



# How ignorance drives our knowledge

cross-disciplinary doctoral course



Organizer: Andrea Gazzola

**Marzo-Giugno 2024**

## Sessions and Speakers

**5 Marzo 16-18: Ethology**

Andrea Gazzola

*Perception of predation risk*

**7 Maggio 16-18: Chemistry**

Stefano Protti

*Faster-than-light: the multifaceted application of photoinduced processes*

**12 Marzo 16-18: Conservation Biology**

Thomas Abeli

*Knowledge gaps and information inertia hampers the conservation of Extinct in the Wild plants*

**14 Maggio 16-18: Cell Biology**

Ilaria Canobbio

*Alzheimer's Disease: To brain or not to brain?*

**19 Marzo 16-18: Physics**

Andrea Fontana

*Analogy and symmetry in Physics: the case of antimatter*

**21 Maggio 16-18: Evolutionary biology (Online-Zoom)**

Stephen Stearns

*Ignorance at the intersection of life history evolution and evolutionary medicine*

**26 Marzo 15-17: Chemistry**

Chiara Milanese

*The Carbon treasure in agrifood waste: a possible solution for the energetic issues?*

**28 Maggio 16-18: Animal Ecology**

Alessandro Balestrieri

*Perspectives in nutritional ecology*

**16 Aprile 16-18: Linguistics**

Silvia Luraghi, Chiara Zanchi, Ilaria Fiorentini

*New Methods, Newer Questions: The Perspective of Linguistics*

**4 Giugno 16-18: Physics**

Giorgio Baiocco

*Low-dose radiation biology: Where are we now?*

**23 Aprile 16-18: Physics**

Giacomo Livan

*The science of success*

**11 Giugno 16-18: Geology**

Matteo Alvaro

*Shake it out: What triggers Earthquakes?*

**Aule D-E, Cascina Cravino, via Bassi 21**

## HOW IGNORANCE DRIVES OUR KNOWLEDGE

**Andrea Gazzola** (Department of Earth and Environmental Sciences, University of Pavia)

### *Ethology*

*Prey perception of predation risk*

How can prey animals assess predation risk? How can we measure predation risk assessment when no defensive behaviour is evident? Can we measure predation risk perception per se?

**Thomas Abeli** (Department of Science, Roma Tre University)

### *Conservation Biology*

*Knowledge gaps and information inertia hampers the conservation of Extinct in the Wild plants*

How do we know if a plant species is extinct? How do we know if a plant species is extinct-in-the-wild? What are the consequences of out-of-date datasets on plant species conservation? How do we update old data and how updates can help species extinction? Is extinction forever? Are there any chances to recover extinct species?

**Andrea Fontana** (National Institute for Nuclear Physics - Section of Pavia)

### *Physics*

*Analogy and symmetry in Physics: the case of antimatter*

What is antimatter made of? The elementary constituents of antimatter, the positron and the antiproton, were predicted by the theory many years before their experimental observation. Physicists were guided by the analogy with ordinary matter and by the search for a symmetry in the equations and in Nature. Today we can produce and study antihydrogen, the simplest antimatter atom, in the laboratory. What are its properties? Does it fall up or down? And... why is antimatter so elusive? Where has all the antimatter gone after the Big Bang?

**Silvia Luraghi, Chiara Zanchi, Ilaria Fiorentini** (Department of Humanities, University of Pavia)

### *Linguistics*

*New methods, newer questions: The perspective of linguistics*

**Giacomo Livan** (Department of Physics, University of Pavia)

**Physics**

*The science of success*

Who gets to be successful and why? Are our societies as meritocratic as we would like them to be? If not, can we understand what factors drive success other than merit? And – last but not least – why the heck is a physicist talking about such things?

**Chiara Milanese** (Department of Chemistry, University of Pavia)

**Chemistry**

*The Carbon treasure in agrifood waste: A possible solution for the energetic issues?*

How is it possible to give a second “energetic” life to agrifood waste? How is it possible to extract the C treasure in the waste? How can we characterise the obtained materials and optimise their properties towards the second life? How is energy stored in these materials? How is hydrogen captured by C in these materials?

**Stefano Protti** (Department of Chemistry, University of Pavia)

**Chemistry**

*Faster-than-light: the multifaceted application of photoinduced processes.*

Light driven processes have gained considerable attention in recent years, as a promising and versatile strategy for application in synthesis, theragnosis and energy storage

**Ilaria Canobbio** (Department of Biology and Biotechnology, University of Pavia)

**Biochemistry and Cell Biology**

*Alzheimer's Disease: To brain or not to brain?*

The aetiology of Alzheimer's Disease (AD) is still an issue. We don't know whether deposition of amyloid peptides in brain parenchyma and cerebral vessels is the cause or the consequence of AD (or a combination of both), and we don't know the physiological functions of amyloid peptides. Despite being considered a pathology of the brain, new evidence suggests that AD may result from systemic rather than cerebral dysfunctions. Different hypotheses have been postulated to describe AD origin and find new therapies to slow it down, but we are still far from discovering the truth

**Stephen Stearns** (Department of Ecology and Evolutionary Biology, Yale University)

**Evolutionary Biology - Evolutionary Medicine**

*Ignorance at the intersection of life history evolution and evolutionary medicine*

Why are most multicellular eukaryotes not able to remodel their tissues as do coelenterates and thereby extend their lifespan, perhaps indefinitely? What is the diversity and spatial distribution of unknown pathogens capable of causing pandemics, who are their hosts, and why might they emerge? How do complex life cycles evolve and what governs the number and types of stages and the duration of each? How to explain major phylogenetic events and their consequences for the subsequent evolution of life history traits?

**Alessandro Balestrieri** (Department of Environmental Science and Policy, University of Milan)

**Animal Ecology**

*Perspectives in nutritional ecology*

Why do animals eat? And how physiological requirements drive their feeding behaviour? Can we learn anything about the nutritional ecology of free-ranging elusive species?  
What can nutritional ecology tell us about fitness? And about competition and, finally, evolution?

**Giorgio Baiocco** (Department of Physics, University of Pavia)

**Physics**

*Low-dose radiation biology: Where are we now?*

The follow-up of atomic bomb survivors seems to support the hypothesis that the risk of developing a solid cancer due to ionizing-radiation exposure increases linearly with the dose (i.e., a measurement of the amount of radiation the subject is exposed to) above 100 mSv (the lowest exposure level that could be reconstructed). Little is known on what are radiation-induced health effects below this exposure level: does a threshold dose exist, below which no effect can be observed? Might low doses of radiation have a beneficial health effect, instead? What are the possible non-cancer effects in this low-dose region, and how can we try to get solid information, free of the many possible confounding factors?

**Matteo Alvaro** (Department of Earth and Environmental Sciences, University of Pavia)

**Geology**

*Shake it out: What triggers Earthquakes?*