MILLENNIUM NUCLEUS OF NATURAL SCIENCES | MILLENNIUM NUCLEUS PHYSICS OF ACTIVE MATTER

Area of Impact: **Materials for new technology**
Specialty: **Physics of Active Matter, Statistical Thermodynamics, Microfluidics**

We have seen how bird flocks, fish schools and other collectives of animals move in a synchronic and organized form, these swarms seem to have a life of its own. The same happens at a smaller level: bacteria suspensions, cellular tissues and artificial swimmers show surprising and unpredictable group movements.

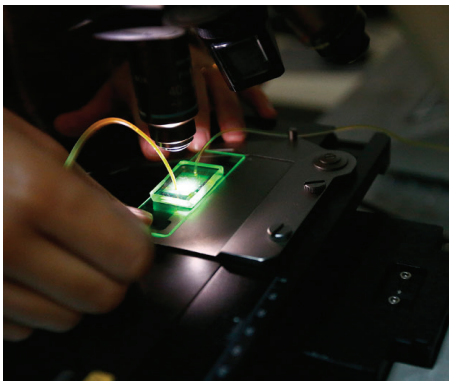
The physicists call these systems as active matter, a term coined during the last decade to describe structures composed by many biological or artificial elements, where each individual has the ability to extract energy from the environment to generate motion.

What properties does the active matter have? How we can predict its behavior? These are some of the questions that the Millennium Nucleus Physics of Active Matter seeks to answer. To this end it brought together a broad and diverse work team that combines experiences -of over a decade- in experimental and theoretical physics, statistical thermodynamics and manipulations of biological models.

Why is its study important? Because active matter is the great paradigm of out- of- equilibrium systems, that at this moment do not have a theory that explain them, despite the great advances in this field in the last 20 years.

And because last generation technologies that integrate biological material at micro and nano scale, work with active matter and --therefore- advance in its knowledge, promises to have direct impacts on its development.

Housed in the Faculty of Physical and Mathematical Sciences of the University of Chile, this academic center has as its ultimate goal to construct a thermodynamic theory for active matter that can be extended to other out of equilibrium systems and, -in the long term,- apply these new concepts to systems of biological interest and revolutionize other fields as medicine and nanotechnology.



MAIN ACHIEVEMENTS

- Development of new theoretical tools for the description of the active matter, models of active congestion, bacteria's swim and study of the self-assembly of active colloidal particles.
- Collaborative project with researchers of the Medicine Faculty of the University of Chile to describe the migration of the cells during the development phase of fish embryos.
- Construction of microfluidic experimental devices to generate and study the dynamic of confined drops.
- Collaborative study on the physics of bacterial swarm with researchers from PUC and ESPCI (France).
- Study of chaotic systems that have stationary states out of non-equilibrium states characterized by transport properties as diffusion.

CONTACT INFORMATION

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ACTIVE MATTER
Millennium Nucleus Physics of Active Matter

MILLENNIUM NUCLEUS OF NATURAL SCIENCES

MILLENNIUM NUCLEUS PHYSICS OF ACTIVE MATTER

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Sebastián González
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RESEARCH TOPICS

- **Active matter.**
- **Bacterial suspensions and cellular tissues.**
- **Statistical thermodynamics, systems out of equilibrium.**
- **Microfluidics, dinamics of confined drops in microchannels .**

NOTED OUTREACH ACTIVITIES

- **Videos and capsules** where physicists from the Millennium Nucleus Physics of Active Matter interview and talk with scientists of other fieds about current and interesting subjects (March-August 2018).
- **Interviews and talks** of researchers of the Nucleus in the massive media and in conferences for general public.

PRODUCTIVITY PUBLICATIONS (2013-2017)

ISI: 27 publicaciones

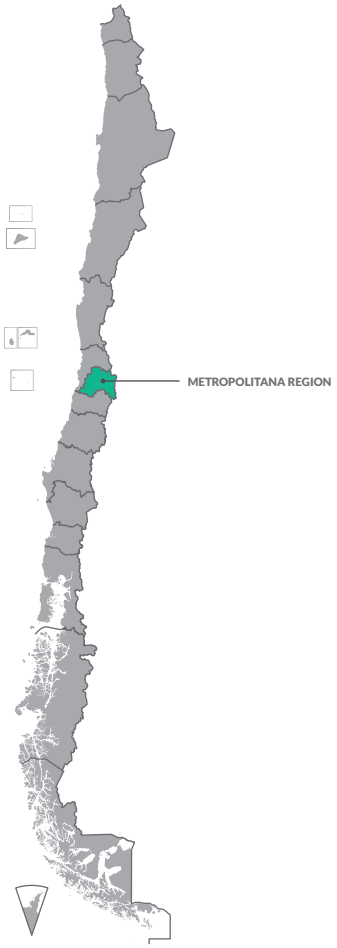
ACTIVE MILLENNIUM NUCLEUS CENTER

From 2017 to 2020

The Millennium Nucleus Centers can be renewed after 3 years, reaching a maximum of 6 years.

PRESENCE

METROPOLITANA REGION



HOST INSTITUTIONS:

UNIVERSIDAD DE CHILE