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Introduction to Advances in Historical Studies Special Issue: *Exploring Changes in How the Histories of the Exact Sciences Have Been Written*: *Interpreting the Dynamics of Change in These Sciences and Interrelations amongst Them—Past Problems, Future Cures*?

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In 2015 this is the second[1] Special Issue as exceptional publication dealing with selected and peer-reviewed essays *on invitation* aiming to link science, historical, epistemological and foundational aspects of sciences along a monograph AHS-issue. First, we would like to congratulate with each and all the authors for the efforts in aggregating so distinguished topics, and obtaining a valuable result of a comprehensive survey concerning historical achievements in the bridging science, history and historical epistemology of science.

The topic of this special issue was preliminary performed by one of us (RP) and discussed in collaboration with John Schuster (Australia), to whom we take opportunity to send our warm and friendly acknowledgments.

[1]The first one in 2014 was dedicated to history and historical epistemology about Newton and Newtonian science.

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Due to its importance, a similar topic will be object of a discussion, as well, at the international roundtable on 2015, 26th June in Lille (France) organized by Raffaele Pisano.

Historians of science—some with high levels of training in the exact sciences and some without such technical expertise—have developed a wide variety of approaches and interpretive frameworks. The subjects dealt with have been as various as the historiographical approaches. These have included the study of particular disciplines; the history of foundations; epistemological aspects; the construction and negotiation of theories; the details of experimental practices; the structure and consequences of networks, organizations and research sites; the relations with the histories of technologies and with wider cultural milieus. The point has been reached at which historians of the exact sciences can benefit from critically assessing feedback from the history of their own research. In other words, the community of historians and philosophers of the exact sciences can now undergo a learning process, grounded in their own collective experience. But, *how to do this*? *How can we compare and assess historiographical approaches and perhaps choose or design one type in preference to others*? Such questions would exist in any area of historical and philosophical-epistemological research, but they become very pointed when thinking about the practice of the history of exact sciences. We grant that rigour and fruitfulness characterise the theoretical and experimental dimensions of the exact sciences, as well as their organization and modes of quality control. *Is anything similar to this possible in historical inquiry*; *in particular how constrained are historical propositions and theses by what counts as their internal evidential bases*? The production of historical-philosophical narratives and explanations are generally thought to be quite as different epistemic objects than the results of the exact sciences. Many points can be made in favour of such a claim. Moreover, these attitudes are grounded in wide spread scepticism about the possibility, scope and reliability of historical findings. Even attenuated versions of such scepticism limit historiographical results to narrative discourses, or more or less plausible interpretations inextricable from the style and subjective framework of their authors. But, despite all this, it still seems possible seriously to ask, *Do we now know enough about the actual dynamics of research in the exact sciences, as a result of historical investigations, that we might begin to think in terms of the similarities and analogies between such research and the activities and outputs of historians, especially historians of science*? Certainly, students of the micro-politics of scientific work have suggested as much: scientific work does not conform to the traditional grandiose images of method, and much more of the human, the judgemental, the rhetorical and the interactional seem woven into the production of scientific results. This rises the possibility that reflection on what has been found out about science dynamics, through the work in the history of the exact sciences, might be translated to further improve the practice of that historiography. The problem is that the kinds of historical-philosophical work that have humanized the dynamics of the sciences are, for many scholars, a source of scepticism about the possibilities of human knowledge and inquiry. Even so, it seems quite feasible that common ground can be found to redeem the rationality, fruitfulness and progress of both the exact sciences and at least certain forms of historiography, especially of those sciences. Hitherto, such attempts, in so far as they have been organized and well known, have been located in strongly competing historical-philosophical research programs, for example those of Mach, Koyré, Kuhn and even Popper-Lakatos. These have all stressed the importance of the use of historical/epistemological categories for inquiry about, and interpretation of, the history of the exact sciences. This Issue therefore asks, "*What does the history of these attempts, and the history of the wider historiography of the sciences, suggest about surpassing the clash of these programs and the merely piecemeal accretion of individual studies of the history of the exact sciences*"? Finally, a correlated crucial aspect of the problem above cited is also: *is History and Philosophy of Science one subject or two*? *If two, what has split them apart, given that once they were thought of as two aspects of a common enterprise*? *That philosophy of science needs history of science ought to be uncontroversial, but does history need philosophy*?

Kristian Camilleri (Australia) offers us a paper concerning the shaping of inquire in the history of exact sciences. Focusing on the period 1750-1960, the author identifies three different approaches: 1) "traditional centre approach", in which—to summarize—history of science is considered according to the supposed existence of scientific traditions; 2) "tool-centre" history. In this case the focus is posed on the way in which novelties introduced in some disciplines can influence the development of a certain science: for example, the development of technique and the introduction of new mathematical concepts influenced physics; 3) "Actor centred historiography": history of science as history of the great scientists. This paper develops an interesting dialectic among the three approaches.

Roberto Mantovani (Italy) addresses an interesting subject, which is in between history of physics and of technology: the improvements of the induction coil carried out by the Italian priest Vincenzo Vignola between

the 30s and the 50s of the 19th century. This paper presents a synthetic history regarding the development of the induction coil after Faraday's discovery, in 1831, of the electromagnetic induction. Afterwards the attention is focused on the Italian situation and, finally, on Vignola's contributions. The functioning of Vignola's induction coils is well explained, and beautiful as well as clarifying imagines of the original coils conceived by Vignola are added.

Hayo Siemsen (Germany) proposes a new methodology to deal with history and philosophy of science. He calls it a "metamethodology". Its initial aim is to identify arbitrary assumptions in science and history of science. This could allow us to combine the different methods used in science and history of science in a meaningful way, so that it is possible to spread a new light on scientific ideas, whose comprehension could be difficult resorting to one sole historiographic or epistemological method. Metamethodology should open the door to a fruitful integration of different methods

Flavia Marcacci (Vatican State) faces Giovanni Battista Riccioli's astronomical system. This paper is a clear proof of the complexity of astronomy in the first half of the 17th century. For, beyond the problems connected with the censure of the Copernican system in 1616, there were scientific questions, which made it uncertain what was the correct astronomical system. Riccioli adopted a Tychonic system and developed profoundly the consequences of his choice. Marcacci explains in a clear manner Riccioli's ideas also adding some imagines drawn from Riccioli's work, which clarify the concepts in a perspicuous manner.

Paolo Bussotti (Germany) and Raffaele Pisano (France) deal with an author, who was one of the most important protagonists of the profound epistemological debate carried out at the beginning at the 20th century and concerning the nature of mathematical knowledge: Federigo Enriques (1871-1946). In particular, Bussotti and Pisano analyse the connections Enriques saw between perceptive spaces and geometrical spaces. Starting from this subject, the paper shows the possibility to offer a general interpretation of Enriques' theory of knowledge and hypotheses on the origin of philosophy in the ancient Greece.

Jouzas Banionis (Lithuania) introduces us into the life and works of the first Lithuanian woman graduate in mathematics: Amelija Mažylytė (1900-1972). This paper is structured in a precise way: a detailed biography of Mažylytė is presented as well as her educative and scientific activity. In particular, the author explains that Mažylytė published works concerning mathematical research and mathematics education, but his main field of research was history of mathematics and her most intense activity was developed between 1928 and 1939. Her important papers are works on Gauss and on history of geometry.

Jean Dhombres (France) presents an historical and epistemological discussion about Functions and Calculus in the 18th century and around the rigorization assumed by Analysis in the 19th century and related to a new mathematical and epistemological paradigm. It has been thoroughly studied, both epistemologically and historically. Taking into account Functions and Cantorian paradigm, Dhombres faces them from scientific and epistemological stand points as to possible change of paradigm concerning new mathematical domains and related epistemological interpretations.

Invited scholars for this special issue described the various ways in which the sciences and their epistemological and philosophical interpretations were written and disseminated. As typically for AHS special issue, the scholars from different traditions and background were invited to discuss on the emergency style thinking in methodology and in theoretical perspective aiming to gather and re-evaluate the current thinking on this subject. It brings together contributions from leading experts in the field, and gives much-needed insight in the subject from a historical point of view, as well; taken as a whole, the volume is testifies to a broad, and thriving, interdisciplinarity in subject area, as well as an absence of historiographical dogma.

This special issue volume composition has been conceived for historians, epistemologists, philosophers and scientists.

Enjoy the stimulating reading!

Raffaele Pisano and Paolo Bussotti *Editors*