Università degli Studi di Napoli
Federico II
dipartimento di studi umanistici

Hybrid Conference
(in-person & online)

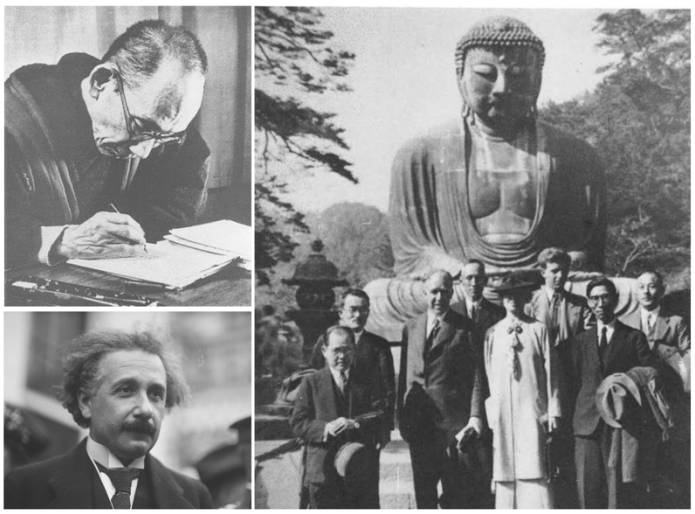
Philosophy and Physics between Europe and Japan

(1922-1953)

Aula ex-cataloghi lignei
Via Porta di Massa 1
2–4 October 2023

Fondazione Italia Giappone
伊日財団

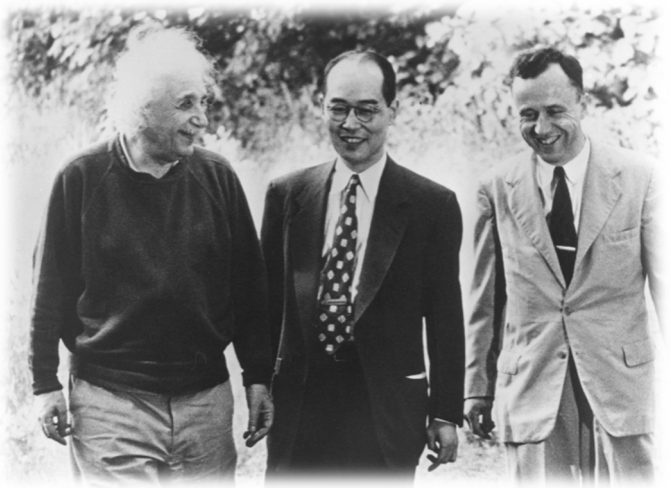
Conference Theme



The main goal of this conference is to reconstruct how Japanese intellectuals and scientists react to the foundational questions emerging from relativity theory and quantum mechanics. Through an interdisciplinary investigation leading to the identification of original contributions and fruitful contaminations, an attempt will be made to highlight, on the one hand, the scientific sensitivity of some philosophers of the so-called Kyoto School, on the other hand, the role played by philosophical reflection in the conceptual development of some Japanese physicists. What we hope for is to acquire new reading-keys to critically reexamine our understanding of philosophy and physics from a cross-cultural perspective.

The time frame is bounded by two particularly significant dates: in 1922, Albert Einstein is invited to Japan, in 1953, the Japanese Association for the Philosophy of Science is founded, and the Research Institute for Fundamental Physics is opened at Kyoto University. Einstein's visit is initiated by the philosopher Nishida Kitarō (founder of the Kyoto School) who, elaborating on the physical concept of field and mathematical topology, in 1926 comes to define the idea of *place* [*basho*], the core of his logical-philosophical system. The birth of the Association for the Philosophy of Science is initiated by the meeting between the philosopher Shimomura Toratarō, a student of Nishida Kitarō and Tanabe Hajime, and a group of mathematicians and physicists (including M. Sugawara, K. Nakamura, S. Tomonaga, Y. Fujioka) at Tokyo University; the creation of the Institute for Research in Physics is due to Hideki Yukawa.

In the years 1922-24, the philosopher Tanabe is in Germany for a period of study under the supervision of Martin Heidegger. In 1928, the physicist Yoshio Nishina, trained in Europe mainly under Niels Bohr at the University of Copenhagen, returns to Japan and starts a research center in quantum physics at RIKEN, the Institute for Physical and Chemical Research, in Tokyo. In the fall of 1929, Werner Heisenberg and Paul Dirac visit Japan and give a series of lectures on the uncertainty principle and the relativistic theory of electron, respectively; the lectures have a profound impact on the young physicists Hideki Yukawa and Shin'ichirō Tomonaga. In 1935, Yukawa advances the hypothesis of the existence of a new particle, the meson, which will later be discovered in cosmic rays (in 1947). In 1937, Niels Bohr visits Japan and the idea of "complementarity" further penetrates the epistemological debate. Finally, in 1949, the first Japanese Nobel Prize is awarded to the physicist Hideki Yukawa.



Looking ahead, 1953 is also a significant year because John A. Wheeler pays his first visit to Japan and initiates a dialogue with some Japanese physicists, in particular Yukawa, based on their respective personal readings of Einstein's ideas.

Programme

Monday, October 2

10:30 *Welcome from the vice Director of the Department of Humanities & from the Head of the Division of Philosophy*

Opening - *Rossella Lupacchini*

In the Shadow of Spacetime: Fields of Awareness and Empty Domains

11:00 Raquel Bouso (University Pompeu Fabra, Barcelona)

On the Sources of Creativity: apropos of Nishida on Einstein in Japan

coffee break

12:00 Luigi Laino (Department of Humanities, University Federico II)

From Einstein, Heisenberg, and Cassirer to Nishida and the Kyoto School
Physical and Philosophical Ideas in Japan

12:45 Enrico Fongaro (Nanzan University, Nagoya)

Zen and Scientific Thought in Kitarō Nishida's Philosophy

lunch

15:00 Simona Venezia (Department of Humanities, University Federico II)

A Topology of Nothing. From the Nothingness to the Place in Heidegger and Nishida

15:45 Felice Masi (Department of Humanities, University Federico II)

A Neo-Kantian Agitprop in Japan: Lask and the Kyoto School

coffee break

16:45 Dean Anthony Brink (National Chiao Tung University, Taiwan)

Nishida, Tanabe, and Tosaka's Approaches to Modern Physics
Epistemological Premises and Questions of Nothingness

17:30 Augustin Jacinto Zavala (El Colegio de Michoacán, México)

Shimomura Toratarō and Quantum Theory

Tuesday, October 3

10:15 Jacynthe Tremblay (Nanzan University, Nagoya, Japan)

The Subject/Object Complementarity in the Schematic Explanations of Nishida

11:00 Kenji Ito (Kyoto University, Japan)

Nishida Kitarō, Quantum Physics, and Objectivity

coffee break

12:00 Yasuo Deguchi (Kyoto University, Japan)

The Inconsistency of Physical Reality: Late Nishida on Quantum Mechanics

12:45 Fedele Lizzi (Department of Physics, University Federico II)

Quantum Space-time

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15:00 GIUSEPPE MARMO (Istituto Nazionale Fisica Nucleare - INFN)
Wave Geometry: An Operator Approach to Space-Time-Matter Manifold

15:45 M. DI MAURO (Dept. Physics, Univ. Trento), S. ESPOSITO (Univ. Federico II), A. NADDEO (INFN)
Exchange Interactions between Europe and Japan in the 1930s
Tomonaga, Yukawa, and the Birth of Nuclear Theory

coffee break

16:45 ROCCO GAUDENZI (Max Planck Institute for the History of Science, Berlin)
The Craftsman and the Designer towards a Theory of Elementary Particles
Cultural Influences, Divergences, and Encounters of the two Souls of Japanese Physics

17:30 ROUNDTABLE

WEDNESDAY, OCTOBER 4

10:15 FRÉDÉRIC BERLAND (University of Paris 8, Vincennes-Saint-Denis)
Yukawa's Elementary Domains & Nishida's Logic of Place

11:00 ENRICO MARESCA (Department of Civilizations and Forms of Knowledge, University of Pisa)
From Spacetime to Fields and back: Elementary Domains as super-Substantivalism

coffee break

12:00 STEFANO FURLAN (Max Planck Institute for the History of Science, Berlin)
Regards croisés: Hideki Yukawa and John Wheeler at the "wayside inn of the ten thousand things"

12:45 DISCUSSION

Abstracts

Frédéric BERLAND

Yukawa's Elementary Domains & Nishida's Logic of Place

The revolution implied by Yukawa's discovery of the meson in 1935 was part of a lively epistemological debate in Japan. At the beginning of the 20th century, a radical materialist tendency represented by Taketani's "stereo-structural logic" and a "logic of mediation" supported by Tanabe within what he called an "existentialist physics" clashed. If it seems at first sight natural to bring Yukawa's non-local field theory closer to Taketani's three-state epistemology, insofar as the two physicists co-authored some of the articles of the series crowned in 1949 by a Nobel Prize, the dialectic implied by the notion of "elementary domain" seems to us irreducible to the dialectic of nature supported by Taketani. Opposed also to Tomonaga's "super-multi-temporal theory" which inspired Tanabe's epistemology of acting conversion, it is from the logic of Nishida's place and his idea of acting intuition that we shall try to understand the theoretical synthesis that Yukawa undertakes to elaborate. Non-locality takes on a new meaning, where vacuum is distinguished from Epicurean emptiness in order to be understood as *Śūnyatā*, *i.e.*, as a "superessential vacuity" or an "undifferentiated continuum" whose meaning and scope in physics can be clarified by Nishida's "dialectic of nothingness".

Raquel BOUSO

On the Sources of Creativity: apropos of Nishida on Einstein in Japan

As is known, from November 17 to December 29, 1922, Albert Einstein visited Japan. Ze'ev Rosencrantz's carefully edited travel journals (Princeton and Oxford, 2018) provide detailed information about that stay that complements what we glean from his journal entries and correspondence. From this edition and from Jun Ishiwara's Notes from Einstein's Lecture at Kyoto University (*Kaizō*, 1923) we know that the philosopher Nishida Kitarō was asked to suggest the subject of Einstein's lecture at Kyoto University, titled "How did I create the theory of relativity?". My paper starts from the question of why Nishida suggested that topic to Einstein instead of the theoretical aspects of relativity, or clarifications on field or space-time notions in which he was very interested. On the one hand, I will investigate what Nishida wrote about Einstein in his diaries and what he says in his work about the common source of creativity in science, mathematics, or art. On the other hand, I will examine Einstein's lecture in Kyoto, his reflections on the genesis of the theory of special relativity given a year earlier before an audience of professors in Chicago, and Einstein's recollections that served as the basis for *Productive Thinking* (1945) by Max Wertheimer. In doing so, I hope to shed light on the understanding and role of creativity in Nishida's philosophy.

Dean Anthony BRINK

Nishida, Tanabe, and Tosaka's Approaches to Modern Physics

Epistemological Premises and Questions of Nothingness

This paper argues that although the importance of modern physics in the philosophical development of Nishida Kitarō, Tanabe Hajime, and Tosaka Jun all are foundational to each philosopher's approach, each draws on diverse and, in many ways, mutually incompatible epistemological premises to bring coherency to their respective projects. Nishida's approach depends often on continuity between his *basho* and physical field theories, while Tanabe depends on leading physicists such as Paul Dirac to engage in contemporary questions of quantum mechanics closer to developments in experimental and theoretical physics, and in ways far exceeding the scopes of Nishida and Tosaka. Tosaka, for his part, is the more vociferous and simpleminded in attacking Nishida, strategies that undercut his own work by merely following the Communist Party line and refusing to take the world-destabilizing modern physics as more than more obfuscating ploys of a devious bourgeoisie. This paper will focus on questions of nothingness in their writings, hoping to generate a better understanding of the relationship between philosophical framings and modern physics, which remains understudied.

Yasuo DEGUCHI

The Inconsistency of Physical Reality: Late Nishida on Quantum Mechanics

In the final stage of his philosophical career, Nishida attempted to incorporate the results of Heisenberg's quantum mechanics, the latest physical theory of the time, into his own philosophical system. This presentation aims to clarify what kind of philosophical thesis Nishida derived from quantum mechanics and what kind of impact this thesis had on his philosophical system.
Nishida's ontology of that period established three categories of reality in general: "world", "self", and "physical reality". Before taking quantum mechanics into consideration, Nishida regarded "world" and "self" among these categories as "contradictory", while he did not recognize any contradiction in "physical reality". However, by taking quantum mechanics into account, Nishida came to regard "physical reality" as "containing contradictions".
Leaving aside the validity of Nishida's interpretation of quantum mechanics, this presentation will examine how his philosophy has been transformed, deepened, or degraded by such an interpretation.

Marco DI MAURO, Salvatore ESPOSITO, Adele NADDEO

Exchange Interactions between Europe and Japan in the 1930s

Tomonaga, Yukawa, and the Birth of Nuclear Theory

The idea of *exchange interactions* dates to the second half of 1920s and is deeply related to the quantum mechanical description of a system of identical particles. It underlies the successful explanation of a variety of phenomena such as multi-electron atomic spectra, homopolar bonds in quantum chemistry, ferromagnetism, and electron-electron collisions, although the interpretation of the exchange mechanism is different in each case. The discovery of the neutron by Chadwick in 1932 brought the application of the concept of exchange forces also into the domain of nuclear physics and, finally, of quantum field theory, paving the way to the understanding of fundamental forces as mediated by virtual particle exchange. The Heisenberg theory of nuclear structure, based on an exchange mechanism responsible for the interaction between protons and neutrons, Majorana's further formulation of nuclear exchange forces and Fermi's theory of β-decay are the first fruitful applications of the novel concept applied to the realm of nuclear physics, but none of them could successfully explain the whole complexity of the nuclear binding force. These works strongly affected H. Yukawa as well as S. Tomonaga, who already had been exposed to the principles of the new quantum mechanics, by taking part to a cycle of lectures given by Heisenberg and Dirac in Japan in 1929 and promoted by Y. Nishina. It took a couple of years until Yukawa conceived his crucial idea of a mediating virtual meson, while Tomonaga was working on the range of proton-neutron interactions in Nishina's laboratory. In this contribution, the role played by Japanese physicists in building the modern understanding of fundamental forces in the 1930s is carefully analysed and related to previous key results. A clear picture emerges also of the influence of European scientists in shaping the development of quantum concepts in Japan.

Enrico FONGARO

Zen and Scientific Thought in Kitarō Nishida's Philosophy

Stefano FURLAN

Regards croisés Hideki Yukawa and John Wheeler at the "wayside inn of the ten thousand things"

A relatively famous picture, taken in Princeton in 1954, portrays three illustrious physicists enjoying a walk and a friendly conversation: Albert Einstein, Hideki Yukawa, John Wheeler. What do the three of them have in common, besides being "colleagues"? Not much, if one looks at the typically result-oriented historiography of physics. On the contrary, this paper intends to show that, in the period between the end of the 1940s and the early 1950s, partly in reaction to the proliferation of the "particle zoo" as well as to the formulation of quantum electrodynamics, both Yukawa and Wheeler, in order to develop radically new

approaches to physics, looked in a creative way at the example of Einstein's general relativity, which they regarded as his supreme lesson. This was not a conventional move, at all: Einstein's most celebrated theory was back then isolated from the frontiers of physics research and had mainly become, to echo Kenneth Ford, a "playground for mathematicians". It is therefore insightful to take a look at Yukawa's attitude towards it, and see how it would inspire his ambitious and philosophically intriguing attempts at reconceptualizing physics during the last decades of his life. This would also become intertwined with an idealized image of ancient Greek thought, as seen from Japan, as well as with the hope that future physics could draw upon Yukawa's beloved classics of Chinese and Japanese thought. Somehow correspondingly, Wheeler's first trip to Japan, in 1953, did not just mark the beginning of his dissemination of general relativity in those lands: in order to expose his daring ideas about the current status of physics, he even resorted to a dialogue between Japanese historical figures and thought of calling the new outlook of physics he was trying to develop "Tokyo program". As much as both Yukawa and Wheeler were coming from years of struggle with subnuclear physics, they unexpectedly turned to general relativity as a heuristic and inspirational resource, and this alone would deserve attention; but I also suggest that, by looking at their respective relation with Einstein's ideas and style, it is possible to discern, already in the early 1950s, some suggestive resonances that would shape the (as yet unexplored) dialogue between Wheeler and Yukawa in the following years as well.

Rocco GAUDENZI

The Craftsman and the Designer towards a Theory of Elementary Particles

Cultural Influences, Divergences, and Encounters of the two Souls of Japanese Physics

On their way towards a theory of elementary particles, Tomonaga Sin-Itiro—skilful and pragmatic craftsman of mathematical methods and "non-reactionary conservative", as Shoichi Sakata affectionately defined him—and his friend and fellow student Yukawa Hideki—bold "designer", speculative and revolutionary—found themselves in a fruitful dialectical opposition. In this process, they shaped, enriched, and complemented each other's view, ultimately coming to resonant conclusions. In this talk, I will sketch these two adventures of thought by framing the respective research programs and illustrating how, in their own ways, they drew from Japanese traditional thought.

Kenji ITO

Nishida Kitaro, Quantum Physics, and Objectivity

This paper explores the significance of quantum mechanics in Nishida Kitaro's philosophical thinking. In a previous study, I examined various reactions from Japanese intellectuals to the fundamental issues of quantum mechanics up until the early 1940s. In this paper, a more detailed analysis will be conducted of Nishida's reactions to quantum mechanics, with a particular focus on his 1943 article, "On the Objectivity of Knowledge (知識の客観性について)." Nishida's responses to quantum mechanics in this article and in other writings, such as lectures and letters, will be evaluated to determine the significance of quantum mechanics in the evolution of his ideas. Specifically, Nishida's discourse on objectivity will be analyzed and contextualized within his broader body of work, as well as the sources he presumably utilized for philosophical matters related to quantum mechanics, including the writings of Tanabe Hajime, Percy W. Bridgman, Werner Heisenberg, Niels Bohr, and Yukawa Hideki.

Augustin JACINTO ZAVALA

Shimomura Toratarō and Quantum Theory

Taking as a starting point Shimomura Toratarō's *Shizen tetsugaku* (*Philosophy of nature*, 1939), what I would like to present, more than a reflection and interpretation, is a series of quotations that allow us to see those places in which Shimomura explains that "the old physics [...] is an atomic theory that has a viewpoint of discontinuity. However, it has not been carried to extreme. On the contrary, relativistic physics, as a physics of *ba*, has the viewpoint of a theory of continuity. And against these two points of view, at present quantum

physics in some sense has the character of the union of the two".* And on the basis of this discussion Shimomura reaches a surprising viewpoint: the concept of quantum needs revision.
In order to understand the import of Shimomura's views concerning the needed revision of the concept of 'quantum', in this paper I would like to touch on the following points: I. The Atomistic model; II. Wave mechanics; and III. Quantum mechanics. After this I will present some aspects, such as the concept of the nature of the three physics and the relationship among them, as can be seen in Shimomura's text.
The above-mentioned *requirement of a fundamental revision of the concept of quantum* is a remarkable result of Shimomura's considerations. As a possible first response to this fundamental requirement, Shimomura points out that quantum theory needs to revise its position in regard to three main themes: 1) operation as a point of subject-object interaction; 2) the theory of the infinite; and 3) the mathematical formation of the infinite. From his considerations concerning these three aspects, Shimomura develops his own view of the 'place' or *basho* of Nothingness, at a time in which Nishida's disciples, all and each one of them, were postulating their own version of Nishida's *basho*.
[* *Shimomura Toratarô chosaku-shû*. Vol. I.Tokyo: Misuzu shobô, 1988, p. 88.]

Luigi LAINO

From Einstein, Heisenberg, and Cassirer to Nishida and the Kyoto School

Physical and Philosophical Ideas in Japan

In my talk I will focus on the spread of relativity and quantum mechanics in 1920s Japan. Therefore, on the one hand, I will deal with Einstein's famous trip and talk in 1922, which I will address starting from the analysis of his diaries. On the other hand, I will tackle Dirac and Heisenberg's visit in 1929, which was influential for Japanese physicists such as Yukawa.
After recasting these issues in the history of epistemology and physics, I will address the philosophical impact of relativity and quantum physics on the Kyoto School. My aim is at comparing and contrasting the Western with the Oriental perspective on the issue of symbolization in physics; that is, I will ask in which sense physical theory symbolically represents relations between natural phenomena. In particular, I will dwell upon the definition of the background starting from which symbolization is achieved by reading in synopsis Nishida's concept of "*mu*" (nothing) and shedding light on the 'place', viz. a structuralist rearrangement of Neo-Kantianism, from which Cassirer's symbolization is accomplished. This will allow us to finally assess the kind of relationship that Oriental and Western philosophies have with scientific ideas.

Fedele LIZZI

Quantum Space-time

Quantum mechanics and relativity changed our perception of dynamics, and forced upon us a global rethinking of the nature of things. This momentous change of paradigm still reverberates on physics and philosophy. Quantum gravity is a theory we do yet have, but there is a suggestion that it might change our view of spacetime, which should become a quantum object itself. One of the main tenets of it is the absence of points as entities, giving a 'pointless space'. Points are nevertheless necessary as elements of the discourse, even if they are negated in it. Surprisingly, especially if one translates the Japanese word '*basho*' as 'place' in the geographical/geometric sense, there are echoes of the philosophy of Nishida in this programme. I will present the quantum spacetime view based on Noncommutative Geometry, and attempt a connection with Kyoto school.

Enrico MARESCA

From Spacetime to Fields and back: Elementary Domains as super-Substantivalism

In his *Field theory of elementary domains and particles* (1968, with Y. Katayama), Hideki Yukawa introduces his program of reconstructing particle physics on *elementary domains*. His goal is to study particle interactions while avoiding the divergence problem of QFT. This approach rests on an audacious assumption about spacetime continuity: an elementary domain is a minimal region of spacetime, whose state can be described by an appropriate wavefunction. This picture allows the state of the domain to evolve according to *difference equations*, so that the excitations of the vacuum state correspond to the production of the particle content

of QFT. In this talk, I argue that Yukawa's approach can be understood as a study case for super-substantivalism, *i.e.,* roughly the idea that fields can be reduced to spacetime. The assumed quantum nature of spacetime provides super-substantivalism with a mathematical mechanism explaining how field properties can emerge from the particle vacuum. As such, Yukawa faces the problem of illustrating *how* apparently non-geometrical properties reduce to spacetime properties. I compare this attempt with Wheeler's *geometrodynamics* program of unification of the electromagnetic with the gravitational field. In the end, Yukawa's attempt shows how the reconstruction of the interaction picture can constitute a genuine challenge for super-substantivalists.

Giuseppe MARMO

Wave Geometry: An Operator Approach to Space-Time-Matter Manifold

A group of theoretical physicists at Hiroshima University, during 1935 to 1944, proposed and worked out a theory they called "Wave Geometry", intended for the unification of the general relativity and the quantum theory. They tried to establish a unified field theory of macroscopic and microscopic physical phenomena: "Natural Phenomena and Space-Time are one Entity..." Due to the outbreak of World War II the research was gradually slowed down and the study was completely stopped by the atomic Bomb on Aug 6, 1945. The Research Institute for Theoretical Physics was located at 1.5 kilometers from the hypocenter of the explosion, many physicists were killed or seriously wounded. In such circumstances the research was not only stopped but remained largely unknown. In this talk I shall briefly review the mathematical and physical contents of Wave Geometry and compare to the recent proposal that goes under the name of Non-Commutative Geometry.

Felice MASI

A Neo-Kantian Agitprop in Japan: Lask and the Kyoto School

It is well known that between 1911 and 1926, that is, in the period between the publication of *The Enquiry into the Good* and that of *The Place*, the reading of Emil Lask's works played a decisive role in the development of Nishida Kitaro's thought. It is equally well known that Tanabe Hajime often uses the Laskian concept of emanatism in his criticism of Nishida as well as in his reading of Hegelian logic. Moreover, between 1925 and 1930, all the works published in Lask's lifetime were translated into Japanese. Then, in 1924, Eugen Herrigel, a student of Lask's and editor of his *Gesammelte Schriften*, moved to Sendai University.
My aim is firstly to show how Lask served in Nishida (1926) to radically rethink the notion of pure experience and its relation to logic, but also the structure of the predicative form and the function of matter in the differentiation of logical forms. Secondly, however, I would also like to make it clear that what marked the Kyoto School's logical reflection was the desperate Lask's attempt to formulate a Bolzanian version of Kantian transcendental logic, demonstrating the impossibility of a neo-critical philosophy of logic except as a metaphysics of logic.

Jacynthe TREMBLAY

The Subject/Object Complementarity in the Schematic Explanations of Nishida

Given the decisive epistemological problems it raised, Niels Bohr's (1885-1962) concept of complementarity exerted a considerable influence on the Japanese philosopher Nishida Kitarō (1870-1945). Continuing Bohr's attempt to find examples of complementarity in biology, anthropology, psychology and the arts, Nishida showed a sustained interest in the complementarity between subject and object, both in the field of psychology and philosophy. In this presentation, the subject/object complementarity will be examined within the framework of the schematic explanations provided by Nishida in the second volume of the *Fundamental Problems of Philosophy* (1934), as well as in the first three volumes of the *Philosophical Essays* (1935, 1937 and 1939). The way in which Nishida combined the complementarity with set theory will put the finishing touches to the demonstration of the fruitfulness of the use of this concept in Nishida's philosophy between 1934 and 1945.

Simona VENEZIA

A Topology of Nothing. From the Nothingness to the Place in Heidegger and Nishida

The paper aims at discussing the relationship between Martin Heidegger and Nishida Kitarō about the concepts of nothing and place in order to demonstrate that it is possible to propose a "topology of nothing" for both these authors. Both start from thematizing a concept of nothing against the substantialism of the western metaphysics and from underlining the necessity of an overcoming of the dualism subject/object. In Heidegger we find a concept of nothing as an ontological dimension in which the impossibility of any determination is central. This passage finds its acme in the so-called "topology" which characterizes his work after the *Kehre*/*Turning*. We can follow a similar path in Nishida who starts from the concept of nothing, passes through the concept of absolute nothingness and arrives at the concept of place/*basho*. Ultimately according to the "logic of the place" developed by Nishida the place can be understood as *mu*, such as "nothing", a dimension in which no subjectivism is possible. In the place there is no subject who acts, but an event that involves and implies takes place in it. In this "eventuality" of nothing and place it is possible to find relevant points of convergence between Heidegger and Nishida.

Participants

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