

Book of abstracts of the

Workshop on Foundations of Science



September 3–4, 2018 - Buenos Aires –
Argentina

Title of the book: Book of abstracts of the Workshop on Foundations of Science
Country of edition: Argentina
City of the publishing house: Buenos Aires
Editorial: Universidad de Buenos Aires

Keynote speakers:

Roman Frigg (Director of the Centre for Philosophy of Natural and Social Science of the London School of Economics)

Otavio Bueno (University of Miami, Editor-in-Chief of the journal Synthese)

Speakers:

Cristian Soto (Universidad de Chile)

Miguel Fuentes (Santa Fe Institute – Universidad de San Sebastián)

Hernán Miguel (Universidad de Buenos Aires)

Pablo Acuña (Pontificia Universidad Católica de Valparaíso)

Diego Maltrana (Pontificia Universidad Católica de Valparaíso)

Sebastian Fortin (Universidad de Buenos Aires)

Jesús Alberto Arriaga (UNAM - Universidad de Buenos Aires)

Juan Camilo Martínez González (Universidad de Buenos Aires)

Cristian López (Universidad de Buenos Aires)

Mariana Córdoba (Universidad de Buenos Aires)

Hernán Accorinti (Universidad de Buenos Aires)

Manuel Herrera (Universidad de Buenos Aires)

Bruno Borge (Universidad de Buenos Aires)

Organizers:

Olimpia Lombardi (CONICET, Universidad de Buenos Aires)

Sebastian Fortin (CONICET, Universidad de Buenos Aires)

Gabriel Catren (Université Paris Diderot)

Buenos Aires Workshop on Foundations of Science

September 3, Monday, 10 hs: Opening

10:30 hs – 11 hs	Juan Camilo Martínez González & Mariana Córdoba <i>“Scientific practice and legal advances with regard to gender identity and sex change”</i>	Hernán Accorinti & Sebastian Fortin <i>“Once again, the old problem of structuralism”</i>
11 hs – 11:30 hs	Coffee break	Coffee break
11:30 hs – 12:30 hs	Otavio Bueno <i>“Observation, empiricism, and microscopy”</i>	Roman Frigg <i>“Anatomy and identity: the inner life of a theory”</i>
12:30 hs – 14:30 hs	Lunch	Lunch
14:30 hs – 15 hs	Pablo Acuña <i>“Dynamics and chronogeometric structure in spacetime theories”</i>	Manuel Herrera <i>“A philosophical analysis of conservation laws”</i>
15 hs – 15:30 hs	Cristian Soto <i>“The inferential conception of physical laws”</i>	Cristian López <i>“Is the symmetry-to-reality inference justified? Time symmetry as a study case”</i>
15:30 hs – 16 hs	Coffee break	Coffee break
16 hs – 16:30 hs	Diego Maltrana <i>“Interactions and frames in science: The hitchhiker's guide to the Universe”</i>	Bruno Borge <i>“Symmetries and conservation laws in pure powers ontology”</i>
16:30 hs – 17 hs	Hernán Miguel & Miguel Fuentes <i>“Can probability cause something?”</i>	Jesús Alberto Jaimes Arriaga & Sebastian Fortin <i>“A quantum chemical perspective about the nature of wave function”</i>

September 3: Monday

September 4: Tuesday

Once again, the old problem of structuralism

Hernán Accorinti And Sebastian Fortin

CONICET, University of Buenos Aires (Argentina)

Structural realism has gradually increased its influence in the field of philosophy of science by overcoming the dead end instituted between realists and anti-realists. Appealing to a structural continuity based on the continuity in mathematical equations, structural realism pretend to overcome the fateful discussions raised between the supporters of so-called no miracle argument and the supporters of pessimistic meta-induction argument. Thus, from a structuralist point of view, it could be possible to guarantee cumulative knowledge and to provide a reasonable explanation (not miraculous) of the pragmatic success of outdated theories.

However, the viability of such project hinge on the potentiality of the very notion of structure. In this sense we are going to evaluate the consequences of assuming that theories only describe the relations that are established in the world but not the nature of the entities. So, we will analyze some equations of the theory of relativity and classical mechanics to see whether the structuralist analysis is satisfactory. We conclude that the structural analysis not only is it trivial, as Newman's objection assert, but it leads us, on the one hand, to an absurd by assuming that the theory of relativity and classical mechanics are exactly the same and, on the other hand, it leads us to a contradiction. In order not to fall into such unfruitful ways, we suggest abandoning the purely formal analysis proposed by structuralist, claiming that a semantic analysis is needed to define the structure of a theory.

Chronogeometric Structure and Dynamics in Spacetime Theories: a Helmholtzian lesson

Pablo Acuña

Pontificia Universidad Católica de Valparaíso (Chile)

In his celebrated *Physical Relativity*, Harvey Brown proposes a dynamical-constructive interpretation of special relativity in which the Lorentz invariance of dynamical laws explains that the structure of spacetime is Minkowskian. He defends a reading of Einstein's theory in which paradigmatic effects—such as length-contraction—get explained by how physical objects are made, rather than by the structure of the spacetime that such objects are embedded into. I propose a different account of the connection between chronogeometric structure and dynamics. I refer to the work of Hermann von Helmholtz on the foundations of physical geometry in order to argue that—in spacetime theories in general—dynamics and chronogeometry must be conceived as two sides of a single coin, so that the project of looking for an arrow of explanation between them is misleading. In short, I argue that spacetime without dynamics is empty—in the sense that a chronogeometric structure postulated independently of dynamical principles has no physical meaning—and that dynamics without chronogeometric structure is blind—in the sense that dynamical laws have no physical meaning unless they are conceived on the backdrop of chronogeometric structure.

A quantum chemical perspective about the nature of wave function

Jesús Alberto Jaimes Arriaga And Sebastian Fortin

CONICET, University of Buenos Aires (Argentina)

The wave function is a central element to the quantum theory and its meaning remains a matter of debate. The aim of this work is to offer a new perspective coming from quantum chemistry to address the question about the dimensionality of wave function. During the process a formalization of the independent electron approximation will be proposed, in order to endow the method with a solid foundation. On this basis, new arguments will be put on the table about the nature of wave function and will serve as a starting point for the future development of an ontology of quantum chemistry.

Symmetries and Conservation Laws in Pure Powers Ontology

Bruno Borge

IIF-SADAF-CONICET, University of Buenos Aires (Argentina)

There are three main frameworks to account for the metaphysics of laws of nature: humean supervenience, the governing views, and dispositionalism. According to the first, laws are a specific type of regularities in the humean mosaic: they are the ones described by the axioms (and theorems) of the best systematization of the world that combines (and balances) simplicity and strength. In governing accounts, the laws are metaphysically robust—they govern/produce and (metaphysically) explain the regularities. According to dispositionalism, natural regularities are explained by fundamental, sparse, powerful properties. Dispositional accounts can be realist or anti-realist about laws. One radical family of versions of this approach is the Pure Powers Ontology (PPO); it claims that all natural properties are pure powers. In this talk, I will defend two main theses: (a) PPO is not a proper metaphysical framework to account for the (determining) role of symmetry principles and conservation laws in modern physics; (b) PPO can be modified in various ways to provide such an account. I explore current alternatives and put forward two additional solutions. Finally, I will make some remarks on the directions the debate on powers has taken in the metaphysics of science.

Observation, Empiricism, and Microscopy

Otávio Bueno

University of Miami (USA)

My goal is to develop an empiricist account of visual evidence and the role it plays in scientific representation, focusing, in particular, on imaging in microscopy. As will become clear, in order to do that the concepts of observation and visual evidence will need to be reexamined and three central questions have to be addressed: (a) What is visual evidence? (b) Is there something special about the role that visual evidence plays in the sciences? (c) Under what conditions is a piece of visual evidence reliable? I answer these questions as part of the development of an empiricist account of microscopy.

Scientific practice and legal advances with regard to gender identity and sex change

Juan Camilo Martínez And Mariana Córdoba

CONICET, University of Buenos Aires (Argentina)

The broadening of access to biomedical technologies of sex change can be celebrated as a political achievement. The law of gender identity (Law 26.743) –approved in Argentina in 2012– states the right to get access to medical (hormonal and surgical) treatments. Despite the existence of different positions about these technologies, whenever the role of science regarding gender identity is discussed, it is usually assumed that medical practices –inserted in a tradition that pathologizes trans people– have an important role in disciplining and normalizing bodies. But in these debates, science is approached from an externalist perspective, being the specific role of philosophy of science, consequently, blurred. In this work, the normative role of science concerning gender identity will be discussed, paying attention to medical treatments for sex change and, specially, to the scientific knowledge behind the treatments. Particularly, biochemical outcomes enter the scene as having an emancipative use, but the assumptions regarding the very definition of the sexes they suppose must be discussed.

Anatomy and Identity: the Inner Life of a Theory

Roman Frigg

London School of Economics (UK)

What constitutes a theory and how do the constituents work together? A prominent answer to this question is given in the so-called semantic view of theory, which identifies a theory with a family of models. Taken at face value, this means that a language is not a part of a theory. I show that this leads to insurmountable problems. The conclusion is that a language must be seen as an essential component of a scientific theory. I present an anatomy of theories that incorporates languages and show how it avoids the problems that the syntactic view of theory (allegedly) faces.

Can probability cause something?

Hernán Miguel And Miguel Fuentes

Santa Fe Institute – Universidad de San Sebastián, University of Buenos Aires
(Argentina)

In this presentation I will discuss the concept of weak emergency in relation to complexity measures. We will use several results and properties from information theory, closely related to the random characteristics of the studied entity and its regularities. Then, we will discuss the scope of this approach to study theoretical change, for which we will use a relevant historical example.

A philosophical analysis of conservation laws

Manuel Herrera

CONICET, University of Buenos Aires (Argentina)

Undoubtedly, conservation laws have played a central role in the explanations of physical phenomena. For this reason, the problems associated with this type of law have been the subject of numerous investigations in the philosophy of physics. In this talk, I will perform a critical analysis of conservation laws, addressing problems such as their definition and the place that they would occupy with respect to other types of laws in physics.

Untying time reversal from the arrow of time in physics

Cristian López

CONICET, University of Buenos Aires (Argentina)

It is a widely-held view that the problem of the arrow of time in physics necessarily depends on the notion of time-reversal invariance: if fundamental physical laws fail to be time-reversal invariant, then there are grounds for a fundamental, objective physical arrow of time. Furthermore, there is also a common idea that the overwhelmingly majority of fundamental physical laws are in fact time-reversal invariant, being so blind to any privileged direction of time. These two closely-related claims heavily relies on three assumptions: (a) that the property of being time-reversal invariant is quite relevant to the problem of the arrow of time in physics (being a sufficient and necessary condition for argument against or for an arrow of time); (b) that only fundamental physical laws are relevant for the discussion; (c) and that the very notion of time reversal is an univocal and fully-shared one. In this presentation, I shall argue that these assumptions conflict each other: firstly, though frequently unnoticed, philosophers and physicists disagree upon how time reversal should be formally characterized, leading to quite different conclusions on the direction of time discussion. Secondly, physicists typically take symmetries as principles guiding theory construction, demanding that physical theories must a priori satisfy time-reversal invariance, which would be equivalent to discard any arrow of time from the very outset if (b) is assumed. Finally, such three assumptions might run the risk of circularity and triviality when the problem of the arrow of time is at stake.

Interactions and frames in science: The hitchhiker's guide to the Universe

Diego Maltrana

Pontificia Universidad Católica de Chile (Chile)

Since Einstein employed the distinction between principles and constructive theories for the explanation of Special Relativity to the laymen (Times, 1919) , the virtues of such distinction has been highlighted in explanatory (Flores, 1999, Van Camp, 2011) , ontological (Romero-Maltrana, 2018) and epistemic terms (Soto C., forthcoming). In this presentation, such distinction will prove itself useful in solving the challenge to realism posed by multiple interpretations of whole--or parcels of--theories. Quantum Mechanics will be used as paradigmatic example to this end, to conclude arguing that the distinction rises as a powerful guide not only in the interpretation of scientific theories, but also towards their explanatory content, their epistemic scope and their ontology.

The inferential conception of physical laws

Cristian Soto

Universidad de Chile (Chile)

This article elaborates the inferential account of physical laws. Addressing issues concerning the application of mathematics to science, we argue that the inferential account provides understanding of the application of mathematical structures to physical structures in the case of physical laws. The inferential account encompasses three stages, namely: (i) the immersion of physical quantities of relevant phenomena into the variables of equations (or other mathematical structures) expressing law statements; (ii) drawing inferences allowed by mathematical structures –where such inferences amount to the representational and explanatory power of law statements–; and (iii) providing a suitable physical interpretation of the extant mathematical structure. We demonstrate that the inferential account provides the tools to tackle various concerns related to laws. Among them, we pay attention to the distinction between mathematical and physical structures; the role of non-referring mathematical variables occurring in physical laws; and the fact that even though there is more mathematical structure than physical structures in laws, it is the world that ultimately dictates the physical scope of nomic statements.