FRANCE - CHILI : TRENTE ET UNIEME APPEL A PROJETS ECOS Sud - ANID (2023)

Tableau récapitulatif des projets sélectionnés

Sciences de la vie

Code projet	Titre du projet	Abstract	Responsable français	Responsable Chilien
PC22B02 WENDEN	Development of molecular-based phenology models for winter and spring phenology	Dormancy is a mechanism developed by perennial trees growing in temperate climates to overcome periods of cold temperatures and to protect fragile tissues from frost. Buds enter dormancy just before winter and after a prolonged exposure to cold, this resting state is released as buds are capable to resume growth and initiate flowering in response to warm temperatures. In the current context of climate change, increasing temperatures are expected to have strong effects on dormancy and the subsequent budbreak, flowering and fruit ripening, with major economic impacts. This is especially relevant for perennial fruit trees such as sweet cherry, in which insufficient chill accumulation can produce uneven flowering and have negative consequences on fruit production. Consequently, the development of robust mathematical models to predict cold and heat accumulation, and therefore flowering patterns in various bioclimatic environments are crucial for breeders and producers. They will allow to anticipate the impending changes and adapt sweet cherry orchards to the future climatic conditions. We believe that more integrative process-based models are widely expected to improve predictions for the timing of dormancy and flowering especially in the context of climate change. With the recent development of highthroughput phenotyping and new generation sequencing, there is currently a great potential to incorporate our understanding of molecular genetic pathways of environmental regulation of development into phenology models. The present proposal, focused on sweet cherry phenology modelling and breeding, is a collaborative project between a Chilean group (Center of Genomics and Bioinformatics, Universidad Mayor, Fruit Trees genomics and physiology lab), with the expertise on molecular regulation of dormancy in sweet cherry, and a French group (INRAE UMR 1332 Biology du Fruit, Adaptation of sweet cherry to climate change), with the expertise on phenology modelling. The idea of this proposal is to improve molecular-based phenological models using data (transcriptomic, metabolomics, temperature), hypotheses and skills from both groups, to obtain a more integrative and accurate predictive model for dormancy and flowering in sweet cherry.	**WENDEN Bénédicte** INRAE – BFP, 71 av. Edouard Bourlaux – CS20032, 33882 Villenave d'Ornon Cedex	**MIYASAKA DE ALMEIDA Andrea** Centro de Genómica y Bioinformática, Facultad de Ciencias - Universidad Mayor

PC23B03 BAILLY-MAITRE	Defining the significance of the Unfolded Protein Response (UPR) as a therapeutic target to treat liver fibrosis	Obesity and alcoholism are increasing the risk of developing liver diseases. Hepatic fibrosis is an integral step in the progression of chronic liver disease, leading to cirrhosis and hepatocellular carcinoma. Fibrosis is characterized by the accumulation of extracellular matrix resulting from chronic liver injury. Activation of hepatic stellate cells (HSCs) represents the central driver of fibrosis associated to abnormal collagen deposition that overload the function of the endoplasmic reticulum (ER), a major compartment involved in protein production and secretion. To cope with ER stress, the ER stress sensor IRE1 engages adaptive responses by inducing the transcription factor XBP1s. Although ER stress is observed in the liver disease, its exact contribution is not well defined. Our preliminary results indicate that IRE1 deficiency protects against liver damage induced by fibrotic stimulus associated with reduced accumulation of collagen. Here we plan to stablish a new collaborative network between Chile and France to strengthen a poorly developed research area. Our interchange program aims to determine the contribution of the IRE1/XBP1 pathway to liver fibrosis and train the new generation of students on a multidisciplinary environment. We plan to define (i) the role of ER stress in HSCs activation, (ii) the effects of IRE1 signaling in liver fibrosis in mouse models, (iii) assess the possible correlation of IRE1 signaling with disease parameters in human liver samples. This proposal represents an attempt to understand better the specific role of ER stress in liver fibrosis and its relation to collagen biology. Thus, this collaboration proposal has the potential to provide a relevant understanding of the cellular and molecular basis of liver injury and the future development of intervention strategies.	**BAILLY-MAITRE Béatrice** Center Mediterranean of Molecular Medicine (C3M), INSERM UMR1065, Nice	**HETZ Claudio** Faculty of medicine, University of Chile, Avenida Independencia 1027, Independencia. Santiago
PC23B05 BERNARD	Role of inositol 1,4,5-trisphosphate receptors in cellular senescence	Cellular senescence entails a permanent cell cycle arrest, characterized by apoptosis resistance, and a pro-inflammatory senescence-associated secretory phenotype (SASP). Physiologically, senescent cells promote tissue remodeling during development and after injury, but when accumulated over a certain threshold, as happens during aging or after cellular stress such as the one induced by chemo- or radiotherapy, contribute to the decline of the regenerative potential and function of tissues, causing several diseases such as type 2 diabetes, osteoarthritis and atherosclerosis. Moreover, the presence of senescent cells promotes tumorigenesis and cancer relapse by inducing dedifferentiation, proliferation and metastasis. Thus, delaying senescent cell accumulation or reducing senescent cell burden presents a promising strategy to alleviate multiple diseases. Understanding the pathways that contribute to senescence is essential to reveal new therapeutic targets. Increasing evidence show that the transfer of calcium from the endoplasmic reticulum to the mitochondria mediate by the inositol 1,4,5-trisphosphate receptors (ITPRs) is fundamental to maintain senescent cell homeostasis and represents an attractive targetable pathway to selectively kill senescent cells. Recently, we developed a scalable synthesis of the specific ITPRs inhibitor desmethyl Xestosopongine B (dmXeB). We hypothesize “The inhibition of the ITPRs with dmXeB causes selective senescent cell death.” To test the hypothesis, we will used both oncogene-induce senescence (OIS) and therapy-induce senescence cellular models, which will be exposes to dmXeB. Moreover, to determine the effect of dmXeB in age induce senescence, we will use 18-months old p16::3MR. Also, we will use LSL-krasG12D mice to evaluate dmXeB effect on OIS in vivo. We expect to identify a novel therapeutic strategy to treat senescence-associated chronic diseases.	**BERNARD David** CNRS DR7, Equipe Bernard - Centre de recherche en cancérologie de Lyon, UMR INSERM U1052/CNRS 5286 - CRCL - 28 rue Laennec - 69373 Lyon	**JULIO CESAR CARDENAS MATUS** Universidad Mayor - Geroscience Center for Brain Health and Metabolism

PC23B06 DELMAS	How biostimulants modulate development and stress responses in plants through the regulation of hormone levels and signaling.	Biostimulants are emerging as a class of crop management products that improve crop yield and quality in a sustainable manner. Ascophyllum nodosum extracts (ANE) have been widely used as growth stimulant to protect crops against freezing, salinity and drought stress. One of the possible mechanisms associated with ANE is the phytohormone-like effects on plants. However, despite the fact that ANE can promote growth activity at relatively low concentrations, the phytohormone levels in ANE cannot explain their growth effects. Thus, it has been proposed that ANE biostimulants could trigger endogenous phytohormone accumulation in plants. Nevertheless, this mechanism is not fully understood and, depending on ANE extraction methodology, the hormone-like effect varies between products. This further confirm the knowledge gap existing in the mechanisms of action of ANE. In this project, we will characterize the physiological changes induced by ANE in Tomato plants as a crop specie and in Arabidopsis as a model specie. The project will be performed under control, salt and heat stress conditions. This project is a collaboration between the Fruit Biology and Pathology laboratory (INRAE, France) and the Plant Development and Biotechnology Laboratory (PUC, Chile). While the French team is expert in Tomato biology and have all the resources to work with this specie, the Chilean team is expert in plant development and hormone signaling in Arabidopsis. This is a highly complementary team with a developing collaboration that involves cotutelle Ph.D. student and visits to France and Chile.	**DELMAS Frederic7** INRAE, Institut National de Recherche pour l'Agriculture, l'alimentation et l'Environnement, UMR1332 Biologie du Fruit et Pathologie, 71 ave. E. Bourlaux, 33882 Villenave d'Ornon	**O'BRIEN Jose** Pontificia Universidad Católica de Chile, Department of Fruit Production and Enology
PC23B09 FISCHER	Unravelling the role of Structural Variants on the reproductive and physiological divergence between Patagonian and Holarctic populations	Historically, the most detectable genetic variation across genomes consisted of single nucleotide polymorphisms (SNPs). However, recent studies revealed that structural variations (SVs) explain a greater fraction of the observed phenotypic diversity within populations. SVs are defined as a DNA region that shows a change in copy number (CNV), orientation, or chromosomal location between individuals. Recent studies in yeast strains using long-read sequencing and SV detection methodologies allowed characterising interspecies diversity in terms of genetic and phenotypic differences. In Chilean Patagonia, we can find Nothofagus forests, which are the native habitat of different Saccharomyces and non-Saccharomyces yeasts, like S. eubayanus, S. uvarum, and Lachancea cidri. Population structure analyses using short-read sequencing demonstrated that these species are genetically structured into Patagonian and Holarctic populations. These lineages exhibit a distinct phenotypic profile and, in some cases, low levels of spore viability, suggesting reproductive isolation. Nevertheless, the genetic variants underlying these population differences are still unknown. Based on these antecedents, in the current proposal, we aim to identify the SVs responsible for the phenotypic differences and partial reproductive isolation between Holarctic and Patagonia lineages in L. cidri, S. eubayanus, and S. uvarum. To this end, we have three specific objectives, i) Generate a complete catalog of SVs across L. cidri, S. eubayanus, and S. uvarum lineages, ii) Determine the fitness impact of SVs in Saccharomyces and Lachancea Patagonian strains, and iii) Evaluate the impact of SVs on the reproductive isolation of S. uvarum. To achieve this, we will combine cutting-edge genomics, functional genomics, and synthetic biology approaches. Different students from both countries will greatly benefit from the exchange and collaborative experiences of this proposal.	**FISCHER Gilles** Sorbonne Université, Laboratoire de Biologie Computationnelle et Quantitative, Biologie des Génomes, 7-9 quai Saint Bernard 75005 Paris	**CUBILLOS Francisco** Universidad de Santiago de Chile, Molecular Genetics Lab

Sciences Exactes

Code projet	**Titre du projet**		**Responsable français**	**Responsable Chilien**

PC23E01 DOUCET	Pd-catalysis: a powerful tool for the access to luminescent Ir(III) complexes combining arylated tris-chelates NCN- or bis-chelates CN with non classical P,N or N,N ancillary ligands	The objective of this project is to employ Pd-catalyzed C-H bond functionalization to prepare unprecedented classes of emitting Ir(III) complexes combining the bis-chelate ancillary heteroelement containing ligands Y,N (Y =P,N) and arylated cyclometalated bischelates (2-(2,4-difluorophenyl)pyridines (a) / 2-(2,4-difluorophenyl)quinolines (b), or tris-chelate (2,2'-(4,6-difluoro-1,3-phenylene)dipyridine (c) / 2,2'-(4,6-difluoro-1,3-phenylene)diquinoline (d) ligands. The Chilean team will provide the chelating ligands N,N and P,N, prepared using reported procedures and the cyclometallated precursors. The French group will prepare the arylated cyclometalated CN and NCN-ligands via Pd-catalyzed C-H bond functionalization. The arylation performed on the series a and b will be extend for the first time to tris-chelate ligands, a more challenging task (series c and d). The new families of the prepared ligands will be used for the preparation of new luminescent bis-chelate, Ir(a2)L et Ir(b2)L, namely complexes [Ir(CN)2((Y,N)]PF6 and tris-chelates derivatives Ir(c)(L)ClPF6 et Ir(d)(L)ClPF6 having the structure [Ir(NCN)2(Cl)2(Y,N)]PF6. These cationic Ir(III) complexes, also containing bulky Y,N (Y = P, N) ancillary ligands will be synthesized during the exchanges of students. The synthesis and characterization, as well as the electrochemical and photophysical properties of these new classes of complexes will be investigated. All complexes will be fully characterized by standard spectroscopic and analytical methods (high resolution mass spectra and elemental analyses), and their structures will be confirmed by X-ray crystal structure analyses. We will examine the impact of this unprecedented association of ligands on a metal center on the luminescence characteristics of the resulting complexes. Based on our previous results, the incorporated aryl group(s) on the cyclometalated phenyl ring(s) is expected to enhance the quantum yield of luminescence of the final Ir(III) complexes. This molecular design of ligands will be associated with bulky ancillary ligands such as six-membered ring ligands, or diphenylphosphine, 1,3,5-triaza-7-phosphoadamantane-substituted ligands, as described below. This project will demonstrate that Pd-catalysis is an essential tool for the development of molecular materials.	**DOUCET Henri** Université de Rennes 1, Institut des Sciences Chimiques de Rennes, UMR CNRS 6226	**ABARCA A. Gabriel** Universidad Bernardo O'Higgins, Santiago, Integrative Center for Biology and Applied Chemistry
PC23E03 EYNARD-BONTEMPS	Small spaces under action	The project Small Spaces Under Action (SSUA) is the natural continuation of a long term cooperation between France and Chile in the areas of dynamical systems and group theory, with ramifications to geometry and analysis. It focuses on the fruitful subject of actions on low-dimensional spaces and deals with very concrete questions, oriented toward three major axes: 1. Actions by diffeomorphisms on 1-manifolds: with a focus on two long-lasting open questions about the connectedness of spaces of Abelian group actions and the simplicity of groups of diffeomorphisms in "critical" regularity. 2. Orderable groups: structure of the space of orders of a given group, Linnel's conjecture about the local indicability of left-orderable groups with no free subgroups, leftorders on Homeo+(R), R-focal actions of solvable groups on the real line, existence of left-orderable groups satisfying Kazhdan's Property (T). 3. Actions on 2-manifolds: structure of the set of groups acting faithfully on a given 2-manifold, growth of groups acting smoothly on 2-manifolds. The proposal involves 7 established researchers, some of which have a very important record of joint publications and projects. Last but not least, the team incorporates 4 PhD students, and this number can (and, hopefully, will) increase along the execution of the project.	**EYNARD-BONTEMPS Hélène** Université Grenoble Alpes, Institut Fourier, 100 rue des Mathématiques, 38610 Gières	**NAVAS Andrés** Universidad de Santiago, Departamento de Matemática y Ciencia de la Computación, Santiago

PC23E07 CRESPIN	GPU computing for applications in numerical simulations and health	GPU computing is widely recognized as a valuable resource for numerical simulations and health-related applications due to their parallel processing capabilities. In this project, we aim to leverage the power of GPU computing to optimize two critical tasks: neighbor search algorithms in particle-based simulations and visualization of molecular structures for drug design. By parallelizing the neighbor search process using GPU computing, we can accelerate simulations and improve efficiency. Additionally, GPU computing can enhance the rendering speed and quality of molecular structures, providing researchers with faster and more accurate insights. The collaboration involves permanent and non-permanent staff from France (U. of Limoges) and Chile (U. Austral and U. Chile), with a goal of publishing at least one co-signed paper each year. The project is connected to existing research initiatives and aims to contribute to the development of efficient implementations of particle-based simulations and advanced visualization methods. The work plan spans three years, focusing on fixed radius and k-nearest neighbor searches, incorporating Delaunay Triangulations and RT cores, and including research visits and publication of results. The expected outcomes include high-quality publications, presentations at conferences, integration into molecular visualization software, and contributions to ongoing research projects in both France and Chile.	**CRESPIN Benoît** Université de Limoges, XLIM UMR CNRS 7252, 123, avenue Albert Thomas, 87000 Limoges	**NAVARRO GUERRERO Cristóbal** Universidad Austral de Chile, Instituto de Informática, Valdivia
PC23E08 RINGUEDE	New materials for molten carbonate based electrochemical cells	In the current energy context, developing clean electricity production technologies such as fuel cells is important. This project focuses on electrochemical devices operating at temperatures above 500 °C, based on molten carbonates at the heart of the electrolyte, such as MCFCs (Molten Carbonate Fuel Cells). In addition to their very high efficiency, the high-power output (up to 60 MW in South Korea for example), and the high operating temperatures lead to significant degradation kinetics, and it is essential to develop new materials whose structure is more stable over the operating time. Thus, we propose to associate CeO2 nanoparticles with Ni and Al-based alloys (Ni-Al5 is the reference material for MCFC anodes), but also with Cu to limit both the physical and catalytic degradation of the electrode in CO2/H2/H2O mixture. The electrolytic membrane of MCFCs is in fact a porous insulating matrix of LiAlO2 in which the carbonate mixture is confined. One of the objectives of this project is to modify this matrix by adding microparticles of CeO2, doped or not, to reduce the losses by ohmic drop, which are very high in these devices. Elementary cells of new compositions can then be assembled from the best materials, and electrochemically tested in terms of power density and current density, then stability. This project combines Chilean partners (coordinated by Mamie Sancy from LEM - PUC Santiago) with French partners (coordinated by Armelle Ringuedé from IRCP - ENSCP Chimie Paristech PSL) to benefit from the complementary skills of each: manufacturing of metal alloys, metal characterizations (essentially carried out by the Chilean part of the project), shaping of electrodes and other components of the MCFC cell (both partners), electrochemical characterizations in molten carbonate baths (mastered by IRCP and to be set up at LEM), electrochemical performances of complete cells (IRCP). It is important to note that we also hope to be able to test the best cells in steam electrolyser mode (for hydrogen production) during the project.	**RINGUEDE Armelle** Ecole Nationale Superieure de Chimie de Paris, Institut de Recherche de Chimie Paris, 11 rue Pierre et Marie Curie ; 75231 Paris Cedex 05	**SANCY VASQUEZ Mamie Odette** Pontificia Universidad Catolica de Chile, LEM UC, Santiago

PC23E10 KEDAD-SIDHOUM	Stochastic programming approach for planning activities with remanufacturing under extended producer responsibility in a sustainability setting	In this project, we are going to take into account the uncertainty on the input data for planning activities within remanufacturing under extended producer responsibility, identifying differences and similarities in the French and Chilean production systems. In particular, we will consider that the demand for refurbished products and the quantity and quality of end-of-life products brought back by consumers are difficult to predict accurately and are therefore subject to uncertainty. This will lead us to study and to solve a stochastic combinatorial optimization problem. We propose to approach this problem by relying on stochastic programming, a branch of applied mathematics that has proved its effectiveness in the treatment of optimization problems under uncertainty. Our contributions will be twofold: 1. We will propose a multi- stage stochastic programming model in which production decisions can be updated as new information on uncertain parameters becomes available. Unlike stochastic programming models with one or two steps already proposed in the academic literature for this problem, a multi-stage model makes it possible to take into account the dynamic aspect of the problem and to adapt the planning to the realization of the uncertain parameters. 2. This multi-stage stochastic programming model will lead to the formulation of very large mixed integer linear programs. We are going to develop and implement new algorithms to solve these mixed integer linear programs in times compatible with industrial use in both countries, France and Chile, providing a guideline and improvement actions for a real implementation. This project will carry out conjoined with two framework projects from Chile and France, which aim to model and to resolve some production planning problems within remanufacturing environment, contributing to the collaboration and scientific production in the area, training of young researchers, and promoting the gender parity among research team members.	**KEDAD-SIDHOUM Safia** Conservatoire National des Arts et Métiers, Laboratoire CEDRIC, 292 Rue Saint-Martin, 75003 Paris	**VASQUEZ Oscar** Universidad de Santiago de Chile, Departamento de Ingeniería Industrial

PC23E11 KAZI-TANI	Nonsmooth Analysis in Stochastic Systems and Optimal Control Theory	This research proposal aims to develop a unified framework for studying stochastic systems and stochastic optimal control problems with non-smooth constraints. The project consists of three main topics: approximation and optimal control of stochastic sweeping processes, stochastic control with chance constraints, and stochastic optimal control of matrix-valued random processes. The first topic focuses on extending the understanding of sweeping processes to the stochastic setting by utilizing stochastic differential equations generated by a Moreau-Yosida regularization procedure. In the second topic, the aim is to adapt techniques from classical chance-constrained optimization to address the challenges posed by stochastic optimal control problems with probability constraints. The goal is to explore more general formulations of chanceconstrained problems in dynamic systems. The third topic aims to develop a theoretical framework for eigenvalue optimization within a stochastic continuoustime context. The objective is to advance the field of eigenvalue optimization theory in the presence of stochastic elements. The project aims to achieve several outcomes. It seeks to establish a collaborative research network between France and Chile in the field of nonsmooth stochastic dynamical systems and optimal control. The project aims to publish co-authored papers in top-tier journals and present findings at international workshops and conferences. It plans to create an online working group for discussions and the integration of students and young researchers. Two workshops will be organized in France and Chile to encourage participation from students and young researchers. The project will allocate resources for the training of doctoral students and facilitate postdoctoral student exchanges. Additionally, it aims to expand collaborative networks and attract researchers through two conferences focused on nonsmooth stochastic dynamical systems and optimal control. The project will create clusters of participants with diverse expertise and organize collaboration through missions, emails, and virtual meetings. Regular online internal meetings and a working group will facilitate progress evaluation and inclusion of students and young researchers. Findings will be disseminated at international workshops and conferences, including two planned workshops in France and Chile. The workshops will involve students, young researchers, and worldwide experts delivering talks and courses. To achieve the goals of the project, we will create a working group by combining important researchers from two fundamental axes: Convex and Variational Analysis (A. Jourani, P. Pérez-Aros, and E. Vilches) and Stochastic differential equations and Probability theory (N. Hernández Santibáñez, N. Kazi-Tani, and S. Mazzonetto). Given the history of successful collaboration of the members of the project and their expertise in their research fields, we hold high expectations for its successful execution. We expect to pave the way for new research avenues. The project's viability is ensured by the expertise of the research group, which comprises experts in convex analysis, variational analysis, stochastic differential equations, and probability theory. Their successful collaboration history and significant contributions to the field further strengthen the project's potential. In conclusion, this proposal holds the potential for significant advancements in multiple areas while simultaneously strengthening scientific cooperation between Chile and France.	**KAZI-TANI Nabil** Université de Lorraine, Institut Elie Cartan de Lorraine, 3 Rue Augustin Fresnel, 57070 Metz	**VILCHES Emilio** Universidad de O'Higgins, Instituto de Ciencias de la Ingeniería, Rancagua

PC23E12 DUBOULOZ	Equivariant Algebraic Geometry with a view towards Birational Geometry and Arithmetics	The main scientific goal of this ECOS-ANID project is to address a series of important natural questions in algebraic and arithmetic geometry revolving around the equivariant geometry of varieties endowed with actions of connected linear algebraic groups over arbitrary fields of characteristic zero. The project is centered around four main lines of research motiviated by the Ph.D projects of the four students involved and to be developed with effective participation of the Franco-Chilean teams. The first subject of interest can be summarized as "Tvarieties and one-complexity G-varieties over characteristic zero fields" and, besides the senior researchers, involves 2 PhD students. The second subject of interest can be summarized as "Birational geometry of Fano varieties with applications to automorphism groups and motivic characteristic classes" and similarly, besides the senior researchers, involves 2 PhD students. To foster the collaborations, the members of the project will have meetings at regular basis. For this, the researchers and students from each team will visit the other once a year.	**DUBOULOZ Adrien** Université de Bourgogne, Institut de Mathématiques de Bourgogne - UMR 5584 du CNRS, 9 Avenue Alain Savary – 21000 DIJON	**MONTERO Pedro** Universidad Técnica Federico Santa María Valparaiso, Departamento de Matemática
PC23E15 BROTCORNE	Data-driven decision-making in location and transportation	Decision-making processes involving uncertainty in the input parameters are commonplace, and the operational research community has investigated different methods to tackle this issue since the 60s. The current widespread availability of data and information presents a great opportunity to enhance the decision-making process, but at the same time, it presents a great challenge to develop new models and algorithms that capture this information. A classical approach to dealing with uncertainty is stochastic and robust optimization. The typical setting of stochastic optimization is to estimate a probability distribution of the unknown parameters and typically optimize an expected value or a risk measure. In the case of robust optimization, an uncertainty set is estimated using the information available, and a worst-case scenario is optimized. Distributionally robust optimization appears as a third natural extension, where a worst-case scenario is optimized, but in contrast with stochastic optimization, the worst-case scenario again includes all the probability distributions with some parameters adapted to the data. In general, many real-life decision-making processes involve solving a task with an uncertain input that can be estimated from historical data. A predict-then-optimize approach is widely used by practitioners in both the industry and the public sector, where first, a machine learning model is trained to make a point estimate of the uncertain parameters, and then the optimization problem is solved using the predictions. A more principled but understudied approach is to integrate the prediction and the optimization task and train the machine learning model using a decision-focused loss. This approach is explained under the term smart-predict-then-optimize, or decision-focused learning. This allows us to treat the problem as a deterministic setting, but the learning process caught the uncertainty and the purpose of these predictions. This can be done by minimizing the regret of the predictions: the excess of cost in the task caused by errors in the predictions. This learning process often involves solving a non-convex optimization problem, or includes the challenge of finding good surrogate losses functions that are specific for each application. To the best of our knowledge, there is no clear answer of what of these modeling tools is the best to manage with the uncertainty. In other words, since they bring different challenges at the moment of solving, estimating underlying probability distributions or uncertainty sets, they raise different solutions and computational efforts that they need to be considered. To understand these differences is crucial to understand the economic impact of the decision-making process in transportation and location. We aim to analyze these trade-offs in this project analyzing several real-world applications. A better understanding of how data can be used to model uncertainty will lead to the development of better models and algorithms and in consequence, to make better decisions in transportation and logistics problems. Thus, the main objective of this project is to provide a general framework for data-driven decision-making for different settings in transportation and logistics and to provide large-scale optimization models and algorithms to tackle uncertainty when data is available for these settings.	**BROTCORNE Luce** INRIA - Centre de l'Université de Lille, INOCS - Integrated Optimization with Complex Structure, Parc scientifique de la Haute-Borne 40, avenue Halley - Bât. A - Park Plaza 59650 Villeneuve d'Ascq	**BUCAREY LOPEZ Victor** Universidad de O'Higgins, Rancagua, Instituto de ciencias de la ingenieria, Rancagua.

PC23E17 DIMITROV	Chilean-French cluster on p-adic arithmetic geometry and automorphic representations	This project it is a collaborative effort focused on specific aspects of the Langlands program and arithmetic geometry carried out by teams from Universidad de Santiago de Chile, Pontificia Universidad Católica de Valparaíso, Université de Lille and Université de Bordeaux. The main theme is the bridge between automorphic forms and Galois representations as envisioned in the Langlands program, with a particular focus on recent spectacular development using p-adic methods allowing deformations around the points of interest. We propose to study eigenvarieties at arithmetically significant points such as Bianchi-Eisenstein series or Hilbert modular forms with complex multiplication. Moreover, we propose to study Reciprocity laws and p-adic L-functions in similar settings, including weight 1 modular forms. Finally, we will study new cases of padic asymptotic distribution on certain arithmetic manifolds.	**DIMITROV Mladen** Université de Lille, Laboratoire de mathématiques Paul Painlevé, Campus Cité Scientifique, 59655 Villeneuve d'Ascq Cedex	**BARRERA Daniel** Universidad de Santiago de Chile, Departamento de Matemática y Ciencia de la Computación
PC23E20 DARBAS	Fast numerical methods for elastic wave propagation problems in nonhomogeneous domains: from theory to real-life applications	Elastic or ultrasonic waves are used in a large range of industrial and societal applications. They are essential for example to model the propagation of seismic waves in sedimentary basins that lead to the phenomenon of site effects.These waves are also used to detect geological structure or to identify natural resources, like oil and gas, through seismic inverse. It is also very important in biomechanical engineering applications such as elastography imaging, or nondestructive testing in medical devices. The purpose of this project is to develop efficient numerical tools to simulate the propagation of time-harmonic elastic waves in non-homogeneous complex domains and to validate the efficiency on real-life applications. To achieve this goal, we will need also to develop check some important mathematical theoretical results. If a lot of studies in the applied mathematics community are devoted to the simulation of acoustic and electromagnetic waves in non-homogeneous waves, the field of elastic waves has been way less considered due the complexity of the physics (involving two kinds of waves), the underlying partial differential equations with vectorial unknowns, and the additional computational costs to overcome. Our project proposes to fill this gap by gathering a pluri-disciplinary team with complementary domains of expertise (from theoretical and applied mathematics to mechanical engineering). Various numerical approaches exist to deal with wave propagation problems but Boundary Element Methods are the best suited to model wave propagation in large scale unbounded domains. In the last 20 years, most of the work in the community has been devoted to improving these methods for homogeneous domains. Robust and reliable solutions have been developed thanks to preconditioning techniques and acceleration methods using compression techniques. These techniques enable to consider large computational domain for frequencies up to a couple of hundred of wavelengths. Our objective is to use the recent developments on fast BEMs for homogeneous domains to consider non-homogeneous elastic domains in an efficient manner. The challenges BEMs are currently facing for non-homogeneous domains are: to be able to propose a parallel formulation to take advantage of modern computer architectures, to propose an efficient preconditioner in that case (acceleration methods prohibit to assembly the dense matrix) and to handle the case of junction points. The formalism of Multi-Trace Formulations has been shown to satisfy these requirements for piecewise constant coefficients in the case of Helmholtz and Maxwell equations. The main goals of the project are decomposed into three steps: Extend the theory of the local Multi-Trace Formulations to 2D and 3D elastodynamics. Implement the local Multi-Trace Formulations and prove their numerical efficiency, e.g. study the computational cost and the number of iterations with respect to the frequency, the mesh parameters and the contrast in the elastic coefficients. Apply the new method to realistic configurations: simulation of seismic wave propagation in sedimentary basins and simulation of the propagation of ultrasonic waves used to perform non-destructive testing of bone-implant interfaces.	**DARBAS Marion** Université Sorbonne Paris Nord, LAGA, Institut Galilée, 99 avenue Jean-Baptiste Clément, 93430 Villetaneuse	**JEREZ HANCKES Carlos Felipe** Universidad Adolfo Ibáñez, Facultad de Ingeniería y Ciencias, Santiago

Sciences Humaines et Sociales

Code projet	Titre du projet	Abstract	Responsable français	Responsable Chilien
PC23H03 BLIDON	Environnements de recherche plus sûrs et plus équitables (SERE). La violence académique sous l'angle du genre et des sexualités.	Dans un contexte de montée des mouvements anti-genre et anti-LGBT dans les démocraties libérales, ce projet vise à documenter à partir d'une enquête en ligne, d'observations et de groupes de parole (focus groupe) les violences dans le monde académique au prisme du genre et des sexualités. L'objectif du projet est d'en mesurer l'ampleur, d'en comprendre les mécanismes et d'en prévenir les effets par la mise en place d'action de sensibilisation et de prévention adéquat. Le projet s'appuie sur une démarche comparatiste entre la France et le Chili. Il permettra aux universités et autres organismes de recherche d'améliorer la compréhension, la sécurité et la capacité d'agir de tous leurs membres, en cherchant à prévenir et à répondre à des problèmes spécifiques tels que les violences de genre et les violences envers les populations LGBTQ+, et en abordant des questions générales d'égalité et de création de cultures accueillantes.	**BLIDON Marianne** Paris 1-Panthéon Sorbonne University, CRIDUP, 5 cours des Humanités, 93300 Aubervilliers	**ASTUDILLO LIZAMA Pablo** Alberto Hurtado University, Département des politiques éducatives, Faculté d'éducation, Santiago

Sciences de la Santé

Code projet	Titre du projet	Abstract	Responsable français	Responsable Chilien
PC23S02 BOUDIN	Extracellular vesicles from fecal microbiota or probiotics to treat autism symptoms in offspring gestated in hypothyroxinemia	Autism spectrum disorder (ASD) is characterized by impairment in social interaction, communication skills, and by repetitive behavior, that affects 1% of the population. Beside behavioural symptoms, around 70 % of children with ASD also presents gastrointestinal symptoms. The etiology of ASD is still largely unknown, but environmental risk factors, in particular those affecting mother health during pregnancy, appears to have crucial roles. In this respect, gestational hypothyroxinemia (reduced T4 hormone with normal levels of TSH and T3) is associated with increased risk of ASD in offspring. The Chilean group found that a mice model of maternal hypothyroxinemia resulted in gastrointestinal and behavioral symptoms relevant to ASD in the offspring. Another important factor in ASD is gut microbiota. The French team found that transfer of dysbiotic microbiota from people with ASD into mice induced gut and behavioral symptoms, suggesting that gut microbiota could contribute to ASD symptoms. Regarding therapeutic strategies, approaches targeting microbiota by fecal microbiota transplantation or by probiotic supplementation resulted in improvement of gastrointestinal and behavioural symptoms in children with ASD and in animal models of ASD. However, it is still unknown which components produced by microbiota and probiotic bacteria are involved in these beneficial effects. We propose that the extracellular vesicles (EVs) could be the mediators of these effects because of their capacity to convey bioactive compounds to short- and long-distance and for their therapeutic potential. However, whether EVs from healthy microbiota or from probiotics could benefit brain and gut functions in ASD still remains to be studied. Our project is to evaluate the benefit of healthy microbiota- or probiotic-derived EVs on behavior and gastrointestinal functions in offspring gestated in hypothyroxinemia. By combining the expertise of the two partner laboratories, this project has the ambition to provide preclinical evidence on a potential novel therapeutic strategy based on bacterial EVs.	**BOUDIN Hélène** Institut National de la Santé et de la Recherche Médicale, UMR1235 The enteric nervous system in gut and brain disorder (TENS), 1 rue Gaston Veil, 44000 Nantes	**RIEDEL Claudia** Université Andres Bello, Laboratory of Endocrino-immunology, Santiago

PC23S05 BOLAÑOS-JIMENEZ	Analysis of the mechanisms underlying the beneficial effects in the offspring of the maternal supplementation with docosahexaenoic acid (DHA) during pregnancy	Obesity is a public health burden worldwide. Though, one of the main contributors to obesity is the consumption of high caloric foods along with a sedentary lifestyle, epidemiological and experimental studies have shown that maternal obesity leads to an increased risk of developing metabolic syndrome and cognitive disorders in the offspring via a developmental process named metabolic programming. The physiological disturbances resulting from metabolic programming, evolve with age, are sex dependent, may be transgenerational in nature, and would be underpinned by epigenetic modifications that result in modified gene expression patterns and pathological phenotypes later in life. However, we ignore what metabolites or molecular factors are passed on by the obese mother to her child and how these factors act on the foetus and the new born to leave a fingerprint that will determine his pathological susceptibility for the rest of his life. Moreover, just as an unhealthy maternal diet can lead to adverse health consequences in the offspring, maternal supplementation with specific nutrients during pregnancy can potentially reverse and/or protect against the detrimental effects of metabolic programming. Docosahexaenoic acid (DHA), a 3-long-chain polyunsaturated fatty acid (n-3 LCPUFA), is one of the most interesting nutrients in this respect. In fact, a large number of observational studies have shown that the consumption of food enriched with DHA or the nutritional supplementation with this 3-polyunsaturated fatty acid has positive health effects ranging from the prevention and reversion of cognitive deficits associated with neurological diseases and ageing to the improvement and prevention of the metabolic syndrome. The overall objective of this project is to determine whether and by which mechanisms DHA supplementation during pregnancy prevents the development of cognitive and metabolic disorders induced in the offspring by maternal obesity. Collectively, the proposed studies should allow to: 1) generate information to establishing nutritional and lifestyle recommendations to women of child bearing age and to pregnant women to overcome the detrimental consequences on offspring's health of maternal obesity; 2) obtain fundamental scientific knowledge for a better understanding of the mechanisms underpinning the metabolic programming of non-communicable diseases and mental disorders.	**BOLAÑOS-JIMENEZ Francisco** INRAE, UMR Physiologie des Adaptations Nutritionnelles (PhAN), Place Alexis Ricordeau.44096 Nantes Cedex 1	**CASANELLO Paola** Pontificia Universidad Católica de Chile, Unidad de Neonatología, Escuela de Medicina, Santiago

Sciences de l'Univers

Code projet	Titre du projet	Abstract	Responsable français	Responsable Chilien
PC23U01 FLAHAUT	Volcanism in the Atacama Desert as an analog to Mars	Volcanic activity on Earth and elsewhere is expressed through a variety of volcanic edifices (strato-volcanoes, domes, etc.), isolated lava flows, and pyroclastic material among others. The shape of these features is known to result from complex, interrelated parameters such as the magma physicochemical properties, the eruption style and the emplacement structural control. Volcanism on Mars appears to have been widespread, and dominantly mafic in composition although more felsic flows and ignimbrite sheets may have been recognised locally. The style, volume, source and duration of Mars volcanic activity is however still poorly understood, and understanding the nature, timing and extent of volcanism on other planets is key to their internal evolution and dynamics, but also potentially their habitability. Fortunately, recent and extensive remote sensing datasets of the martian surface have been produced during the last decades of space exploration. Most of these relevant data remain underexploited, but have the potential to unravel key magmatic processes that shaped the early history of the red planet. To break down the barriers that currently obstruct the in-depth interpretation of available extraterrestrial data, we propose to carry out analog studies on Earth, where orbital predictions can be verified	**FLAHAUT Jessica** CRPG, UMR 7358, CNRS /Université de Lorraine, 15 rue Notre Damme des Pauvres, 54500 VANDOEUVRE-LES NANCY	**LARREA MARQUEZ Patricia** departamento de Geologia, Universidad de Chile, PlazaErcilla 803, Santiago

		(and improved) in situ. We specifically focus on the hyperarid Atacama Desert of Chile, which presents a range of exceptionally well-preserved and well-exposed volcanic features. The proposed approach combines terrestrial and Mars remote sensing studies, with in situ analyses (providing ground truth), and is building on the highly complementary skills of the Chilean and French partners. In turn, the project will bring insights into volcanism in the Central Andes of the Atacama Desert and magmatic processes on Mars, but should also generate key tools for remote sensing analyses of planetary surfaces.		
PC23U02 ECHEVIN	Modélisation de l'impact d'un canyon sous-marin sur la circulation, la productivité biologique et l'oxygénation des eaux côtières: cas du canyon du Bio-Bio près des côtes du Chili Central		**ECHEVIN Vincent** Laboratoire d'Océanographie et de Climatologie: Approches Expérimentales et Numériques (LOCEAN), Sorbonne Université, Boite 100, 4 place JUSSIEU, 75252 PARIS cedex 05	**SALDIAS Gonzalo** Université du Bio-Bio, Departamento de Fisica, Concepcion