



Area of Impact: Mathematics

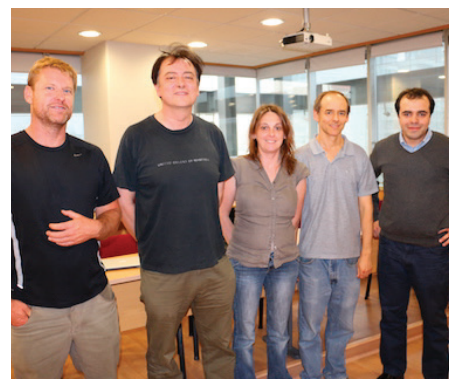
Specialty: Partial Differential Equations

The analysis of partial differential equations (PDE) is a fundamental branch of mathematics. It allows us to model complex natural phenomena that appear both in applied sciences - for example biology, finance and environment - as in theoretical matters within mathematics.

Specifically, this discipline is focused on models whose description involves quantities or continuous variables, such as distance, amount of material, time or temperature. The PDEs describe differential relations between these variables.

The theoretical study of these relationships is an essential challenge in this area. On one hand it allows us to understand qualitative properties of the models that are difficult to capture otherwise (for example, numerical simulation), and on the other, it helps us validate or discard the model in its ability to describe the physical phenomenon observed.

This Nucleus, born in 2015, consists of two main researchers, 4 associate and 3 assistant researchers, from the University of Chile, the Catholic University and the Federico Santa María Technical University.



MAIN ACHIEVEMENTS

- The discovery of the first example, sidestepping a symmetrical hypothesis, of a singularity that emerges in finite time from the problem of temporal flow of harmonic maps, and the demonstration of its stability. This flow represents a classic model of the evolution of liquid crystals. The resulting answer offers a significant advance for the comprehension of the so-called geometric flows, an area of geometry, and the mathematical analysis is especially relevant due to its implications.
- Organization of the conference "PDE at the End of the World" in Punta Arenas in March 2015, which gathered some of the most important mathematicians worldwide in the area of Partial Differential Equations (PDE).

CONTACT INFORMATION

DIRECTOR: Manuel del Pino

ACTING DIRECTOR: Alexander Quass



Manuel del Pino



Alexander Quass

Contact email: **mramon@dim.uchile.cl**

Communications email: **capdenucleomilenio@gmail.com**

Telephone: **+56 9 6202 3982**

Web: **www.capde.cmm.uchile.cl**

CAPDE
Núcleo Milenio NC 130017

RESEARCHERS

Principal Researcher:
Manuel del Pino

Acting Principal Researcher:
Alexander Quass

Assistant Researchers:
Juan Dávila
Duván Henao
Claudio Muñoz
Mónica Musso

Associate Researchers:
Salomón Alarcón
Ignacio Guerra
Fethi Mahmoudi

Senior Researcher:
Patricio Felmer

RESEARCH TOPICS

- Singular perturbations and analysis of variations.
- Singularity formation in nonlinear evolution problems.
- Fractional nonlinear elliptic equations.

NOTED OUTREACH ACTIVITIES

- **1000 scientists, 1000 classrooms.** Talks aimed at high school students.
- **"Each other's cousin".** Play that humorously presents mathematical concepts and encourages high school students, especially women, to become interested in this discipline.
- **The Beauty of Concepts.** Video showing the presence of mathematics behind natural phenomena and everyday life through examples and testimonies of scientists, including Manuel del Pino and Claudio Muñoz. The host is Cristián Warnken.
- **Discussion on Mathematics and Gender,** alongside the Women's Mathematics Collective of Chile.

 **PRODUCTIVITY PUBLICATIONS**
(2015)
ISI: 37

 **ACTIVE MILLENNIUM NUCLEUS CENTER**
From 12/24/2014 to 12/24/2017
The Millennium Nucleus Centers can be renewed after 3 years, reaching a maximum of 6 years.

 **PRESENCE**
VALPARAÍSO REGION
METROPOLITANA REGION



HOST INSTITUTIONS:



UNIVERSIDAD TECNICA
FEDERICO SANTA MARIA