Preliminary Programme
WORKSHOP ON PHILOSOPHY OF SCIENCE: IN HONOUR OF ROBERTO TORRETTI
9-10 November 2023
(WPS 2023 Santiago – Chile)

Venue:
To be determined

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Thursday, 9 November 2023	
11.00 – 11.10	**Welcome: celebrating Roberto Torretti** **CRISTIÁN SOTO** (Universidad de Chile, Chile / British Academy, LSE, UK)
11.10 – 12.10	**KEYNOTE SPEAKER** **OLIMPIA LOMBARDI** (CONICET / Universidad de Buenos Aires, Argentina) ***A Kantian-Rooted Pluralist Realism for Science***
12.10 – 12.30	Coffee
12.30 – 13.30	**KEYNOTE SPEAKER** **AREZOO ISLAMI** (San Francisco State University, U.S.A.) ***Wigner's Problem: Unravelling the "Mystery" of Applicability***
13.30 – 15.30	Lunch
15.30 – 16.15	**JUAN REDMOND & RODRIGO LÓPEZ-ORELLANA** (Both from Universidad de Valparaíso, Chile) ***Modeling in science and surrogative reasoning: An interactive and dynamic perspective on hypothesis generation in scientific modeling***
16.15 – 17.00	**GUADALUPE METTINI** (Universidad de Buenos Aires / CONICET, Argentina) ***Values in Scientific Modelling***
17.00 – 17.20	Coffee
17.20 – 18.20	**KEYNOTE SPEAKER** **OTÁVIO BUENO** (University of Miami, U.S.A.) ***Necessity and Contingency: Quantum Mechanics and Empiricist Modalism***

Friday, 10 November 2023	
10.00 – 11.00	**KEYNOTE SPEAKER** **ANJAN CHAKRAVARTTY** (University of Miami, U.S.A) ***Recent Challenges to Stance Voluntarism in Connection with Scientific Knowledge***
11.00 – 11.45	**BRUNO BORGE** (CONICET / Universidad de Buenos Aires, Argentina) ***Integrating Realism and Pragmatism in Scientific Ontology***
11.45 – 12.00	Coffee
12.00 – 12.45	**PABLO ACUÑA** (Pontificia Universidad Católica de Chile, Chile) ***Scientific Understanding in Astronomical Models from Eudoxus to Kepler***
12.45 – 13.30	**ALDO FILOMENO** (Pontificia Universidad Católica de Valparaíso, Chile) ***Statistical Explanations of Macroscopic Regularities as an Account of Fundamental Laws***
13.30 – 15.30	Lunch
15.30 – 16.15	**JOAQUIM GIANNOTTI** (FONDECYT Researcher, Universidad de Chile, Chile) ***Powers, Best Systems, and Laws***
16.15 – 17.00	**CARLOS ROMERO** (Pontificia Universidad Católica de Valparaíso, Chile) ***Chaos, Modality and Constraint***
17.00 – 17.20	Coffee
17.20 – 18.30	**ROUND TABLE:** **PHYSICAL LAWS AND THE EFFECTIVENESS OF** MATHEMATICS **OTÁVIO BUENO** (University of Miami, U.S.A.) **AREZOO ISLAMI** (San Francisco State University, U.S.A.) **CRISTIÁN SOTO** (Universidad de Chile, Chile / British Academy, LSE, UK)

ABSTRACTS

PABLO ACUÑA
(PUC de Chile, Chile)

Scientific Understanding in Astronomical Models from Eudoxus to Kepler

After being dismissed by logical positivists, the concept of scientific understanding has been recently vindicated by Henk de Regt's influential work. In a nutshell, scientific understanding relates to scientists' ability to use a theory, in the sense of being able to build models of target phenomena from that theory. In turn, this ability depends on the theory complying with certain standards of intelligibility that make it usable for scientists. A central feature of de Regt's stance on understanding is its pragmatic nature. Standards of intelligibility vary both synchronically and diachronically, and essentially connect to pragmatic factors. In this talk, I approach the fascinating history of the development of astronomical models from Eudoxus to Kepler as a case study that vindicates de Regt's proposal. I will show how standards of intelligibility, that vary both synchronically and diachronically, essentially determine the development and characteristics of astronomical models. I will examine what are the factors that determine the variations in those standards, and how in turn such factors relate to pragmatic issues concerning metaphysical values that come and go along the history of ancient and early modern astronomy.

BRUNO BORGE
(Universidad de Buenos Aires / CONICET)

Integrating Realism and Pragmatism in Scientific Ontology

In recent years, novel approaches to scientific ontology have sought to merge key insights from both realist and pragmatist philosophical traditions. Two primary strategies have emerged in this endeavor. Firstly, some scholars have proposed the development of varieties of pragmatist scientific realism. Secondly, others have worked on establishing criteria to differentiate scientific assertions that should be subject to realist commitments from those that should be approached with a pragmatic attitude. Chang (2022) and Chakravartty (2017), for instance, exemplify these respective strategies. In this presentation, I undertake a critical examination of these approaches for integrating realist and pragmatist perspectives within scientific ontology. Building upon this analysis, I offer some general insights and criteria for effectively integrating realism and pragmatism in the realm of scientific ontology.

OTÁVIO BUENO, keynote speaker
(University of Miami, U.S.A.)

Necessity and Contingency: Quantum Mechanics and Empiricist Modalism

Modality plays a significant role in quantum mechanics. It is invoked in the impossibility of certain quantum configurations, the necessity of certain radioactive decays, or the probability (a modality with degrees) of certain experimental outcomes. What is the source of such modality? (See Hale [2012], pp. 116-164, for the corresponding issue in the context of logic and metaphysics.) Should the necessities involved in quantum mechanics be explained by other necessities or can they be explained by contingencies? Necessity-first approaches take the necessary as basic and use it to explain the contingent (Wilson [2020], p. 14). Contingency-first approaches do the reverse. In this paper, I critically engage with the recent response to this issue articulated by quantum modal realism (Wilson [2020], pp. 22-171). I then offer an empiricist modalist alternative that insists that the source of modality is found in the relevant properties of the objects under consideration, while resisting essentialism and the necessity-first approach.

ANJAN CHAKRAVARTTY, keynote speaker
(University of Miami, U.S.A.)
Recent Challenges to Stance Voluntarism in Connection with Scientific Knowledge
Epistemic stances are collections of attitudes, values, aims, and policies relevant to assessing evidence, eventuating in belief or agnosticism regarding the output of scientific investigations. If in some cases conflicting stances promoting scientific realism and antirealism, respectively, are both rationally permissible, this would seem to undermine the possibility of resolving certain debates between realists and antirealists. In this talk I reply to two recent concerns about this conception of stances, to the effect that: (1) scientific realism is, in fact, rationally obligatory for realists, given certain natural epistemological assumptions; and (2) this sort of permissivism would validate pseudoscience and science denialism.

ALDO FILOMENO
(PUC de Valparaíso, Chile)
Statistical Explanations of Macroscopic Regularities as an Account of Fundamental Laws
In this talk I consider a number of results in renormalization-group theory which account for stationary motion or for the universality of critical phenomena in effective (field) theories. I argue that these results, well-studied by physicists and recently philosophers, provide one explanation that is missing in the philosophical literature on laws of nature: a statistical explanation of stable, regular, behaviour in a physical system. This project mutually complements a similar project recently carried out by Filomeno (2019), and is in tune with the idea of understanding fundamental laws as constraints, as it has been recently argued by (Filomeno, 2021; Adlam, 2022; Chen and Goldstein, 2022).

JOAQUIM GIANNOTTI
(FONDECYT Researcher / Universidad de Chile, Chile)
Powers, Best Systems, and Laws
Some metaphysicians have argued for meshing the ontology of powerful properties with a conception of laws of nature as elite explanatory regularities (Katzav 2005, Demarest 2017, Kimpton-Nye 2017, 2021, 2023; Williams 2019). The resulting 'Powers Best System Accounts' (Powers BSAs) aspire to carve a promising middle ground between anti-Humeanism and Humeanism. They combine the theory that the natural properties bear non-trivial necessary connections with the idea that laws are just true generalizations that best balance, among other negotiable desiderata, strength and simplicity. However, Toby Friend (2023) has recently argued that this mix is unstable: Powers BSAs are unworkable and undermotivated. I aim to defend Powers BSAs by arguing for a distinction between the metaphysical grounds and the explanatory source of laws of nature. On the resulting view, the obtaining of laws is fully grounded in facts about powers and their modal connections to other properties, but their explanatory character is only partially grounded in such facts. The full grounds of the laws' explanatoriness contain some features that aren't plausibly grounded in powers. Thusly construed, Powers BSAs are distinct from both Humean and powers regularity views.

AREZOO ISLAMI, keynote speaker
(San Francisco State University, U.S.A.)
Wigner's Problem: Unravelling the "Mystery" of Applicability
The *Applicability Problem* is the problem of explaining *why* mathematics is applicable to the empirical sciences. This problem is revived and reformulated by the physicist Eugene Wigner under the striking title "The Unreasonable Effectiveness of Mathematics in the Natural Sciences". In this seminal work, Wigner argued that the applicability of mathematics is a

miracle, “a wonderful gift which we neither understand nor deserve”. The reactions to this problem range from metaphysical claims about the mathematical structure of our universe to epistemic claims about the structure of our cognition and formalist claims about the nature of mathematics as a game.

In my view, to find an explanation for this relationship, we first need to understand the explanandum itself. More fundamental than the why-question (why is mathematics applicable in the natural sciences) is the *how-question* (how is mathematics applicable in the natural sciences). By studying how mathematics is used in different eras and areas of natural sciences we begin to understand the relationship between mathematics and other sciences, and more importantly address questions such as *what mathematics is*, as used and practiced. By distinguishing pseudo-problems from the genuine problems of applicability, we open new paths in our philosophical reflections about mathematics and the sciences.

OLIMPIA LOMBARDI, keynote speaker
(CONICET / Universidad de Buenos Aires, Argentina)

A Kantian-Rooted Pluralist Realism for Science

In this presentation, I will delineate a Kantian-rooted realism according to which the worlds of science are always the result of a synthesis between the conceptual schemes embodied in scientific theories and practices and the independent noumenal reality. However, my position takes distance from the Kantian doctrine by admitting the possibility of different conceptual schemes, both diachronically and synchronically. This view not only leaves room for abrupt and discontinuous changes in the history of science, but also leads to an ontological pluralism that allows for the coexistence of irreducible and different, even incompatible ontological domains at the same historical time.

GUADALUPE METTINI
(CONICET / Universidad de Buenos Aires, Argentina)

Values in Scientific Modelling

An important part of the philosophical literature on models has been concerned with explanations of how they are used to obtain information about the world. In this talk, however, we focus on the process of building scientific models: We are interested in the criteria for modelling, in particular those used to select the aspects of the target to be represented, and the choice of data to be used to construct the model. A plausible reading of the modelling process interprets representational decisions as dependent on value judgments. The introduction of idealisations, distortions, abstractions and approximations is fundamental to these tools in terms of the applicability of the model, the tractability of the problem on which it is built, or the explanatory capacity of the model. The introduction of deliberate distortions is linked to the purposes for which the model is constructed and involves a trade-off between the costs and benefits of, for example, simplifying some aspects of the phenomenon in the representation. However, this perspective seems to conflict with the idea that it is possible to draw approximate true conclusions about phenomena from models. Moreover, the introduction of false assumptions seems to contradict the goal of science to provide true descriptions of the world. We will argue that epistemic and non-epistemic values underlie decisions about which aspects of the phenomenon to represent and the idealisations used in the representation. The deliberate introduction of biases in modelling is guided by the same values that lead other instances of scientific inquiry, such as the choice of theories. By making these values explicit, the criteria used in modelling become transparent and their relationship to the pursuit of truth as a property of science becomes understandable. This view is proposed as a contribution to advancing the discussion of values in scientific knowledge and linking it to philosophical work on scientific models.

JUAN REDMOND & RODRIGO LÓPEZ-ORELLANA
(Universidad de Valparaíso, Chile)

Modeling in science and surrogative reasoning: An interactive and dynamic perspective on hypothesis generation in scientific modeling

It is widely agreed among philosophers of science that scientific models allow for surrogative reasoning concerning their target systems (Frigg & Nguyen 2020). The aim of our talk is to defend the idea that surrogative reasoning in modeling practice corresponds to the setting of an inferential agreement between the model and its target system. Indeed, according to Swoyer (1991: 449), surrogative reasoning is understood as the generation of hypotheses from the model and about its target system. Our point is that these hypotheses are not conclusions statically obtained in the model and then transposed or assumed in the target system but are themselves the inferential and dynamic agreement established between the model and the target system as actors in an interactive game. Our proposal must be considered as feedback to Contessa's statement about surrogative reasoning: "an activity as mysterious and unfathomable as soothsaying or divination" (2007: 61). In this quotation Contessa refers to the 'obscure' relationship between epistemic representation and valid surrogative reasoning. However, in the present contribution we distance ourselves from the notion of representation and fill this gap pointed out by Contessa with a proposal that relates surrogative reasoning to a logical foundation. In summary, the perspective we defend, on the one hand, opposes the idea that surrogative reasoning should be understood as a type of representation-based thinking; on the other hand, we argue that surrogative reasoning should find its foundations exclusively in logic. To support the latter idea, we give the logical foundations of surrogative reasoning from the approach of dialogical pragmatism which we consider a suitable framework for this purpose. Indeed, Dialogic with its playful and dynamic semantics, allows us to capture interactive relationships and in particular, according to our proposal, the generation of hypotheses as an agreement established between the model and its target system.

CARLOS ROMERO
(PUC de Valparaíso, Chile)

Chaos, Modality and Constraint

I argue that the notion of *chaotic dynamics* requires modality to be defined, and I extend this argument to the case of quantum chaos. This, I argue, puts pressure on different views about the ontology of quantum theory ---particularly on those that reject modal objectivism. On these grounds, I develop objections against van Fraassen's empiricism, Sider's Humean neo-conventionalism, and the Albert-Ney theory of configuration space fundamentalism known as ‘wave function realism’.