HPS&ST Newsletter
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Introduction

The HPS&ST Newsletter is sent monthly to about 10,300 emails of individuals who directly or indirectly have an interest in the contribution of history and philosophy of science to theoretical, curricular and pedagogical issues in science teaching, and/or interests in the promotion of innovative, engaging and effective teaching of the history and philosophy of science. The newsletter is sent on to different international and national HPS lists and international and national science teaching lists. In print or electronic form, it has been published for 40+ years.

The Newsletter, along with RESOURCES, OBITUARIES, OPINION PIECES and more, are lodged at the website: HERE

The newsletter seeks to serve the diverse international community of HPS&ST scholars and teachers by disseminating information about events and publications that connect to concerns of the HPS&ST community.

Contributions (publications, conferences, Opinion Piece, etc.) are welcome and should be sent direct to the editor: Michael R. Matthews, UNSW, **m.matthews@unsw.edu.au** .

2023 NARST Annual International Conference, April 18-21, Chicago.

The US National Association for Research in Science Teaching conference (**HERE)** has for

many years had a strand (#13) dedicated to 'History, Philosophy, Sociology, and Nature of Science'.

Strand 13 sessions at the Chicago conference are:

Developing Teachers' NOS Views

Preservice SPED Teachers' Nature of Science Conceptions and Lesson Planning

Mila Rosa L Carden[1], Bridget K Mulvey[2], Laura Corr[3]
[1] University of North Texas, Denton, Texas, USA. [2] Kent State University, Kent, Ohio, USA. [3] Arizona State University, Tempe, Arizona, USA

Exploring the view of NOS and PCK of NOS in a group of biology teachers.

Carolina Parraguez, Paola Nuñez, Hernan Cofre
Universidad Catolica de Valparaiso, Valparaiso, Chile

Leveraging a History and Philosophy of Science Course to Develop PCK for Teaching NOS

Khadija E Fouad, Alan J King, Matthew Lance
Appalachian State University, Boone, NC, USA

Pre-Service Teachers' Scientific Content Knowledge and Nature of Science Views after a Socioscientific Issues-based Unit

Savannah R Graham, Hayat Hokayem
Texas Christian University, Fort Worth, Texas, USA

Issues and Trends in NOS Research

Review of the Research on Teaching, Learning, and Assessment of Nature of Science: 2013–2021

Fouad Abd-El-Khalick[1], Norman G. Lederman[2]
[1] University of North Carolina at Chapel Hill, Chapel Hill, NC, USA. [2] Illinois Institute of Technology, Chicago, IL, USA

A Systematic Review of NOS Research in Science Education: Varieties of Scholarship, Trends and Considerations

Noushin Nouri[1], William F. McComas[2], Maryam Saberi[3]
[1] University of Texas Rio Grade Valley, Edinburg, Tx, USA. [2] University of Arkansas, Fayetteville, Arkansas, USA. [3] Ministry of education, Ministry of education, Iran, Islamic Republic of

Synthesis of Variations in Nature of Science (NOS) Among Adult Learners

Joseph V. Watts, Kent Crippen
University of Florida, Gainesville, Florida, USA

Nature of Science Assessment Efforts: Interplay Between Contemporary Frameworks and Curricular Tensions

Alex J Sobotka, Michael P Clough
Texas A&M University, College Station, TX, USA

The role of nature of science in tackling societal emergencies: An international perspective

Symposium: Wonyong Park[1], Hagop Yacoubian[2], Alison Cullinane[3], Haira Gandolfi[4], Noemi Waight[5], Shakhnoza Kayumova[6], Jennifer Tripp[5], Feyza Achilova[7], Andreia Guerra[8], Cristiano Moura[8]
[1] University of Southampton, United Kingdom. [2] American University of Armenia, Armenia. [3] University of Edinburgh, United Kingdom. [4] University of Cambridge, United Kingdom. [5] University at Buffalo, USA. [6] University of Massachusetts, Dartmouth, USA. [7] Dartmouth High School, USA. [8] Centro Federal de Educação Tecnológica Celso Suckow da Fonseca, Brazil

New Contexts for NOS Teaching and Learning

Cognitive and Epistemic Account of Nature of Engineering: Implications for Science Education in Schools

Miri Barak[1], Tamar Ginzburg[1], Sibel Erduran[2]
[1] Technion, Haifa, Israel. [2] University of Oxford, Oxford, United Kingdom

Development of chemical experiments for the explicit reflection of Nature of Science

Janne-Marie Bothor, David-Samuel Di Fuccia
University of Kassel, Kassel, Germany

E-VNOS: Analysis Framework for Characterizing Enacted Views of the Nature of Science in Student Theses

Annelies Pieterman-Bos[1,2], Marc H.W. van Mil[1]
[1] University Medical Center Utrecht, Utrecht, Netherlands. [2] Utrecht University, Utrecht, Netherlands

Examining Middle School Students' Nature of Science Views
Dilara Goren, Ebru Kaya
Boğaziçi University, Istanbul, Turkey

A new focus for achieving scientific literacy

Symposium: Renee Schwartz[1], Judith Lederman[2], Valarie Akerson[3], Selina Bartels[4], Patrick Enderle[1], Irene Neumann[5], Kerstin Kremer[6], Frauke Voilte[7]
[1] Georgia State University, Atlanta, Georgia, USA. [2] Illinois Institute of Technology, Chicago, Illinois, USA. [3] Indiana University, Bloomington, Indiana, USA. [4] Valparaiso University, Valparaiso, Indiana, USA. [5] IPN -Leibniz Institute for Science and Mathematics Education, Kiel, Germany. [6] Justus-Liebig-University Giessen, Germany. [7] Leibniz Universität Hannover, Germany

International Society for History, Philosophy and Social Studies of Biology (ISHPSSB) biennial conference, 9-15 July 2023, Toronto

Keynote speaker, Deborah McGregor (York University) will present on climate and environmental justice, and an interdisciplinary public panel will discuss how environmental degradation, indigeneity, human right to water and health all intersect in and around the Great Lakes. The panelists are Patricia Corcoran (University of Western Ontario), Blaire Morseau (University of Massachusetts Boston), Jennifer Read (University of Michigan), and Marsha Richmond (Wayne State University).

These conversations will be complemented with a tour of the Royal Ontario Museum natural history and world cultures collections, walking through the causes, consequences and solutions to climate crisis.

Please visit the **conference website** to submit abstracts.

HPS&ST in Latin America

5th International Conference on History, Philosophy and Science Teaching in Latin America (IHPST-LA 2023)

History, Philosophy, Sociology and Science Teaching in times of Scientific Denial

The IHPST-LA will be held in Porto Alegre (Brazil) from August 9th to 11th, 2023. It will gather researchers from all Latin America to discuss HPS&ST and its contemporary challenges. More information is available **HERE**.

The event will take place at the headquarters of the Institute of Physics of the Federal University of Rio Grande do Sul, in Porto Alegre. Paper submissions will be accepted until April 2nd, 2023. registration, submission rules, dates, are available on the event website: www.ufrgs.br/ihpstla2023/ .

The IHPST-LA 2023 event will provide space for dialogue, communication, meetings, in which we can overcome barriers and difficulties to further strengthen our research community. In difficult times like the ones we are experiencing, consolidating and advancing the promotion of research and research and teaching institutions is a powerful way of contributing to building a better and fairer world. We are waiting for everyone in August in Porto Alegre for this moment.

Do you have any contributions about HPS&ST in Latin America?

Do you have any contributions about HPS&ST in Latin America? If you have any information about events, publications, research groups, books about HPS&ST in Latin American and want to submit a brief note to be published in the HPS&ST Newsletter, please contact first Nathan Lima here or secondly Michael Matthews here.

HPS&ST in Asia

If you have any information about events, publications, research groups or books about HPS&ST in Asia and want to submit a brief note to be published in the HPS&ST Newsletter, please contact first Xiao Huang (Zehjiang Normal University) **HERE** or secondly Michael Matthews **HERE**.

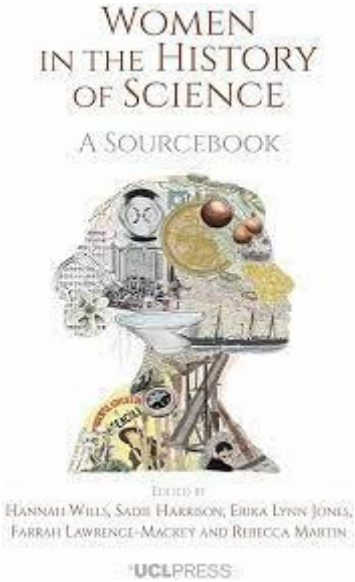
 # Women in the History of Science: A Sourcebook

Edited by Hannah Wills, Sadie Harrison, Erika Lynn Jones, Rebecca Martin, and Farrah Lawrence-Mackey
University College London Press

Free download: HERE

Women in the History of Science (446 pps) brings together primary sources that highlight women's involvement in scientific knowledge production around the world. Drawing on texts, images and objects, each primary source is accompanied by an explanatory text, questions to prompt discussion, and a bibliography to aid further research.

Arranged by time period, covering 1200 BCE to the twenty-first century, and across 12 inclusive and far-reaching themes, this book is an invaluable companion to students and lecturers alike in exploring women's history in the fields of science, technology, mathematics, medicine and culture.

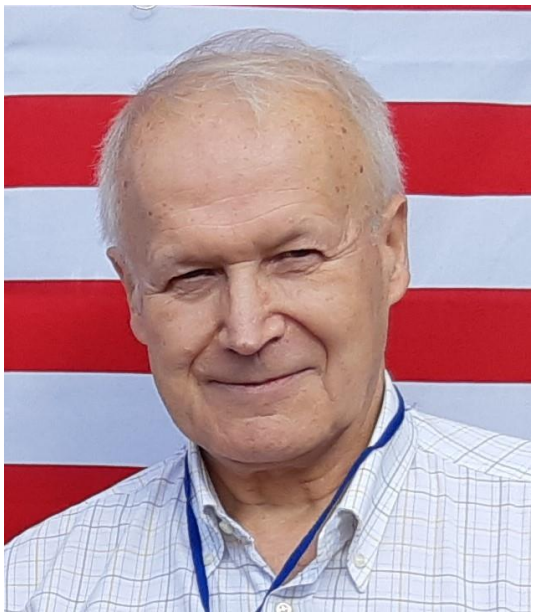


While women are too often excluded from traditional narratives of the history of science, this book centres the voices and experiences of women across a range of domains of knowledge. By questioning our understanding of what science is, where it happens, and who produces scientific knowledge, this book is an aid to liberating the curriculum within schools and universities.

Opinion Page. Philosophy of Science in Ukraine: A Personal Story

Vladimir Kuznetsov

Chief researcher of the Department of Logic and Methodology of Science of the H. S. Skovoroda Institute of Philosophy of the National Academy of Sciences of Ukraine, Doctor of Philosophy, Professor of Chair of Physical and Mathematical Disciplines of the National University "Kyiv-Mohyla Academy" (part-time). Publications HERE



I am a Ukrainian philosopher of physics who worked in central Kyiv not far from where the first bombs fell after the February 2022 Russian invasion. Like many others who are too old to serve, I now live out of the country but remain hopeful of returning to a free and democratic Ukraine.

The borders of the Soviet philosophy of science (Dialectical Materialism or Diamat) were set by the following sacred works: F. Engels's *Anti-Dühring* (*Herrn Eugen Dührings Umwälzung der Wissenschaft* (1878)), *Dialectics of Nature* (1925), and V. Lenin's *Materialism and Empirio-Criticism* (1909). In general, these works offered a mechanistic materialist interpretation of the physical picture of the world of classical physics without considering thermodynamics and electrodynamics.

The history of the philosophy of science in the USSR beginning from the end of the sixties may be considered as the transition from the hard to the soft form of Diamat. It should be noted that other kinds of philosophising about science were practically unknown. Translations of some books by Western scientists and philosophers were published some 10-20 years after their original publications. In many cases, access to them was limited by the sacramental stamp *Only for scientific libraries*. Translations necessarily included extended introductions by editors who rhetorically claimed the superiority of Diamat in solving the problems formulated in these 'foreign' books; tor them, Western scientists could set up philosophical problems, but not resolve them. Access to philosophy of science journals was available only in a few libraries in Moscow and Leningrad. Assuredly, Soviet philosophical society was not open in the Popperian sense.

With the 1991 collapse of the USSR the proclaimed union between scientists and philosophers also dissolved. At present, the Ukrainian state shows no interest in sustaining the philosophy of science (Kuznetsov 2021b) nor any sciences at all (Loktev 2021). The latest publications on the history of Ukrainian philosophy do not mention the works of Ukrainian philosophers of science at all (Tkachuk 2011).

How did I become a philosopher of science?

In 1969 I graduated from the Faculty of Physics of Kyiv University with a specialization in the theory of elementary particles. The curriculum also included the obligatory study of the components of Marxist-Leninist doctrine: dialectical and historical materialism, ethics, aesthetics, the political economy of socialism, the political economy of capitalism, scientific communism, and scientific atheism. In accordance with the Soviet practice of that time, I was recommended for admission to the graduate school of the Institute of Theoretical Physics.

While preparing for the exams, I was unexpectedly called up for two years in the Soviet Army as a lieutenant engineer. The two years I spent in Turkmenistan had a strong influence on my life plans. Fate brought me together with the work of Pavel Kopnin (2022) *Hypothesis and Cognition of Reality* (1962), a book in the library of Krasnovodsk, Turkmen SSR! Another book that encouraged my project was Adolf Grünbaum's *Philosophical Problems of Space and Time* (1963). It stays for me as one of the examples of a serious philosophical and historical analysis of current scientific problems. The idea arose to try my hand at the philosophy of physics and in 1971 I entered graduate studies at the Department of Philosophical Issues of Modern Natural Science at the Institute of Philosophy of the Academy of Sciences of the Ukrainian SSR.

In conditions when the Marxist-Leninist version of the philosophy was considered the only one true philosophy, I presented my thesis about the state of the theory and physics of elementary particles in the categorical language of dialectical materialism. The results were the inclusion in its repertoire categories of interaction, self-development, self-organization, evolution, the world as integrity, actual and potential, observable and unobservable, virtual and hidden types of existence, interaction, nothingness, the Universe as everything, and emptiness (vacuum). Attention was also drawn to the role in physical cognition not of individual categories, but of their compositions. Their examples are bundles of space-time-motion, continuity-discreteness-process, form-matter-interaction, quality-quantity-measure, matter-attribute-form, attribute-property-relation, general-special-particular, and attribute-quantity-value.

The thesis assumed that the transition of physics from conceptualizing knowledge of nature in terms of perceptual constancy, natural place, and natural motion (Aristotelian physics); to various forms of spatial mechanical motion and their causes (classical physics); and now to *causa sui* of the physical world (cosmology) and to the interaction of physical realities as forms of matter

differentiation (physics of elementary particles)—has been correctly identified and understood. The universals of physical cognition were analysed in the theoretical context of identifying, individualizing, and differentiating physical realities in terms of their attributes.

Modern scientific ideas about the world, which continue to develop and are unlikely to ever be completed, are fundamentally different from the physical picture of the world of the times of Engels and Lenin. Considering this, for the scientific substantiation of modern philosophical assumptions about categories standing for universal attributes of matter, it is necessary to understand what and how each modern science claims about its field as a part of the material world. Since in modern science it is theories that are the main tool for obtaining new knowledge about the world (experimental data make sense only within the framework of theories), it is necessary to understand how theories fulfil this role. It means that, without a reliable reconstruction of scientific theories as the tools for obtaining new knowledge, an adequate epistemology for the philosophy of science is impossible.

My philosophical position

I recognize the materiality and knowability of the physical world and trust that science gives its sufficiently correct and verifiable picture, which becomes increasingly full and precise. If these provisions are the basic postulates of the materialist philosophy of science, then I am its supporter.

In the last century, the development of experimental studies of the physical/material world has opened realities that could not be described by classical theories. The physical world turned out to be indistinctly split, at least into mega-, macro- and microcosmos. Megacosmos has the Universe as a whole, metagalaxies, galaxies and stars. In the macrocosm there are planets and their satellites, as well as solid bodies, liquids, and gases, without considering their atomic and molecular structure. In the microcosm there are atoms, nuclei, elementary particles, and their constituents.

In other words, each microcosm is "inhabited" by its own autonomous material realities/entities. From an ontological point of view, such realities are the same type of particulars with their inherent attributes. Particulars are individualized by at least one quantitative value of one of their attributes. For example, solid bodies differ in the quantitative values of their mass. All electrons have the same quantitative values of mass, charge, and spin, but in most cases, they are distinguishable by fuzzy values of their energy and spatial localization.

Many contemporary philosophers of science reject these ontological claims. However, productive scientists who understand what and how they work and function as producers of knowledge do not support such a denial. The remoteness of muchphilosophy of science fromthe actual practice of science explains why there are so few references of these works in encyclopaedias of science and mathematics.

The centrality of analysis of theories for the epistemology of physics

Trusting what modern science states about the known realities of the Universe and their attributes (see the pictogram *Ends of Evidence*, which shows the spatial dimensions of reliably known realities (Wolchover 2015)), what else is still for the philosophers of science to do in their attempts to comprehend science and its development? To my mind, it is the study of how and by what means physicists and scientists in general make their statements about the Universe, its sub-worlds and their realities.

To reveal this, it is necessary to explain what role theories play in these processes. This is impossible without an adequate understanding of the composition of theories and their relationship to their fields of application. I would suggest that readers, before continuing to look through the rest of this text, fix their answer to the question, what are the components of the theories known to them? After reading this text, I would ask a reader to compare her/his answer with proposed in this article.

Theories are not the pointless speculations of idle minds. Scientific theories have their respective fields of application and produce verifiable claims about those fields. Adherents of Dimat as a theory

claim that it has the maximum possible scope. The epistemological problem is that there is no way to test this ontological claim. Representatives of classical physics also claimed the universal applicability of classical theories to describe the physical world and any of its realities/forms of differentiation.

Considering the abovementioned division of the physical world, it is possible, as a first approximation, to distinguish two types of theories. These are the so-called domain-independent theories that describe the universal attributes of different sub-worlds irrespectively of the types of their realities. These are: for the macrocosm – classical mechanics, classical statistical theory, classical thermodynamics, and special relativity; for the megacosmos – the general theory of relativity; for the microcosm – quantum mechanics in its non-relativistic and relativistic versions. In the frames of domain-independent theories, physicists build so-called domain-dependent theories, the domains of which are certain types of realities. Often philosophers of science do not distinguish these theory types.

Philosophically speaking, the domains of domain-dependent theories consist of particulars with their attributes while the domains of domain-independent theories consist of attributes irrespective of the nature of their carriers (Burgin & Kuznetsov 1993b). In what follows, only domain-dependent theories will be considered because their domains include realities while domains of domain-independent theories are abstractions from attributes of the realities in question.

Celestial mechanics is about motions of celestial objects. It describes their space-time trajectories caused be gravity interactions of special bodies – galaxies, stars, planets, their satellites, and comets. The theories of elementary particles are about particles not about macroscopic bodies. The confidence of modern physicists that quarks are components of hadrons is just as grounded as the confidence of the last four centuries' astronomers that the Solar system includes the Sun and planets or the mid-twentieth-century physicists that an atom consists of an electron shell and a nucleus.

Theory and its domain define each other and co-evolute. This does not mean that in the outcome of these processes, the theoretical components become the realities of the theory domain, and the latter transforms into the components of the theory. In the sixties, the domain of the theory of elementary particles included tens of particles. Now, the domain of this theory includes hundreds of newly discovered particles and sub-particles like quarks and gluons. Not going into detail, theoretical components stand for realities while realities are modelled by complexes of theoretical components.

Thus, theory should be analysed in unity with its domain. The latter consists of specific realities of a certain type, their phenomena, processes, and patterns. For example, classical mechanics describes the patterns of motion of macroscopic bodies whose relative velocities are much less than the speed of light. Atomic theory describes the properties and patterns of interaction of atoms at energies that do not destroy atoms. The domain of general quantum theory includes diverse types of microscopic realities, the interactions between which are of a discrete nature. Depending on the type of these realities and the conditions for their experimental study, scientists build corresponding theories of these realities. Such theories form specific networks of interrelated theories. General atomic theory is a net of domain specific atomic theories domains of which consists of various kinds of atoms.

Any real theory is a complex product of, and engine for, the cognitive activity of scientists. Given this, what are the types of components of the theory?

For a long time, the answer offered by the so-called propositional or standard view of theory dominated the philosophy of science (Suppe 1974). According to it, a theory is a static and deductively ordered system of two types of statements related to the realities of its domain. There are several law-like general statements from which an infinite number of singular statements are deduced. This process was understood as theory development. Several derived statements with names of domain realities have empirical content, which makes it possible to compare them with experimental data on realities.

Despite its long life and popularity, the standard view seems too oversimplified to be a relevant

view of actual scientific theories, their relationships, and historical development. Practically any set of statements about anything can be called a theory. A vivid example of this is the use of the term *theory* in works of Diamat's gurus.

Joseph Sneed's book *The Logical Structure of Mathematical Physics* (1971) laid the foundation for a structuralist view of theories closer to the actual practice of their use in science. He focused on the representation of realities from the domain of theory through their abstract models, which depict bundles of chosen attributes of realities. Applying the set-theoretic language promoted in the philosophy of science by Patrick Suppes (1957) Sneed, together with Wolfgang Balzer and Carlos Moulines (Balzer et al 1987) formulated and developed the main provisions of the structuralist philosophy of science and used it for studies of theories as systems of models as well as nets of such theories.

Disentanglement of theory into subsystems

Propositional and modelling views do not exhaust theory features/functions in scientific cognition. Indeed, equally important is resolving by theories problems of both intratheoretical difficulties/contradictions and experimental study of the corresponding realities. Theory (scientists who master theory!) stands for realities through their models, so, the abovementioned problems ought to be formulated in the frame of models. As a rule, a theory with a sufficiently large domain deals with many types of problems – general and singular, internal and external, physical and mathematical, fundamental and applied, constructive and analytical, simple and complex, known and new, problems and their subproblems, problems and their superproblems, etc.

One distinctive feature of theory progress is the growing quantity of types of problems formulated in it. These considerations give impetus to the view of theory as a system of problems of various kinds. In contemporary theorized science (Gabovich & Kuznetsov 2019) problems should be resolved within a developing theory by what is available in it and what needs be newly introduced (borrowed from mathematical theories or sometimes specially invented methods). A theory that does not solve problems is useless for scientific knowledge.

Progress in problem solutions is another impact on the development of theory. Every theory has elements in common with other theories and peculiar methods for problem resolution. Classical and quantum mechanics use methods of resolving various differential equations. Methods of the mathematical theory of finite-dimensional geometries are typical for classical mechanics, while those of infinite-dimensional Hilbert spaces are for quantum theory. Therefore, the theory can be also viewed as a system of its methods.

Considering theory as a system of models, as a system of problems, and as a system, in particular, of methods for solving problems, allows us to see that any of these views presupposes and actualizes others. We talked about the chain: models - problems - solutions. Starting from the processes of model construction, we get a more branched nonlinear structure of chains. It reflects the use of languages, methods, approximations, estimates, and heuristics, taking part in model building.

To unite these different views, let us consider theory as a polysystem, the subsystems of which are associated with the mentioned and other views on the theory. Different directions of the modern Western philosophy of science partially and separately studied these subsystems.

We have named this approach the structure-nominative reconstruction of theory. It originated in collaboration with the mathematician Mark Burgin (Burgin & Kuznetsov 1994a; 1994b). Its title is explained by the fact that the components (structures) of the theory are analysed as having definite names in a broad sense. Formal and informal versions of the named set theory (Burgin 2011) supply tools for such an analysis (Burgin & Kuznetsov 1991; 1993a; 1994a).

Informally, the named set is a triple $\mathbf{X} = (X, n, N)$, where X and N are sets from fixed classes, and n — mapping from X in I that belongs to the class M. The set X is called the carrier of the named set **X**, the set I is the set of names of the named set **X**, and n is the naming relation of the named set **X**.

There are individualized, uniquely named, one-named etc. types of named sets.

Take, for example, a triple consisting of the formulations of a certain problem, ways to solve it, and its solution. They are interconnected and create a certain wholeness. This gives the metamodel of this triple a named set. Its carrier is the set of formulations of the problem, the set of names is the set of its solutions, and the naming relation is realized through the set of methods for obtaining solutions.

This is not trivial reformulation because with the help of such metamodeling we can describe in the language of the theory of named sets the interrelated and coordinated changes of sets of: formulations, old and innovative solutions, and traditional and invented methods. Analogous named sets we can construct and study for metamodeling triples of models, modelling relation, and realities modelled; problem solution, estimating relation, and values of estimations, etcetera. In a sense, such metamodeling is like constructing propositions from separate words. It seems plausible to hypothesise that our thinking includes operations not only with words but also with propositions consisting of words.

Thus, the language of named sets can transform the language of the philosophy of science from producing single statements about the corresponding aspects of, for example, realities studied into the language of paragraphs uniting statements in more informative units that describe not separate aspects of realities but their relatively complete picture.

The first version of the structure-nominative reconstruction separates two subsystems roughly corresponding to the standard and structuralist views of theories and established many ties between these views that go beyond logical notions (Burgin & Kuznetsov 1986).

The second distinguishes five inhomogeneous subsystems. Their composition is clear from their titles. These are the logical-linguistic, model-representative, pragmatic-procedural, problem-heuristic, and binding subsystems. The latter fixes the relationship between the components, structures, and subsystems listed above (Burgin & Kuznetsov 1994b).

The third informal version is developing in the collaboration with theoretical physicist Alexander Gabovich. We distinguish ontic, denominative, linguistic, definitional, model-representational, formal-model, logistic, nomic, approximative, problematic, operational, procedural, evaluative, heuristic, hypothetical, and connecting/connective subsystems (Gabovich & Kuznetsov 2019; Kuznetsov 2021a). As shown in case studies of Newtonian mechanics and celestial mechanics, those theories contain all these subsystems. Due to informal character of this version, we prefer to call it as the polysystemic reconstruction of theories (Gabovich, Kuznetsov 2023).

Metaphorically, each subsystem is a specific holographic reproduction of the entire theory. Central to each subsystem are its main components. Its auxiliary components function as *raw materials* for the main ones.

In view of the interweaving of subsystems, when characterizing the components of any of them, it is necessary to refer to the components of other subsystems. For example, building models and posing problems are processes from the operational subsystem. Their implementation requires certain heuristics, estimates, and approximations that constitute the corresponding subsystems of the developing theory. For example, models are helpful for a problematic subsystem, since many of its main components are formulated from the standpoint of modelled realities. In turn, certain problems can be considered as auxiliary to the model subsystem, since they contribute to the analysis of existing models and encourage the construction of new ones. Thus, one can speak about the entanglement of theory subsystems: changes in components of one subsystem produce the proper changes in components of other subsystems.

Problems as components of scientific theory have many aspects. We list only two of them. *First*, problems differ in the situations that led to them. Speaking about the problems of describing, explaining, and predicting phenomena generated by realities from the subject area of the theory, philosophers of science usually do not pay attention to their component composition. If we take them into account, it turns out that these problems are preceded by a range of problems associated with models of realities, with their

creation, with the selection and analysis of selected models, with the problems of formulating in terms of selected problem models, with the problems of finding or creating methods for finding solutions to problems, with problems of evaluation of the obtained solutions and problems of correlation of solutions with the data of experimental research of realities Almost each type of the listed problems requires a specific language. *Second*, the problems differ in terms of the characteristics of their formulations. They can be mathematical and physical, internal, and external in relation to the theory, formal and informal, etcetera.

According to polysystem reconstruction, theories can be distinguished by the degree of maturity and development of their subsystems. For example, the model and problematic subsystems of all string theories are currently underdeveloped in terms of their ontic subsystems. The fact is that in terms of the proposed models, problems have not yet been formulated, the solution of which would have consequences that could be evaluated using existing or possible experimental equipment in the near future. The problems that string theorists are currently concerned with are internal to string theories. That is, they relate to problems of development and coordination of its subsystems.

Changes in the components of any subsystem of the theory can give impetus to the development of its other subsystems. Similarly, the emergence of a new theory can begin with the formation of a first and imperfect version of any of its future subsystems. The history of the development of every science is full of examples of such processes. It also opens opportunities to explore diverse types of development of scientific theory, each of which begins with changes in a separate subsystem and, over time, induces changes in other subsystems.

For example, celestial mechanics began with the observations of Tycho Brahe, which Johann Kepler processed. Then the germs of its ontic and denominative subsystems arose. And then came Newton, who introduced all the other sub-systems of celestial mechanics. A polysystemic view of a theory allows us to consider its history as an interweaving of the histories of its subsystems.

Subsystems have a multi-level hierarchical structure. For example, a specific language is a component of a language subsystem. In the first approximation, the language has basic alphabetical, dictionary, phraseological (idiomatic) and text constitutive levels. There are also associated levels corresponding to the actions of building, combining, transforming, and evaluating the components of the language subsystem. These levels include rules and procedures for performing the mentioned actions. Figuratively speaking, the level construction of subsystems is still a true dark matter for most available reconstructions of scientific theories in contemporary Western philosophies of science.

Thus, we can conclude that scientific theories turn out to be much more complex than most philosophers of science think. It is possible that primitive representations of theories are the main reason for the lack of mention of the results of their philosophical analysis both in the sciences themselves, and in didactics and philosophy of teaching science.

In sum, the polysystemic view of theories is characterizes by:

- The natural incorporating and synthesizing various forms (concepts, models, problems, operations, estimations etcetera) of knowledge differentiation into homogeneous subsystems of the scientific knowledge.
- Setting up links between these forms, thanks to which they conjointly contribute to creating new knowledge through changes of available knowledge system.
- Contributing to unification of knowledge systems as each of its separate constituents finds its natural nest with all the necessary links with other constituents.

The polysystemic version of the structure-nominative reconstruction goes further than its first and second versions by:

- Isolating larger number of uniform subsystems.
- Considering both the composition of the subsystems and their transformations.
- Opening prospects for a consistent study of the developments of scientific knowledge systems in terms of changes of its components and their relationships**.**

● Revealing non-trivial relationships between theories

The foregoing account of the structure and analysis of scientific theory has been elaborated elsewhere (Gabovich & Kuznetsov 2023).

Conclusion

There are great distinctions between the views of scientific theory developed by diverse groups of physicists, logicians, philosophers of science, philosophers of science teaching, science teachers, and educators. It is time to work out a single common view based on the analysis of practical theories, and not just what scientists and philosophers of science from different directions say about theories. This requires deepening the nature of science (NOS) studies (see, for example, Badmus & Jita 2022; Erduran & Dagher: 2014; Galili 2019; Khine: 2012; Mathews 2014a, 2014b; McComas 2020; Summers & Abd-El-Khalick 2019; Wallace 2017) to the level of studying the nature of scientific theory (NOST).

Selected Publications

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Invitation to Submit Opinion Piece

In order to make better educational use of the wide geographical and disciplinary reach of this *HPS&ST Note*, invitations are extended for readers to contribute opinion or position pieces or suggestions about any aspect of the past, present or future of HPS&ST studies.

Contributions can be sent direct to editor. Ideally, they might be pieces that are already on the web, in which case a few paragraphs introduction, with link to web site can be sent, or else the pieces will be put on the web with a link given in the Note.

They will be archived, and downloadable, in the OPINION folder at the HPS&ST web site **HERE**:

 # Varia

- Charles Sawyer: Joseph Agassi and the Travails of a late-1960s HPS graduate student. HERE
- Academic freedom in Turkey: Boğaziçi University. Details HERE
- *Science & Education* Open Access articles (387). HERE
- *Constructivism in Science Education: A Philosophical Examination*, M.R. Matthews (ed.), Springer 1998, 248 pps, HERE

 # XVII-th Congress on Logic, Methodology, and Philosophy of Science and Technology (CLMPST 2023)
Science & Values in an Uncertain World

Buenos Aires, Argentina, 24–29 July 2023.

This will be the first CLMPST congress held in the southern hemisphere.. These congresses have been organised since its first instalment, held at Stanford University in 1960, by the *Division of Logic, Methodology and Philosophy of Science and Technology of the International Union for History and Philosophy of Science and Technology* (DLMPST/IUHPST), the global voice for logic and philosophy of science and technology.

The members of the DLMPST represent the national research communities of 38 countries from all continents and twelve international research organisations. For many decades, our congresses were mostly organised in Europe and North America, not reflecting the truly global nature of the logic and philosophy of science community. We are very happy to see

that CLMPST 2023 will break this pattern by highlighting the important role of the southern hemisphere for our field.

The academic world in 2023 is a very different place than it was when the congress was in Prague in 2019. Some of the themes that were central in 2019 remain as acute as ever such as the rising danger of science denialism and disinformation; but the global Covid pandemic that hit the world in 2020, leading to an extensive public debate about the way scientific knowledge is created, the role of values in scientific research, the interface between science and policy decisions, the robustness of scientific knowledge, the role of scientific models for predictions, and in general, decision-making under uncertainty. Logic and philosophy of science and technology are central for all of these topics. Therefore, it is most fitting that the congress in Buenos Aires will be held under the theme *Science and Values in an Uncertain World*.

The large number of submissions of presentations and symposia to CLMPST XVII should guarantee that the whole community is represented at the congress and that it covers this complex theme from a variety of different viewpoints. In addition to submitted presentations and symposia, DLMPST will continue to highlight the links of our fields to the wider global communities in science and the humanities by special symposia. Continuing a tradition going back to the congresses in Helsinki (2015) and Prague (2019), we aim to have jointly organised special symposia with our mother organisations, the *International Science Council* (ISC) and the *Conseil International de Philosophie et des Science Humaines* (CIPSH) on topics where the input of logicians and philosophers of science and technology can impact global science and humanities policy.

Nancy Cartwright (President)
Benedikt Löwe (Secretary-General)

Plenary speakers: Philip Kitcher, Helen Longino, Itala d'Ottaviano

Invited speakers: Maria Caamaño, Matteo Colombo, David Danks, Yasuo Deguchi, John Dupré, Catarina Dutilh Novaes, Juliet Floyd, Maya Goldenberg, Erich Grädel, Décio Krause, Fenrong Liu, Paolo Mancosu, Alfredo Marcos, Nikolaj Jang Lee Linding Pedersen, Elaine Pimentel, Anya Plutynski, Paula Quinon, Giuseppe Rosolini, Federica Russo, Daniel Steel, Josefa Toribio, Peter Vickers, Sylvia Wenmackers and Leandro Vigners

Full congress details: HERE

PhD Award in HPS&ST

We welcome publishing details of all PhDs awarded in the field of HPS&ST. Send details (name, title, abstract, supervisor, web link) to editor: m.matthews@unsw.edu.au

Recent HPS&ST Research Articles

Cultural Studies of Science Education (Vol. 18, Issue 1, March 2023)

Special issue: Reflecting on Freire: A Praxis of Radical Love and Critical Hope for Science Education

Editors: Betzabé Torres Olave, Sara Tolbert, Alejandra Frausto Aceves

Ampatzidis, G., Ergazaki, M. (2023). Using the History of the Super-Organismic-Plant-Community Concept to Help Students Understand the Nature of Science. *Sci & Educ*, 1-20. https://doi.org/10.1007/s11191-023-00433-8

Archila, P.A., Restrepo, S., Truscott de Mejía, A. et al. (2023). STEM and Non-STEM Misconceptions About Evolution: Findings from 5 Years of Data. *Sci & Educ*, 1-19. https://doi.org/10.1007/s11191-023-00428-5

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Kraus, S.F.(2023). The Method of Observation in Science Education: Characteristic Dimensions from an Educational Perspective. *Sci & Educ*, 1-36. https://doi.org/10.1007/s11191-023-00422-x

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Wiyarsi, A., Çalik, M., Priyambodo, E. et al. (2023). Indonesian Prospective Teachers' Scientific Habits of Mind: A Cross-Grade Study in the Context of Local and Global Socio-scientific Issues. *Sci & Educ*, 1-27. https://doi.org/10.1007/s11191-023-00429-4

Recent HPS&ST Related Books

Ames, M. G., & Mazzotti, M. (Eds.) (2023). *Algorithmic Modernity: Mechanizing Thought and Action, 1500-2000*. Oxford, UK: Oxford University Press. ISBN: 9780197502426

"Algorithms have been transforming human society long before the advent of computing. Yet they continue to exist in relative invisibility despite their presence behind many of our modern social interactions. The rhetoric of algorithmic neutrality is more alive than ever, and algorithms are often depicted as obvious and unproblematic—without context and without history.

"*Algorithmic Modernity* draws together the history of mathematics and intellectual history

to convey the enduring global history of the algorithm as a computational tool, epistemic ideal, and rhetorical figure alongside the ascendance of modernity. Through historical reconstructions of relevant thinkers and cultural phenomena over the last five hundred years, this collection of essays reveals how algorithms became the standard method for solving problems from the early inclusion of algorithms in Newton's formation of calculus to their later influence in the New Deal economy. Together, these essays create an informed history for readers interested in the social and cultural implications of today's pervasive digital algorithm.

"Featuring experts in mathematics, history, and computing, *Algorithmic Modernity* presents a multi-faceted exploration of the genealogy of algorithmic thinking in modern times." (From the Publishers)

More information HERE

Bellis, D., Garber, D., & Palmerino , C.R. (Eds.) *Pierre Gassendi: Humanism, Science, and the Birth of Modern Philosophy*. Abingdon, UK: Routledge. ISBN 9781138697454

"Pierre Gassendi (1592–1655) was a major figure in seventeenth-century philosophy and science and his works contributed to shaping Western intellectual identity. Among "new philosophers," he was considered Descartes's main rival, and he belonged to the first rank of those attempting to carve out an alternative to Aristotelian philosophy. In his writings, he promoted a revival of atomism and Epicureanism within a Christian framework, and advocated an empiricist and probabilistic epistemology which was to have a major impact on later thinkers such as Locke and Newton. He is moreover important for his astronomical work, for his defense of Galileo's mechanics and cosmology, and for his activity as a biographer.

"Given the importance of Gassendi for the history of science and philosophy, it is surprising to see that he has been largely ignored in the Anglophone world. This collection of essays constitutes the first book on Gassendi in the English language that covers his biography, bibliography, and all aspects of his work. The book is divided into three parts. Part I offers a reconstruction of the genesis of Gassendi's Epicurean project, an overview of his biography, and analyses of Gassendi's early attacks on Aristotle, of his advocacy of Epicurean philosophy, and his relation to the skeptical tradition and to Cicero's thought.

Part II addresses Gassendi as a participant in seventeenth-century philosophical and scientific debates, focusing especially on his controversies with Descartes and Fludd. Part III explores Gassendi's contributions to logic, theories of space and time, mechanics, astronomy, cosmology, and the study of living beings, and presents the reception of Gassendi's thought in England.

"This book is an essential resource for scholars and upper-level students of early modern philosophy, intellectual history, and the history of science who want to get acquainted with Pierre Gassendi as a major philosopher and intellectual figure of the early modern period." (From the Publishers)

More information HERE

Figueredo, V. M (2023). *The Curious History of the Heart: A Cultural and Scientific Journey*. Columbia, NY: Columbia University Press. ISBN: 9780231208185

"For much of recorded history, people considered the heart to be the most important organ in the body. In cultures around the world, the heart—not the brain—was believed to be the location of intelligence, memory, emotion, and the soul. Over time, views on the purpose of the heart have transformed as people sought to understand the life forces it contains. Modern medicine and science dismissed what was once the king of the organs as a mere blood pump subservient to the brain, yet the heart remains a potent symbol of love and health and an important part of our cultural iconography.

"This book traces the evolution of our understanding of the heart from the dawn of civilization to the present. Vincent M.

Figueredo—an accomplished cardiologist and expert on the history of the human heart—explores the role and significance of the heart in art, culture, religion, philosophy, and science across time and place. He examines how the heart really works, its many meanings in our emotional and daily lives, and what cutting-edge science is teaching us about this remarkable organ. Figueredo considers the science of heart disease, recent advancements in heart therapies, and what the future may hold. He highlights the emerging field of neurocardiology, which has found evidence of a "heart-brain connection" in mental and physical health, suggesting that ancient views hold more truth than moderns suspect.

"Ranging widely and deeply throughout human history, this book sheds new light on why the heart remains so central to our sense of self." (From the Publisher)

More information HERE

Clancy, K. (2023). *Period: The Real Story of Menstruation*. Princeton, NJ: Princeton University Press. ISBN: 9780691191317

"Menstruation is something half the world does for a week at a time, for months and years on end, yet it remains largely misunderstood. Scientists once thought of an individual's period as useless, and some doctors still believe it's unsafe for a menstruating person to swim in the ocean wearing a tampon. *Period* counters the false theories that have long defined the study of the uterus, exposing the eugenic history of gynecology while providing an intersectional feminist perspective on menstruation science.

"Blending interviews and personal experience with engaging stories from her own pioneering research, Kate Clancy challenges a host of myths and false assumptions. There is no such a thing as a "normal" menstrual cycle. In fact, menstrual cycles are incredibly variable and highly responsive to environmental and psychological stressors. Clancy takes up a host of timely issues surrounding menstruation, from bodily autonomy, menstrual hygiene, and the COVID-19 vaccine to the ways racism, sexism, and medical betrayal warp public perceptions of menstruation and erase it from public life.

"Offering a revelatory new perspective on one of the most captivating biological processes in the human body, *Period* will change the way you think about the past, present, and future of periods." (From the Publishers)

More information HERE

Gbur, G. J. (2023). *Invisibility: The History and Science of How Not to Be Seen*. New Haven, CT: Yale University Press. ISBN: 9780300250428

"Is it possible for something or someone to be made invisible? This question, which has intrigued authors of science fiction for over a century, has become a headline-grabbing topic of scientific research.

"In this book, science writer and optical physicist Gregory J. Gbur traces the science of invisibility from its sci-fi origins in the nineteenth-century writings of authors such as H. G. Wells and Fitz James O'Brien to modern stealth technology, invisibility cloaks, and metamaterials. He explores the history of invisibility and its science and technology connections, including the discovery of the electromagnetic spectrum, the development of the atomic model, and quantum theory. He shows how invisibility has moved from fiction to reality, and he questions the hidden paths that lie ahead for researchers.

"This is not only the story of invisibility but also the story of humankind's understanding of the nature of light itself, and of the many fascinating figures whose discoveries advanced this knowledge." (From the Publishers)
More information HERE

Giacomelli, J. (2023). *Uncertain Climes: Debating Climate Change in Gilded Age America*. Chicago, IL: The University of Chicago Press. ISBN: 9780226824437

"Even people who still refuse to accept the reality of human-induced climate change would have to agree that the topic has become inescapable in the United States in recent

decades. But as Joseph Giacomelli shows in *Uncertain Climes*, this is actually nothing new: as far back as Gilded Age America, climate uncertainty has infused major debates on economic growth and national development.

"In this ambitious examination of late-nineteenth-century understandings of climate, Giacomelli draws on the work of scientists, foresters, surveyors, and settlers to demonstrate how central the subject was to the emergence of American modernity. Amid constant concerns about volatile weather patterns and the use of natural resources, nineteenth-century Americans developed a multilayered discourse on climate and what it might mean for the nation's future. Although climate science was still in its nascent stages during the Gilded Age, fears and hopes about climate change animated the overarching political struggles of the time, including expansion into the American West. Giacomelli makes clear that uncertainty was the common theme linking concerns about human-induced climate change with cultural worries about the sustainability of capitalist expansionism in an era remarkably similar to the United States' unsettled present." /From the Publisher)

More information HERE

Hicks, M.T., Jaag, S., & Loew, C. (Eds.) (2023). *Humean Laws for Humean Agents*. Oxford, UK: Oxford University Press. ISBN: 9780192893819

"*Humean Laws for Human Agents* presents cutting-edge research by leading experts on the Humean account of laws, chance, possibility, and necessity. A central question in metaphysics and philosophy of science is: What are laws of nature? Humeans hold that laws are not *sui generis* metaphysical entities but merely particularly effective summaries of what actually happens. The most discussed recent work on Humeanism emphasizes the laws' usefulness for limited agents and uses pragmatic considerations to address fundamental and long-standing problems.

The current volume develops and critically examines pragmatic Humean accounts, with innovative new work on the epistemology of laws and chance, the problem of induction, counterfactuals, special science laws, and a Humean account of essence. Taken together, the papers provide a roadmap for developing pragmatic Humeanism and connate views, setting the agenda for future research." (From the Publisher)

More information HERE

Inuzuka, T. (2021). *Alexander Williamson: A Victorian chemist and the making of modern Japan* (H. Laurie, Trans.). London, UK: UCL Press. ISBN: 9781787359314. [Open Access]

"Alexander Williamson was professor of chemistry at UCL (1849–87) and a leading scientist of his time. He taught and cared for visiting Japanese students, thereby assisting them with their goal of modernising Japan. This short, accessible biography explores his contribution to nineteenth-century science as well as his lasting impact on Japanese society.

"In 1863 five students from the Chōshū clan, with a desperate desire to learn from the West, made their way to England. They were put in the care of Williamson and his wife. Their mission was to learn about cutting-edge Western technology, science, economics and politics. When they returned home they rapidly became leading figures in Japanese life at a particularly turbulent time, one of them serving as the country's first prime minister. Subsequently many other Japanese students followed in their footsteps and studied at UCL.

"The remarkable story of the part Williamson and UCL played in the modernisation of Japan is little known today. This biography will promote a deeper understanding of Williamson's scientific innovations and his legacy for Anglo-Japanese relations. An Afterword briefly outlines the extraordinary careers of the pioneering students after they left Britain." (From the Publishers)

More information HERE

Jay, M. (2023). *Psychonauts: Drugs and the Making of the Modern Mind*. New Haven, CT: Yale University Press. ISBN: 9780300257946

"Until the twentieth century, scientists investigating the effects of drugs on the mind did so by experimenting on themselves. Vivid descriptions of drug experiences sparked insights across the mind sciences, pharmacology, medicine, and philosophy. Accounts in journals and literary fiction inspired a fascinated public to make their own experiments—in scientific demonstrations, on exotic travels, at literary salons, and in occult rituals.

"But after 1900 drugs were increasingly viewed as a social problem, and the long tradition of self-experimentation began to disappear.

"From Sigmund Freud's experiments with cocaine to William James's epiphany on nitrous oxide, Mike Jay brilliantly recovers a lost intellectual tradition of drug-taking that fed the birth of psychology, the discovery of the unconscious, and the emergence of modernism. Today, as we embrace novel cognitive enhancers and psychedelics, the experiments of the original psychonauts reveal the deep influence of mind-altering drugs on Western science, philosophy, and culture." (From the Publishers)

More information HERE

Jones, A. (2023). *How Kant Matters for Biology: A Philosophical History*. Chicago, IL: The University of Chicago Press. ISBN: 9781786839732

"Kant denied biology the status of a proper science, yet his account of the organism profoundly influenced a range of intellectual disciplines. This book examines Kant's influence on biology in the British Isles by proposing that his influence owes to misunderstandings of his philosophy. Andrew Jones exposes the incompatibility between transcendental realism and scientific naturalism and charts how Kant, nevertheless, influenced various aspects of the scientific method.

With this context in mind, Jones examines the extent to which core concepts in contemporary philosophy—natural law, the unity of science, and our understanding of organisms— are compatible with scientific naturalism and proposes new avenues for developing Kant-inspired approaches within contemporary philosophy of science." (From the Publisher)

More information HERE

Johns, A. (2023). *The Science of Reading: Information, Media, and Mind in Modern America*. Chicago, IL: The University of Chicago Press. ISBN: 9780226821481

"Reading is perhaps the essential practice of modern civilization. For centuries, it has been seen as key to both personal fulfillment and social progress, and millions today depend on it to participate fully in our society. Yet, at its heart, reading is a surprisingly elusive practice. This book tells for the first time the story of how American scientists and others have sought to understand reading, and, by understanding it, to improve how people do it.

"Starting around 1900, researchers—convinced of the urgent need to comprehend a practice central to industrial democracy—began to devise instruments and experiments to investigate what happened to people when they read. They traced how a good reader's eyes moved across a page of printed characters, and they asked how their mind apprehended meanings as they did so. In schools across the country, millions of Americans learned to read through the application of this science of reading. At the same time, workers fanned out across the land to extend the science of reading into the social realm, mapping the very geography of information for the first time. Their pioneering efforts revealed that the nation's most pressing problems were rooted in drastic informational inequities, between North and South, city and country, and white and Black—and they suggested ways to tackle those problems.

"Today, much of how we experience our information society reflects the influence of these enterprises. This book explains both how the science of reading shaped our age and why, with so-called reading wars still plaguing schools across the nation, it remains bitterly contested." (From the Publisher)

More information HERE

Johnsen, H. C. G. (2023). *Science Meets Philosophy: What Makes Science Divided but Still Significant*. Abingdon, UK: Routledge. ISBN: 9781032354354

"The book is an attempt to bring together what are often seen as incommensurable scientific and philosophical positions. Its core argument is that a main reason for the divisions about what constitutes scientific knowledge relates to disagreements on philosophical issues. The book explores what these disagreements are about, and discusses whether they can be overcome.

"Taking a historical perspective, the book traces the divides in science back to three main philosophical traditions: realism, idealism, and scepticism. It maps how these have inspired three main current positions in science: logical empiricism, phenomenology, and sociology of scientific knowledge.

"The book is intended for a general audience concerned with today's debates on scientific knowledge and society. It will be useful for students and researchers studying philosophy of science, sociology of scientific knowledge, realism, phenomenology, positivism, logical empiricism, analytical philosophy, and sustainable scientific knowledge." (From the Publishers)

More information HERE

Keller, V. (2023). *The Interlopers: Early Stuart Projects and the Undisciplining of Knowledge*. Baltimore, MD: Johns Hopkins University Press. ISBN: 9781421445922

"Many accounts of the scientific revolution portray it as a time when scientists disciplined knowledge by first disciplining their own behavior. According to these views, scientists such as Francis Bacon produced certain knowledge by pacifying their emotions and concentrating on method. In *The Interlopers*, Vera Keller rejects this emphasis on discipline and instead argues that what distinguished early modernity was a navigation away from restraint and toward the violent blending of knowledge from across society and around the globe.

"Keller follows early seventeenth-century English "projectors" as they traversed the world, pursuing outrageous entrepreneurial schemes along the way. These interlopers were developing a different culture of knowledge, one that aimed to take advantage of the disorder created by the rise of science and technological advances. They sought to deploy the first submarine in the Indian Ocean, raise silkworms in Virginia, and establish the English slave trade. These projectors developed a culture of extreme risk-taking, uniting global capitalism with martial values of violent conquest. They saw the world as a riskscape of empty spaces, disposable people, and unlimited resources.

"By analyzing the disasters—as well as a few successes—of the interlopers she studies, Keller offers a new interpretation of the nature of early modern knowledge itself. While many influential accounts of the period characterize European modernity as a disciplining or civilizing process, *The Interlopers* argues that early modernity instead entailed a great un-disciplining that entangled capitalism, colonialism, and science." (From the Publishers)

More information HERE

Kraemer, F. (2023). *A Centaur in London: Reading and Observation in Early Modern Science*. Baltimore, MD: Johns Hopkins University Press. ISBN: 9781421446318

"Historians traditionally argue that the sciences were born in early modern Europe during the so-called Scientific Revolution. At the heart of this narrative lies a supposed shift from the knowledge of books to the knowledge of things. The attitude of the new-style intellectual broke with the text-based practices of erudition and instead cultivated an emerging empiricism of observation and experiment. Rather than blindly trusting the authority of ancient sources such as Pliny and Aristotle, practitioners of this experimental philosophy insisted upon experiential proof.

"In *A Centaur in London,* Fabian Kraemer calls a key tenet of this master narrative into question—that the rise of empiricism entailed a decrease in the importance of reading practices. Kraemer shows instead that the early practices of textual erudition and observational empiricism were by no means so remote from one another as the traditional narrative would suggest. He argues that reading books and reading the book of nature had a great deal in common—indeed, that reading texts was its own kind of observation. Especially in the case of rare and unusual phenomena like monsters, naturalists were dependent on the written reports of others who had experienced the good luck to be at the right place at the right time. The connections between compiling examples from texts and from observation were especially close in such cases.

"*A Centaur in London* combines the history of scholarly reading with the history of scientific observation to argue for the sustained importance of both throughout the Renaissance and provides a nuanced, textured portrait of early modern naturalists at work." (From the Publishers)

More information HERE

Levitt, T. (2023). *Elixir: A Parisian Perfume House and the Quest for the Secret of Life*. Cambridge, MA: Harvard University Press. ISBN: 9780674250895

"For centuries, scientists believed that living matter possessed a special quality—a spirit or essence—that differentiated it from nonliving matter. But by the nineteenth century, the scientific consensus was that the building blocks of one were identical to the building blocks of the other. *Elixir* tells the story of two young chemists who were not convinced, and how their work rewrote the boundary between life and nonlife.

"In the 1830s, Édouard Laugier and Auguste Laurent were working in Laugier Père et Fils, the oldest perfume house in Paris. By day they prepared the perfumery's revitalizing elixirs and rejuvenating *eaux,* drawing on alchemical traditions that equated a plant's vitality with its aroma. In their spare time they hunted the vital force that promised to reveal the secret to life itself. Their ideas, roundly condemned by established chemists, led to the discovery of structural differences between naturally occurring molecules and their synthetic counterparts, even when the molecules were chemically identical.

"Scientists still can't explain this anomaly, but it may point to critical insights concerning the origins of life on Earth. Rich in sparks and smells, brimming with eccentric characters, experimental daring, and the romance of the Bohemian salon, *Elixir* is a fascinating cultural and scientific history." (From the Publishers)

More information HERE

Lyons, S. L. (2020). *From Cells to Organisms: Re-envisioning Cell Theory*. Toronto: University of Toronto Press. ISBN: 9781442635098

"More than a history, *From Cells to Organisms* delves into the nature of scientific practice, showing that results are interpreted not only through the lens of a microscope, but also through the lens of particular ideas and prior philosophical convictions.

"Before the twentieth century, heredity and development were considered complementary aspects of the fundamental problem of generation, but later they became distinct disciplines with the rise of genetics. Focusing on how cell theory shaped investigations of development, this book explores evolution, vitalism, the role of the nucleus, and the concept of biological individuality. Building upon the work of Thomas Huxley, an important early critic of cell theory, and more recent research from biologists such as Daniel Mazia, *From Cells to Organisms* covers ongoing debates around cell theory and uses case studies to examine the nature of scientific practice, the role of prestige, and the dynamics of theory change." (From the Publisher)

More information HERE

Pombo, P., Gärtner, K, & Jesuíno, J. (Eds.). (2023). *Theory and Practice in the Interdisciplinary Production and Reproduction*

of Scientific Knowledge: ID in the XXI Century. Dordrecht: Springer. ISBN: 978-3-031-20405-0

"This book addresses the urgent need for a large and systematic analysis of current interdisciplinary (ID) research and practice. It demonstrates how ID is essentially a cognitive phenomenon, something different from the frivolous and inconsequential attempt of trying to overcome the disciplinary competencies and exigencies. By ID, the authors show that it is a manifestation of the transversal rationality that underlies current scientific activity. It is the very progress of specialized disciplines that requires interdisciplinary new research practices and new forms of articulation between domains, something that has a strong impact on the traditional disciplinary structure of scientific and educational institutions.

"Divided into two parts, the book presents a conceptual framework as well as several case studies on ID practices. The book aims at covering three main themes. It contributes to the stabilization of ID meaning and characterizes the main ID theorizations which have been proposed until now. It builds an innovative and broad understanding of the several ID determinations as an essentially cognitive phenomenon and of its institutional implications at the level of disciplinary structures and curricular organization. Finally, it distinguishes and maps the diversity of ID procedures and practices which are being used and tested by contemporary scientific and educational institutions. This book is addressed to philosophers, scientists and every one interested in science production and reproduction, including science teaching." (From the Publishers)

More information HERE

Ragan, M. A. (2023). *Kingdoms, Empires, and Domains: The History of High-Level Biological Classification*. Oxford, UK: Oxford University Press. ISBN: 9780197643037

"A generation or two before Socrates, thinkers classified the world's organisms into three categories: plants, animals, and man. However, Aristotle recognized that some organisms, such as sponges and sea-fans, share properties of both plants and animals. These became known as zoophytes. Since then, scientists have explored the idea of a "third kingdom." In *Kingdoms, Empires, and Domains*, leading molecular systematist Mark A. Ragan offers a history of the idea that there is more to the living world than plants and animals.

"Progressing chronologically through philosophical, religious, literary, and other pre-scientific traditions, Ragan traces how transgressive creatures such as sponges, corals, algae, fungi, and diverse microscopic beings have been described, categorized, and understood throughout history. The book considers their appearance in early Christian, Islamic, and Jewish traditions; myths, legends, and traveller's tales; occult literature; and more. *Kingdoms, Empires, and Domains* also details how the concept of a "third kingdom" has evolved throughout the history of scientific botany and zoology, and continues to evolve up to the present day.

"*Kingdoms, Empires, and Domains* features original translations of passages from key historical texts, many of which have never appeared in English before. It also draws on the most recent and reliable scientific literature. A sweeping, interdisciplinary study, *Kingdoms, Empires, and Domains* is essential reading for students and scholars of the history of biological classification and anyone interested in the history of ideas about the natural world." (From the Publishers)

More information HERE

Rheinberger, H.-J. (2023). *Split and Splice: A Phenomenology of Experimentation*. Chicago, IL: The University of Chicago Press. ISBN: 9780226825328

"The experiment has long been seen as a test bed for theory, but in *Split and Splice*, Hans-Jörg Rheinberger makes the case, instead, for treating experimentation as a creative practice. His latest book provides an innovative look at the experimental protocols and connections that have made the life sciences so productive.

"Delving into the materiality of the experiment, the first part of the book assesses traces, models, grafting, and note-taking—the conditions that give experiments structure and make discovery possible. The second section widens its focus from micro-level laboratory processes to the temporal, spatial, and narrative links between experimental systems. Rheinberger narrates with accessible examples, most of which are drawn from molecular biology, including from the author's laboratory notebooks from his years researching ribosomes.

"A critical hit when it was released in Germany, *Split and Splice* describes a method that involves irregular results and hit-or-miss connections—not analysis, not synthesis, but the splitting and splicing that form a scientific experiment. Building on Rheinberger's earlier writing about science and epistemology, this book is a major achievement by one of today's most influential theorists of scientific practice." (From the Publisher)

More information HERE

Rudolph, J. L. (2023). *Why We Teach Science (and Why We Should)*. Oxford, UK: Oxford University Press. ISBN: 9780191959295

"Few people question the importance of science education in American schooling. It's the key, after all, to economic growth, develops the ability to reason more effectively, and enables us to solve everyday problems. Good science teaching results in all these benefits and more—or so we think. But what if all this is simply wrong? What if the benefits we assume science education produces turn out to be an illusion, nothing more than wishful thinking?

"In *Why We Teach Science (and Why We Should)*, John Rudolph examines the reasons we've long given for teaching science and assess how they hold up to what we know about what students really learn in science classrooms and what research tells us about how people actually interact with science in their daily lives. The results will surprise you.

"Instead of more and more rigorous traditional science education to fill the STEM pipeline, Rudolph challenges us to think outside the box of traditional instruction and make the case for an expansive science education aimed instead at rebuilding trust between science and the public—something we desperately need in our current era of impending natural challenges and science denial." (From the Publishers)

More information HERE

Sarkar, D. (2023). *Possible Knowledge: The Literary Forms of Early Modern Science*. Pennsylvania, PA: University of Pennsylvania Press. ISBN: 9781512823363

"The Renaissance, scholars have long argued, was a period beset by the loss of philosophical certainty. In *Possible Knowledge*, Debapriya Sarkar argues for the pivotal role of literature—what early moderns termed *poesie*—in the dynamic intellectual culture of this era of profound incertitude. Revealing how problems of epistemology are inextricable from questions of literary form, Sarkar offers a defense of poiesis, or literary making, as a vital philosophical endeavor.

"Working across a range of genres, Sarkar theorizes "possible knowledge" as an intellectual paradigm crafted in and through literary form. Sixteenth- and seventeenth-century writers such as Spenser, Bacon, Shakespeare, Cavendish, and Milton marshalled the capacious concept of the "possible," defined by Philip Sidney as what "may be and should be," to construct new theories of physical and metaphysical reality. These early modern thinkers mobilized the imaginative habits of thought constitutive to major genres of literary writing—including epic, tragedy, romance, lyric, and utopia—in order to produce knowledge divorced from historical truth and empirical fact by envisioning states of being untethered from "nature" or reality.

"Approaching imaginative modes such as hypothesis, conjecture, prediction, and counterfactuals as instruments of possible knowledge, Sarkar exposes how the speculative allure of the "possible" lurks within scientific experiment, induction, and theories of probability. In showing how early modern

literary writing sought to grapple with the challenge of forging knowledge in an uncertain, perhaps even incomprehensible world, *Possible Knowledge* also highlights its most audacious intellectual ambition: its claim that while natural philosophy, or what we today term science, might explain the physical world, literature could remake reality. Enacting a history of ideas that centers literary studies, *Possible Knowledge* suggests that what we have termed a history of science might ultimately be a history of the imagination." (From the Publishers)

More information HERE

Wills, H., Harrison, S., Jones, E.L., Martin, R. & Lawrence-Mackey, F. (Eds.) (2023). *Women in the History of Science: A sourcebook*. London, UCL. ISBN: 9781800084155 [Open Access]

"*Women in the History of Science* brings together primary sources that highlight women's involvement in scientific knowledge production around the world. Drawing on texts, images and objects, each primary source is accompanied by an explanatory text, questions to prompt discussion, and a bibliography to aid further research. Arranged by time period, covering 1200 BCE to the twenty-first century, and across 12 inclusive and far-reaching themes, this book is an invaluable companion to students and lecturers alike in exploring women's history in the fields of science, technology, mathematics, medicine and culture.

"While women are too often excluded from traditional narratives of the history of science, this book centres on the voices and experiences of women across a range of domains of knowledge. By questioning our understanding of what science is, where it happens, and who produces scientific knowledge, this book is an aid to liberating the curriculum within schools and universities." (From the Publishers)

More information HERE

Authors of HPS&ST-related papers and books are invited to bring them to attention of the Newsletter's assistant editor Paulo Maurício (**paulo.asterix@gmail.com**) for inclusion in these sections.

Third International Congress on the History of Science in Education, 4-6 September 2023

We are pleased to invite you to save the date for the 3rd International Congress on the History of Science in Education (3CIHCE), taking place at the University of Algarve (UAlg) in Faro, between the **4th and 6th of September 2023**. The Congress is organised by the UAlg in collaboration with the University of Trás-os-Montes and Alto Douro (UTAD), the University of Coimbra (UC) and Higher Education Institutions from Brazil and Spain.

Maintaining the objectives of previous editions, the 3CIHCE aims to bring together researchers, professors and students interested in the history and teaching of Biology, Geology, Chemistry, Physics and Mathematics, as well as Educational Sciences, Engineering, Agricultural Sciences, Pharmacy/Pharmaceutical Sciences, Medicine, Dental Medicine, Veterinary Medicine, Nursing, Biochemistry, Nutrition and Food Sciences, Anthropology, Astronomy, Psychology, Economics, Sociology, Ecology, Cellular and Molecular Biology and Nanosciences, among others, in an enriching and multidisciplinary debate.

The conference is intended for undergraduate, master, and doctoral students, professors of the 1st, 2nd and 3rd cycles of basic education and secondary education, university professors, researchers, and the public, and will be carried out in a hybrid format (face-to-face and videoconference).

We cordially invite you to submit your abstract until **May 31, 2023**, and registration for the congress can be performed until July 31, 2023. The submitted works will be evaluated by the Scientific Committee led by Professor Isilda Rodrigues from UTAD.

Please note that abstracts must contain the title, names of authors and their affiliations, a maximum of 250 words, up to 5 keywords, be written in English and Portuguese, in Arial font, size 11 and with 1.5 line spacing. The website, program and other relevant information will be available soon.

Isilda Teixeira Rodrigues
Education
University of Trás-os-Montes
isilda@utad.pt

Ninth Norwegian Conference on History of Science, 29 November – 2 December 2023, Trondheim, Norway

The conference is being held at the Norwegian University of Science and Technology. The organizers invite papers on any aspect of the history of science, technology or medicine and particularly welcome papers engaging with the issue of anniversaries, broadly defined.

Historians can be ambivalent about anniversaries. On the one hand, they offer an opportunity to reassess and mobilize interest in topics that otherwise would not receive widespread attention. Anniversaries are an occasion to reflect on the enduring importance of history to the contemporary world and are frequently used to argue for funding specific projects. On the other hand, not all topics of historical interest have anniversaries; anniversaries may isolate topics from their historical context or facilitate an arbitrary juxtaposition of past and present; and they may foster expectations that the past must be celebrated rather than critically analyzed.

Such topics are fundamental to historical inquiry, prompting reflection on the relationships between scholars and audiences, between research and social context – including teaching – and between events of the past and the imperatives of the present.

Deadline for submissions June 1.
For more information, see conference webpage
Contact person: Annette Lykknes (annette.lykknes@ntnu.no)

Vale: Joseph Agassi (1927-2023)

Joseph Agassi, the prolific Israeli historian, philosopher and sociologist of science, a noted student of Karl Popper, and a scholar with the widest political, cultural and educational interests—died on 22 January aged 95.

Agassi graduated in physics and philosophy from The Hebrew University, then completed the MSc degree in physics (1951). In 1952 he went to London University (the LSE) to study, and work as a research assistant, with Karl Popper. He

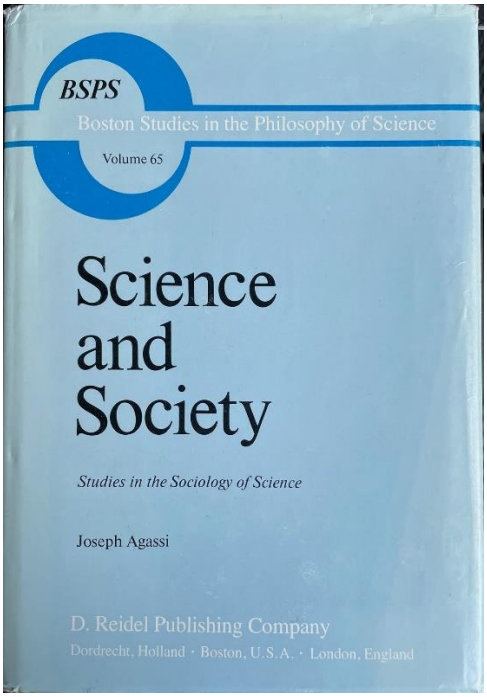
graduated PhD in 1956. An account of Agassi's career and publications is **HERE**. A Wikipedia entry, that usefully has 50+ downloadable Agassi papers, is **HERE**.

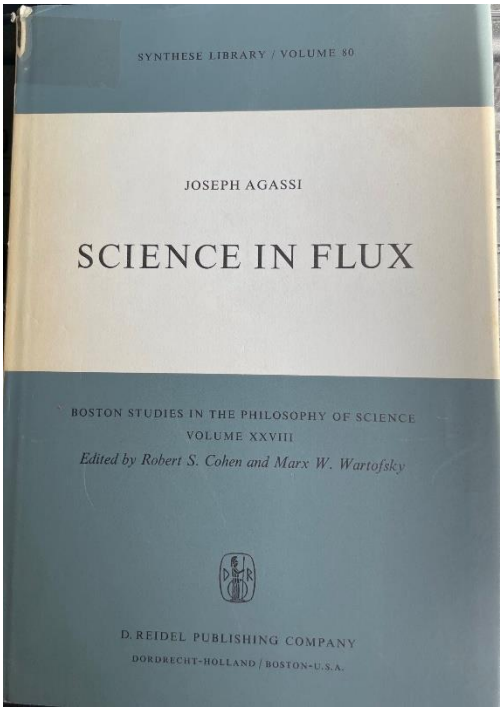
Agassi articulated, refined, expanded and defended Popper's research programme of Critical Rationalism. He thrived on intellectual exchange, through publications, in conferences and in animated conversations. He had continuing engagements with a range of top-rank philosophers and social scientists, and with any student who wanted a serious communication or asked a probing question.

Among numerous philosophers with whom he engaged was Mario Bunge who also spent time in Popper's LSE department and who became a personal friend. Bunge, in his so-informative *Memoirs*, says of Agassi: 'I believe Joseph is Popper's best pupil, and one of the few who neither flattered nor betrayed him' (p.139). And 'He was Popper's most lucid, loyal, and yet independent student' (p.368).

Marx Wartofsky, Joseph Agassi, Mario Bunge.
Boston University HPS Department, 1978.
Photo: Charlie Sawyer

Robert Cohen was another philosopher friend and colleague was with whom Agassi taught and researched at Boston University's HPS Centre. He contributed a number of important volumes to Cohen's *Boston Studies* series, and gave presentations in the Boston Colloquium.

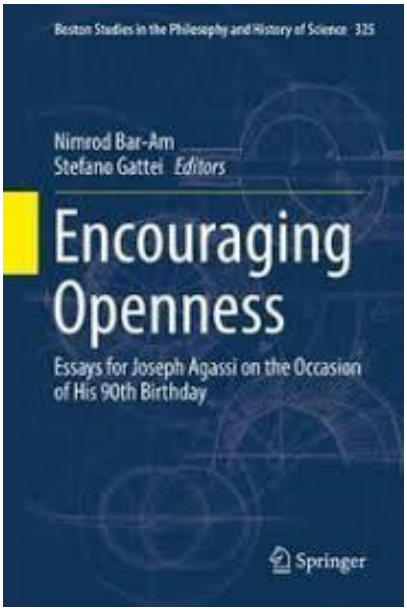




One of the twenty papers in the second collection well captures Agassi's orientation to HPS:

'The Nature of Scientific Problems and Their Roots in Metaphysics' (pp.208-239).

A 580-page, 42-chapter *Boston Studies* volume, *Encouraging Openness*, commemorated his 90th birthday.



Agassi had life-long interests in education: both the improvement of science teaching and learning, and the wider Enlightenment Project's justification of science education as the prime vehicle for cultural and social betterment. He wrote pieces for children that cultivated scientific interest and competence. A collection of 25 of his education papers published over a 45-year period was published in 2014: *The Hazard Called Education* (Springer).

Ian Winchester, in his essay 'Joseph Agassi's Educational Thoughts', published in the above *Encouraging Openness*, writes: 'For over 50 years, Joseph Agassi has thought and written about education'. And observes:

> … what struck me most about Joseph's educational thinking was its being direct and to the point.

Coming HPS&ST Related Conferences

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April 18-21, 2023, NARST Annual Conference, Chicago
Details **HERE**

April 20-21, 2023, History of Science, Technology and Medicine (HSTM) Network Ireland Annual Meeting, Dublin City University.
Details: **HERE**

April 20-21, Conference *Gravitational Constant: From Local to Universal*, St Andrews, Scotland
Details **HERE**

May 5-7, 2023, 'Science, Values and Society', Postgraduate Philosophy Student Conference, Alberta, Canada
Details: **HERE**

May 23-24, 2023, Ernst Mach Workshop: 'On Causation', Prague
Details: **HERE**

June 8-9, 2023, 10th International Philosophy of Medicine Roundtable, Bologna, Italy
Details **HERE**

June 9-11, 2023, Eighth Annual Conference on the History of Recent Social Science, Uppsala, Sweden
Details **HERE**

June 27-30, 2023, ASERA Annual Conference, Cains, Australia
Details **HERE**

July 4-7, 2023, European Society for the History of the Human Sciences, Rome conference
Details **HERE**

July 9-15, 2023, ISHPSSB biennial conference, Toronto, Canada.
Details **HERE**

July 24-29, 2023, 17th DLMPST Congress, University of Buenos Aires
Information: Pablo Lorenzano, **HERE**

August 9-11, 2023, IHPST-LA regional conference, Porto Alegre, Brazil
Details **HERE**

August 14-18, 2023, International Committee for History of Technology, 50th Conference, Tallinn, Estonia
Details **HERE**

August 29-Sept.3, 2023, ESERA biennial conference, Cappadocia, Turkey
Details **HERE**

September 4-6, 2023, 3rd International Conference on History of Science and Education, Algrave, Portugal.
Details Isilda Teixeira Rodrigues

September 18-22, 2023, 42nd Scientific Instrument Symposium, Palermo, Italy
Details **HERE**

September 20-23, 2023, European Philosophy of Science Association (EPSA23), Belgrade, Serbia
Details **HERE**

November 29-December 2, 2023, 9th Norwegian Conference on the History of Science, Trondheim, Norway.
Details **HERE**

HPS&ST Related Organisations and Websites

IUHPST – International Union of History, Philosophy, Science, and Technology
DLMPST – Division of Logic, Mathematics, Philosophy, Science, and Technology
DHST – Division of History, Science, and Technology
IHPST – International History, Philosophy, and Science Teaching Group
NARST - National Association for Research in Science Teaching
ESERA - European Science Education Research Association
ASERA - Australasian Science Education Research Association
ICASE - International Council of Associations for Science Education
UNESCO – Education
HSS – History of Science Society
ESHS – European Society for the History of Science
AHA – American History Association
ACS HIST – American Chemical Society Division of the History of Chemistry
GWMT - Gesellschaft für Geschichte der Wissenschaften, der Medizin und der Technik
ISHEASTME – International Society for the History of East Asian History of Science Technology and Medicine
EASE - East-Asian Association for Science Education
BSHS – British Society for History of Science
EPSA - European Philosophy of Science Association
AAHPSSS - The Australasian Association for the History, Philosophy, and Social Studies of Science
HOPOS – International Society for the History of Philosophy of Science
PSA – Philosophy of Science Association
BAHPS - Baltic Association for the History and Philosophy of Science
BSPS – The British Society for the Philosophy of Science
SPSP - The Society for Philosophy of Science in Practice
ISHPSB - The International Society for the History, Philosophy, and Social Studies of Biology
PES – The Philosophy of Education Society (USA)

The above list is updated and kept on the HPS&ST website at: **HERE**

HPS&ST related organizations wishing their web page to be added to the list should contact assistant editor Paulo Maurício (paulo.asterix@gmail.com)

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