0, \text{ on } \mathbb{R}^m, \quad \text{for all } j \in \{1,...,m\},\ j \neq i. \tag{6.3}$$

Before stating the main results, we need some additional hypotheses on the nonlinearities f_i, for all $i \in \{1,...,m\}$.

(H1) The principal eigenvalue λ_1 of the matrix $DF(0)$ is positive,

(H2) F is globally Lipschitz on $\mathbb{R}^m$,

(H3) There exists $\Lambda > 1$ such that, for all $s = (s_i)_{i=1}^m \in \mathbb{R}_+^m$ satisfying $\mid s \mid \geq \Lambda$, we have $f_i(s) \leq 0$,

(H4) For all $s = (s_i)_{i=1}^m \in \mathbb{R}_+^m$ satisfying $\mid s \mid \leq \Lambda$, $Df_i(0)s - f_i(s) \geq c_{\delta_1} {s_i}^{1+\delta_1}$,

(H5) For all $s = (s_i)_{i=1}^m \in \mathbb{R}_+^m$ satisfying $\mid s \mid \leq \Lambda$, $Df_i(0)s - f_i(s) \leq c_{\delta_2} \mid s \mid^{1+\delta_2}$,

where the constants c_{δ_1} and c_{δ_2} are positive and independent of $i \in \{1,...,m\}$.

We are now in a position to state our main theorem, which shows that the solution to (6.1) moves exponentially fast in time.

Theorem 6.4.1 *Let $d \geq 1$ and assume that F satisfies (6.3) and (H1) to (H5). Let u be the solution to (6.1) with a non negative, non identically equal to 0 and continuous initial condition u_0 satisfying (6.2). Then there exists $\tau > 0$ large enough such that for all $i \in \{1,...,m\}$, the following two facts are satisfied:*

a) *For every $\mu_i > 0$, there exists a constant $c > 0$ such that,*

$$u_i(t,x) < \mu_i, \quad for\ all\ t \geq \tau\ and\ |x| > ce^{\frac{\lambda_1}{d+2\alpha}t}.$$

b) *There exist constants $\varepsilon_i > 0$ and $C > 0$ such that,*

$$u_i(t,x) > \varepsilon_i, \quad for\ all\ t \geq \tau\ and\ |x| < Ce^{\frac{\lambda_1}{d+2\alpha}t}.$$

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6.4.8 ANA2 - CONTROL AND STABILIZATION OF PARTIAL DIFFERENTIAL EQUATIONS

ANA2-1 Fágner Araruna, Universidade Federal da Paraíba, Brazil

Controllability and stability to some beams and plates systems

In this talk, I will discuss recent results on asymptotic properties (when the modulus of elasticity in torsion tends to infinity), controllability and stability to Mindlin Timoshenko systems, which describe vibration of beams and plates, in their semilinear and nonlinear formulations.

ANA2-2 Nicolás Carreño, Universidad Técnica Federico Santa María, Chile

Stackelberg-Nash exact controllabillity for the Kuramoto-Sivashinsky equation

In this talk, we apply the concept of Stackelberg-Nash strategies to the control of a fourth-order parabolic equation known as the Kuramoto-Sivashinsky equation. We assume that we can act on the equation through a hierarchy of controls. A first control (the leader) is assumed to choose the policy. Then, a Nash equilibrium pair (corresponding to a noncooperative multiple-objective optimization strategy) is found; this governs the action of the other controls (the followers). As in previous works for parabolic equations, we are able to obtain the controllability to the trajectories, but this time the observation domains for the followers do not need to be identical.

This is a joint work with Maurício C. Santos.

ANA2-3 Eduardo Cerpa, Universidad Técnica Federico Santa María, Chile

On the control of the improved Boussinesq equation

The Boussinesq equation was introduced to describe the flow of shallow water waves with small amplitude. In order to overcome the lack of well-posedness of this equation, it can be approached by the Improved Boussinesq equation. In this talk we are interested in the control properties of the latter. First, we consider a boundary control and prove that the system is approximately controllable but not exactly controllable. Second, we introduce an internal control supported on a moving region and prove that the system is exactly controllable. The main tools we use are spectral analysis and the Moment Theory.

ANA2-4 Abdón Choque, Universidad Michoacana de San Nicolás de Hidalgo, México

On a set of bounded solutions of the null approximate control wave equation problem

Consider the control wave equation

$$f_{tt} - f_{xx} = u\, g(x), \quad x \in [0, \pi], \tag{6.4}$$

with

$$f_x(t,0) = f(t,\pi) = 0, \;\; f(0,x) = f_0(x) \;\text{ and }\; f_t(0,x) = f_1(x) \tag{6.5}$$

where g, f_0 and f_1 belong to $L_2[0,\pi]$.

Based on the trigonometric moment problem on $[0, 2\pi]$ we construct a family of piecewise continuous bounded controls $|u| \leq 1$ which are solutions of the approximate null control problem of the wave equation.

ANA2-5 Ademir Pazoto, Universidade Federal do Rio de Janeiro, Brazil

Stabilization of a Boussinesq system with generalized damping

We study the stability properties of a family of Boussinesq systems proposed by J.L. Bona, M. Chen and J.C. Saut to describe the two-way propagation of small amplitude gravity waves on the surface of water in a canal, when generalized damping operators are introduced in each equation. By means of spectral analysis and Fourier expansion, we prove that the solutions of the linearized system decay uniformly or not to zero. In the uniform decay case, we show that the same property holds for the nonlinear system.

Joint work with Sorin Micu from University of Craiova.

ANA2-6 Ivonne Rivas, Universidad del Valle, Colombia

Some stabilization problem with time-varying feedback law

We study the stabilization problem initially for a class of quadratic systems in finite dimension and then, for the Korteweg-de Vries equation on bounded interval. In both cases, the lineal system is not controllable. We build a class of time-variable feedback laws for which the solutions of the closed-loop system with small initial data decay exponentially to zero.

Joint work with Jean-Michel Coron and Shengquan Xiang.

6.4.9 ANA3 - FLUID DYNAMICS, NON LINEAR AND DISPERSIVE PDES - FREE BOUNDARY VALUE PROBLEMS AND HYPERBOLIC GEOMETRY

ANA3-1 Daniel Alfaro, Universidade Federal do Rio de Janeiro, Brazil

Convergencia de un método espectral totalmente discreto para algunos sistemas de tipo Boussinesq

Este trabajo se dedica al estudio de la convergencia de un método numérico para la solución de algunos sistemas de tipo Boussinesq que fueron introducidos por J. Bona et al.[2][3] para la modelación matemática de la propagación de ondas en la superficie de un fluido bajo la acción de la fuerza de gravedad. El método aproximado discutido consiste en aplicar el método espectral de Fourier para la discretización espacial de las ecuaciones diferenciales junto con un esquema de Runge-Kutta para la integración en el tiempo. El análisis numérico del método muestra que el mismo es eficiente y de alta precisión. También presentamos experimentos numéricos para ilustrar los resultados teóricos.

Trabajo conjunto con Mauro A. Rincon y Juliana C. Xavier.

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ANA3-2 Ángel Castro, Instituto de Ciencias Matemáticas, Spain

Mixing solutions for the Muskat problem

In this talk we will present the existence of weak solutions of the incompressible porous media equation (IPM) starting with an initial data of Muskat type in the fully unstable regime. We will talk about the main ingredients of the proof including: convex integration, interface dynamics and pseudo-differential operators.

ANA3-3 Francisco Gancedo, Universidad de Sevilla, Spain

Recents results for SQG sharp front and the Muskat problem

In this talk we study two scenarios in contour dynamics. The Muskat problem, where the dynamics of two fluids of different nature in porous media are modeled. And front of temperature driven by the Surface Quasi-geostrophic equation (SQG). The dynamics for both free boundary problems are not well understood. A main issue for both free boundary problems is finite time singularity formation versus global in time results. For Muskat we show a blow-up criteria for solution to became singular in a stable case. For SQG a uniqueness results for the free boundary modulo reparameterization is given.

ANA3-4 Javier Gomez Serrrano, Princeton University, USA

Global smooth solutions for the inviscid SQG equations

Motivated by our previous results of global existence for active scalars in the patch setting, we are able to construct the first nontrivial family of global smooth solutions for the surface quasi-geostrophic (SQG) equations. These solutions rotate with uniform angular velocity both in time and space. In this talk, we will discuss the main ingredients of the proof: bifurcation theory and computer-assisted estimates.

Joint work with Angel Castro and Diego Cordoba.

ANA3-5 Mamadou Gueye, Universidad Técnica Federico Santa, Chile

Singular optimal control / a 1-D Parabolic-Hyperbolic Degenerate example

In this talk, we consider the controllability of a strongly degenerate parabolic equation with a degenerate one-order transport term. Despite the strong degeneracy, we prove a result of well-posedness and null controllability with a Dirichlet boundary control that acts on the degenerate part of the boundary. Then, we study the uniform controllability in the vanishing viscosity limit and prove that the cost of the control explodes exponentially fast in small time and converges exponentially fast in large time in some adapted weighted norm. The main tools used are a spectral decomposition involving Bessel functions and their zeros, some usual results on admissibility of scalar controls for diagonal semigroups, and the moment method of Fattorini and Russell.

ANA3-6 Camille Laurent, Université Pierre et Marie Curie, France

Quantitative unique continuation, intensity of waves in the shadow of obstacle and approximate control

Unique continuation is very often proved by Carleman estimates or Holmgren theorem. The first one requires the strong geometric assumption of pseudoconvexity of the hypersurface. The second one only requires that the hypersurface is non characteristic, but the coefficients need to be analytic.

Motivated by the example of the wave equation, several authors (Tataru, Robbiano-Zuily, Hömander) finally proved in great generality that there could be unique continuation in some intermediate situation where the coefficients are analytic in part of the variables. In particular, for the wave equation, it allowed to prove the unique continuation across any non characteristic hypersurface for non analytic metric.

In this talk, after presenting these works, I will describe some recent work where we quantify this unique continuation. This leads to optimal (in general) logarithmic stability estimates. They quantify the penetration into the shadow region and the cost of approximate controllability for waves.

Joint work with Matthieu Léautaud

ANA3-7 Rodrigo Lecaros, Centro de Modelamiento Matemático, Chile

Control of underwater vehicles in inviscid fluids

Abstract. In this talk, we present the advances related with the study of the controllability of an underwater vehicle immersed in an innate volume of an inviscid fluid in 3D. Taking as control input the flow of the aid through a part of the boundary of the rigid body. We assumed that the flow is irrotational. And we obtained a finite-dimensional system similar to Kirchhoff laws in which the control input appears through both linear terms (with time derivative) and bilinear terms. Applying Coron's return method, we established some local controllability results for the position and velocities of the underwater vehicle. Examples with six, four, or only three controls inputs are given for a vehicle with an ellipsoidal shape. In a recent work, the authors pursue this study, by considering the more general case of a flow with vorticity. It is shown that the controllability of the position and the velocity of the underwater vehicle (a vector in R^{12}) holds in a flow with vorticity whenever it holds in a ow without vorticity.

This is a joint work with Lionel Rosier.

ANA3-8 Gino Montecinos, Centro de Modelamiento Matemático, Chile

An ADER-type scheme for a class of equations arising from the water-wave theory

In this work we propose a numerical strategy to solve a family of partial differential equations arising from the water-wave theory. These problems may contain four terms; a source which is an algebraic function of the solution, a convective part involving first order spatial derivatives of the solution, a diffusive part involving second order spatial derivatives and the transient part. Unlike partial differential equations of hyperbolic or parabolic type, where the transient part is the time derivative of the solution, here the transient part can contain mixed time and space derivatives.

In Zambra et Al. (2012), the authors proposed a globally implicit strategy to solve the Richards equation. In that case, transient terms consisted of algebraic expressions of the solution. Motivated by this work, we propose a one-step finite volume method to deal with problems in which transient terms are differential operators. Here, a locally implicit formulation is investigated, which is based on the ADER philosophy. The scheme is divided in three steps: i) a polynomial reconstruction of the data; ii) solutions to Generalized Riemann Problems (GRP); iii) the solution of differential problems. Note that steps i) and ii), are those of conventional ADER schemes for conservation laws. Advantages of the present approach include the possibility to construct high-order approximations in both space and time, for which existing methodologies for hyperbolic problems can be applied. The differential problems associated to the transient term can be non-linear and numerical strategies can be adopted to deal wit it. Convergence of the scheme is proved rigorously and an empirical convergence rates assessment is carried out in order to illustrate the high space and time accuracy of the present scheme.

ANA3-9 Juan Carlos Muñoz, Universidad del Valle, Colombia

Well-posedness and computation of travelling wave solutions of a regularized Benjamin-Ono system

Wave propagation in stratified media has attracted interest of many physicists and mathematicians, for both well-posedness theory, and asymptotic theory due to the challenging modelling, mathematical and numerical difficulties involved in the analysis of the mathematical models involved.

In this talk, we present of a new regularized Benjamin-Ono system recently derived by J.C. Muñoz [3] to describe the propagation of an internal weakly dispersive, weakly nonlinear wave at the interface of two immiscible fluids with constant densities, which are contained at rest in a long channel with horizontal rigid top and bottom, and the thickness of the lower layer h_2 is assumed to be effectively infinite (deep water limit). In this mathematical model, there are two well separated small scales: $\alpha = \frac{a}{h_1}$, and $\epsilon = \frac{h_1}{L}$, where a is the characteristic amplitude of the propagating pulse, h_1 is the thickness of the upper layer, and L is the propagation distance. This Benjamin-Ono system assumes a balance between $O(\alpha)$ nonlinear terms and quadratic dispersive terms $O(\epsilon^2)$ in the phenomenon. Within this physical regime, two new regularizing dispersive terms arise in the model, which alter the mathematical properties of the solutions. In previous works, such as those by Choi and Camassa [2], and Bona et al. [1], first-order nonlinear and dispersive effects were balanced (i.e. $O(\alpha) = O(\epsilon)$), and quadratic nonlinear $O(\alpha^2)$ and dispersive terms $O(\epsilon^2)$ were neglected. We also analyze local existence of solutions

of the periodic initial value problem, and discuss numerical strategies to approximate travelling wave solutions of the system considered [4].

Joint work with Felipe Pipicano. This research was supported by Universidad del Valle under project C.I. 71020 and Colciencias FP44842-080-2016

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ANA3-10 Cesar J. Niche, Universidade Federal do Rio de Janeiro, Brazil

A survey of recent results on the characterization of decay of solutions to dissipative equations

Solutions to many dissipative equations in Fluid Mechanics, like the Navier-Stokes, quasi-geostrophic and Navier-Stokes-Voigt equations, obey energy inequalities that imply that their L^2 or Sobolev norms decay in time. In the late 80's M.E. Schonbek developed the Fourier Splitting method, which has been widely used to establish decay rates for these and many other systems of equations.

The Fourier Splitting method is based on the idea that "long time behavior of solutions is determined by small frequencies" and for it to provide uniform decay rates, it is necessary to restrict initial data to subsets of L^2 (say, $L^p \cap L^2, 1 \leq p < 2$, or data for which the linear part of the equations has certain decay). The question that then naturally arises is whether it is possible to establish decay for *any* initial data in L^2.

In this talk we will survey recent work in which the decay rates are characterized, for any initial data, for solutions to many families of dissipative equations. This description is based on the decay character $r* = r*(u_0)$ associated to the initial datum u_0. This number is, roughly speaking, the order of u_0 at the origin in frequency space and can be used to give explicit upper (and sometimes lower) bounds for the decay rates. As a consequence of this, we show how the same initial datum can produce quantitatively and qualitatively different behavior for solutions to very similar equations.

The results described in this talk have been obtained by Lorenzo Brandolese, Maria E. Schonbek and myself through joint and individual work.

ANA3-11 José Raul Quintero, Universidad del Valle, Colombia

Solitons for a Higher order KP model - On the existence of solitons for a generalized KP equation of higher order

In this paper we are interested in establishing the existence of solitons (travelling waves of finite energy) for a generalized KP equation of higher order

$$(M_1 u_t - M_2 u_x + (f(u, u_x, u_{xx}))_x)_x - M_3 u_{yy} + \gamma u = 0, \tag{6.6}$$

where M_i is a differential operator of order 4 ($i = 1, 2$) and M_3 is a differential operator of order 2 and the nonlinear term f is a homogeneous functions of degree $p + 1$ in the variable u, u_x, and u_{xx} having the form

$$f(q, r, s) = \partial_q F(q, r) - r\partial_{rq} F(q, r) - s\partial_{rr} F(q, r), \tag{6.7}$$

where F is a homogeneous function of degree $p + 2$ of the form $F(q, r) = \sum_{j=1}^{k} F_j(q, r)$, such that for $1 \leq j \leq k$

$$F_j(\lambda q, r) = \lambda^{p_{1,j}} F_j(q, r), \;\; F_j(q, \lambda r) = \lambda^{p_{2,j}} F(q, r), \tag{6.8}$$

with $p + 2 = p_{1,j} + p_{2,j}$ (if F_j depends only in either q or r, we assume that F_j is homogeneous of degree $p + 2$). In particular, we have that F is a homogeneous function of degree $p + 2$.

The generalized model (6.6) is associated with multiple dispersive models related for example with long wave propagation of fluid, models for the deformations of a hyperelastic compressible plate relative to a uniformly pre-stressed state, models for gravity surface waves in a shallow water channel and internal waves in the ocean, capillary surface waves or oblique magneto-acoustic waves in plasma, long internal waves in a rotating fluid propagating in one dominant direction with slow transverse effects, including the Coriolis phenomenon, among others.

For $M_1 = I_d$, $M_3 = \alpha I_d$, $M_2 = -\partial_x^2$, $\gamma = 0$ (absence of rotation effect) and $F(q,r) = \frac{1}{p+2}q^{p+2}$, we obtain the well known generalized KP model that describes for $p = 1$ long waves with small-amplitude in a fluid propagating in one dominant direction with slow transverse effects.

On the other hand, for $M_1 = I_d$, $M_3 = \alpha I_d$, $M_2 = \beta\partial_x^2$, and $F(q,r) = \frac{1}{p+2}q^{p+2}$ we obtain a 2D equation that describes for $p = 1$ small-amplitude, long internal waves in a rotating fluid propagating in one dominant direction with slow transverse effects, known as the rotation KP equation (Coriolis effect), which for negative dispersion models gravity surface waves in a shallow water channel and internal waves in the ocean, and for positive dispersion models capillary surface waves or oblique magneto-acoustic waves in plasma. In this model constant γ measures the effects of rotation and is proportional to the Coriolis force. The Ostrovsky equation is also included in the (gKP) model in the case $\gamma \neq 0$, (nontrivial rotation effects).

For $M_2 \equiv 0$, $\gamma = 0$ and $F(q,r) = \frac{1}{2}q^3 + \frac{\mu}{2}qr^2$, we obtain a 2D equation known as the hyperelastic dispersive equation that was derived by R. M. Chen as a model for the deformations of a hyperelastic compressible plate relative to a uniformly pre-stressed state. To reduce the full three-dimensional field equation to an approximate two-dimensional plate equation, an assumption has been made that the thickness of the plate is small in comparison to the other dimensions. It is also assumed that the small perturbations superimposed on the pre-stressed state only appear in the vertical direction (the z-direction) and in one horizontal direction (the x-direction); hence the variation of waves in the transverse direction (the y-direction) is small. In this particular case, the parameters are all material constants to describe the stiffness of the plate and to measure weak transverse effects. The material constant μ occurs as a consequence of the balance between the nonlinear and dispersive effects. Moreover, in this particular case, the model generalizes several well-known equations including the BBM equation, the regularized long-wave KP equation (also referred as KP-BBM equation and the Camassa-Holm (CH) equation depending on the coefficients).

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ANA3-12 Ivonne Rivas, Universidad del Valle, Colombia

Lower Regularity Solutions of a Class of Non-homogeneous Boundary Value Problems of the Korteweg-de Vries Equation on a Finite Domain

We study an initial-boundary value problem of the Korteweg-de Vries equation posed on a bounded interval $(0;L)$ with nonhomogeneous boundary conditions, which is known to be locally well-posed in the Sobolev space $H^s(0;L)$ with $s > \frac{-3}{4}$. Taking the advantage of the hidden dissipative mechanism and the sharp trace regularities of its solutions we show in this paper that the problem is locally well-posed in the space $H^s(0;L)$ with $s > -1$.

Joint work with with Bingyu Zhang and Jia Chaohun. This research was supported by Universidad del Valle and Colciencias FP44842-080-2016

6.4.10 ANA4 - INVERSE PROBLEMS: THEORY, MEHTODS AND APPLICATIONS

ANA4-1 Juan Pablo Agnelli, Universidad de Córdoba, Argentina

On the identification of piecewise constant coefficients in optical diffusion tomography by level set

We propose a level set regularization approach combined with a split strategy for the simultaneous identification of piecewise constant diffusion and absorption coefficients from a finite set of optical tomography data (Neumann-to-Dirichlet data). This problem is a high nonlinear inverse problem combin-

ing together the exponential and mildly ill-posedness of diffusion and absorption coefficients, respectively. We prove that the parameter-to-measurement map satisfies sufficient conditions (continuity in the L^1 topology) to guarantee regularization properties of the proposed level set approach. On the other hand, numerical tests considering different configurations bring new ideas on how to propose a convergent split strategy for the simultaneous identification of the coefficients. The behavior and performance of the proposed numerical strategy is illustrated with some numerical examples.

ANA4-2 Adriano De Cezaro, Universidade Federal do Rio Grande, Brazil

On the Choice of the Tikhonov Regularization Parameter and the Discretization Level: A Discrepancy-Based Strategy

In collaboration with Dr. Vinicius Albani and Dr. Jorge P. Zubelli (IMAP - Brazil)

We address the classical issue of appropriate choice of the regularization and discretization level for the Tikhonov regularization of an inverse problem with imperfectly measured data. We focus on the fact that the proper choice of the discretization level in the domain together with the regularization parameter is a key feature in adequate regularization. We propose a discrepancy-based choice for these quantities by applying a relaxed version of Morozov's discrepancy principle. Indeed, we prove the existence of the discretization level and the regularization parameter satisfying such discrepancy. We also prove associated regularizing properties concerning the Tikhonov minimizers.

ANA4-3 Doris Hinestroza, Universida del Valle, Colombia

Stabilization of lower order derivatives using higher order derivatives

In collaboration with: Andrés Felipe Lerma, University del Valle – Colombia.

In Inverse Problem theory, we are interested in solve the next problem: if a phenomenon is modeled by the equation

$$T_c(x) = g$$

where $T_c : X \to Y$ is a linear operator between X and Y Hilbert spaces which depend on a coefficient c, and $u \in X$ is known for all $f \in Y$, find the coefficient c and then, the operator L_c. This problem is called as **an identification problem**. This sort of phenomenons are very common in applied mathematics. For example, in strength of materials, if the transversely distributed load $f(x)$ and the flexural rigidity coefficient are known $a(x)$ in the interval $[0, 1]$, we are intesented in finding the deflection of the beam $u(x)$ with respect to a neutral axis modeled by the Euler - Bernoulli equation:

$$\frac{\partial^2}{\partial x^2}(a(x)\frac{\partial^2 u}{\partial x^2}) = f(x), \quad 0 \leq x \leq 1 \tag{6.9}$$

Since the inverse problem perspective, we are interested in the problem of find the coefficient $a(x)$ if $u(x)$ and $f(x)$ are known. However, to solve it, under some conditions, it is necessary to calculate a second order derivative and it is well know that the problem of calculating a derivative is an ill-posed problem. That is, when $u(x)$ is known with small noise, the derivative $u'(x)$ can not be obtained without big noise. Many different techniques have been presented before to stabilize the first order derivative: mollification, iterative methods, Tikhonov regularization. In this talk, we will present a new method using the reconstruction of the higer order derivatives: given a function $u(x)$ and using Landweber iteration method, we will reconstruct the fourth order derivative and using integration of that function, we will obtain the second order derivative. We will show that it can be a better technique to approach the derivative under certain conditions. Besides, we will present estimatives, generalize the method to stabilize lower order derivatives if higher order derivatives are known and finally, we will present some examples of interest.

ANA4-4 Alejandro Marañon, Universidad de los Andes, Colombia

Retos y Perspectivas de los Problemas Inversos en la Caracterización Dinámica de Materiales

La caracterización del comportamiento dinámico de materiales juega un papel muy importante en las industrias automotriz, aeroespacial y naval, entre otras. Comúnmente, en estas industrias se utilizan simulaciones numéricas, en la forma de paquetes comerciales de elementos finitos explícitos, para el diseño de componentes y estructuras los cuales pueden estar sometidos a altas tasas de deformación unitaria. Estas simulaciones requieren de modelos constitutivos de los materiales, y sus parámetros asociados, para predecir el proceso de deformación de dichos componentes y estructuras. En consecuencia, los ingenieros que trabajan en este tipo de simulaciones necesitan estimar los parámetros del modelo constitutivo del material a partir de técnicas experimentales no estandarizadas, tales como el ensayo de Taylor, la barra divida de Hopkinson, y el ensayo de caída gravitacional, entre otros.

La caracterización dinámica de un material a partir de este tipo de ensayos puede ser formulada como un problema inverso en el cual una salida final conocida y deseada – deformación plástica de la muestra, propagación instantánea de una onda de presión a través de la misma o la penetración instantánea de un indentador rígido en la muestra, etc., se utiliza para determinar la entrada del sistema en términos de los parámetros del modelo constitutivo que describen el comportamiento del material. Sin embargo, la solución de este tipo de problemas inversos presenta una serie de retos, tales como: primero, los parámetros del modelo constitutivo son una función de la tasa de deformación unitaria, que varia en el tiempo y en la posición. Segundo, los modelos constitutivos de los materiales utilizados en este ámbito son fenomenológicos, donde la descripción de la deformación plástica del material depende de una tasa de deformación característica global. Tercero, un modelo constitutivo típico puede requerir de la estimación de cuatro a ocho parámetros de forma simultanea, los cuales pueden presentar interacciones. Cuarto, el funcional de minimización depende de la solución numérica explícita de sistemas de ecuaciones diferenciales parciales acopladas no lineales, donde la solución explícita consume mucho tiempo y capacidad computacional, y depende de algoritmos propietarios comerciales secretos. Quinto, los modelos constitutivos y sus parámetros asociados no son "reales", y en cambio son "modelos constitutivos computacionales" que dependen fuertemente de las simplificaciones y los algoritmos explícitos usados en la solución de las ecuaciones diferenciales. Sexto, los procesos de deformación de las muestras del material durante los ensayos son termo-mecánicamente acoplados y pueden depender de la historia de la deformación. Séptimo, las técnicas no estandarizadas utilizadas para la caracterización dinámica de materiales son complejas, costosas, y de baja repetibilidad dado que no es posible controlar de forma precisa las variables experimentales.

En esta ponencia se presentarán los avances en la solución de los problemas inversos asociados a la caracterización dinámica de materiales realizados durante la última década en el Grupo de Integridad Estructural de la Universidad de los Andes. En especial, se presentarán los resultados, los retos y las perspectivas para la estimación de los parámetros de modelos constitutivos de materiales a partir de los ensayos de Taylor, de la barra dividida de Hopkinson, de caída gravitacional y el de indentación dinámica.

ANA4-5 Carlos Mejía Salazar, Universidad Nacional de Colombia, Colombia

Fractional derivatives, inverse problems and discrete mollification

In the first part of the talk, we introduce discrete mollification as a regularization tool for the numerical solution of inverse problems. The second part deals with inverse problems that arise from partial differential equations in which fractional derivatives appear. The third and main part of the talk, is the solution of an inverse problem for a time fractional advection-dispersion equation in a 1-D semi-infinite setting. The fractional derivative is interpreted in the sense of Caputo and advection and dispersion coefficients are constant. This inverse problem is ill-posed and our approach is a finite difference space marching scheme enhanced by adaptive discrete mollification. Error estimates and illustrative numerical examples are provided.

ANA4-6 Alberto Mercado, Universidad Federico Santa María, Chile

Inverse problems for dispersive equations

We present the inverse problem of retrieving the principal coefficient in a Korteweg–de Vries (KdV) equation from boundary measurements of a single solution, as a model of the problem of recovering information on the topography of a channel by means of boundary measurements of a water wave. The Lipschitz stability of this inverse problem is obtained using a global Carleman estimate for the linearized KdV equation, under some symmetry assumptions on the coefficients.

ANA4-7 Claudio Muñoz, Universidad de Chile, Chile

On the Calderón's problem for quasilinear conductivities

In this talk I will explain the Calderón's inverse problem related to a quasilinear conductivity. After some brief historical review, we will show that a large class of gradient-dependent conductivities can be recovered for a general quasilinear equation. For doing this we use the method from Sun-Uhlmann and some new ideas coming from complex-valued test functions.

ANA4-8 Luis Eduardo Olivar, Universidad del Tolima, Colombia

Identification of a coefficient in a two-dimensional nonlinear inverse problem through regularization and Lagrangian methods

I will give a brief overview of some concepts used in inverse problems ill posed, and show how the combined Lagrangian method with a technique of discretization probem: identification of a coefficient in an elliptical equation dimensional. Leads to a linear system, which it can be regularized by Lagrange. I also use Newton's method in the solution of the problem. I will show some numerical results for the one-dimensional and two-dimensional case.

6.4.11 ANA5 - HAMILTON-JACOBI EQUATIONS: REGULARITY THEORY AND APPLICATIONS TO LIFE AND SOCIAL SCIENCES

ANA5-1 Eduardo Espinosa, Universidad Nacional Autónoma de México, México

Discrete and continuous games reviewed from the perspective of dynamic programming

In this talk I will present an analysis of different classes of alternate games from different perspectives, including game theory, logic, bounded rationality and dynamic programming. In this paper we review some of these approaches providing a methodological framework which combines ideas from all of them, but emphasizing dynamic programming and game theory. In particular I shall present the relationship between games in discrete and continuous time and state space and how the latter can be understood as the limit of the former. I will show how in some cases the Hamilton-Jacobi-Bellman equation for the discrete version of the game leads to a corresponding HJB partial differential equation for the continuous case and how this procedure allow us to obtain useful information about optimal strategies.

ANA5-2 Tao Li, Shanghai University, China

Continuous-Time Distributed Consensus Algorithms with Random Noises

Measurement and communication uncertainties are important factors for the stability and performances of cooperative dynamic networks. We consider continuous-time stochastic consensus algorithms of multi-agent systems with additive or multiplicative measurement noises, where the information exchange among agents is described by a directed graph. For the case with additive noises, the stochastic weak and strong consensus are examined. Some necessary conditions and sufficient conditions on the algorithm gain are given for the stochastic approximation type algorithm to ensure the mean square and almost sure consensus. We show that the mean square strong consensus and almost sure strong

consensus are equivalent. For the case with multiplicative noises, by investigating the structure of the closed-loop system and the tools of stochastic differential equations, we develop several small consensus gain theorems in terms of the control gain, the number of agents and the noise intensity function to ensure the mean square and almost sure consensus and quantify the convergence rate and the steady-state error. For symmetric measurement models, the almost sure convergence rate is estimated by the Iterated Logarithm Law of Brownian motions.

ANA5-3 Haili Liang, Shanghai University, China

Stochastic Stability of Snowdrift Based Evolutionary Dynamics

The evolutionary game theory is a powerful tool for the theoretical analysis of the strategic interactions of large population of individuals over time. We study evolutionary dynamics based on snowdrift games in infinite well-mixed populations and structured populations, respectively. Firstly, we identify the stochastically stable equilibria for two-player and multi-player dynamics in infinite well-mixed populations. Then we show that with the same values of cost and benefit of cooperation and under certain conditions, there is a unique stochastically stable equilibrium in both multi-player and two-player dynamics, and the proportion of cooperators of the multi-player game is higher than that of the two-player game. Finally, we study the stochastic stability of evolutionary dynamics on regular graphs. Each player is represented by a node of the graph, and the edges denote who meets whom. We find that stochastic effects and spatial effects may quantitatively change the asymptotic behavior of the dynamics, and smaller graph degree leads to more cooperators.

ANA5-4 Pablo Padilla, Universidad Nacional Autónoma de México, México

From Voronoi patterns to Hamilton-Jacobi equations

We discuss the emergence of Voronoi patterns as the result of a simple application of Huygens principle. This allows us to introduce the Hamilton-Jacobi formalism in this context. Other approaches involving chemical wave propagation and stochastic dominance are discussed.

This is joint work with David Padilla and Enrique Lemus.

ANA5-5 Juliana Pimentel, Universidade Federal do ABC, Brazil

Estimates for a class of slowly non-dissipative reaction-diffusion equations

In this talk, we consider slowly non-dissipative Hamilton-Jacobi equations and establish several estimates. In particular, we manage to control L^p norms of the solution in terms of $W^{1,2}$ norms of the initial conditions, for every $p > 2$. This is done by carefully combining preliminary estimates with Gronwall's inequality and the Gagliardo-Nirenberg interpolation Theorem. By considering only positive solutions, we obtain upper bounds for the L^p norms, for every $p > 1$, in terms of the initial data. In addition, explicit estimates concerning perturbations of the initial conditions are established. The stationary problem is also investigated; we prove that L^2 regularity implies L^p regularity in this setting, while further hypotheses yield additional estimates for the bounded equilibria. We conclude the talk with a discussion of the connection between our results and some related problems in the theory of slowly non-dissipative equations and attracting inertial manifolds.

ANA5-6 Héctor Sánchez-Morgado, Universidad Nacional Autónoma de México, México

Mean-field games with mild singularities

We examine second-order time-dependent reduced mean-field game system in the presence of mild singularities. In particular, we prove the existence of classical solutions for the aforementioned problem.

We study the following system:

$$\begin{cases} -u_t(x,t) + H(x,Du(x,t)) = \Delta u(x,t) - m^{-\alpha}(x,t) & \text{in } \mathbb{T}^d \times [0,T) \\ m_t(x,t) - \nabla \cdot (D_p H(x,Du) m(x,t)) = \Delta m(x,t) & \text{in } \mathbb{T}^d \times (0,T], \end{cases}$$

equipped with the following initial-terminal boundary conditions

$$\begin{cases} u(x,T) \,=\, u_T(x) & \text{in } \mathbb{T}^d \\ m(x,0) \,=\, m_0(x) & \text{in } \mathbb{T}^d. \end{cases}$$

under the following

Assumption. [Mild singularity] $\alpha > 0$.

Assumption. There exist constants $C_1,\, C_2 > 0$ so that

$$C_1 + C_2|p|^\gamma \,\leq\, H(x,p) \,\leq\, C_1 \,+\, C_2|p|^\gamma$$

and

$$|D_pH(x,p)| \,\leq\, C_1 \,+\, C_2|p|^{\gamma-1},$$

for $1 < \gamma < \dfrac{d+2}{d+1}$.

Assumption. There exist constants $C_1,\, C_2 > 0$ so that

$$D_pH(x,p)\cdot p - H(x,p) \,\geq\, C_2H(x,p) - \,C_1.$$

This is joint work with D. A. Gomes and E. A. Pimentel

ANA5-7 Olivâine Santana de Queiroz, Universidade Estadual de Campinas, Brazil

TBA

ANA5-8 Boyan Sirakov, Pontifícia Universidade Católica do Rio de Janeiro, Brazil

Stationary states of reaction-diffusion and Schrodinger systems with inhomogeneous or controlled diffusion

We obtain classification, solvability and nonexistence theorems for positive stationary states of reaction-diffusion and Schrodinger systems involving a balance between repulsive and attractive terms. This class of systems contains PDE arising in biological models of Lotka-Volterra type, in physical models of Bose-Einstein condensates and in models of chemical reactions. We show, with different proofs, that the results obtained in [ARMA, 213 (2014), 129-169] for models with homogeneous diffusion are valid for general heterogeneous media, and even for controlled inhomogeneous diffusions.

6.4.12 ANA6 - SPECIAL FUNCTIONS, ORTHOGONAL POLYNOMIALS AND APPROXIMATIONS THEORY

ANA6-1 Cleonice Fátima Bracciali, Universidade Estadual Paulista, Brazil

Para-orthogonal polynomials on the unit circle associated with periodic Verblunsky coefficients

We consider a sequence of para-orthogonal polynomials on the unit circle that satisfy a three term recurrence relation. We impose some restrictions on the sequences of the coefficients in the three term recurrence relation and we obtain associated measures with periodic Verblunsly coefficients.

Joint work with:
Jairo S. Silva, A. Sri Ranga, Daniel O. Veronese.

ANA6-2 Abdón Choque Rivero, Universidad Michoacana de San Nicolás de Hidalgo, México

On a multiplicative representation of the orthogonal matrix polynomials via Dyukarev-Stieltjes matrix parameters

We obtain a multiplicative decomposition of four families of orthogonal matrix polynomials on [a,b] and their second kind polynomials via Dyukarev-Stieltjes matrix parameters (DSMP). We also derive Blaschke-Potapov factors of auxiliary resolvent matrices of the truncated Hausdorff matrix moment problem; each factor is decomposed with the help of DSMP.

ANA6-3 Erdal Emsiz, Pontificia Universidad Católica de Chile, Chile

Branching formulas for symmetric hypergeometric polynomials in several variables

We recently found an explicit branching formula for the six-parameter Macdonald-Koornwinder polynomials with hyperoctahedral symmetry (also known as the multi-variable Askey-Wilson polynomials). Via degenerations we arrive at corresponding branching rules for symmetric hypergeometric orthogonal polynomials of Wilson, continuous Hahn, Jacobi, Laguerre, and Hermite type. Iteration of the branching formulas allows us to build these polynomials in several variables from the corresponding one-variable polynomials.

Based on joint work with Jan Felipe van Diejen (Universidad de Talca).

ANA6-4 Ulises Fidalgo, University of Mississippi, USA

Convergent interpolatory quadrature schemes

We use a connection between interpolatory quadrature formulas and Fourier series to find a wide class of convergent schemes of interpolatory quadrature rules. In the process we use techniques from Riemann-Hilbert problems for varying measures and convex analysis.

ANA6-5 Natalia Camila Pinzón-Cortés, Universidad Nacional de Colombia, Colombia

On Linearly Related Sequences of Difference Derivatives of Discrete Orthogonal Polynomials

Let ν be either $\omega \in \mathbb{C}\setminus\{0\}$ or $q \in \mathbb{C}\setminus\{0,1\}$, and let D_ν be the corresponding difference operator defined in the usual way either by $D_\omega p(x) = \frac{p(x+\omega)-p(x)}{\omega}$ or $D_q p(x) = \frac{p(qx)-p(x)}{(q-1)x}$. Let $\mathcal{U}$ and $\mathcal{V}$ be two moment regular linear functionals and let $\{P_n(x)\}_{n\geq 0}$ and $\{Q_n(x)\}_{n\geq 0}$ be their corresponding orthogonal polynomial sequences (OPS). We will discuss an inverse problem in the theory of discrete orthogonal polynomials involving the two OPS $\{P_n(x)\}_{n\geq 0}$ and $\{Q_n(x)\}_{n\geq 0}$ assuming that their difference derivatives D_ν of higher orders m and k (resp.) are connected by a linear algebraic structure relation such as

$$\sum_{i=0}^{M} a_{i,n} D_\nu^m P_{n+m-i}(x) = \sum_{i=0}^{N} b_{i,n} D_\nu^k Q_{n+k-i}(x), \quad n \geq 0,$$

where $M, N, m, k \in \mathbb{N}\cup\{0\}$, $a_{M,n} \neq 0$ for $n \geq M$, $b_{N,n} \neq 0$ for $n \geq N$, and $a_{i,n} = b_{i,n} = 0$ for $i > n$. In this way, $(\mathcal{U}, \mathcal{V})$ is called a (M, N)-D_ν-coherent pair of order (m, k), extending to the discrete case several previous works made in the continuous case. As an application we will consider the OPS with respect to the following Sobolev-type inner product

$$\langle p(x), r(x)\rangle_{\lambda,\nu} = \langle \mathcal{U}, p(x)r(x)\rangle + \lambda \langle \mathcal{V}, (D_\nu^m p)(x)(D_\nu^m r)(x)\rangle, \quad \lambda > 0,$$

assuming that $\mathcal{U}$ and $\mathcal{V}$ (which, eventually, may be represented by discrete measures supported either on a uniform lattice if $\nu = \omega$, or on a q-lattice if $\nu = q$) constitute a (M, N)-D_ν-coherent pair of order m (that is, an (M, N)-D_ν-coherent pair of order $(m, 0)$), $m \in \mathbb{N}$ being fixed.

ANA6-6 Alagacone Sri Ranga, Universidade Estadual Paulista, Brazil

Two families of orthogonal polynomials on the unit circle from basic hypergeometric functions

For $a, b, c \in \mathbb{C}$, $c \neq 0, -1, -2, \ldots$ and $0 < |q| < 1$ the ${}_2\Phi_1$ q-hypergeometric or the ${}_2\Phi_1$ basic hypergeometric function may be defined by

$${}_2\Phi_1(q^a, q^b; q^c; q, z) = \sum_{n=0}^{\infty} \frac{(q^a;q)_n\,(q^b;q)_n}{(q^c;q)_n\,(q;q)_n}\, z^n,$$

for $|z| < 1$ and by analytic continuation for other values of $z \in \mathbb{C}$. Here, $(q^a;q)_0 = 1$ and $(q^a;q)_n = (1-q^a)(1-q^{a+1})\cdots(1-q^{a+n-1})$, $n \geq 1$. When one of the parameters a or b is equal to $-k$, where k is a nonnegative integer, then the sum terminates at $n = k$ and we have a polynomial in z of degree k.

The sequence $\{\ {}_2\phi_1(q^{-k}, q^{b+1};\ q^{-\bar{b}-k+1};\ q, q^{-\bar{b}+1/2}z)\}_{k\geq 0}$ of basic hypergeometric polynomials is known to be orthogonal on the unit circle with respect to the weight function $|(q^{1/2}e^{i\theta};\ q)_\infty/(q^{b+1/2}e^{i\theta};\ q)_\infty|^2$. This result, where one must take the parameters q and b to be $0 < q < 1$ and $\Re(b) > -1/2$, is due to P.I. Pastro. In the present work we deal with the orthogonal polynomials on the unit circle with respect to the two parametric families of weight functions $\hat{\omega}(b;\theta) = |(e^{i\theta};\ q)_\infty/(q^b e^{i\theta};\ q)_\infty|^2$ and $\check{\omega}(b;\theta) = |(qe^{i\theta};\ q)_\infty/(q^b e^{i\theta};\ q)_\infty|^2$, where $0 < q < 1$ and $\Re(b) > 0$. The orthogonal polynomials are given in terms of the sequence of basic hypergeometric polynomials $\{\ {}_2\phi_1(q^{-k}, q^b;\ q^{-\bar{b}-k+1};\ q, q^{-\bar{b}+1}z)\}_{k\geq 0}$.

ANA6-7 Pablo Román, Universidad Nacional de Córdoba, Argentina

New families of matrix-valued orthogonal polynomials related to Gelfand pairs of rank one

I this talk I will discuss a method to obtain one-parameter deformations of certain families of matrix-valued orthogonal polynomials related to Gelfand pairs of rank one. In particular, I will introduce a family of matrix-valued orthogonal polynomials of arbitrary size obtained by applying our method to the family of matrix-valued Chebyshev polynomials related to the pair.

6.4.13 ANA7 - HARMONIC ANALYSIS AND GEOMETRIC MEASURE THEORY WITH APPLICATIONS

ANA7-1 Bruno Bongioanni, Universidad Nacional del Litoral e IMAL-CONICET, Argentina

BMO, weights and the Schrödinger operator

In the last decade, many authors have been working in the development of the Harmonic Analysis generated by the Schrödinger operator. In this talk we present some advances concerning boundedness of some of the operators of this analysis. New spaces appear in this context in order to study regularity of functions and also a new versions of Muckenhoupt weights.

ANA7-2 Marilina Carena, Universidad Nacional del Litoral e IMAL-CONICET, Argentina

Muckenhoupt weights with singularities on lower dimensional sets

The class A_p of Muckenhoupt weights are extensively used in real and harmonic analysis, as well as, in the theory of partial differential equations. For example, the behavior of the source near the boundary F of the domain of a Dirichlet boundary value problem, may cause non-solvability in a non-weighted Sobolev space. Nevertheless, the problem can be solved in an adequate weighted Sobolev space, in which the difficulties might be avoided. If the source has an unbounded growth near the boundary F, we should search for a weight which vanishes there. This is the case of the power-type weights, which are of the form $d^\beta(x, F)$, where $d(x, F)$ is the distance from the point x to F. Weighted Sobolev spaces with Muckenhoupt weights are of particular interest since weighted imbedding theorems and Poincaré type inequalities hold.

We consider a general metric measure space (X, d, μ), and we give sufficient conditions on a set $F \subseteq X$ and on a real number β in such a way that $d(x, F)^\beta$ becomes a Muckenhoupt weight. Then, we consider a function $w(t)$ generalizing the powers t^β, and we obtain sufficient conditions on $w(t)$ and on F of X, such that $w(d(x, F)) \in A_p(X, d, \mu)$. We state a joint condition on the function w, the set F and the measure μ, that for the case of $F = \{x_0\}$ is the same that the required in [1].

References

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ANA7-3 Felipe Gonçalvez, Instituto de Matemática Pura e Aplicada IMPA, Brazil

Band-Limited Approximations and Interpolation Formulas

In the late 1930s, Beurling found a function B(x) with Fourier transform supported in the interval [-1,1] that majorates the sign function and minimizes the $L^1(R)$ distance to it. In the 1974, Selberg used Beurling's construction to define functions L(x) and M(x) with Fourier transform supported in [-1,1] that, respectively, minorate and majorate the characteristic function of an interval and minimizes the $L^1(R)$ to it. These functions were mainly used to give sharp estimates in Analytic Number Theory, but nowadays it is a field on its own.

A crucial property of these extremal functions is that they interpolate the target function in a sequence of real points and are often given by an interpolation formula involving these interpolation nodes and the values of the target function and its derivatives at these points. In this talk we give a quick view of the main aspects of the theory and also its connection with de Branges spaces of entire functions and sampling/frame theory.

ANA7-4 Jean Moraes, Universidade Federal do Rio Grande do Sul, Brazil

L^2 estimates for t-Haar Multipliers on spaces of homogeneous type

In this talk, we show how to generalize the Haar basis for $L^2(\mathbb{R})$ to general spaces of homogeneous type (X, v, σ), σ a positive doubling measure and v a weight. We then show that this generalization is indeed a complete orthonormal basis for $L^2(vd\sigma)$.

We also present a constructive proof of a collection dyadic cubes in a space of homogeneous type (SHT) which are "honest," i.e., that there are no more than two children per generation. We then go to show how these cubes can be used to prove a generalization of D. Chung's Good Bellman Function in SHT.

We will use these constructions to estimate the $L^2(d\sigma)$ norm of the t-Haar multipliers $(T_v^\sigma)^t$ associated to a weight $v \in A_2^d(d\sigma)$. The estimates that we will present are sharp in the sense that they cannot be improved and be expected to hold for all σ, since any improvement will not hold if σ is the Lebesgue measure.

Joint work with David Weirich.

ANA7-5 Victoria Paternostro, Universidad de Buenos Aires e IMAS-CONICET, Argentina

Structure and frame properties of noncommutative shift-invariant spaces

In this talk we will discuss the structure of subspaces of a Hilbert space that are invariant under unitary representations of a discrete group. We shall give characterizations of Riesz and frame sequences associated to group representations extending previous results for abelian groups and for cyclic subspaces of unitary representations of noncommutative discrete groups. For the cyclic case, we will see that the Gramian associated to an orbit of a single function and the Bracket map associated to the representation, agree. This will allow us to obtain all the characterization results for cyclic Riesz and frame sequences, previously proven in several context with very elaborated proofs, in a simply way. For the general case, that is, systems generated by more that one function, we will see that Riesz and frame properties are related to a notion for frame and Riesz basis in Hilbert modules endowed with inner products taking values in spaces of unbounded operators. The results presented in this talk are a joint work with Eugenio Hernández and Davide Barbieri from Universidad Autónoma de Madrid.

ANA7-6 Ezequiel Rela, Universidad de Buenos Aires e IMAS-CONICET, Argentina

Sharp weighted estimates and further improvements via Reverse Hölder Inequalities

In the theory of weighted inequalities for A_p weights, the expected bound for an operator T is something like:

$$\|T\|_{L^p(w)} \leq c\,[w]_{A_p}^{\beta} \qquad w \in A_p.$$

These type of inequalities were proved for a large class of classical operators, including maximal operator and singular integrals. To test the sharpness of the exponent β, each situation demands a specific example. Usually, a 1-parameter family of functions and weights asymptotically verifying that the same

inequality cannot hold for a smaller β. In this talk I will present a recent discovery of a close connection between the best possible β for the above inequality and the asymptotic behaviour of the unweighted L^p norm $\|T\|_{L^p}$ as p goes to 1 and $+\infty$. Using this method, we verify the sharpness of know bounds and provide a lower bound for the exponent β for those cases when it is still not know if this best possible value is attained.

Moreover, we will show that this sharp bound can be further improved in terms of mixed constants $A_p - A_\infty$. This improvement is achieved by using a precise quantitative formulation of the open condition satisfied by the A_p classes. The key here is the recently obtained Reverse Holder Inequality involving A_∞ constants.

This is a joint work with Teresa Luque from ICMAT and Carlos Pérez Moreno from Universidad del País Vasco UPV/EHU and Ikerbaske.

ANA7-7 Pablo Schmerkin, Universidad Torcuato Di Tella y CONICET, Argentina

Distance sets, box-counting and Ahlfors-regular sets

The Falconer distance set conjecture from 1985 says that if A is a Borel subset of the plane of Hausdorff dimension ≥ 1, then the set of distances between points of A has full Hausdorff dimension. Despite deep advances by Mattila, Wolff, Bourgain and others, the conjecture remains wide open. I will present some recent progress in the case in which A is an Ahlfors-regular set, including a discretized box-counting version of the conjecture in this setting.

ANA7-8 Wilfredo Urbina, Roosevelt University, USA

Transference results from the L^p continuity of operators in the Jacobi case to the L^p continuity of operators in the Hermite and Laguerre case

Using the well known asymptotic relations between Jacobi polynomials and Hermite and Laguerre polynomials we develop a transference method to obtain the L^p-continuity of the Gaussian-Riesz transform and the L^p-continuity of the Laguerre-Riesz transform from the L^p-continuity of the Jacobi-Riesz transform, in dimension one as well as the L^p-continuity of the Gaussian-Riesz transform and the L^p-continuity of the Laguerre-Riesz transform from the L^p-continuity of the Jacobi-Riesz transform. Additionally from the L^p-continuity of the Jacobi–Littlewood-Paley g function, in dimension one, we also obtain the the L^p-continuity of the Gaussian-Littlewood-Paley g function and the L^p-continuity of the Laguerre-Littlewood-Paley g function.

6.4.14 ANA9 - NONLINEAR DISPERSIVE EQUATIONS

ANA8-1 Jaime Angulo, Universidade de Sao Paulo, Brazil

Stability of peak solutions for NLS equations on a star graph

The aim of this talk is to demonstrate effectiveness of extension theory of symmetric operators for investigation of stability of standing waves for semi-linear Schrödinger equations with δ- and δ'-interaction on a start graph. Our approach relies on the theory of stability for Hamiltonian systems which are invariant under a one-parameter group of operators.

Joint work with:
N. Goloshchapova, Department of Mathematics, IME-USP.

ANA8-2 Eddy Bustamante, Universidad Nacional de Colombia, Colombia

On the decay and support of the Zakharov-Kuznetsov equation and the well-posedness of the initial value problem associated to it

In this talk we consider the Zakharov-Kuznetsov equation

$$\partial_t u + \partial_x^3 u + \partial_x \partial_y^2 u + u\partial_x u = 0, \quad (x,y) \in \mathbb{R}^2, t \in [0,1]. \tag{6.10}$$

We present three results obtained for this equation. The first one is about the support of the solutions of (6.10). We prove that a sufficiently smooth solution u which has compact support at two different times must vanish identically.

The second result is a unique continuation principle in which we prove that if the difference of two sufficiently smooth solutions u_1 and u_2 of (6.10) decays as $e^{-a(x^2+y^2)^{3/4}}$ for a large enough $a > 0$, at two different times, then both solutions coincide.

The last result is about the well-posedness of the initial value problem associated to (6.10) in the weighted Sobolev spaces $H^s(\mathbb{R}^2) \cap L^2((1+x^2+y^2)^r dxdy)$, for $s > 3/4$ and $r = s/2$

ANA8-3 Luca Fanelli, Università di Roma, Italy

Fractional Schrodinger operators in external fields: improved dispersion, local smoothing and weighted Strichartz estimates

We will summarize some recent results concerned with fractional Schrödinger groups of the form e^{itH^a}, being $H = (-i\nabla + A)^2 + V(x)$ and $a > 0$. Using the spherical harmonics decomposition $H = \sum_{m\in\mathbb{Z}} H_m \otimes \mathbf{1}$, we are able to establish the dispersive behavior of the single projection H_m and to obtain uniform (in m) dispersive estimates. Diamagnetic phenomena, Zeeman and Starks effects come into play.

The results are obtained, in different teams, in collaboration with F. Cacciafesta (Milano Bicocca), V. Felli (Milano Bicocca), M. Fontelos (ICMAT - Madrid), G. Grillo (Milano Politecnico), H. Kovarik (Univ. Brescia), and A. Primo (Autónoma - Madrid).

ANA8-4 José Manuel Jiménez, Universidad Nacional de Colombia, Colombia

Polynomial decay of the solutions for some nonlinear dispersive equations

In this talk we will show recent results about decay properties of the solutions for some nonlinear dispersive equations, namely the Benjamin equation, the Zakharov-Kuznetsov equation and the Ostrovsky equation.
We study the well-posedness of the Cauchy problem associated to these nonlinear dispersive equations in the weighted Sobolev spaces

$$Z_{s,r} := H^s(\mathbb{R}^n) \cap L^2(1+\langle x\rangle^2 r dx), \ n = 1,2, \ r > 0.$$

The results are obtained in collaboration with Eddye Bustamante and Jorge Mejía, from Universidad Nacional de Colombia, Sede Medellín.

ANA8-5 Michal Kowalczyk, Universidad de Chile, Chile

Kink dynamics in the ϕ^4 model: asymptotic stability in the odd space

We consider a classical equation known as the ϕ^4 model in one space dimension. The kink, defined by $H(x) = \tanh(x/\sqrt{2})$, is an explicit stationary solution of this model. From a result of Henry, Perez and Wreszinski it is known that the kink is orbitally stable with respect to small perturbations of the initial data in the energy space. In this talk we show asymptotic stability of the kink for odd perturbations in the energy space. The proof is based on Virial-type estimates partly inspired from previous works of Martel and Merle on asymptotic stability of solitons for the generalized Korteweg-de Vries equations. However, this approach has to be adapted to additional difficulties, pointed out by Soffer and Weinstein in the case of general Klein-Gordon equations with potential: the interactions of the so-called internal oscillation mode with the radiation, and the different rates of decay of these two components of the solution in large time.

This is a joint work with C. Muñoz and Y. Martel.

ANA8-6 Claudio Muñoz, Universidad de Chile, Chile

The scattering problem for unstable solitons: collision, decay and blow-up for critical inhomogeneous NLS equations (joint work with F. Merle)

We consider the L^2-critical, nonlinear Schroedinger equation with a positive, slowly varying potential acting on the nonlinearity. Previous results by Merle, Banica, Carles and Duyckaerts, and Raphael and Szeftel, studied global existence versus the emergence (and uniqueness) of minimal mass blow-up solutions (of pseudo conformal type) concentrated at a maximum point of the potential, and depending on the regularity of the potential. In this talk we address the case of a potential with no critical points, which leads, in the language introduced by Merle, to the study of either critical or supercritical mass problems, but without size restriction on the mass. For these classes of potentials, we describe the physically relevant scattering problem of a soliton-like solution against the potential. We show that in any case, the dynamics is driven towards a singular regime where only two options are available: either blow-up up in finite time according to a log-log law, or scattering to a linear solution, with the fate of the solution only depending on the sign of the involved nonlinear potential and the slowly varying character of the potential.

ANA8-7 Didier Pilod, Universidade Federal do Rio de Janeiro, Brazil

Construction of a minimal mass blow up solution of the modified Benjamin-Ono equation

We construct a minimal mass blow up solution of the modified Benjamin-Ono equation (mBO), which is a classical one dimensional nonlinear dispersive model.

Let $Q \in H^{\frac{1}{2}}$, $Q > 0$, be the unique ground state solution associated to mBO. We show the existence of a solution S of mBO satisfying $\|S\|_{L^2} = \|Q\|_{L^2}$ and

$$S(t) - \frac{1}{\lambda^{\frac{1}{2}}(t)} Q\left(\frac{\cdot - x(t)}{\lambda(t)}\right) \to 0 \quad \text{in } H^{\frac{1}{2}}(\mathbb{R}) \text{ as } t \downarrow 0,$$

where

$$\lambda(t) \sim t, \quad x(t) \sim -|\ln t| \quad \text{and} \quad \|S(t)\|_{\dot{H}^{\frac{1}{2}}} \sim t^{-\frac{1}{2}} \|Q\|_{\dot{H}^{\frac{1}{2}}} \quad \text{as } t \downarrow 0.$$

This existence result is analogous to the one obtained by Martel, Merle and Raphaël (J. Eur. Math. Soc., 17 (2015)) for the mass critical generalized Korteweg-de Vries equation (gKdV). However, in contrast with the gKdV equation, for which the blow up problem is now well-understood in a neighborhood of the ground state, S is the first example of blow up solution for mBO.

The proof involves the construction of a blow up profile, energy estimates as well as refined localization arguments, developed in the context of Benjamin-Ono type equations by Kenig, Martel and Robbiano (Ann. Inst. H. Poincar, Anal. Non Lin., 28 (2011)). Due to the lack of information on the mBO flow around the ground state, the energy estimates have to be considerably sharpened here.

This talk is based on a joint work with Yvan Martel (Ecole Polytechnique)

ANA8-8 Yannick Sire, John Hopkins University, USA

Dispersive equations involving the fractional laplacian

I will describe some recent results on Schrodinger equations with fractional laplacian. Such equations come from quantum mechanics and have been introduced by Laskin. I will focus on well-posedness and ill-posedness in Sobolev spaces. I will also describe a new class of travelling solitons consisting in boosting a pseudo-galilean invariance.

6.4.15 ANA9 - CONTINUOUS OPTIMIZATION AND OPTIMAL CONTROL

ANA9-1 Orestes Bueno Tangoa, Universidad del Pacífico, Perú

On maximality of quasimonotone operators

In this talk, we analyze certain aspects of maximal (in the sense of graph inclusion) quasimonotone operators, and their relation with the notion of maximal quasimonotonicity introduced by Aussel and Eberhard [1]. We conclude by characterizing the maximal quasimonotonicity of operators defined in the real line.

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ANA9-2 Aris Daniilidis, Centro de Modelamiento Matemático, Universidad de Chile, Chile

From self-expanded to snake-like curves

Starting from the convex paradigm, we shall review properties of orbits of gradient dynamical systems, in both continuous and discrete case.

ANA9-3 Juan Carlos de los Reyes, Escuela Politécnica Nacional, Ecuador

Stationarity conditions for optimization problems with variational inequality constraints

We discuss on the derivation of optimality conditions for optimization problems constrained by a class of variational inequalities of the second kind. These problems typically arise in physical phenomena that exhibit a threshold behaviour (viscoplastic fluid flow, frictional contact, etc.) and in variational methods for image processing. We present different methodologies for obtaining optimality conditions, as well as a hierarchy of the stationary points obtained (C-stationary, B-stationary and strong stationary). For the numerical solution of the problems an inexact trust-region algorithm is proposed and analyzed. Computational experiments illustrate the performance of the proposed approach.

ANA9-4 Yboon Victoria García Ramos, Universidad del Pacífico, Perú.

Integration formulas without convexity

We present some integration formulas for non convex functions, which extend the well know and classical one by Rockafellar [1] in the convex setting, and improve similar results due to Thilbault-Combari [2] and Thilbault-Marcellin [3]. The main tool is a formula for the subdifferential of the conjugate function given in terms of the $\epsilon-$subdifferential for non necessarily convex functions.

Joint work with:
Abderrahim Hantoute, Centro de Modelamiento Matemático, U. chile.
Rafael Correa, Departamento de Ingeniería Matemática y
Centro de Modelamiento Matemático, U. chile.

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ANA9-5 Luis Mauricio Graña Drummond, Universidade Federal de Rio de Janeiro, Brazil

On the choice of special Pareto points

We propose two strategies for choosing Pareto solutions of constrained multiobjective optimization problems. The first one, for general problems, furnishes *balanced* optima, i.e., feasible points that, in some sense, have the closest image to the vector whose coordinates are the objective components infima. It consists of solving a single scalar-valued problem, whose objective requires the use of a monotonic function which can be chosen within a large class of functions. The second one, for practical problems where there is a preferences among the objective's components to be minimized, gives us points that satisfy this order criterion. The procedure requires the sequential minimization of all these functions. We also study other special Pareto solutions, the *sub-balanced* points, which are a generalization of the balanced optima.

ANA9-6 Alfredo Iusem, Instituto Nacional de Matemática Pura e Aplicada IMPA, Brazil

On the Quadratic Eigenvalue Complementarity Problem

We introduce several new results on the Quadratic Eigenvalue Complementarity Problem (QEiCP), focusing on the nonsymmetric case, i,e, without making symmetry assumptions on the matrices defining the problem. First we establish a new sufficient condition for existence of solutions of this problem, which is somewhat more manageable than previously existent ones. This condition works through the introduction of auxiliary variables which leads to the reduction of QEiCP to an Eigenvalue Complementarity Problem (EiCP) in higher dimension. Hence, this reduction suggests a new strategy for solving QEiCP, which is also analyzed in the paper. We also present an upper bound for the number of solutions of QEiCP and exhibit some examples of instances of QEiCP whose solution set has large cardinality, without attaining though the just mentioned upper bound. We also investigate the numerical solution of the QEiCP by exploiting a nonlinear programming and a variational inequality formulations of QEiCP. Some numerical experiments are reported and illustrate the benefits and drawbacks of using these formulations for solving the QEiCP in practice.

ANA9-7 René Meziat Vélez, Universidad del Rosario, Colombia

Exact and convex relaxations of non-convex, non-local, homogeneous, two-dimensional variational problems with low-degree, polynomial structure

In this talk we will focus on non-local, non-convex, homogeneous, two-dimensional variational problems given in the following way:

$$\min_{u\in X} J(u) = \int_{\Omega\times\Omega} F(\nabla u(x), \nabla u(y))\, dxdy \tag{6.11}$$

where $\Omega \subset R^2$ is a bounded regular domain in the euclidean plane R^2 and X is the family of functions $u : \Omega \to R$ in the Sobolev space $W^{1,p}(\Omega)$ with $p > 1$, which satisfy the boundary conditions

$$u - u_0 \in W_0^{1,p}(\Omega) \tag{6.12}$$

with $u_0 \in W^{1,p}(\Omega)$ and $J(u_0) < \infty$, under the special case in which the integrand F in (6.11) is a non-convex, symmetric, four-degree, two-dimensional polynomial in every component: s and t.The convex, finite-dimensional relaxation proposed here provides us with the information about the weak solution in Young measures of (6.11). It is remarkable that we can explicitly calculate minimizers and minimizing sequences of (6.11) for a rather general family of non-convex, highly non-linear, non-convex integrands F by using convex optimization tools. We will present theory and numerical methods.

6.4.16 DINSIS1 - DYNAMICAL SYSTMES AND ERGODIC THEORY

DINSIS1-1 Pierre Berger, Université de Paris, France

On the Kolmogorov typicality of dynamics displaying infinitely many coexisting sinks

In this talk we will show that the finiteness of the number of attractors is not typical in the sens of Kolmogorov. Moreover, we will show the existence of an open set of surface map U in which typically in the sense of Kolmogorov-Arnold, the dynamics displays infinitely many attractors. This means that for a C^r-generic family $(f_a)_a$ of maps f_a in U, for every small parameter a, the dynamics f_a displays infinitely many sinks.

A part of this work is in collaboration with S. Crovisier et E. Pujals.

DINSIS1-2 Daniel Coronel, Universidad Andrés Bello, Chile

Sensitive dependence of Gibbs measures in quasi-quadratic families

The Gibbs measures of an interaction can behave chaotically as the temperature drops to zero. This was first observed in some XY models in statistical mechanics, and then, in some symbolic systems. In this talk we discuss a related phenomenon that we have observed in some quasi-quadratic families. More precisely, there are parameters exhibiting a sensitive dependence of equilibrium states for the geometric potential at zero temperature, that is, an arbitrarily small perturbation on the parameter of the family can produce significant changes in the low-temperature behavior of its equilibrium states when temperature goes to zero. We will also show the first example of a chaotic and sensitive dependence of equilibrium states at positive temperature.

Joint work with Juan Rivera-Letelier.

DINSIS1-3 Maria Isabel Cortez, Universidad de Santiago de Chile

Topological full groups and continuous orbit equivalence

The topological full group associated to a free group action on the Cantor set is a subgroup of the group of homeomorphisms on X. This group is an invariant for continuous orbit equivalence, and it is also a very interesting object from the group theory point of view. In this talk we will introduce some general concepts and we will present some results in collaboration with Kostya Medynets.

DINSIS1-4 Sylvain Crovisier, Université de Paris, France

Finiteness of measures maximizing the entropy for surface diffeomorphisms

Newhouse has shown that smooth surface diffeomorphisms have ergodic measures maximizing the entropy. With Jérôme Buzzi and Omri Sarig we prove that their number is finite. This is a consequence of a generalisation of the coding and of the spectral decomposition into basic sets known for hyperbolic diffeomorphisms.

DINSIS1-5 Carlos Gustavo Moreira, Instituto de Matemática Pura e Aplicada, Brazil

On the fractal geometry of horseshoes in arbitrary dimensions

We will discuss some works in progress which give a reasonably good perspective of understanding the main properties of the fractal geometry of typical dissipative horseshoes in arbitrary dimensions.

In the first work, in collaboration with J. Palis and M. Viana, given a horseshoe Λ whose stable spaces have dimension k we define a family of fractal dimensions (the so-called *upper stable dimensions*) $\overline{d}_s^{(j)}(\Lambda)$, $1 \leq j \leq k$, which satisfy $\overline{d}_s^{(1)}(\Lambda) \geq \overline{d}_s^{(2)}(\Lambda) \geq \cdots \geq \overline{d}_s^{(k)}(\Lambda) \geq HD(\Lambda \cap W^s(x))$, $\forall x \in \Lambda$ (and analogously for the unstable directions) with the following properties: given $1 \leq r \leq k$ and $\epsilon > 0$ there is a ϵ-small C^∞ perturbation of the original diffeomorphism for which the hyperbolic continuation of Λ has a

subhorseshoe $\tilde{\Lambda}$ which has strong stable foliations of codimensions j for $1 \leq j \leq r$ and which satisfies $\overline{d}_s^{(r)}(\tilde{\Lambda}) > \overline{d}_s^{(r)}(\Lambda) - \epsilon$.

In the second work in progress, in collaboration with W. Silva (which extends a previous joint work in codimension 1), we prove that if a horseshoe Λ has strong stable foliations of codimensions j for $1 \leq j \leq r$ and satisfies $\overline{d}_s^{(r)}(\Lambda) > r$ then it has a small C^∞ perturbation which contains a blender of codimension k: in particular C^1 images of stable Cantor sets of it (of the type $\Lambda \cap W^s(x)$ in $\mathbb{R}^k$ will typically have persistently non-empty interior. We also expect to prove that when $r < \overline{d}_s^{(r)}(\Lambda) \leq r+1$ the Hausdorff dimension of these stable Cantor sets typically coincide with $\overline{d}_s^{(r+1)}(\Lambda)$, and this dimension depends continuously on Λ on these assumptions, which would imply typical continuity of Hausdorff dimensions of stable and unstable Cantor sets of horseshoes.

DINSIS1-6 Alejandro Passeggi, Universidad de la República de Urugay

Rotation Theory of annular continua

Attracting annular continua are natural objects for dissipative systems of the two dimensional annulus. These are usually studied by means of the rotation set, naturally given in this context by an interval. The existence of a relation between the *size* of the rotation set and the *topological entropy* in contexts as endomoprhisms of the circle and homeomorphisms of the torus, had suggested that something similar might hold for attracting annular continua in the annulus. The answer is negative in general, but it was an open problem for the case of those annular continua which are *irreducible*.

In a recent article we found a complete answer to this problem: although a non-trivial rotation set implies positive entropy, there is no relation between the length of the interval and the topological entropy, that is, there exists examples with a uniformly large rotation set but arbitrary small topological entropy. As byproduct, we obtain that these continua having non-trivial rotation sets, are created by means of a topological horseshoe, which in turn gives C^0-stability of the phenomena.

In this talk, we are going to introduce this problem and the results, and show some aspects about the proofs of the mentioned results.

Joint work with R. Potrie and M.Sambarino

DINSIS1-7 Mario Ponce, Pontificia Universidad Católica de Chile, Chile

A Law of Large Permanents and Applications to Random Graphs

The permanent of a square matrix carries a lot of information about the entries of the matrix and can be used to model many problems on combinatorics. For an infinite matrix with dynamically defined entries (an observable evaluated on an $\mathbb{N}^2$-action), we prove a theorem (Law of Large Permanents) relating the distributional values of the underlying measures and the values of the observable, with the limit behavior of the permanent of this matrix. Applications to counting perfect matchings for random graphs in random environments are obtained.

These are joint works with Jairo Bochi and Godofredo Iommi (PUC-Chile).

DINSIS1-8 Martin Sambarino, Universidad de la República Uruguay, Uruguay

Stable Ergodicity

We present the Pugh-Shub conjecture on stable ergodicity. The C^1 general case has been settled recently by Avila-Crovisier-Wilkinson. We will discuss some progress in the C^r case when the central dimension is two.

6.4.17 DINSIS2 - GEOMETRY OF DIFFERENTIAL EQUATIONS AND THEIR SINGULARITIES

DINSIS2-1 David Blázquez-Sanz, Universidad Nacional de Colombia, Colombia

Some results on parallelisms of algebraic varieties by means of differential Galois theory

A parallelized manifold is a manifold with a basis of the tangent bundle that span a Lie algebra of the dimension equal to that of the manifold. Isogenies are local diffeomorphisms that conjugate parallelisms. Parallelized manifolds may be classified up to isogeny. In the smooth category parallelized manifolds are isogenous to Lie groups with selected basis of their Lie algebras. In the analytic context, it has been proved that any parallelized compact complex manifold is isomorphic to quotient of a complex Lie group by a discrete subgroup. These results have been extended to some open complex manifolds. A recent result of P. Deligne shows that such classification is impossible in the algebraic category. We find many cases of parallelized varieties are that not isogenous to algebraic groups. We study the differential Galois theory of the differential equation, given by Cartan and Darboux, satisfied by isogenies. We provide criteria, based on differential Galois theory, to insure that a parallelized variety is isogenous to an algebraic group. We prove that, if g is a centerless Lie algebra, then a variety admits two mutually commuting g-parallelisms if an only if it is isogenous to an algebraic group. This is joint work with Guy Casale (Université Rennes).

DINSIS2-2 Alexander Cardona, Universidad de los Andes, Colombia

Index theory and global pseudo-differential calculus on Lie groups

In recent years Ruzhansky and Turunen defined a new pseudo-differential calculus on compact Lie groups in which, using the representation theory for this type of groups, the symbols are no longer local functions on the cotangent bundle but semi-discrete objects of matrix nature; such objects are called "global pseudo-differential operators". During this talk the index theory for global pseudo-differential operators will be presented and contrasted with the corresponding classical theory (developed by Atiyah and Singer in the sixties), some examples and potential applications will be addressed.

DINSIS2-3 Jean Carlos Cortissoz, Universidad de los Andes, Colombia

The surprising behavior of the Ricci flow in a cylinder

In this talk we shall consider the following boundary value problem for the Ricci flow

$$\begin{cases} \frac{\partial \tilde{g}}{\partial \tilde{t}} = -\tilde{R}\tilde{g} \quad \text{in} \quad M \times \left(0, \tilde{T}\right) \\ k_{\tilde{g}} = \gamma \quad \text{on} \quad \partial M \times \left(0, \tilde{T}\right) \\ \tilde{g} = g_0 \quad \text{in} \quad M, \end{cases}$$

where $\gamma = k_{g_0}$ is the geodesic curvature of the initial metric, and M is a surface homeomorphic to a cylinder $\mathbb{S}^1 \times [-\rho, \rho]$. We will assume that the Gaussian curvature of the initial metric is strictly positive, and the geodesic curvature is nonpositive. We will show longtime existence results for both, the problem described above and its normalized version. We will show that whereas in the normalized flow we must expect that the curvature converges towards 0, for the solution to the above boundary value problem the curvature blows-up in infinite time. In contrast with the case of closed surfaces of zero Euler characteristic, we will prove that when $k_{g_0} < 0$ in one of the boundary components, then the convergence towards zero curvature, in the normalized flow, cannot be exponential. This is a joint work with Alexander Murcia.

DINSIS2-4 Joaquín Delgado Fernández, Universidad Autónoma Metropolitana, México

On the global bifurcation diagram of the Gray-Scott model of reaction diffusion

We consider the system of equations due to Gray-Scott that models the reactions and diffusion of chemical components

$$U_t = D_1 \nabla^2 U - UV^2 + F(1-U), \tag{6.13}$$
$$V_t = D_2 \nabla^2 V + Uv^2 - (F+k)V \tag{6.14}$$

defined on the square $(x, y) \in [0, 1] \times [0, 1]$, with non-negative parameters D_1, D_2, F, k. As a first step towards understanding the zoo of spatial and temporal patterns that this system exhibits we present a study of spatially uniform states, described by neglecting de diffusion terms leading to a planar dynamical system. In the plane of paramters F-k we prove the existence of a Bogdanov-Takens (BT) and Bautin (GH) bifurcation points. As a consequence local codimension-1 curves of Hopf and homoclinic curves exist near BT and a line of fold of limit cyles exist near GH. We perform a numerical continuation using MatCont of local curves which yields a global map of bifurcations of the system. A global bifurcation of hetheroclinic saddle connection is also explored.

DINSIS2-5 Ronaldo Garcia Ronaldo García, Universidad Federal de Goiás, Brazil

Lines of Curvature on Quadric Hypersurfaces of $\mathbb{R}^4$

In this talk will be described the geometric structures of the lines of principal curvature and the partially umbilic singularities of the three-dimensional generic quadric hypersurfaces of R^4. This includes the compact ellipsoid, the *ellipsoidal hyperboloids* of one and two sheets and the *toroidal hyperboloids*.

DINSIS2-6 Mikhail Malakhaltsev, Universidad de los Andes, Colombia

3-webs with singularities: topological and differential invariants

A 3-web with singularities is an ordered collection of three one-dimensional distributions L_1, L_2, L_3 on a 2-dimensional manifold M. The subset Σ where these distributions are not pairwise transversal is called the singularity set Σ. We study the corresponding G-structure with singularities, and, under some conditions on Σ, find topological and differential invariants of the 3-web with singularities at the points of Σ. Also we give concrete examples of calculations of these invariants. This is a joint work with Fabián Arias.

DINSIS2-7 Daniel Offin, Queen's University, Canada

Stability of periodic orbits by Conley-Zehnder index theory

Roughly speaking, the Conley-Zehnder index measures the number of half windings of a fundamental solution for a periodic linear Hamiltonian system. This index, and its closely related cousin the Morse index for the equivariant action functional, can be used to give non perturbative arguments for linearized stability and instability for families of periodic orbits in Hamiltonian systems. We will give several examples of this from the setting of parametric resonance in parameterized families, to minimum distance lines in kinetic plus potential systems. Using a necessary and sufficient condition for elliptic stability of periodic orbits in two degree of freedom systems, we ouline the global argument for families of hyperbolic orbits in the Henon-Heiles system.

DINSIS2-8 Salomón Rebollo Perdomo, Universidad del Bío-Bío, Chile

Limit cycles in perturbations of planar vector fields with curves of singularities

The bifurcation phenomena of limit cycles is richer in perturbation of vector fields with curves of singularities than in perturbation of vector fields with only isolated singularities. For example, more limit cycles can bifurcate in the former case than in the latter one. We will consider perturbations of planar polynomial vector fields that have centers and curves of singularities. For the perturbed vector field we will study its limit cycles that bifurcate from the centers of the unperturbed vector field. We will give some results about the maximum number of this kind of limit cycles that the perturbed vector field can support.

DINSIS2-9 Jesús Muciño Raymundo, Centro de Ciencias Matemáticas UNAM, México

Essential singularities of complex analytic vector fields

We consider the real part $\mathfrak{Re}(X)$ of complex analytic vector fields X on a Riemann surface M, having as singularities, zeros, poles and essential singularities. It is equivalent to study singular flat metrics on M provided with singular unitary geodesic fields. This road necessarily goes to families of vector fields with a finite number of complex parameters, where natural bifurcation problems appear. This is a joint work with Álvaro Alvarez Parrilla and Eduardo Frías Armenta.

DINSIS2-10 Farid Tari, Universidad de Sao Paulo ICMC, Brazil

Frames and direction mappings on surfaces

There are some natural/geometric frames on smooth and regular surfaces in the Euclidean 3-space; the one given by the two principal and normal directions (away from umbilic points) and the other by the asymptotic and normal directions (in the complement of the elliptic region) are two such frames. Frames can be viewed locally as map-germs from a 2-space to a 3-space. We analyze the stable singularities of frames. It turns out that those of geometric frames provide geometric information about the surface. Another way to obtain geometric information about surfaces is to consider the images of the asymptotic and principal foliations on the unit sphere by their associated unit direction fields. We show that, in most cases, these are the configurations of a generic divergent diagram or of a generic integral digram (so are solutions of first order differential equations). The remaining cases are new configurations of generic divergent/integral diagrams. This is a joint work with J. W. Bruce.

DINSIS2-11 Marco Uribe, Universidad Católica de la Santísima Concepción, Chile

Principal Poincaré Pontryagin function associated to some families of Morse real polynomials

It is known that the principal Poincaré Pontryagin function is generically an Abelian integral. We give a sufficient condition on monodromy to ensure that it is also an Abelian integral in non-generic cases. In non-generic cases it is an iterated integral. We give in a special case a precise description of the principal Poincaré Pontryagin function, an iterated integral of length at most 2, involving logarithmic functions with only 1 ramification at a point at infinity. We extend this result to some non-isomonodromic families of real Morse polynomials. This is joint work with Michèlle Pelletier (Université de Bourgogne)

DINSIS2-12 Ferrán Valdez Lorenzo, Centro de Ciencias Matemáticas UNAM, México

The Goldfish problem, homogeneous foliations and billiard dynamics

In this talk we explain the relation between Calogero's "Goldfish problem", homogeneous complex foliations in dimension 2 and billiard dynamics inside polygonal tables.

6.4.18 GEOM1 - GEOMETRIC STRUCTURES IN MATHEMATICAL PHYSICS

GEOM1-1 Alexander Cardona, Universidad de Los Andes, Colombia

Geometric Quantization of Twisted Dirac Structures

In this talk we define the geometric prequantization of Poisson algebras of admissible functions associated to Dirac structures twisted by a background 3-form, and we illustrate this procedure for the cases of symplectic, contact and usual Poisson structures as natural examples. We will also present the relationship between prequantization and reduction when the background manifold is acted by a compact Lie group.

GEOM1-2 Matías del Hoyo, , Instituto de Matemática Pura e Aplicada, Brazil

Morita equivalences of vector bundles

Lie groupoids provide a unifying framework to deal with several structures on differential geometry, such as manifolds, Lie groups, actions, fibrations and foliations. Vector bundles over them arise naturally, with the tangent and cotangent constructions as prominent examples, and admit a neat interpretation as representations up to homotopy. In this talk I will discuss these notions and elucidate the behavior of vector bundles under Morita equivalence. I will relate our contributions with representations up to homotopy and with deformation cohomology of Lie groupoids. Finally I will sketch an approach to the theory of (categorified) vector bundles over stacks.

Joint with C. Ortiz (USP).

GEOM1-3 Nicolás Martínez Alba, Instituto de Matemática Pura e Aplicada, Brazil - Pontificia Universidad Javeriana, Colombia

A geometrical viewpoint of the equation of motion in classical field theory

In late 70' the multisymplectic framework for classical (first-order) field theory was stated by Kijowski and Tulczyjew. The equations of motion for a Hamiltonian section, called Hamilton-de Donder-Weyl equations, can be studied by using the multisymplectic form in the extended bundle. In this talk I will present a new geometrical way, via a Poisson bracket type, to study the equation of motions in the extended and the reduced bundles in this framework.

Joint work with Juan Carlos Marrero.

GEOM1-4 Alexander Quintero, Universidad del Valle, Colombia

Aspectos algebraicos de las ecuaciones diferenciales parciales no lineales

En los estudios pertinentes a las propiedades de conservación de ciertas ecuaciones de evolución no lineales (como por ejemplo la ecuación de Korteweg-de Vries) desempeñan un papel protagónico ciertas estructuras algebraicas que no dependen de presunciones de carácter analítico, elección de espacios de funciones, teoremas de existencia y unicidad, etc. En esta charla de carácter divulgativo se revisarán algunos de los aspectos anteriores. Así mismo, se discutirá la interrelación que existe entre la geometría algebraica (la clasificación de variedades algebraicas) y las ecuaciones diferenciales parciales no lineales.

GEOM1-5 Roberto Rubio, Instituto de Matemática Pura e Aplicada, Brazil

Higher-Dirac structures and their foliated geometry

Whereas the graph of a Poisson structure on a manifold M is seen as an integrable Lagrangian subbundle of $TM \oplus T^*M$ (i.e., a Dirac structure), the graph of a higher-Poisson structure, lying on TM plus the k-th exterior power of T^*M, is not necessarily Lagrangian. In joint work with H. Bursztyn and N. Martínez-Alba we redefine higher-Dirac structures as integrable weak-Lagrangian subbundles, so that higher-Poisson structures correspond to higher-Dirac structures transversal to TM. Higher-Dirac structures are, in particular, Lie algebroids, so their projection to TM is an involutive distribution and hence induces a (singular) foliation. A precise linear algebraic description of weak-Lagrangian subspaces allows us to describe the geometry appearing on the induced foliation by means of the differential of a somehow mysterious complex which only concerns a particular class of sections.

GEOM1-6 Ivan Struchiner, , Universidad de São Paulo, Brazil

Integration of Structure Equations of G-Structures

G-structures are many times studied by means of their structure equations. These equations can be thought of as infinitesimal objects associated to the geometry, i.e., they are obtained by a differentiation procedure. In my talk I will deal with the inverse procedure. Given a complete finite set of structure

equations for a class of G-structures, I will describe a geometric integration method which aims to obtain the corresponding geometric structures which have these equations as their structure equations. This will be done through the use of Lie theory for Lie algebroids and Lie groupoids. The talk will be based on joint work with Rui Loja Fernandes.

GEOM1-7 José Antonio Vallejo, Universidad Autónoma de San Luis Potosí, Mexico

Algebroides de Lie y operadores de cohomología en Física y Matemáticas

Trataré de motivar la aparición de la noción de algebroide de Lie en teorías de campo con ligaduras, un contexto en el que también aparece la cohomología (concretamente la llamada BRST) para después pasar a analizar con más detalle la relación entre ambos. Concretamente, veremos como construir algebroides a partir de operadores de coborde con unas propiedades muy generales, que aparecen en variados contextos geométricos como estructuras producto, tangentes, complejas, etc.

GEOM1-8 Andrés Vargas, Pontificia Universidad Javeriana, Colombia

Conformal symmetries of Distributions in Riemannian manifolds

Conformal vector fields play a fundamental role in many physical theories admitting some kind of conformal invariance (*e.g.*, scale invariance). To mention an important example, on a Lorentzian manifold they can be thought of as infinitesimal symmetries of the causal structure of space-time. The aim of this talk is to present some results from a purely geometrical point of view concerning the existence and properties of conformal symmetries of distributions defined by irrotational vector fields on (pseudo)-Riemannian manifolds. Applications to the case of integral curves of these vector fields will be briefly considered.

6.4.19 GEOM2 - GEOMETRY AND PHYSICS

GEOM2-1 Fabián Belmonte, Universidad Católica del Norte, Chile

Quantization of Systems Reduced by Commuting Hamiltonian Flows, a Decomposable Weyl Calculus and Commutation of Quantization and Reduction

Under suitable conditions we can perform the following constructions in Classical and Quantum Mechanics, we claim they are in some sense analogue: Let Σ be a symplectic manifold and $h_1, \cdots, h_k \in C^\infty(\Sigma)$ be a finite family of pairwise Poisson commuting complete real hamiltonians and let $\Phi^1, \cdots, \Phi^k$ their respective flows. Also let $J = (h_1, \cdots, h_k)$ and $\Phi_{t_1,\cdots,t_k} := \Phi^1_{t_1} \circ \cdots \circ \Phi^k_{t_k}$. Then, for each $\lambda \in J(\Sigma)$ regular, the energy level submanifold $J^{-1}(\lambda)$ is invariant under Φ, and it turns out that the orbit space $\Sigma_\lambda := J^{-1}(\lambda)/\Phi$ is a symplectic manifold.

On the quantum side, let $H_1, \cdots, H_k$ be a finite family of pairwise commuting selfadjoint operators on a Hilbert space $\mathcal{H}$ and $sp(H_1, \cdots, H_k)$ its joint spectrum. Then there is a measure η on $sp(H_1, \cdots, H_k)$, an η-mesurable field of Hilbert spaces $\{sp(H_1, \cdots, H_k) \ni \lambda \to \mathcal{H}(\lambda)\}$, and a unitary operator $T : \mathcal{H} \to \int^{\oplus}_{sp(H_1,\cdots,H_k)} \mathcal{H}(\lambda) d\eta(\lambda)$ such that

$$(TH_j u)(\lambda) = \lambda_j (Tu)(\lambda) \ \forall u \in Dom(H_j).$$

This suggest that, if the operator H_j correspond through quantization to h_j, then Σ_λ should be quantized in $\mathcal{H}(\lambda)$. This is an informal claim, but when $\Sigma = T^*\mathbb{R}^n$ and each h_j depend only of the position variables, we proved that our claim follows. In such cases, we computed all the ingredients for the constructions mentioned above and we found an explicit quantization for each Σ_λ. This allows us to define a new calculus that we called a decomposable Weyl Calculus, defined on a subspace of the algebra of constansts of motion of the initial family $h_1, \cdots, h_k$. Comparing the decomposable Weyl Calculus with the canonical Weyl calculus leads to a concept of commutation of quantization and reduction. If X is a vector field on $\mathbb{R}^n$ tangent to the position component of each energy level $J^{-1}(\lambda)$, then the hamiltonian $h_X(p,q) :=< q, X(p) >$ belongs to the algebra of constants of motion and quantization and reduction commute on it. This results were obtained using the co-area formula and some ideas from foliated cohomology theory, we are going to explain carefully this point.

GEOM2-2 Elizabeth Gasparim, Universidad Católica del Norte, Chile

Deformations of Calabi–Yau varieties and their moduli of vector bundles

I will describe the universal deformation spaces of local surfaces and CY threefolds and their applications to mathematical physics. Then I will show how the moduli spaces of vector bundles changes under deformations of these varieties.

This is joint work with S. Barmeier and A. Torres-Gomes.

[GEOM2-3 Ignacio Sebastián Gómez, Universidad Nacional de la Plata, Argentina

Gaussian ensembles from an information geometric approach

We present the gaussian emsembles of random matrix theory as a particular case of the information geometrodynamical approach to chaos (IGAC) applied to models of statistical manifolds. Moreover, with the aim of unify some characterizations, using IGAC we also propose a geometrodynamical version of the ergodic hierarchy which allows to place the gaussian ensembles within the more chaotic level, i.e. the Bernoulli level. This proposal justifies the validity of application of the gaussian ensembles in strongly chaotic quantum systems.

GEOM2-4 Marcos Jardim, Universidade Estadual de Campinas, Brazil

Brane involutions and irreducible holomorphic symplectic manifolds

In the context of irreducible holomorphic symplectic manifolds, we say that (anti)holomorphic (anti)symplectic involutions are "brane involutions" since their fixed point locus is either a complex or a lagrangian submanifold with respect to each of the three Kahler structrures of the associated hyperkahler structure, what is called a brane in the mathematical physics literature.

Starting from a brane involution on a K3 or abelian surface, one can construct a natural brane involution on its moduli space of sheaves, and we study the behaviour of these involutions under the Fourier–Mukai transform. Later, we recall the lattice-theoretical approach to Mirror Symmetry. We provide two ways of obtaining a brane involution on the mirror and we study the behaviour of the brane involutions under both mirror transformations, giving examples in the case of a K3 surface and K3[2]-type manifolds.

Joint work with Emilio Franco and Grégoire Menet.

GEOM2-5 Dmitry Kaledin, Steklov Mathematical Institute, Rusia

TQFT in the context of homotopical algebra

Topological quantum field theories (TQFTs) have been extremely useful in mathematics in the last twenty years, and they appear in areas as diverse as representation theory and algebraic geometry. However, for many applications, one needs a homological version of TQFT where one works with complexes of vector spaces instead of vector spaces, and considers the resulting structures "up to a quasiisomorphism". This presents some rather non-trivial technical difficulties. I am going to discuss the problems that appear, and present a beautiful solution to them all discovered recently by E. Balzin.

GEOM2-6 Jorge Littin, Universidad Católica del Norte, Chile

Quasi-additive estimates on the Hamiltonian for the One-dimensional Long Range Ising Model and its consequences

We study the problem of getting quasi-additive bounds for the Hamiltonian of the Long Range Ising Model, when the interaction term decays proportionally to $\frac{1}{d^{2-\alpha}}$, $\alpha \in (0,1)$. We revisit the paper by Cassandro, Ferrari, Merola & Presutti [1], where they extend to the case $\alpha \in [0, \frac{\ln 3}{log 2} - 1)$ the result of the existence of a phase transition by using a Peierls argument given by Fröhlich and Spencer [2] for $\alpha = 0$. The main arguments of [1] are based on hierarchical structures called Triangles and Contours, which are related to the original definition of Contours introduced by Fröhlich and Spencer in [2]. In

this work, we extend the e quasi-additive decomposition of the Hamiltonian for $\alpha \in [0, 1)$ in terms of the Contours defined in [1]. The most relevant is a quasi additive decomposition for the Hamiltonian in terms of Contours when $\alpha \in [0, 1)$ but not in terms of triangles and constitutes a generalization of existing results. This decomposition has some important consequences which will be explained here.

Joint work with Pierre Picco

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GEOM2-7 Per Sundell, Universidad Andrés Bello, Chile

Higher spins and topological strings

Physical and mathematical interconnections between models for higher spin theories and topological open and closed strings are presented, and their potential in string theory and holography is discussed.

GEOM2-8 Bruno Suzuki, Universidad Católica del Norte, Chile

Topological String Partition Function on Generalised Conifolds

We show that the partition function on any generalised conifold with a large number of crepant resolutions can be equivalently computed on a compound du Val singularity with a unique crepant resolution.

Joint work with E. Gasparim, A. Torres-Gomez and C. Varea.

6.4.20 GEOM3 - GEOMETRY AND TOPOLOGY / INTERACTIONS OF ALGEBRAIC TOPOLOGY AND GEOMETRIC GROUP THEORY

GEOM3-1 Jonathan Barmak, Universidad de Buenos Aires, Argentina

The fundamental group of a two-dimensional complex with the fixed point property

By the Lefschetz fixed point theorem, if a finite group G admits a presentation with the same number of relators as generators, then there exists a compact polyhedron X with fundamental group isomorphic to G and the fixed point property (i.e. each self map of X has a fixed point). For groups with non-zero deficiency the problem is related to a question posed in 1969 by R.H. Bing. In this talk I will show that non-cyclic abelian groups do not appear as fundamental groups of two-dimensional complexes with the fixed point property. An example by I. Sadofschi Costa of a group presented by two generators and three relators provides the first example of a 2-complex with the fixed point property and non-trivial reduced Euler Characteristic, answering Bing's question in the affirmative.

GEOM3-2 Jerson Borja, Universidad de los Andes, Bogotá, Colombia

Evasiveness of graph properties and graphs on 2p vertices

A property of graphs on n vertices is said to be evasive if its query complexity is the maximum n(n-1)/2. The evasiveness conjecture for graph properties asserts that every non-trivial monotone graph property is evasive. An important advance in the conjecture was achieved when Kahn, Saks and Sturtevant in the paper "A topological approach to evasiveness" showed a connection between this complexity problem and topology. To each monotone graph property, there is an associated simplicial complex and it is proved that potential monotone non-evasive graph properties have a collapsible associated simplicial complex. With the help of some special groups: the Oliver groups, they prove the validity of conjecture when the number of vertices n is a prime power. They also prove the 6 vertices case. Since then, much of the work on the evasiveness conjecture is based on this topological approach.

In this talk, we review the topological approach, then specialize to graphs on 2p vertices, where p is prime, to show the following results: first, by considering some Oliver groups we get lower bounds for the dimension of the simplicial complex associated to potential non-evasive monotone graph properties; then, by studying the size of the automorphism group of graphs, we give estimations of the Euler characteristic of simplicial complexes associated to potential non-evasive monotone graph properties. Finally we test our estimations in the cases of 10 vertices.

GEOM3-3 Mauricio Bustamante, Binghamton University, USA

Smooth bundles with nonpositively curved fibers

I will discuss some features of the topology of smooth bundles whose fiber is a closed smooth manifold that supports a nonpositively curved Riemannian metric. Specifically, I will show (topological) rigidity results for the associated vertical tangent bundle and a vanishing theorem for the generalized Miller-Morita-Mumford classes. This is joint work with Tom Farrell and Yi Jiang.

GEOM3-4 Guillermo Cortiñas, Universidad de Buenos Aires, Argentina

Borel regulator and K-theory of group algebras

We shall see how an arithmetic invariant, such as the Borel regulator, can be used to relate algebraic and analytic conjectures on the K- theory of group algebras.

GEOM3-5 Germán, Combariza, Pontificia Universidad Javeriana, Bogotá, Colombia

Cohomology of Profinite Groups

In this talk we introduce the notion of profinite groups and compute some example. We will see how to compute its cohomology from two diferent point of views: the LHS spectral sequence and using a special module that shifts the cohomology.

GEOM3-6 Matías del Hoyo, Instituto de Matemática Pura e Aplicada, Brazil

Discrete dynamics and stacks

We study actions of discrete groups over connected spaces by means of their orbit stack. Stacks are categorified spaces, they can be regarded as ordinary spaces with further information attached, remembering the isotropies of the actions that give rise to them. I will overview this notion, show that for simply connected spaces the stack recovers the dynamics up to conjugacy, and discuss the general case and its relation with covering theory of stacks. For dynamics over the circle, I will explain the link between the rotation number and the cohomological degree, and how to recover geometrically some classic results of Rieffel on Morita equivalences of quantum tori.

GEOM3-7 Rita Jiménez-Rolland, Centro de Ciencias Matemáticas UNAM, México

Cohomology and point-counting over finite fields

In this talk we consider some families of varieties with actions of certain finite reflection groups – varieties such as the hyperplane complements or complex flag manifolds associated to these groups. Beautiful results of Grothendieck–Lefschetz and Lehrer relate the topology of these complex varieties with point-counting over finite fields. Church, Ellenberg and Farb noticed that their representation stability results on the cohomology groups corresponds to asymptotic stability for "polynomial" statistics on the varieties over finite fields. Our goal is to discuss this correspondence and describe what is the underlying algebraic structure of these families' cohomology rings that makes the formulas convergent. This is joint work with Jennifer Wilson.

GEOM3-8 Daniel Juan Pineda, Centro de Ciencias Matemáticas UNAM, México

Classifying spaces for mapping class groups

We construct an explicit model for the classifying space for virtually cyclic subgroups of the mapping class group. An interesting feature is the analysis of the commensuratos of cyclic subgroups in these groups.

Joint with Alejandra Trujillo

GEOM3-9 Conchita Martínez, Universidad de Zaragoza, Spain

On the rational homology and assembly maps of generalized Thompson groups

We show that the rational homology of a family of generalizations of Higman-Thompson groups V that include the Brin-Higman-Thompson groups sV vanishes above a certain degree that depends on s. We then apply that computation to the rationalized Farrell-Jones assembly map in algebraic K-theory. This is a joint work with Brita Nucinkis and Marco Varisco.

GEOM3-10 Gabriel Minian, Universidad de Buenos Aires, Argentina

A new asphericity test for group presentations and some applications

The notion of asphericity is central to topology, geometry and algebra. Recall that a path-connected space is called aspherical if its higher homotopy groups are trivial. A group presentation is aspherical if its standard 2-complex is aspherical. One of the best-known asphericity tests for 2-complexes (or group presentations) is Gersten's weight test which is a generalization of Sieradski's coloring test. Gersten's weight test is based on the combinatorial Gauss-Bonnet theorem.

In this talk I will describe a new test for studying asphericity of group presentations, which was recently introduced in a joint paper with Jonathan Barmak. Our I-test provides a criterion for deciding when a presentation of an indicable group is aspherical and it is based on a description of the second homotopy group of the 2-complex associated to the presentation as the kernel of the boundary map in the cellular chain complex of its universal cover. I will compare the I-test with the different variations of the weight test and show how to use our methods to prove asphericity in cases where the known tests fail.

Similarly as in the case of Gersten's weight test, our I-test guarantees diagrammatic reducibility of the presentation. This concept, first studied by Sieradski and Gersten, is stronger than asphericity and is intimately related to the existence of solutions of equations over groups. Finally I will apply these new methods to investigate a conjeture of Ivanov related to Kaplansky problem on zero divisors.

GEOM3-11 Andrés Navas, Universidad de Santiago de Chile, Chile

Orderable groups: some open questions

The study of orderable groups has received some attention over the last year motivated by related issues in topology and dynamics. We will review some of the main open questions and discuss some hints to paths to solutions.

GEOM3-12 Luis Jorge Sánchez Saldaña, Centro de Ciencias Matemáticas UNAM, Morelia, México

The Whitehead Group of the Hilbert Modular group

We will present a joint work with Mauricio Bustamante computing the lower algebraic K-Theory of the Hilbert Modular Group.

6.4.21 GEOM4 - NON-ARCHIMEDEAN ANALYSIS AND PHYSICS

GEOM4-1 José Aguayo, Universidad de Concepción, Chile

C-Algebras of Operators on Free Banach Spaces

In this presentation we will talk about free Banach spaces over non-archimedean valued field $\mathbb{K}$, C-algebras of operators on a free Banach space and spectral measures.

In non-archimedean context, there is a slogan that says "There is no p-adic Hilbert spaces". Let us call Hilbert-like space to any vector space E with an inner product such that it is a Banach space for the associated norm and each closed subspace M of E, $M + M^{\perp} = E$ (this property is call Orthomodular Property). Unfortunately or fortunately, there exists a negative result about this definition (see 6) that says:

Theorem 1 *Let $|2| = 1$. Then there do not exist infinite-dimensional Hilbert-like spaces over K.*

Nevertheless, we can have infinite-dimensional Banach spaces whose norm is coming from an inner product, but they don´t have the Orthomodular Property (see [2&3]).

A non-archimedean Banach space over $\mathbb{K}$ is said to be a Free Banach space if there exists a family $(e_i)_{i\in I}$ in E such that any $x \in E$ can be written in the form $x = \sum_{i\in I} x_i e_i,\ x_i \in \mathbb{K}$ and $\|x\| = \sup_{i\in I} |x_i| \|e_i\|$.

In this case, the family $(x_i e_i)_{i\in I}$ must be summable and, in the non-archimedean context, it is enough to have that $\lim_{i\in I} |x_i| \|e_i\| = 0$. The family $(e_i)_{i\in I}$ is called an orthogonal base of E.

It is not difficult to prove that each free Banach space is isometrically isomorphic to some $c_0(I;\mathbb{K};s)$, the space of all $(x_i)_{i\in I} \in \mathbb{K}^I$ such that $\lim_{i\in I} |x_i| s(i) = 0$, where $s : I \to (0,\infty)$ and its norm is $\left\|(x_i)_{i\in I}\right\|_{\infty} = \sup_{i\in I} |x_i| s(i)$.

Now, if $s : I \to (0,\infty)$ is the constant function equal 1 and the residue class field of $\mathbb{K}$ is formally real, then $c_0(I;\mathbb{K})$ admits an inner product $\langle\cdot,\cdot\rangle$ whose norm $\|\cdot\|_{\infty}$ is induced by this inner product.

The main goal of this talk is to present the Gelfand space of some commutative Banach algebras with unit within the space of bounded linear operators defined on the free Banach space $c_0(I;\mathbb{K})$. We will also show, under special conditions, that each of these algebras is isometrically isomorphic to some space of continuous functions defined over a compact. Such isometries preserve idempotent elements. This fact will allow us to define the respective associated measure which is known as spectral measure. We will finish this talk showing that each element of such algebras described above can be represented as an integral of some continuous function, where the integral has been defined through of the spectral measure.

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GEOM4-2 Leonardo Chacón Cortés, Pontificia Universidad Javeriana, Colombia

Heat Traces and Spectral Zeta Functions for $p-$adic Laplacians

In this talk we present the heat traces and spectral zeta functions for certain p-adic Laplacians. We show that the heat traces are given by p-adic integrals of Laplace type, and that the spectral zeta functions are p-adic integrals of Igusa-type. We find good estimates for the behaviour of the heat traces when the time tends to infinity, and for the asymptotics of the function counting the eigenvalues less than or equal to a given quantity.

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GEOM4-3 Timothy Gendron, Universidad Nacional Autónoma de México UNAM, México

Quantum j-Invariant in Positive Characteristic and Hilbert's 12th Problem

Let $k = \mathbb{F}_q(T)$ be the field of rational functions in T over the finite field of q elements $\mathbb{F}_q$ and let k_∞ be its completion with respect to the valuation $v_\infty(f) = -\deg_T(f)$. The quantum j-invariant is introduced as a modular invariant, discontinuous multi-valued function

$$j^{\mathrm{qt}} : k_\infty \cup \{\infty\} \multimap k_\infty \cup \{\infty\}.$$

If $K \subset k_\infty$ is a quadratic extension of k and $\mathcal{O}$ is the integral closure of the ring $\mathbb{F}_q[T]$ in K, we prove that there exists $f \in K - k$ such that the Hilbert class field $H_{\mathcal{O}}$ associated to $\mathcal{O}$ is generated over K by $j^{\mathrm{qt}}(f)$.

GEOM4-4 Tomasz Kostrzewa, Warsaw University of Technology, Poland

Sobolev spaces on groups

Sobolev space were first introduced on subsets of $\mathbb{R}^n$ and later generalized to more complicated structures e.g. Riemannian manifolds and metric measure spaces. In my talk I will introduce another definition of Sobolev spaces - this time on a locally compact abelian groups. This spaces share many properties with classical Sobolev spaces e.g. compact and continuous embeddings hold.

In my talk I will concentrate on properties of Sobolev spaces on metric groups. In this case we can prove some stronger embedding results and also find good dense subsets of our spaces. I will also discuss which results can be applied to the p-adic groups case.

This talk is based on joint work with P. Górka.

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GEOM4-5 Daniel Pons, Universidad Andrés Bello, Chile

Non canonical metrics on $Diff(S^1)$

We review some of V. I. Arnold's ideas on diffeomorphism groups on manifolds. When the underlying manifold is the circle, we study the geometry of such a group endowed with some metrics.

GEOM4-6 Enrique Reyes, Universidad de Santiago de Chile, Chile

Some Non-Archimedean tools in Integrable Systems

I present some appearances of Non-Archimedean tools in the standard theory of Integrable Systems. In particular, I show how to understand the so-called prolongation theory of Wahlquist and Estabrook (and the related construction of nonlocal conservation laws) by using Non-Archimedean norms, and I also summarize some recent work on the solution of the initial value problem for the whole Kadomtsev-Petviashvili hierarchy of non-linear partial differential equations, via formal infinite-dimensional Lie groups and Lie algebras defined with the help of Non-Archimedean valuations.

This report is partially based on the following papers:

1. H.N. Van Eck, A Non-Archimedean Approach to Prolongation Theory. Letters in Mathematical Physics 12 (1986), 231-239.

2. M. Mulase, Solvability of the super KP equation and a generalization of the Birkhoff decomposition. Invent. Math. 92 (1988), 1-46.

3. A. Eslami Rad and E.G. Reyes, The Kadomtsev-Petviashvili hierarchy and the Mulase factorization of formal Lie groups. Journal of Geometric Mechanics 5 (2013), 345-364.

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GEOM4-7 John Jaime Rodriguez Vega, Universidad Nacional de Colombia, Colombia

Ecuaciones de tipo parabólico sobre bolas $p-$ádicas

In this talk we solve the Cauchy problem associated to a radial symbol constant on a ball of radius p^r and we show that the fundamental solution, $Z_r(x,t)$, vanishes outside the ball of radius p^{-r}.

En este charla encontramos la solución al problema de Cauchy asociado a un símbolo radial que es constante en bolas de radio p^r, y mostramos que la solución fundamental $Z_r(x,t)$ se anula fuera de una bola de radio p^{-r}.

GEOM4-8 Anselmo Torresblanca, Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México

Ultrametric diffusion, exponential landscapes, and the first passage time problem

The ultra-diffusion equations were introduced by Avetisova, Bikulov A. Kh., Osipov A. and V. Zubarev, A. P., around the year 2.003 in connection with certain models p-adic complex systems. In this conference we study certain ultra-diffusion equations connected with energy landscapes of exponential type. We show that the fundamental solutions of these equations are transition density functions of Markov processes with state space $\mathbb{Q}_p^n$, we study some aspects of these processes including the continuity of their paths and the first passage time problem.

GEOM4-9 Alberto Verjovsky, Universidad Nacional Autónoma de México UNAM, México

Poincaré theory for the adèle class group $\mathbb{A}/\mathbb{Q}$and compact Abelian one–dimensional solenoidal groups

In this talk we explain how to generalize the notion of Poincaré rotation number for homeomorphisms of the unit circle to homeomorphisms of the additive adèle class group $\mathbb{A}/\mathbb{Q}$ of the rational numbers $\mathbb{Q}$. It should be emphasized that our theory is valid for any general compact Abelian one–dimensional

solenoidal group G, which is also a one–dimensional foliated space. Poincaré's dynamical classification theorem is also generalized to homeomorphisms of solenoids isotopic to the identity whose rotation element is an irrational element (i.e., monothetic generator) of the given group. Then the definition is extended for homeomorphisms of solenoids which are isotopic to irrational rotations whose rotation element is not in the base leaf. Like in the case of Tate's thesis, a fundamental role in the present paper is played by Pontrjagin duality. We remark that our theory obtains as "rotation number" of a homeomorphism of G, an element of G which we call the rotation element. This is joint work with Manuel Cruz López.

GEOM4-10 Wilson A. Zúñiga-Galindo, Centro de Investigación y Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México

Non-Archimedean Reaction-Ultradiffusion Equations and Complex Hierarchic Systems

We initiate the study of non-Archimedean reaction-ultradiffusion equations and their connections with models of complex hierarchic systems. From a mathematical perspective, the equations studied here are the p-adic counterpart of the integro-differential models for phase separation introduced by Bates and Chmaj. Our equations are also generalizations of the ultradiffusion equations on trees studied in the 80's by Ogielski, Stein, Bachas, Huberman, among others, and also generalizations of the master equations of the Avetisov et al. models, which describe certain complex hierarchic systems. From a physical perspective, our equations are gradient flows of non-Archimedean free energy functionals and their solutions describe the macroscopic density profile of a bistable material whose space of states has an ultrametric structure. Some of our results are p-adic analogs of some well-known results in the Archimedean settting, however, the mechanism of diffusion is completely different due to the fact that it occurs in an ultrametric space. The talk will be based on reference [10].

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6.4.22 GEOM5 - LIE THEORY

GEOM5-1 María Laura Barberis, Universidad Nacional de Córdoba, Argentina

Conformal killing 2-forms on low dimensional Lie groups

Conformal Killing forms were introduced a few decades ago in the physics literature as a way to construct first integrals of the equation of motion. Conformal Killing forms generalize to higher degrees the notion of conformal vector fields, and can be characterized by the fact that their covariant derivative with respect

to the Levi-Civita connection is completely determined by their exterior derivative and divergence. Such forms have been applied to define symmetries of field equations.

We consider left invariant conformal Killing 2-forms on Lie groups with a left invariant metric. We present some results for 2-step nilpotent Lie groups and for compact Lie groups with a bi-invariant metric. In dimension 3, we obtain the classification of the Lie groups and the left invariant metrics admitting conformal Killing 2-forms.

In the 4-dimensional case, we obtain some general results for Riemannian manifolds and we consider conformal Killing 2-forms (not necessarily left invariant) on 4-dimensional Lie groups. We describe all metric Lie algebras of dimension 4 whose associated simply connected Lie groups G endowed with the corresponding left-invariant Riemannian metric carry non-trivial conformal Killing 2-forms.

GEOM5-2 Henrique Bursztyn, Instituto Nacional de Matemática Pura e Aplicada, Brazil

Lie theory of vector bundles and related double structures

I will discuss vector bundles in the realm of Lie groupoids (resp. Lie algebroids), known as VB-groupoids (resp. VB-algebroids). Just as Lie groupoids are common generalizations of manifolds and Lie groups, VB-groupoids encompass (categorified) vector bundles and linear representations. I will explain the Lie theory relating VBgroupoids and VB-algebroids, including examples, applications and generalizations to more intricate double structures. Along the way, I will point out the role of Poisson geometry in our results.

This is joint work with A. Cabrera and M. del Hoyo.

GEOM5-3 Matthew Dawson, Centro de Investigación en Matemáticas, México

Principal Series Representations for Direct Limit Groups

We will discuss some results about unitary representations associated with certain infinite-dimensional Riemannian symmetric spaces. In particular, motivated principally by the program of reflection positivity for symmetric spaces, we construct and show some basic properties of a generalization to the infinite-dimensional group $SL(\infty, \mathbb{R})$ of the principal series representations induced from maximal parabolic subgroups. The correct generalization of the concept of L^2 induction is made more complicated by the fact that infinite-dimensional symmetric spaces do not possess invariant measures (in fact, they do not even possess quasi-invariant measures), but we use a previous construction of Doug Pickrell to get around this problem.

GEOM5-4 Gestur Ólafsson, Louisiana State University, USA

Transforming unitary representations from one real form to another

In this talk we will discuss some resent result on how one can transform one unitary representation to one Lie group to another Lie group with the same complexified Lie algebra. Originally this was done for some complementary series represenation of hermitian Lie group (joint work with P. E. T. Jorgensen) but now the theory has been extended considerably, including some infinite dimensional Lie group. The idea is based on reflection positivity which is one of the axioms of constructive quantum field theory as they were formulated by Osterwalder and Schrader 1973/1975.

We start by discussing c-duality and then introduce the notion of reflection positive representations. We discuss the special case of the real line, that is reflection positive 1-parameter groups. We then give examples of reflection positive representations and reflection positive kernels. Finally we discuss recent results on integration of infinitesimally unitary representations. This is joint project with K-H Neeb.

GEOM5-5 Gil Salgado, Universidad Autónoma de San Luis Potosí, México

Contact Lie algebras

The notion of double extension plays a significant role providing an inductive construction of finite dimensional Lie algebras endowed with a geometric structure. We shall show that a suitable double extension of a finite dimensional indecomposable contact Lie algebra is a contact Lie algebra again. The main result in this work is that every finite dimensional contact nilpotent Lie algebra $\mathfrak{g}$ ($\dim \mathfrak{g} \geq 5$) can be obtained as a double extension of a contact nilpotent Lie algebra of codimension 2.

GEOM5-6 Juan Tirao, Universidad Nacional de Córdoba, Argentina

The algebra of differential operators associated to a weight matrix

Given a weight matrix $W(x)$ of size N on the real line one constructs a sequence of matrix valued orthogonal polynomials, $\{P_n\}_{n\geq 0}$. We study the algebra $\mathcal{D}(W)$ of differential operators D with matrix coefficients such that $P_n D = \Lambda_n P_n$, with Λ_n in the algebra A of $N \times N$ complex matrices. We study certain representations of this algebra, prove that it is a *-algebra and give a precise description of its isomorphic image inside the algebra A^{N_0}. This may develop into a reach and interesting connection between approximation and ring

6.4.23 GEOM6 - ALGEBRAIC AND GEOMETRIC TOPOLOGY

GEOM6-1 Alejandro Adem, University of British Columbia, Canada

Homotopy Group Actions and an Exotic Example

In this talk we will introduce the notion of homotopy group actions and discuss some of their key cohomological invariants. We will apply this approach to construct an exotic finite group action on a product of two spheres which we show cannot be handled via existing methods. This is joint work with Jesper Grodal.

GEOM6-2 Jonathan A. Barmak, Universidad de Buenos Aires, Argentina

Homotopy type and the fixed simplex property

It can be proved that every compact polyhedron homotopy equivalent to a sphere admits a fixed point free map. However, for dimension n greater than 1, there exist triangulations of the n-sphere with the fixed simplex property, that is, each simplicial endomorphism has a fixed point. We will prove that given any compact, connected polyhedron, there exists a simplicial complex with the same homotopy type and the fixed simplex property. As a consequence we obtain that there are finite topological spaces with the fixed point property and arbitrary weak homotopy type.

GEOM6-3 Anna Marie Bohmann, Vanderbilt University, USA

Constructing equivariant spectra

Equivariant spectra determine cohomology theories that incorporate a group action on spaces. Such spectra are increasingly important in algebraic topology but can be difficult to understand or construct. In recent work, Angélica Osorno and I have developed a construction for building such spectra out of purely algebraic data based on symmetric monoidal categories. Our method is philosophically similar to classical work of Segal on building nonequivariant spectra. In this talk I will discuss this work and an extension to the more general world of Waldhausen categories. Our new construction is more flexible and is designed to be suitable for equivariant algebraic K-theory constructions.

GEOM6-4 José María Cantarero, Centro de Investigación en Matemáticas CIMAT, México

Representations of fusion systems

Given a finite group G and a prime p, the p-local properties of G can be recovered from the category of subgroups of a p-Sylow of G and the conjugations between them by elements of G. A saturated fusion system over a finite p-group is a category that satisfies similar properties. After introducing fusion systems, their classifying spaces and some examples, we will talk about their complex representations and see that their properties have implications on the Grothendieck ring of vector bundles and the p-local cohomology of the classifying space.

GEOM6-5 Jesús Espinoza, Universidad de Papaloapán, México

Topological Data Analysis

The Topological Data Analysis (TDA) is a relatively new area that seeks to obtain relevant information from a data cloud through the shape that it presents. To do this, we endow the cloud data with a topological space structure through the geometric realization of an abstract simplicial complex (Vietoris-Rips complex, Cech complex, etc.). Then, its shape is studied using topological algebraic invariants associated with this topological space (persistent homology and persistent Betti numbers) and codified in what is called a barcode or persistence diagram. This approach has shown its strong potential especially in areas such as medicine, in the treatment of cancer patients, where the use of TDA was essential to identify a subgroup of breast cancers, information not detected by classical methods of data analysis. More recently, a collaboration of Mt. Sinai's Ichan School of Medicine and Ayasdi (leading company in implementing TDA in health sciences, financial markets, risk analysis, etc.), allowed for the detection new subgroups of patients with type 2 diabetes (T2D), which permitted a more precise diagnosis and therapies for this disease.

When the data cloud presents changes or evolves over time, the corresponding barcode for each time can be recorded through a function that is dependent on time and certain proximity parameters utilized for the construction of the abstract simiplicial complex. In "Topaz CM, Ziegelmeier L, T. Halverson (2015) Topological Analysis of Biological Data Aggregation Models PLoS ONE 10 (5):. E0126383" the authors study the contour levels of these functions to perform a topological analysis of a cloud data of simulated positions of a group of biological individuals moving according to a Vicsek's model.

In this talk, these tools are introduced in detail and some applications to several data clouds from different models are presented, as well as their corresponding topological analysis.

GEOM6-6 Ernesto Lupercio, Centro de Investigaciones y de Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México

Sandpiles, quantum gravity and non-commutative geometry

In this talk I will survey our work (with R. Penrose with A. Guzman and N. Kalinin; and with Meerssemann and Verjovsky) on the relations between the subjects in the title. We will also describe a new family of fractals (the Teotitlan fractals) we encounter as a relevant byproduct.

GEOM6-7 Jacob Mostovoy, Centro de Investigaciones y de Estudios Avanzados del Instituto Politécnico Nacional CINVESTAV, México

Planar braids and configuration spaces of points with multiplicity at most 2

I will talk about the well-known toy version of knot theory, namely, the theory of planar curves without triple self-intersections. Many of the questions which can be asked about knots have their versions for such curves; most notably, one can define finite-type invariants for these curves and prove that they separate their isotopy classes (the corresponding statement for knots is still a conjecture). I will talk about the problem of constructing the universal finite-type invariant for the triple-point free planar curves.

This is joint work with Christopher Roque.

GEOM6-8 María Amelia Salazar, Instituto de Matemática Pura e Aplicada, Brazil

An explicit integration of Lie algebroids

Interesting geometric structures like Poisson and Jacobi manifolds, can be encoded using Lie algebroids together with a compatible tensor, called Spencer operators. For these type of geometries one can look for desingularisations. This bring us back to the question of understanding the linearization of multiplicative forms on groupoids and the corresponding integrability problem. In this talk I will explain how we can explicitly construct the integration of a Lie algebroid to local Lie groupoid, and the integration of a Spencer operator to a multiplicative form. This procedure give us the method to construct the desingularisations that we were looking for: as an example we obtained an explicit construction of symplectic realizations of Poisson manifolds. This is based on ongoing work with Alejandro Cabrera and Ioan Marcut.

6.4.24 LOG1 - LOGIC AND COMPUTABILITY

LOG1-1 Alejandro Díaz-Caro, Universidad Nacional de Quilmes, Argentina

Towards a quantum lambda calculus with quantum control

There are two main trends on the study of functional quantum programming languages: On one hand, a well developed line follows the scheme of quantum-data/classical-control. That is a model where the actual quantum computation runs in a quantum memory while the program controlling which operations to apply and when, runs in a classical computer. This scheme counts with a recent semantical study for higher-order quantum computation, as well as several prototypes such as QML or the more scalable and recent Quipper. On the other hand, there is the scheme of quantum data and control. Its origins can be traced back to the linear-algebraic lambda calculus (Lineal) and its multiple type systems. This model, while less suitable to produce a scalable quantum programming language nowadays, may give better insights on the quantum properties and the quantum operations.

The work I will present is inscribed in this second line. We propose an extension of lambda calculus to handle some properties of quantum computing. The starting point is to consider the quantum superposition as a commutative pair and the quantum measurement as a non-deterministic projection over it. Destructive interferences are achieved by introducing an inverse symbol with respect to pairs. The no-cloning property is ensured by using a combination of syntactic linearity, which is enough for unitary gates, with linear logic, to forbid measure functions from duplicating their arguments.

LOG1-2 Peter Dybjer, Universidad de Chalmers, Sweden

Game Semantics and Normalization by Evaluation

Game semantics and normalization by evaluation have both been active fields of research since the 1990s. In game semantics the computation of a program is viewed as the actions of a player playing a game against the enviroment. Among other things game semantics has given rise to a solution to the long standing full abstraction problem in semantics. Normalization by evaluation on the other hand is a technique for computing normal forms in lambda calculi by interpreting terms in a model and then "reifying" the semantic value to a normal form. We shall here show a new way to present Hyland and Ong's game semantics for PCF by using normalization by evaluation (nbe). We use the bijective correspondence between innocent well-bracketed strategies and PCF Bohm trees, and show how operations on PCF Bohm trees, such as composition, can be computed lazily and simply by nbe. The usual equations characteristic of games follow from the nbe construction without reference to low-level game-theoretic machinery. As an illustration, we give a Haskell program computing the application of innocent strategies.

Joint work with Pierre Clairambault, CNRS, ENS Lyon.

LOG1-3 Walter Ferrer Santos, Universidad de la República, Uruguay

Ordered Combinatory Algebras and Realizability

We propose the new concept of Krivine ordered combinatory algebra (KOCA) as foundation for the categorical study of Krivine's classical realizability, as initiated by Streicher (Streicher (2013)). We show that KOCA's are equivalent to Streicher's abstract Krivine structures for the purpose of modeling higher-order logic, in the precise sense that they give rise to the same class of triposes. The difference between the two representations is that the elements of a KOCA play both the role of truth values and realizers, whereas truth values are sets of realizers in AKSs.

Joint work with: Jonas Frey, Mauricio Guillermo
Octavio Malherbe and Alexandre Miquel

LOG1-4 Santiago Figueira, Universidad de Buenos Aires, Argentina

Model Theory of XPath with data tests

We present recent results on the model theory of XPath —arguably the most widely used XML query language— with data (in)equality tests over the class of data trees. These are trees where each node contains a label from a finite alphabet and a data value from an infinite domain. We provide notions of bisimulations for some fragments of XPath with data tests and we show that these notions precisely capture the logical equivalence relation associated with each fragment. We show two results where the tool of bisimulation plays a central role: characterization and definability. Bisimulations work both for data trees or data graphs. While the problem of computing the largest bisimulation over the class of finite data trees is PTIME, it becomes more difficult when finite data graphs are considered: we show that in general the problem is PSPACE-complete, but identify several restrictions that yield better complexity bounds. Finally, we give a sound and complete axiomatization for a simple fragment of XPath with data tests.

LOG1-5 Jonas Frey, University of Copenhagen, Denmark

Classical realizability and implicit computational complexity

Classical realizability was introduced in the early 2000s by J.-L. Krivine as a model construction for ZF set theory extending Cohen's forcing method, and has since been studied from different angles by researchers in logic, computer science, and category theory.

I will present an approach to use classical realizability as a tool in implicit complexity theory, based on joint ongoing work with J. Grue Simonsen. Specifically, we associate classical realizability models to computational complexity classes, and study the ensuing models using tools of topos theory.

The topos theoretic approach allows to view these models as geometric structures, broadly speaking supporting the intuition that complexity classes can be regarded as generalized topologies on the set of integers.

LOG1-6 Stéphane Graham-Lengrand, Centre National de la Recherche Scientifique, France

A proof-theoretical approach to satisfiability solving

Proof theory has been very successful at supporting the development of software for proof-checking, and of tableaux-based software for automated reasoning.

It is more rarely used as a source of inspiration for other vast areas of automated reasoning, such as SAT- and SAT-Modulo-Theories solving: these have rather developed their own model-based techniques for designing and combining decision procedures for quantifier-free problems in specific theories (and adding to them some support for quantifiers).

We provide here a proof-theoretic description of the core mechanism of SAT- and SMT-solvers, which usually implement variants of the DPLL procedure or, more precisely, the CDCL procedure (Conflict-Driven Clause Learning). This mechanism alternates model construction steps and conflict analysis steps, which correspond to top-down and bottom-up proof construction steps.

Through that lense, we promote for satisfiability-solving the proof-theoretical idea of identifying core inference possibilities that are distinct from the strategies used to apply them, and describe how Milner's LCF approach for guaranteeing correctness in theorem proving can be lifted to the field of SMT-solving.

We show how it can be generalised to guarantee (both "provable" and "non-provable") answers in a prover architecture where numerous components (e.g. for different theories) interact and collaborate, some of which are trusted and some of which are not.

Finally, we discuss how this proof-theoretical approach to automated reasoning could open a safe way to exploit distributed implementation, and possibly machine learning.

LOG1-7 Alexandre Miquel, Universidad de la República, Uruguay

Implicative algebras for generalizing forcing

In this talk, we present work in progress in the direction of merging the theory of forcing (in the sense of Cohen) with the theory of classical realizability (in the sense of Krivine).

For that, we introduce the notion of implicative algebra, a very simple algebraic structure that subsumes both complete Heyting (or Boolean) algebras and classical realizability structures such as introduced by Krivine. We show in particular how this structure (that is organized around the order of subtyping) allows us to lift the operations of the lambda-calculus to the level of truth values, so that they can be manipulated as generalized realizers.

In the second part of the talk, we explain how implicative algebras can be used to factorize the construction of Boolean-valued models of ZF (equivalent to forcing) and the construction of classical realizability models of ZF. We conclude by presenting the open problems that are naturally raised by this approach.

LOG1-8 Antonio Montalbán, University of California at Berkeley, USA

Natural Objects in Computability Theory

Here is an interesting phenomena that occurs in computability theory and other parts of logic: Some natural class of objects is defined but the class turns out to be badly behaved. However, when one restricts oneself to the “natural” objects within the class, the class is very well-behaved. We will talk about this phenomena in general, and show our results for the case of many-one degrees.

6.4.25 LOG2 - SET THEORY AND MODEL THEORY

LOG2-1 Alexander Berenstein, Universidad de los Andes, Colombia

Supersimple theories expanded with a predicate for a forking independent subset

We study expansions of models of a supersimple theory with a new predicate of forking-independent elements that are dense inside a type $G(x)$, we call such expansions H-structures associated to G. We show that any two such expansions have the same theory and that under some technical conditions, the saturated models of this common theory are again H-structures associated to G. We extend this work to the continuous setting and use it to build examples of continuous simple structures that are not stable.

Joint work with Itai Ben Yaacov, Evgueni Vassiliev, Juan Felipe Carmona.

LOG2-2 Christina Brech, Universidad de Sao Paulo, Brazil

Generalized Schreier families and large Banach spaces with no indiscernible sequences

Subsymmetric sequences in Banach spaces can be seen as indiscernible structures. Tsirelson constructed the first reflexive (separable) Banach space with no subsymmetric subsequences. We will discuss how to generalize this result to large densities. The main idea is to obtain generalized Schreier families of finite subsets on large index sets and we manage to construct those families on any set of cardinality smaller than the first Mahlo cardinal. This is a joint work with J. Lopez-Abad and S. Todorcevic.

LOG2-3 Xavier Caicedo, Universidad de los Andes, Colombia

On the Model Theory of Sheaves

Sheaves of structures yield a natural model theory of variable, dynamic, or ex- tended structures which provides a geometric foundation for intuitionistic logic, and illuminates classical and continuous model theory through several natural categorical constructions. We describe some of those connections and their po- tential applications, as generic models, geometric functors, classifying toposes and Morita equivalence of theories.

LOG2-4 Samaria Montenegro, Universidad de los Andes - Universidad de Costa Rica, Colombia - Costa Rica

Shelah's classification theory and pseudo real closed fields

One of the objects of study of model theory are complete first-order theories and their classification. Shelah classified complete first-order theories by their ability to encode certain combinatorial configurations. In this talk we will explain some of these classes and we will focus in the class of NTP2 theories. In particular we explain the example of pseudo real closed fields (PRC-fields). PRC-fields are a generalization of real closed fields and pseudo algebraically closed fields. The main theorem of this talk is a positive answer to the conjecture by Chernikov, Kaplan and Simon: If M is a PRC-field, then the complete theory of M is NTP2 if and only if M is bounded.

LOG2-5 Claribet Piña, Universidad de los Andes, Colombia

Admissible trees and homogeneous sets

Ever since 1930, when for the first time F. Ramsey publishes his famous theorem, it has been a concern to know the smallest value for an integer m satisfying $m \to (n)^r_l$ for given r, n and l positive integers. That is, we wonder what is the smallest integer m satisfying the following.

Theorem. *Given r, n and l positive integers, there is an integer m such that if A is a set with $|A| = m$ and $c : [A]^r \longrightarrow l$ is any coloring of the $r-$subsets of A into l colors, there is $B \subseteq A$ with $|B| = n$ such that c is constant on $[B]^r$.*

Many efforts have been put into calculating only few of these numbers. However, what it is pretty clear is that the sizes m and n depend one on each other, and thus the complexity of A in the theorem depends on the complexity of B. In this sense, given positive integers r and l, we wondered about the existence of a family $\mathcal{F}$ of finite subsets of $\mathbb{N}$ such that given a family $(c_t)_{t\in\mathcal{F}}$ of colorings $c_t : [t]^r \longrightarrow l$ there is another family $\mathcal{G}$, depending on $\mathcal{F}$, such that if t belongs to the family $\mathcal{G}$, then t is $c_{t'}-$homogeneous for some $t' \in \mathcal{F}$. In other words, $\mathcal{G}$ is a family of homogeneous for the elements of $\mathcal{F}$.

In this talk we will introduce certain type of families $\mathcal{F}$ for which the statement above holds when $r = 1$ and $r = 2$. Moreover, we will establish the relation between the complexities of the families $\mathcal{F}$ and $\mathcal{G}$ in both cases.

One of the main tools to prove the results mentioned above is the concept of *admissible trees*, for sets in any of the families that we will work with, which we will introduce in the talk. We will also provide an application of all of this to a result in partition calculus.

LOG2-6 Carlos Uzcátegui, Universidad Industrial de Santander, Colombia

Descriptive set theoretic properties of partial actions of Polish groups

A *Polish G-space* is a Polish space X (i.e. a completely metrizable and separable space) with a continuous action of a Polish group G on X. This class of spaces has received considerable attention in the last decades, in particular, a lot of work has been done for the classification of the orbit equivalence relations induced by Polish group actions using the tools of descriptive set theory [2][6][7][8]. In this talk, in stead

of global actions, we consider partial actions of Polish groups and discuss some of its descriptive set theoretic properties.

A *partial action* of a group G on a set X is a collection of partial maps $\{m_g\}_{g\in G}$ on X satisfying $m_1 = \mathrm{id}_X$ and $m_g \circ m_h \subseteq m_{gh}$, for all $g, h \in G$. Partial actions were introduced by R. Exel [3][4][5] for the study of C^*-algebras. We are interested in partial actions of a topological group over a topological space, in this case the domain and range of the functions m_g are required to be open subsets of X and each m_g has to be a homeomorphism. The *partial orbit equivalence relation* is then naturally defined by letting $xE_G^p y$, if there is $g \in G$ such that x is in the domain of m_g and $m_g(x) = y$.

An interesting feature of topological partial actions is that they admit globalizations, that is to say, every topological partial G-action over a space X is the restriction of a global G-action over a larger space $Y \supseteq X$. Moreover, there is a minimal globalization, denoted X_G, called the *enveloping space* of X [2][9]. We show that (under very mild conditions) X_G is a standard Borel space, when X and G are Polish spaces. This allows to transfer some results about Polish G-spaces into the context of partial actions. For instance, the existence of universal actions, Effros's theorem, etc.

An important tool for comparing equivalence relations is given by the pre-order of Borel reducibility, which is also the basis for defining a notion of complexity for equivalence relations [6][7][8]. If E and F are equivalence relations over two Polish spaces X and Y, respectively, we say that F *Borel reduces to* E, in symbols $F \leq_B E$, if there is a Borel function $f : Y \to X$ such that xFy iff $f(x)Ef(y)$ for all $x, y \in X$. We will illustrate how partial actions fit into that framework by showing that some results about orbit equivalence relations induced by Polish group actions also hold for by partial actions.

This is a joint work with Hector Pinedo Tapia.

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[LOG2-7] Carlos Videla, Mount Royal University, Canadá

Undecidable fields of algebraic numbers

After Julia Robinson's breakthrough result of 1949 in which she proved the undecidability of the field of rational numbers the problem of classifying (in some unspecified sense) the undecidable /decidable fields of algebraic numbers was raised. In my talk I will review old and new results concerning this Tarski-Robinson question.

LOG2-8 Rafael Zamora, Institut Mathematique de Jussieu, Francia

Injectivity in tests for separability by potentially Lavrentieff sets

In descriptive set theory, we study classes of subsets of a Polish space, such as those in the Borel hierarchy. When you consider product spaces, generalizations of these classes arise naturally. One such generalization is the class of potentially Γ sets, where Γ is a class of Borel sets. For example, potentially open sets

are exactly those sets that are the countable union of Borel rectangles. We will provide injective test to check for separability of analytic sets by potentially Lavrentieff sets (also known as difference classes).

This is joint work with Dominique Lecomte.

6.4.26 LOG3 - MODEL THEORY AND GEOMETRY : RECENT INTERACTIONS

LOG3-1 Leonardo Cano, Universidad Sergio Arboleda, Colombia

Basic aspects of the geometric rigidity of the j function on complex elliptic curves

In the talk we remind that the j-function is the invariant that distinguishes complex structures of surfaces of genus 1. We point out geometric aspects related with Hurwitz spaces of holomorphic functions between Riemann surfaces, that could explain the rigidity of uniqueness of j, using the last two words in an intuitive way.

LOG3-2 John Alexander Cruz, Max Planck Institut fuer Mathematik, Germany

Towards a model theoretic approach to F_1 - geometry

The geometric motivation of the object F_1, "the field with one element" came from the work of Jac Tits in 1956, where he explained how one can define the Chevalley group of characteristic one to obtain some interesting geometries such that the symmetric groups happens to be the Weyl group of the corresponding Lie groups. In the last two decades there have been a lot of development, with motivation coming from Arakelov theory and some ideas relating the notion to the Riemann zeta function.

We interpret fields of characteristic 1 and algebras over those fields as multiplicative monoids with a shadow addition. The initial object in the category of F_1-algebras is $F_1 = \{0, 1\}$ the field with one element. We define the cyclotomic extensions F_{1^n} of F_1 as the F_1-algebra gievn by the union between $\{0\}$ and the nth-roots of unity. We also give a definition for F_1^{alg} and formulate a conjecture that such an object is $\omega - stable$. If time permits I will discuss some relations to the Arakelov geometry modulo n introduced by Kapranov-Smirnov

This is a joint project with Boris Zilber and Lubna Shaheen.

LOG3-3 Timothy Gendron, Instituto de Matemáticas UNAM, México

Ultraschemes and the Universal Modular Invariant

Ultraschemes are geometric objects locally modeled on sheaves of ultrapowers of a structure over a Stone space. A modular ultrascheme is one whose points parametrize (models of) elliptic curves with additional structure e.g. a finite subgroup, a foliation, etc. We introduce the universal modular invariant as a function on a modular ultrascheme and show how the classical and quantum modular invariant (the latter a multi-valued modular function defined on the moduli space of quantum tori) may be obtained from it as subquotients.

LOG3-4 Jonathan Kirby, University of East Anglia - Norwich, United Kingdom

Exponentially closed fields

The field $\mathbb{C}$ of complex numbers is well-known to be algebraically closed; this is the so-called fundamental theorem of algebra. As a model-theoretic structure, it follows that it is strongly minimal: every subset of $\mathbb{C}$ definable in the ring language is finite or co-finite. If we consider the complex field in the ring language expanded by the exponential function, much less is known. I will explain the theory of exponentially closed fields, analogous to algebraically closed fields, the status of the conjecture that $\mathbb{C}$ is exponentially closed, and how that would imply that it is quasiminimal: every subset of $\mathbb{C}$ definable in the exponential ring language should be countable or co-countable. Diophantine geometry appears in two ways. Kummer theory is involved in classifying and counting the types of exponential field extension which occur, and the Conjecture on Intersections with Tori and related theorems are involved in several places. Some of this is joint work with Boris Zilber, and some with Martin Bays.

LOG3-5 Jorge Plazas, Pontificia Universidad Javeriana, Colombia

Towards a model theoretic framework for Real Multiplication

About 15 years ago Y. Manin proposed addressing the explicit class field theory problem for real quadratic fields using real multiplication noncommutative tori in a manner analogous to the case of quadratic imaginary fields where explicit class field theory can be given in terms of elliptic curves with complex multiplication. Despite various parallels and favorable results an arithmetic theory of noncommutative tori is yet to be developed. In this talk we review real multiplication of noncmmutative tori in the light of recent results in model theory paying special attention to results of an arithmetic-geometric nature as those of Harris and Daw-Harris and their possible connection to results closer to noncommutative geometry as those of Gendron and collaborators. We close with an outline of a proposed program where the discussed techniques from model theory are used to approach real multiplication.

LOG3-6 Andrés Villaveces, Universidad Nacional de Colombia, Colombia

Modular invariants, towards real multiplication

Finding a "non-commutative limit" of the j-invariant (to real numbers, in a way that captures reasonably well the connection with extensions of number fields) has prompted several approaches (Manin-Marcolli, Castaño-Gendron, etc.). I will describe some connections between these approaches and model theory. In particular, I will focus on the role of recent interactions with differentiably closed fields in the model-theoretic analysis of modular invariants and its potential for the extension to the real limit.

6.4.27 PROB1 - TRENDS IN PROBABILITY

PROB1-1 Octavio Arizmendi, Centro de Investigación en Matemáticas, México

Additive and Multiplicative Limit Theorems in Free probability

In this talk I will survey on limit theorems and infinite divisibilty for additive and multiplicative convolutions in free probability. In particular, I will describe recent results with Takahiro Hasebe on Multiplicative Free Levy processes near 0. If time permits I will also describe the analogous results in Boolean Probability.

PROB1-2 Margaret Johanna Garzón Merchán, Universidad Nacional de Colombia, Colombia

Fractional stochastic differential equation with discontinuous diffusion

In this talk we will consider a stochastic differential equation driven by a fractional Brownian motion with Hurst parameter $H = 1/2$ and with discontinuous diffusion coefficient. We will show the existence and uniqueness of solution for this kind of differential equations. The main interest in working in this type of equations is related to the problem of a fractional version of the skew Brownian motion. This process is defined as the solution of the stochastic differential equation with singular drift coefficient; and it behaves like a Brownian motion except that the sign of each excursion is chosen using an independent Bernoulli random variable of parameter $p \in (0, 1)$, and for $p = 1/2$ the process corresponds to a Brownian motion.

PROB1-3 Michael A. Hoegele, Universidad de los Andes, Colombia

Negative top Lyapunov exponents for gradient SDE driven by small Lévy noise

We shall present a generic class of dissipative gradient SDE driven Lévy noise at small intensity. Main examples are multiwell-potentials driven by additive or moderate multiplicative α-stable noise. We shall explain how the interaction of the noise structure and the dissipativity implies that solutions of such system exhibit a negative top Lyapunov exponent.

This work in progress with B. Gess, MPI Leipzig, Germany.

PROB1-4 Harold Moreno Franco, Centro de Investigación en Matemáticas, México

A singular stochastic control problem

In this talk, we will analyse a singular stochastic control problem, where the controlled process is governed by a ddimensional Lévy process. This type of problem is closely related to a Hamilton-Jacobi-Bellman (HJB) equation, whose operator is an elliptic integro-differential operator, which corresponds to the infinitesimal generator of the d-dimensional Lévy process.

PROB1-5 Víctor Manuel Pérez Abreu, Centro de Investigación en Matemáticas, México

On the Dyson-Brownian motion and fractional Brownian motion analogous

We shall start with a review on the Dyson-Brownian motion, which is the process of eigenvalues of a Hermitian Brownian process and whose empirical spectral measure-valued process converges to the so-called free Brownian motion. Then we will present analogous recent results for the Hermitian fractional Brownian motion.

These are joint works with David Nualart, Juan C. Pardo and José L. Pérez G.

7

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Notes