

# HPS&ST NEWSLETTER





# HPS&ST NEWSLETTER

APRIL 2022

The HPS&ST NEWSLETTER is emailed monthly to about 9,800 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 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 to the NEWSLETTER (publications, conferences, opinion pieces, etc.) are welcome and should be sent direct to the editor: Michael R. Matthews, UNSW ([m.matthews@unsw.edu.au](mailto:m.matthews@unsw.edu.au)).

The NEWSLETTER, along with RESOURCES, OBITUARIES, OPINION PIECES and more, are available at the website: <http://www.hpsst.com/>

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## Thomas Kuhn Centenary Celebration and Conference, 13-15 July 2022, University of Kent, UK

## Royal Society and US Academy of Sciences Biographical Memoirs

Thomas Kuhn (18 July 1922-17 June 1996) is widely considered as one of the most important philosophers of science in the 20th century. His book *The Structure of Scientific Revolutions* (SSR) is also regarded as one of the most influential works in the philosophy of science. Kuhn famously introduced the concept of paradigm to analyse the history of science. He also developed the incommensurability thesis. Kuhn's work contributed to the so-called historical turn in the 20th century philosophy of science. Its influence goes beyond philosophy of science and makes a huge impact on history of science, sociology of science, and the social sciences.

2022 will mark the 100th anniversary of the birth of Thomas Kuhn and the 60th anniversary of the publication of SSR. The conference aims to examine Kuhn's contribution to contemporary philosophy of science, revisit his legacy for the history and philosophy of science, and reflect on the prospect of the Kuhnian philosophy of science.

### Keynote Speakers

Hanne Andersen (University of Copenhagen)  
Theodore Arabatzis (University of Athens)  
Alexander Bird (University of Cambridge)  
Hasok Chang (University of Cambridge)  
Donald Gillies (University College London)  
Vasso Kindi (University of Athens)

### [Programme](#)

### [Book of Abstracts](#)

Information [here](#).

The Royal Society is a learned society and the United Kingdom's national academy of sciences. Since 1932, the Royal Society has been publishing extended obituaries of its Fellows and Foreign Members. *The Biographical Memoirs* are recognized as definitive accounts of the life and work of these eminent scientists, providing a valuable resource for both scientists and historians of science.

Each memoir is carefully researched and creatively written, usually by a close colleague or research collaborator. The main focus is the science and scientific endeavour, but the memoirs also offer a fascinating insight into the character and personalities of the individuals involved. Readers can discover how the science was achieved within the historical context, and follow the development of specific scientific disciplines and fields of research.

These memoirs provide a rich and unique resource to supplement undergraduate and post-graduate teaching and seminars. Students will benefit from understanding how their research field has developed, and be inspired by the stories of those who have succeeded before.

### [Royal Society Biographies](#)

### [US National Academy of Sciences Biographical Memoirs](#)

## University of Leeds, History & Philosophy of Science Online Seminar Series, Spring 2022

Wednesdays 3.15-5pm GMT (except on May 11th)

**April 27** Fati Fan (Binghampton) 'All Eyes, All Ears, All the Time: Environmental Monitoring, Sensory Experience, and Political Epistemology in Communist China and Beyond'

**May 11** Chris Lean (Sydney), 'The future role of synthetic biology in conservation' NB at 11 am GMT

Join us on Zoom for these seminars, [here](#).

For further information, please contact the Director of the Leeds HPS Centre, Dr Ellen Clarke: [e.clarke@leeds.ac.uk](mailto:e.clarke@leeds.ac.uk)

## Coulomb's Main Works on Electricity and Magnetism

Andre Koch Torres Assis

*Commented Translation of Coulomb's Main Works on Electricity and Magnetism*, (Apeiron, Montreal), 515 pages, ISBN-10: 198-7-980-31X and ISBN-13: 978-1-987-98031-8.

This book contains complete and commented translations, from French to Portuguese, of the main works of Charles-Augustin de Coulomb (1736-1806). They include his French Academy prize-winning memoir of 1777 on the best manner of constructing magnetic needles, his torsion work of 1784 and his 7 major Memoirs on electricity and magnetism read at the Academy from 1785 to 1791.

The book is freely available in PDF format [here](#).

The printed book can be ordered from Amazon [here](#).

## HPS&ST in Latin America

- Announcements
- The Revista Brasileira de História da Ciência (Brazilian Journal of History of Science) is calling for papers for a special issue on HPS&ST: [História da Ciência para uma Educação em Ciências do futuro](#); [La Historia de la Ciencia para una Educación Científica del Futuro](#); The History of Science for a Science Education of the Future (to access the Spanish and English versions, click in the language option at the right side of the webpage). The journal accepts submissions in Portuguese, Spanish and English.

### Events

- On May 12, there will be held a virtual discussion on the recently published book *Redescobrimos a Teoria Quântica: um resgate dos principais conceitos nos discursos do prêmio Nobel*. The book provides commentaries and the Portuguese translation of important Nobel lectures on Quantum Theory. To attend the meeting, see [here](#). More information may be found [here](#). Participants will receive the book for free by e-mail.
- XX IOSTE Symposium (International Organisation for Science and Technology Education) will be held in Federal University of Pernambuco and Mar Hotel Conventions, Recife, Brazil, from July 25th to 29th. The theme of the event will be "Esperança in uncertain times: the role of science and technology education

in/for a changing world”, an allusion to Paulo Freire’s concept of *Esperança* (“hope”). The event presents a special strand for submissions of HPS&ST field. Information is available at <http://www.ioste2022.com/>.

- Charbel El-Hani and Cláudio R. M. Reis, who teach History and Philosophy of Biology at the Federal University of Bahia, Brazil, have begun sharing classes from a course they offer to undergraduate students. These are short and basic classes on central issues in History and Philosophy of Science and Biology, with English subtitles.

The first one can be found [here](#). And at the [resources](#) folder of the HPS&ST website.

- The History, Philosophy and Biology Teaching Lab (LEFHBIO), associated with the Institute of Biology/ Federal University of Bahia and the National Institute of Science and Technology in Interdisciplinary and Transdisciplinary Studies in Ecology and Evolution (INCT IN-TREE), Brazil, would like to publicise its seminar cycle, initiated in this year of 2022, with invited researchers from the fields of Research in Science Education, Philosophy of Biology, Ecology, Evolution and other areas of the Biological Sciences, as well as with social movements and community leaders.

The seminars will take place monthly, always on a Tuesday 10:00 AM BRT, using the Zoom platform. Each seminar will have a maximum audience of 100 participants, based on order of access.

May 24 2022, 10:00AM BRT

Matriz compreensiva da educação científica com uma abordagem intercultural (A broad matrix of science education with an intercultural approach)

Adela Molina (Universidad Distrital Francisco

José de Caldas, Colombia)

Language: Spanish June 7 2022, 10:00AM BRT

How should we think scientifically about biological objects?

Maël Montévil (École Normale Supérieure, Paris, France)

Language: English

The access link is [here](#).

## Publications

- Professor André Assis has just published the book *Tradução Comentada das Principais Obras de Coulomb sobre Eletricidade e Magnetismo*, in which Coulomb’s chief works are translated into Portuguese. The book may be accessed for free [here](#).
- *Ciência & Educação* has just published its most recent issue. The papers can be accessed [here](#).
- *Caderno Brasileiro de Ensino de Física* has just published its most recent issue. The papers can be accessed [here](#).
- The current editorial of *Ciência & Educação* introduces a fundamental discussion for the Brazilian and international Science Education community:



Suzani Cassiani, Sandra L.E. Selles, Fernanda Ostermann, ‘Denialism and Anti-science Cri-

ticism: Decolonial Questions.’ The text is available [here](#).

Along with all its history, Brazil has faced structural racism, that generates continuous violence against black citizens, although the myth of racial democracy- a sociological theory that minimizes racism in Brazil claims that the great miscegenation between Europeans, natives, and Afro-descendants in this country caused a peaceful and democratic coexistence - always tries to silence it. (talvez citar o Gilberto Freyre ou o link abaixo do texto de Motta, 2000)

The authors, Suzani Cassiani, Sandra Selles, and Fernanda Ostermann, recall that, along the XXth century, many scientific endeavors tried to legitimize ethnical, genre, and sexual orientation prejudices.

On the other hand, during the pandemics, denialism and antiscience movements were responsible for spreading fake news about sanitary precautions, impacting the outcomes of the disease. Specially, coronavirus, in Brazil, damaged even more the already vulnerable populations. In this scenario, the authors propose the challenge of opposing denialism and antiscience movements from a decolonial perspective.

In the paper, the reader will find fundamental discussions about the role of the Science Education community in an unequal society in the global South.

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](#) or secondly [Michael Matthews](#).

## East European Network for Philosophy of Science (EENPS) 2022 Conference

The [East European Network for Philosophy of Science](#) (EENPS), in co-operation with the [Institute of Philosophy and Semiotics](#), University of Tartu, announces the [fourth conference](#) of East European Network for Philosophy of Science in Tartu on 17-19 August 2022.



### Keynote Speakers

Helen E. Longino, C.I. Lewis Professor, emerita (Stanford University)

Tarja Tellervo Knuuttila (University of Vienna)

Lukáš Bielík (Comenius University Bratislava)

## Opinion Piece: Thomas Kuhn and Science Education: A Troubled Connection

Michael R. Matthews, School of Education, UNSW, Sydney, Australia

Michael R. Matthews is an honorary associate professor in the School of Education at the University of New South Wales. He has published extensively in the fields of philosophy of education, history and



philosophy of science, and science education. He was Foundation Editor (1990-2015) of the Springer journal *Science & Education: Contributions from the History and Philosophy of Science*. His publications include: seven books, 50 articles, 40 book chapters, and 10 edited anthologies and handbooks.

Publications [here](#).

A pen-picture [here](#).



Thomas Kuhn was the most influential historian of science in the twentieth century. His impact was felt in all academic fields and beyond the academy into society and culture. ‘Paradigm’ is a commonplace in newspaper editorials, political speeches, and much else, ‘incommensurability’ is oft heard in religious debate, and ‘theory dependence’ is everywhere in social science, ‘alternative realities’ is part of indigenous science discourse. Kuhn published a great deal<sup>1</sup>, but his global reputation was based upon one work: *The Structure of Scientific Revolutions* first published sixty years ago (1962). Kuhn’s impact on science education has been immense, and is testified to in the opening sentence of a very contemporary 2022 article written by

David Treagust, Australia’s foremost science educator<sup>2</sup>:

Perhaps one of the major influences on our understanding of how scientific research and scientific knowledge evolves and develops was the publication of Thomas Kuhn’s (1962) *The Structure of Scientific Revolutions*. This small book really changed the way we look at the enterprise that is science. (Treagust 2022, p.16)

The first edition of *Structure* appeared in 1962 in the obscure *International Encyclopedia of Unified Science* (Volume 2 Number 2) edited by the logical empiricist Otto Neurath and read by a small coterie of philosophers. Its argument lay dormant until the enlarged second edition was published as a book in 1970.

The second edition precipitated the Kuhnian tsunami. It was quickly translated into 16+ languages and sold over a million copies. In Australia’s *Arts and Humanities Citation Index*, it was the most cited book on any subject through the 1970s and 1980s. Doubtless it held much the same position in comparable indexes in most countries, both English-speaking and otherwise. The above listed [July centenary conference](#) celebration of his life and work is witness to the enduring interest in Kuhn’s work.

## Pedagogical Origins of Structure

What is oft overlooked is that Kuhn’s ‘revolutionary’ account of science had educational origins, namely his teaching in James Conant’s Harvard General Education Programme. And the early

<sup>1</sup>A 2000 listing of his publications, beginning in 1945, runs to ten pages (Conant & Haugeland 2000, pp.325-335).

<sup>2</sup>David Treagust has 36,000 citations. He is not a minor or peripheral figure. His quoted words indicate how normalised Kuhn’s ‘picture of science’ has become among educators.



formulation of Kuhnian theory was fuelled by reflection and research on science pedagogy.

In the Preface of Kuhn's first book, *The Copernican Revolution*, which arose from his lectures in Conant's programme, he writes:

Work with him [Conant] first persuaded me that historical study could yield a new sort of understanding of the structure and function of scientific research. Without my own Copernican revolution, which he fathered, neither this book nor my other essays in the history of science would have been written (Kuhn 1957, p. xi).

Kuhn had a serious and deep interest in how students learn science, and how they come to give meaning to basic scientific concepts such as mass, acceleration, field and so on. His 1959 address 'The Essential Tension' (Kuhn 1959) was his first substantial discussion of the characteristics of effective pedagogy and the cognitive mechanisms involved in learning scientific concepts. He maintained this interest to the end of his career.

Kuhn's pedagogical interest is well displayed in his little-known 1990 essay '[On Learning Physics](#)'<sup>3</sup>. The essay is a careful and valuable contribution to the science of learning. It gives due recognition to science teachers in the communicating, embedding and development of science:

The vocabulary in which the phenomena of a field like mechanics are described and explained is itself a historical product, developed over time, and repeatedly transmitted, in its then-current state, from one generation to its successor. (Kuhn 1990/2000 p.11)

He gives detailed attention to five factors that are

required for the learning of 'force', 'mass' and 'weight'. Students are adding to their everyday vocabulary, to their lexical repertoire. But the Newtonian concepts 'can only be acquired together with the theory itself' (p.11). He supposes there are only two ways the Newtonian concepts can be learnt:

One that stipulates the second law and finds the law of gravity empirically; another that stipulates the law of gravity and discovers the second law empirically. (p.16)

A consequence is that individual speakers 'will differ about the epistemic status of generalisations that the community members share' (p.16). This is fine, provided there are not anomalies between theory and expected observations. But when there are anomalies, for example 'between celestial observations and the motion of the lunar perigee,' then problems arise.

Scientists who had learned Newtonian 'mass' and 'weight' along the first of my two lexical-acquisition routes would be free to consider altering the law of gravity as a way to remove the anomaly. On the other hand, they would be bound by language to preserve the second law. On the other hand, scientists who had acquired 'mass' and 'weight' along my second route would be free to suggest altering the second law but would be bound by language to preserve the law of gravity. (Kuhn 1990/2000 p.16)

For explication he directs readers to his paper 'Commensurability, Comparability, Communicability' (Kuhn 1982). And in a footnote he writes:

Despite my critics, I do not think that the position developed here leads to relativism, but the threats

<sup>3</sup>The essay is contained in 'Dubbing and Redubbing: The Vulnerability of Rigid Designation' in C.W. Savage (ed.) *Scientific Theories*, University of Minnesota Press, 1990, pp.302-308. And reproduced in *Science & Education* 9(1-2), 2000.

to realism are real and require much discussion. (Kuhn 1990/2000 p.19)

It was no accident that, very early in Kuhn's career and certainly by 1966, he sought to collaborate with Jean Piaget, the internationally renowned developmental psychologist. Kuhn popularized Piaget's 'cognitive ontogeny recapitulates scientific phylogeny' thesis among historians and philosophers of science. Piaget had written:

The fundamental hypothesis of Genetic Epistemology is that there is a parallelism between the progress made in logical and rational organisation of knowledge and the corresponding formative psychological processes. (Piaget 1970, p.13)

Piaget was, in turn, repeating the Hegel-Darwin informed opinion of Herbert Spencer that was expressed in the latter's 1861 *Essays on Education and Kindred Subjects*:

If there be an order in which the human race has mastered its various kinds of knowledge, there will arise in every child an aptitude to acquire these kinds of knowledge in the same order... Education is a repetition of civilization in little.

This opinion had underwritten the popular history-based *Genetic* approach to curricula structure. The connection was well expressed by J.C. Hogg in his 1938 chemistry text:

The historic development is a logical approach. The slow progress of the early centuries was owing to a lack of knowledge, to poor technique and to unmethodical attack. But these are precisely the difficulties of the beginner in chemistry. There is a bond of sympathy between the beginner and the pioneer. (Hogg 1938, p.vii)

It was no idle claim of Kuhn's when he wrote:

Part of what I know about how to ask questions of dead scientists has been learned by examining Piaget's interrogations of living children. (Kuhn 1977, p.21).

It is of some interest to those studying the growth of disciplines that Kuhn recognised how accidental and serendipitous was his discovery of Piaget's work:

A footnote encountered by chance [reading Merton's thesis] led me to the experiments by which Jean Piaget has illuminated both the various worlds of the growing child and the process of transition from one to the next. (Kuhn 1970, p.vi)

It is easy to accept that Piaget's view that the conceptual development of children was stage-like, and that this development exhibited discontinuities, played a role in Kuhn's characterisation of scientific development<sup>4</sup>. In any *rational*, cleaned-up reconstruction of Kuhn's theory this input would be important, but its realisation was accidental.

Conversely, Alexander Koyré, the historian of science, averred that it was Aristotle's physics that taught him to understand Piaget's children. Summarising the two-way interaction, the philosopher Philip Kitcher believed that developmental psychologists can gain insights into the linguistic advances of young children by studying the shifts that have occurred in the history of science; and historians and philosophers of science can learn from the experimental results and analyses of the child psychologists (Kitcher 1988).

Given that learning, cognitive apprenticeships, transmission of basic concepts, and mastering of

<sup>4</sup>See Kitchener (1986), Siegel (1982, 1985) and Rowell (1993).

methodologies, were important components of the establishment of a paradigm, it is not surprising that Kuhn was engaged by such questions regarding human learning<sup>5</sup>. Nor is it surprising that these features of Kuhn's corpus made it attractive and accessible to science educators. Psychology, learning, cognition, perception all provided a natural bridge between the research of science educators and advocates of the 'new philosophy of science'.

In one of the rare studies of Kuhn and education, Hanne Andersen points out:

Kuhn's early interest in science education centers around two claims: (1) the empirical claim that science education as it actually takes place does lead to convergent thought, and (2) the normative claim that the development of convergent thought through rigorous training is necessary for the progress of science. (Andersen 2000, p.91)

## Educators' Early Neglect of *Structure*

The first edition of *Structure* (1962) had little impact on anything and zero impact on science education. John Robinson's *The Nature of Science and Science Teaching* (Robinson 1968) was the very first book to link together philosophy of science and science teaching. Kuhn is nowhere mentioned in its 150 pages (Matthews 1997).

In 1968 there was an important panel discussion on 'Philosophy of Science and Science Teaching' at the annual US National Association for Research in Science Teaching conference. Contributors included John Robinson, Michael Connelly and Marshall Herron. The papers were published the following year in Volume Six of *The Journal of*

*Research in Science Teaching*. Kuhn is not mentioned.

In 1969, Hans O. Andersen published *Readings in Science Education for the Secondary School* (Andersen 1969). It was a collection of 60 research papers informed by commitment to the principle:

Science instruction should be based on a series of principles selected for their value in projecting science as a process of inquiry designed to discover new facts, improve quantitative descriptions of known facts, and organize these facts into conceptual schemes which more adequately describe the phenomena of the universe and beyond. (Andersen 1969, p.2)

And:

The only way to succeed in increasing science enrollments [sic] without a subsequent loss of positive attitude is to make the course offerings so interesting and so valuable to the student that he will demand more. (Andersen 1969, p.2)

The discipline was 'calling out for Kuhn' but *Structure* sat unread. Kuhn is not mentioned in the anthology's 430 pages and 60 readings.

Nor did Kuhn inform the widespread post-Sputnik curriculum debates of the 1960s. In the US, twenty-eight curricular projects were being supported by the National Science Foundation in 1975. During this period the 'alphabet' curricula were conceived, born and raised: PSSC, CBA, BSCS, CHEMS, IPS, ESCP and so on. In the UK, the various Nuffield schemes were launched at the same time. It has been oft commented upon that these forward leaps were, philosophically speaking, more backward than forward. The science education

<sup>5</sup>For a wide-ranging discussion, with numerous references to research literature in cognitive science, see Nersessian (2003).



community was not engaging with, nor learning from, developments in the history and philosophy of science. Michael Connelly commented, in 1974, of the post-Sputnik curricular boom, that:

While this activity began with philosophical concerns for knowledge and for enquiry, it was largely dominated by the works of a few psychologists, notably, Bruner, Ausubel, Gagne, Piaget. (Abimbola 1983, p.182)

A few rare commentators in the 1960s, who were familiar with both the philosophical and the educational literature, noted this neglect of 'new' philosophy by science educators. Yehuda Elkana observed that science education from the 1950s to Sputnik was formed in the image of 'inductivist-realist' philosophy of science (Elkana 1970, p.3). He said of post-Sputnik PSSC and BSCS curricula and teaching material that they 'reflect the positivistic-Instrumentalist philosophy of science [logical empiricism], which was at the height of its influence in the early days of space travel' (Elkana 1970, p.8).

Elkana lamented that Kuhn's *Structure* and Joseph Schwab's 'The Teaching of Science as Inquiry' (Schwab 1960) were published at the same time, yet share no common literature. They were 'two very important books, both highly influential in their own fields, both relying on two traditions and two bibliographies which completely ignore each other' (Elkana 1970, p.15). Elkana sketched out the 'practical implications for the teaching of science' that Kuhn's new philosophy of science generated.

A few years later, [Michael Martin](#), the Boston University philosopher, surveyed the same literature as Elkana, paying particular attention to

the rush of 'inquiry' and 'discovery' curricula and recommendations put into Western educational orbit by Sputnik. He drew attention to the important 1966 Educational Policies Commission document, *Education and the Spirit of Science* (EPC 1966), and charted the myriad ways in which it, and other curricula as well, reproduced simplistic inductivist understanding of scientific inquiry (Martin 1972, 141-147).

The homely inductivism of *Education and the Spirit of Science* had the imprimatur of the highest office in US education. It was published eight years after Norwood Russell Hanson's *Patterns of Discovery* (Hanson 1958) which received wide philosophical attention for its 'theory dependence of observation' thesis, seven years after Popper's anti-inductivist work *The Logic of Scientific Discovery* (Popper 1934/1959) was translated into English and also given wide philosophical attention, and four years after the publication of Feyerabend's essay 'Explanation, Reduction, and Empiricism' that shook the foundations of inductivist accounts of science (Feyerabend 1962).

In 1974 Martin opined:

a great deal has been written on the philosophy of science; perhaps even more has been written in science education. However, surprisingly little has been written on the relation between the two areas. (Martin, 1974, 293)

The unfortunate divide of the time between HPS and science education was well documented in a study by Richard Duschl titled 'Science Education and Philosophy of Science: Twenty-five Years of Mutually Exclusive Development' (Duschl 1985)<sup>6</sup>. Though, given what educators were subsequently

<sup>6</sup>Some of this history of separate development is discussed in Matthews (1994, chap.2). An exception to 'silo' research was the work of Harvey Siegel (1978, 1979, 1989).

to make of their discovery of Kuhn, the delay perhaps was no bad thing. Had Kuhn been discovered along with his critics, it would have been a good thing. It would have informed and lifted educator's understanding of the scientific endeavour. That did not happen.

## Delayed Embrace of Kuhn

Publication of the second edition of *Structure* (1970) changed things dramatically: Kuhn was enthusiastically taken into education and into much else. In 1985, Derek Hodson published a review of research on 'Philosophy of Science, Science and Science Education' in which he ascertained that of 22 articles published, and theses submitted, in the period 1974-1984, fourteen addressed Kuhnian themes (Hodson 1985).

In 2000, Cathleen Loving and William Cobern conducted a citation analysis of two major science education journals *Science Education* and *Journal of Research in Science Teaching* for the thirteen-year period 1985-1998 and, not surprisingly, found that there were numerous citations of Kuhn covering such Kuhnian themes as: paradigms (30 articles), conceptual change theory, constructivist epistemology, incommensurability, authenticity of textbooks, the social components of science, and also the philosophical comparison of Kuhn and other methodologists of science (Loving & Cobern 2000). They commented that the science education community had become a Kuhnian cheer-squad.

The embrace is laid out in one of the first science education articles to engage with Kuhn's theory, namely Ted Cawthron and Jack Rowell's 'Epistemology and Science Education' (Cawthron &

Rowell 1978). They drew parallels between Piaget's theory of knowledge and his psychological account of the constructive knowing subject, and what they found in Kuhn. For them, Kuhn established that:

We see things not just as they are but also partly as we are, and this is not due simply to differences in interpretation of otherwise stable facts or data. The "objective" real world becomes merged with its "subjective" interpretation and the Cartesian Dichotomy is replaced by a dialectic epistemology with distinctly relativistic implications. (Cawthron & Rowell 1978, p.45)

The most influential article in conceptual change research was one written by George Posner and colleagues 'Accommodation of a Scientific Conception: Toward a Theory of Conceptual Change' (Posner, Strike, Hewson & Gertzog 1982)<sup>7</sup>. It is explicitly based on Kuhn's analysis of paradigm change in science. One of the authors of that study noted this dependence and itemised how Kuhn's analysis was transferred to the study of individual conceptual change (Hewson 1981, p.387). The authors proposed that, for individual conceptual change or learning to take place, four conditions had to be met:

1. There must be dissatisfaction with current conceptions.
2. The proposed replacement conception must be intelligible.
3. The new conception must be initially plausible.
4. The new conception must offer solutions to old problems and to novel ones; it must suggest the possibility of a fruitful research program.

<sup>7</sup>Having 9,100+ citations (April 2022).

Strike and Posner, in retrospect, describe their original conceptual change theory as ‘largely an epistemological theory, not a psychological theory ...it is rooted in a conception of the kinds of things that count as *good* reasons’ (Strike & Posner 1992, p.150). They say that their original theory is concerned with the ‘formation of rational belief’ (p.152); it does not ‘describe the typical workings of student minds or any laws of learning’ (p.155).

Despite their explicit entreaty, the bulk of conceptual change research, or research on the learning of science, which followed Posner and Strike’s paper ignored philosophy. Hardly surprising as philosophy is not part of science teacher education and is rarely part of education graduate programmes. Educational research did not, and more seriously could not, engage with what might constitute ‘rational’ conceptual change: philosophical competence was needed to identify rational conceptual change. There has been a very deep cleavage between serious epistemology and psychology in educational research. For example, the supposed study, by educators, of knowledge acquisition is really just the study of changing beliefs: if beliefs develop, then knowledge develops. Psychologists and educational researchers are indifferent to whether the change is rational, irrational or anything else.

## Kuhnian Philosophy and Constructivism in Education

Kuhnian philosophy<sup>8</sup>, more particularly his epistemological relativism and his ontological idealism, had enormous impact on educational theory and curriculum. Kuhn is front and centre in con-

structivism which for nearly forty years has dominated educational research and theorising<sup>9</sup>. All leading constructivists acknowledge Kuhn as the fount of their relativist and idealist view of science.

Derek Hodson wrote:

It has been argued earlier that Kuhnian models of science and scientific practice have a direct equivalent in psychology in the constructivist theories of learning. There is, therefore, a strong case for constructing curriculum along Kuhnian lines’ (Hodson 1988, p.32).

Ernst von Glasersfeld, in the opening sentences of a much-cited paper, said that Kuhn’s *Structure* ‘brought to the awareness of a wider public’ the professional crisis ‘of faith in objective scientific knowledge’ (Glasersfeld 1989, p.121).

David Hawkins, in an article on the history of constructivism, wrote that *Structure* ‘provided “constructivist” justification’ for ‘philosophies of relativism and subjectivism’ (Hawkins 1994, p.10). Joseph Novak acknowledged Kuhn as instrumental in the development of his own constructivist epistemology that underscores the research programme on children’s alternative conceptions (Novak 1998, p.6). Nancy Davis and colleagues used ‘Thomas Kuhn’s (1970) work as a basis to support change in guiding epistemological paradigms’ whereby they endorse constructivism and reject objectivism (Davis et al. 1993, p.627).

Cathleen Loving’s and William Cobern’s review of Kuhn’s influence on science education research noted that ‘there is not a single critical voice; the science education community has turned into an

<sup>8</sup>The term ‘Kuhnian’ rather than ‘Kuhn’s’ is deliberate as it is notorious that a great many positions were advanced in Kuhn’s name that he did not recognise as his own.

<sup>9</sup>For an account of the influence of constructivism in science education, see Matthews (2000, 2015 chap.8). For wider views of the matter, see contributions to Phillips (2000).



admiration society for 'Thomas Kuhn' (Loving & Cobern 2000, p.199).

But these Kuhnian connections with education have not received the attention they deserve. Characteristically, the [programme](#) of the Kuhn centenary conference makes no reference to the pedagogical origins of Kuhnian thought, or to its impact on educational theorising.

To give greater exposure to Kuhn's engagement with pedagogy, and his impact on educational theorising, a thematic issue of *Science & Education* on 'Kuhn and Science Education' ([Vol.9 Nos.1-2, 2000](#)) was organised and I contributed a ten-page Editor's Introduction. There were contributions from philosophers, scientists, historian, educators and psychologists: [Alexander Levine](#), [Stephen Brush](#), [Steve Fuller](#), [Berry van Berkel](#), [Wobbe de Vos](#), [Adri Verdonk](#) and [Albert Pilot](#), [Hanne Andersen](#), [Cathleen Loving](#) and [William Cobern](#), [Robert Nola](#), [Harry Shipman](#), [Stellan Ohlsson](#), [Mick Nott](#), and [Howard Sankey](#). Included in the issue was Kuhn's 1990 essay '[On Learning Physics](#)'. Following this up, two years later I published a long article in *Science Education* on 'Kuhn and Education' ([Matthews 2004](#)).

## Kuhn and Philosophy: A Fraught Relationship

Kuhn's central philosophical ideas were not novel; something Kuhn oft acknowledged<sup>10</sup>. Many elements of his philosophy of science were extant when the first edition of *Structure* was published in 1962. The intellectual ground for the Kuhnian 'revolution' had been well prepared. Simple empiricist and logical positivist understandings of science had been challenged on many fronts.

Marx's 1852 *Eighteenth Brumaire of Louis Bonaparte* could have been, and by a few was, appealed to by doubters of the orthodox empiricist account of science. Marx memorably wrote:

Men make their own history, but they do not make it just as they please ... they make it under circumstances directly found, given and transmitted from the past. The tradition of all the dead generations weighs like a nightmare on the brain of the living. (Tucker 1978, p.595)

This is a harbinger of the sociology of knowledge, and was acknowledged as such by Karl Mannheim, the founder of that discipline (Mannheim 1936/1960). Marx's observation was consistent with Kuhn's programme, though I am not aware that Kuhn referred to it.

In the 1930s, Ludwik Fleck wrote on the social construction of facts and on the necessity of an historical component for understanding (Fleck 1935/1979). At the same time Gaston Bachelard wrote on epistemological ruptures in the history of science, and on the impact of epistemological obstacles on cognition (Bachelard 1934/1984). In the 1940s, R.G. Collingwood elaborated how particular periods in the history of science had different metaphysical presuppositions which were fundamental assumptions about the constituents of the world and their properties that were not given directly in experience (Collingwood 1940, 1945). In the 1950s, Stephen Toulmin wrote on how discoveries in the physical sciences consisted, in part, of finding fresh ways of looking at phenomena, and advocated the importance of history for the philosophy of science (Toulmin 1953). At the same time, Norwood Russell Hanson wrote on the theory dependence of observation and on the contested nature of the facts in scientific dis-

<sup>10</sup>See repeated acknowledgements of scholars in his autobiographical interview (Baltas, Gavroglu & Kindi 1997).

putes (Hanson 1958). Michael Polanyi wrote on the place of tacit knowledge in science, the corrective function of the scientific community, and the importance of initiation into accepted methodologies and practices for the conduct of science (Polanyi 1958).

Few, if any, of these ‘unsettling’ positions found their way into the comfortable orthodox empiricist/inductivist understanding of science that dominated education research and the preparation of science teachers.

Kuhn’s *Structure* brought all these contra-empiricist elements together in a way hitherto not seen and, for whatever combination of philosophical, sociological and cultural reasons, gave them enormous exposure. The time was ripe for Kuhnianism. In the 1970 Postscript to *Function* he famously, or infamously, said that truth was irrelevant to judgements of scientific progress:

Does it really help to imagine that there is some one full, objective, true account of nature and that the proper measure of scientific achievement is the extent to which it brings us closer to that ultimate goal?’ (Kuhn 1970, p.171).

This formulation fails to distinguish *fallibilism* which characterises good scientific understanding from *absolutism* which is irrelevant to science. Further, Kuhn simply rejected realism in philosophy of science. He denied that the theoretical terms of *any* scientific theory successfully refer to objects in the world; not just that contingently they have so far been unsuccessful or false, but rather in principle they cannot so refer. The world in itself is unknowable. Ernan McMullin recognised that: ‘The radical challenge of *Structure* is directed not at rationality but at realism’ (McMullin 1993, p.71).

lin 1993, p.71).

Kuhn’s ‘novel’ ideas were taken out of the philosophy corridor and let loose in the marketplace. The Kuhnian wave broke over philosophy departments, and in quick succession other humanities, social science and education departments.

My own first exposure to Kuhn was fifty years ago (1973) as a University of Sydney philosophy student after some years of science teaching. It was a fourteen-week, final-year honours seminar<sup>11</sup>. It was devoted to a detailed reading of the second edition of *Structure*, along with the essays in the related Imre Lakatos and Alan Musgrave edited *Criticism and the Growth of Knowledge* (Lakatos & Musgrave 1970). It was a precious learning experience. [Wal Suchting](#) was the convenor, there were ten or so students. Staff members Michael Devitt, Alan Chalmers, David Stove, and others, week-by-week contributed.

While a good many, if not most, scholars around the world were impressed, if not ‘bowled over’ by Kuhn, the Sydney philosophers in 1973 were not. They were under-impressed with Kuhn’s philosophical arguments; indeed, they thought there were barely any such arguments. Wittgenstein, Braithwaite, Polanyi, Whewell, Popper, Goodman and Hanson are the only philosophers cited in the first edition of *Structure*. And these, with the notable exception of Hanson, are mentioned only in passing. There is no prolonged analysis of any philosophical argument, excepting a brief analysis of arguments about perception and what contributions the observer makes to the object as perceived. What arguments there were, amounted to empiricism in new clothes: theory dependence of observation still took observation as an epistemological fundamental. Suchting maintained, for in-

<sup>11</sup>Sydney philosophy, and the Kuhn seminar, are described in Matthews (2021, pp.75-82).

stance, that debate about the theory dependence, or otherwise, of observation was just an in-house empiricist family-squabble. As he later expressed the matter:

The central deficiency of empiricism is one that it shares with a wide variety of other positions, namely, all those that see objects themselves, *however they are conceived*, as having epistemic significance *in themselves*, as inherently determining the ‘form’, as it were, of their own representation. (Suchting 1995, p.13)

David Stove subsequently wrote of Kuhn:

his entire philosophy of science is actually an engine for the mass-destruction of all logical expressions ...[he] is willing to dissolve even the strongest logical expressions into sociology about what scientists *regard as* decisive arguments (Stove 1982, p.33).

Alan Chalmers believed that *Structure* contained two incompatible strands: one *relativist*, that was developed by sociologists of knowledge; the other, *objectivist* that could have been, but was not, advanced by Kuhn (Chalmers 2013, p.115).

The Sydney department was also under-impressed with Kuhn’s historical analyses, especially his pivotal account of Galileo’s physics which they thought was plainly mistaken. The department was a hold-out against the Kuhnian enthusiasm that swept through the academy in the 1970s, washing out ideas of truth, objectivity and universality from nearly all humanities and social science departments, and a good many philosophy departments.

The department’s honour’s seminar proved to be an inoculation against the irrationalism that would soon sweep education faculties and

teacher-education institutions. Having page-by-page read *Structure*, with a group of serious scholars, it was jarring to see the completely cavalier, uncritical Kuhnianism that emerged in education circles, and elsewhere, in the 1970s and ’80s (and through to the present day).

Sydney philosophers were not the only holdouts. [Mario Bunge](#) recounts in his autobiography that in 1966 he attended an influential colloquium on causality convened in Geneva by Jean Piaget. Kuhn was a participant. Bunge observed:

Kuhn’s presentation impressed no one at the meeting, and it confirmed my impression that his history of science was second-hand, his philosophy confused and backward, and his sociology of science non-existent. (Bunge 2016, p.181)

This is too harsh a call on Kuhn’s historical work, at least of his careful studies of the history of quantum theory (Kuhn 1978).

Israel Scheffler, who had joint appointments in the Harvard Philosophy and Education departments, responded to the first edition of *Structure*, arguing that Kuhn’s charge of irrationality in paradigm choice:

fails utterly, for it rests on a confusion. It fails to make the critical distinction between those standards or criteria which are internal to a paradigm, and those by which the paradigm is itself judged. (Scheffler 1966, p.84).

John Searle, a philosopher, observed:

...the remarkable interest in the work of Thomas Kuhn on the part of literary critics did not derive from a sudden passion in English departments to understand the transition from Newtonian Mechanics to Relativity Theory. Rather, Kuhn was seen



as discrediting the idea that there is any such [objective] reality. If all of 'reality' is just a text anyway, then the role of the textual specialist, the literary critic, is totally transformed. (Searle 1994, p.38)

Jan Golinski, an historian, wrote:

I see Kuhn as having little positive influence on philosophers and almost none (directly) on historians. His most significant influence within science studies was mediated by sociologists, whose reading of his work he specifically repudiated (Golinski 2012, p.15).

Alexander Bird concluded a sympathetic appraisal of Kuhn with the qualification:

Kuhn's treatment of philosophical ideas is neither systematic nor rigorous. He rarely engaged in the stock-in-trade of modern philosophers, the careful and precise analysis of the details of other philosopher's views, and when he did so the results were not encouraging. (Bird 2000, p.ix)

Abner Shimony, a Boston University physicist and philosopher, said of the key Kuhnian move of deriving methodological lessons from scientific practice that:

His work deserves censure on this point whatever the answer might turn out to be, just because it treats central problems of methodology elliptically, ambiguously, and without the attention to details that is essential for controlled analysis. (Shimony 1976, p. 582)

Wolfgang Stegmüller, an Austrian philosopher, opined that the crux of Kuhn's theory of science

was 'a bit of musing' of a philosophical incompetent (Stegmüller 1976, p.216).

Stegmüller's was a harsh judgement, but Kuhn was candid in admitting that he had no training in philosophy and was an 'amateur' (Kuhn 1991/2000, p.106). And, to a point, he thought that having no formal training was advantageous: He was not schooled in 'old thinking', he did not develop a certain 'cast of mind'. The Sydney philosophers valued their cast of mind – write clearly, avoid purple passages, pay attention to evidence, develop arguments, value scholarship, be consistent, know the tradition, and so on. They thought it was the educational task of the philosophy discipline to forge such a 'cast of mind' in students.

It is noteworthy that his long, and charming, 1997 autobiographical interview with Aristides Baltas, Kostas Gavroglu and Vasso Kindi is, significantly, titled: 'A Physicist who became a Historian for Philosophical Purposes'<sup>12</sup>. Kuhn relates:

I had made that attempt to investigate going into philosophy immediately after the war when I first came back and got into [Harvard] graduate school and I decided I wasn't going to go back to fulfill undergraduate philosophy. And in certain respects I'm extremely glad I didn't, because I would have been taught things that would have given me a cast of mind which would have, in many ways, helped me as a philosopher, but they'd have made me into a different sort of philosopher. So, I had decided, when I applied to the Society [Harvard Society of Fellows], to do history of science. My notion was, and my application indicated, that there was important philosophy to come out of it; but I needed first to learn more History. (Baltas, Gavroglu & Kindi 1997, p.166)

Did Kuhn ever learn philosophy? A moot ques-

<sup>12</sup>The interview originally appeared in a Greek philosophy of science journal and was then reproduced in Conant & Haugeland (2000).

tion. After Harvard, he went to University of California, Berkeley, with beginning teaching appointments in both the History and the Philosophy Departments. At tenure time, the Acting Chancellor called him in and relayed:

The recommendation for your promotion has now gone all the way through, it's favourable, and I have it on my desk. There is just one thing. The senior philosophers voted unanimously for your promotion – in History. (Baltas, Gavroglu & Kindi 1997, p.182)

For Kuhn:

I was extraordinarily angry ...and very deeply hurt, I mean that's a hurt that has never altogether gone away. (Baltas, Gavroglu & Kindi 1997, p.182)

He did consciously try to make up lost philosophical ground and this can be seen in his 1993 'After-words' in the Paul Horwich volume devoted to his work (Kuhn 1993). Other physicists did do 'the hard yards' in philosophy – Abner Shimony and Mario Bunge come immediately to mind and so better served 'philosophical purposes'<sup>13</sup>.

## Kuhn and Science-Technology-Society (STS) Studies

Naomi Oreskes, an historian and philosopher<sup>14</sup>, surveyed Kuhn's work and gave a very constrained account of his contribution to HPS:

Scholars generally agree that the largest impact of Kuhn's work – besides adding the term *paradigm*

*shift* to the general lexicon – was in helping to launch the field of science studies. (Oreskes 2020, p.66)

Oreskes is correct in this assessment. Three STS scholars acknowledged Kuhn as the founder of their discipline, and went on to say in their Editorial Introduction to an STS anthology:

In the wake of STS research, philosophical words such as truth, rationality, objectivity, and even method are increasingly placed in scare quotes when referring to science – not only by STS practitioners, but also by scientists themselves and the public at large. (Brante, Fuller & Lynch, 1993, p.ix)

Bruno Latour and Stephen Woolgar, the Kuhn-influenced sociologists of scientific knowledge, wrote in their influential *Laboratory Life*<sup>15</sup>:

The "out-there-ness" [of the external world] is the consequence of scientific work rather than it cause ... science is a form of fiction or discourse like any other, one effect of which is the 'truth effect', which (like all literary effects) arises from textual characteristics. (Latour & Woolgar 1986, pp.182, 184)

Glen Aikenhead, a leading Canadian science educator, informed readers that contemporary social studies of science (STS), reveal science as:

mechanistic, materialist, reductionist, empirical, rational, decontextualized, mathematically idealized, communal, ideological, masculine, elitist, competitive, exploitive, impersonal, and violent. (Aikenhead 1997, p.220)

<sup>13</sup>For Shimony, see Myrvold & Christian (2009); for Bunge, see Matthews (2019).

<sup>14</sup>She is co-author of *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (Oreskes & Conway 2010) and currently a regular contributor to *Scientific American*.

<sup>15</sup>The book is widely, and approvingly, cited in science education. Peter Slezak provides a withering, but rarely cited, critique (1994b).

Obvious questions of: Why study science? Why trust science? Has science produced knowledge? How has science been so successful in identifying and dealing with disease? were passed over.

Two cultural studies researchers in education assert:

Recent scholarship in science studies [STS] has opened the way for more thoughtful science education discourses that consider critical, historical, political, and sociocultural views of scientific knowledge and practice. Increased attention to the problematic nature of western science's claims to objectivity and universal truth has created an educational space where taken-for-granted meanings are increasingly challenged, enriched, and rejected ... Thus, science's long accepted claim to epistemological superiority has now become bound to the consideration of cultural codes, social interests, and economic imperatives. (Bazzul & Sykes 2011, p.268)

Although the power-house social-constructivist Edinburgh Programme was convincingly criticised by many (Bunge 1991, 1992, Slezak 1994 a,b) confidence about universal science was universally diminished. Relativism and agnosticism concerning knowledge of the natural, social, cultural, and moral worlds became the academic and public norm. And, depressingly, the science education norm<sup>16</sup>.

Of course, Kuhn is more cited than read; the mere citation of Kuhn is considered to constitute an argument, or to provide evidence, for some philosophical view. Marilyn Fleer, a professor at Monash University, writes:

In recent years, the rational foundations of Western science and the self-perpetuating belief in the scientific method have come into question ... The notion of finding a truth for reality is highly questionable. (Fleer 1999, p.119)

Typically, no evidence is adduced for this sweeping claim except an unpaginated reference to Kuhn. The practice of having an unpaginated Kuhn citation substitute for evidence, or argument, is widespread. It became the disciplinary norm in science education. Merely putting the name 'Kuhn' in brackets after some claim was, and in places still is, regarded as sufficient warrant for making the claim, no matter how outrageous and ill-supported it might be. And, importantly, no attention is paid to the arguments of numerous others that refute the claim.

## Conclusion

Kuhn deserves full praise for recognising the centrality of education in the growth of science, for investigating the cognitive processes involved in the learning of scientific concepts and, of course, for so powerfully putting philosophy of science into the academic and public domains<sup>17</sup>. As claimed by David Treagust, and cited at the beginning of this Opinion Piece, for academics and the public, Kuhn's *Structure* 'really changed the way we look at the enterprise that is science'.

But, as usual, along with the upside there was a downside. Kuhn admitted in 1997 that his treatment of the orthodox philosophical tradition was 'irresponsible' (Conant & Haugeland 2000, p.305). And elsewhere he confessed: 'I should never have

<sup>16</sup>The unhealthy reach of relativism and idealism in science education is described in (Matthews 2015, chap.8, 2021, chap.7)

<sup>17</sup>There have been hundreds, just in English, of substantial philosophical books and anthologies devoted to Kuhn and Kuhnian themes. Many praising, many condemning.



written the purple passages.' And he is surprised at their impact:

To my dismay, ... my 'purple passages' led many readers of *Structure* to suppose that I was attempting to undermine the cognitive authority of science rather than to suggest a different view of its nature. (Kuhn 1993, p.314)

Dismay? Did Kuhn not read his own text? Did he not take his writing seriously? At the risk of introducing a purple passage: Should Donald Trump have been surprised that his followers stormed the US Capital after his January 6 speech on the White House Ellipse?

Kuhn's is a too easy a *mea culpa*: A philosopher writing a purple passage is akin to a mechanic not putting oil in a serviced car: for both, it is a culpable error. The mechanic has to pay for the damage done; unfortunately, the philosopher does not pay for the damage done to students, schoolteachers, faculty and the public who uncritically read their 'irresponsible' text.

Philosophers cannot be entirely responsible for their followers, and Kuhn did disown much of the relativism, idealism and subjectivism that was being promoted in his name (Kuhn 1991/2000). Nevertheless, given the deleterious impact of Kuhn-inspired philosophy in educational constructivism, in STS studies, in fueling post-modernism, and in important debates about inclusion of indigenous science in science programmes—he should have been more considered, restrained, and careful in his writing. A more orthodox philosophical 'cast of mind' would have done no harm and, doubtless, would have done good. Though there would have been fewer sales of *Structure* and not as many translations made.

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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 NEWSLETTER, 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 [Michael Matthews](#) or [Nathan Oseroff-Spicer](#).

- *Science & Education* Open Access Articles (86) [here](#)

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 NEWSLETTER.

They will be archived in the OPINION folder at the HPS&ST web site: <http://www.hpsst.com/>.

## Varia

- Fourth International Conference of the German Society for Philosophy of Science

The Fourth International Conference of the German Society for Philosophy of Science (GWP.2022), which was originally scheduled for March 2022, will **now take place from 15-17 of August 2022**, at Technische Universität Berlin. The line-up of talks and contributed papers/symposia remains unchanged (no new CfP will be necessary). For more information, see <https://www.wissphil.de/gwp2022/>

- Greg Lusk: 2022, 'Is HPS a valuable component of a STEM education? An empirical study of student interest in HPS courses within an undergraduate science curriculum', *European Journal of Philosophy of Science* Vol. 12. Open Access: [here](#)
- Mark Young: 2022, 'From Epistemology to Policy: Reorienting Philosophy Courses for Science Students', *European Journal of Philosophy of Science* Vol. 12 Open Access: [here](#)
- *European Journal for Philosophy of Science* Open Access Articles (139) [here](#)

## PhD Awards in HPS&ST

We welcome publishing details of all PhDs awarded in the field of textschps&st. Send details (name, title, abstract, supervisor) to editor: [m.matthews@unsw.edu.au](mailto:m.matthews@unsw.edu.au).

## PhD Theses in HPS&ST Domain

The HPS&ST NEWSLETTER is the ideal medium for publicising and making known submitted and awarded doctoral theses in the HPS&ST domain.

The following details should be submitted to the editor at [m.matthews@unsw.edu.au](mailto:m.matthews@unsw.edu.au):

- Candidate's name and email
- Institution
- Supervisor
- Thesis title
- Abstract of 100-300 words
- Web link when theses are required to be submitted for open search on web.

## Recent HPS&ST Research Articles

HOPOS: *The Journal of the International Society for the History of Philosophy of Science* (Vol 12, Number 1, 2022)  
Special Section: Building Universes: The

Philosophical and Mathematical Underpinnings of Cosmology (Eighteenth–Twentieth Centuries)

Editors: Silvia De Bianchi, and Federico Viglione

*Foundations of Science* (Volume 27, issue 1, March 2022)

Special Issue: Rethinking Technology in the Anthropocene

Editors: Pieter Lemmens, and Yoni Van Den Eede

*Perspectives on Science* (Volume 30, Issue 2, 2022)

Special Issue: Severe Uncertainty in Science, Medicine, and Technology

Guest Editors: Mattia Andreoletti, Daniele Chiffi, and Behnam Taebi

*European Journal for Philosophy of Science*

Topical Collection: Teaching philosophy of science to students from other disciplines

Orgs: Sara Green, Joeri Witteveen

Available [here](#)

Anisa, Widodo, A., Riandi et al. (2022). Students' Argumentation in Science Lessons: How effective is Rebuttal Analysis Framework in Representing the Complexity of Classroom Argumentation? *Sci & Educ*, 1-29. doi:[10.1007/s11191-022-00320-8](#)

Cullinane, A., Hillier, J., Childs, A. et al. (2022). Teachers' perceptions of Brandon's Matrix as a framework for the teaching and assessment of scientific methods in school science. *Res Sci & Educ*, 1-20. doi:[10.1007/s11165-022-10044-y](#) online first

Davis, I.M. (2022). "Round, red globules floating in a crystalline fluid" – Antoni van Leeuwenhoek's observations of red

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Davis, I.M. (2022). Antoni van Leeuwenhoek: defining proportion in the microscopic realm during the 17th century. *FEMS Microbiology Letters*, 369(1). doi:[10.1093/femsle/fnac025](#)

Goodwin, A. (2022). Chemistry: progress since 1860—reflections on chemistry and chemistry education triggered by reading Muspratt's Chemistry. *Found Chem*, 1-22. doi:[10.1007/s10698-022-09424-z](#) online first

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Harman, O. (2022). A Conversation with Darwin on Man Revisited: 150 Years to The Descent of Man. *J Hist Biol*, 1-17. doi:[10.1007/s10739-022-09673-w](#)

Howard, S. (2022). From the Boundary of the World to the Boundary of Reason: The First Antinomy and the Development of Kant's Critical Philosophy. *HOPOS: The Journal of the International Society for the History of Philosophy of Science*. doi:[10.1086/718992](#) early view

Kollmer, C.A. (2022). International Culture Collections and the Value of Microbial Life: Johanna Westerdijk's Fungi and Ernst Georg Pringsheim's Algae. *J Hist Biol*, 1-29. doi:[10.1007/s10739-022-09669-6](#)

Lockard, J., Goggin, P. (2022). Teaching Mars Literature. *Sci & Educ*, 1-14. doi:[10.1007/s11191-022-00333-3](#) online first

Lusk, Greg: 2022, 'Is HPS a valuable component of a STEM education? An empirical study of student interest in HPS courses within an undergraduate science curriculum', *European Journal of Philosophy of Science* 12 Open Access: [here](#)

Seeley, L., Vokos, S., & Etkina, E. (2022). Updating our language to help students learn: Mechanical energy is not conserved but all forces conserve energy [Guest Editorial]. *American Journal of Physics* 90, 251-252. doi:[10.1119/5.0067448](#)

Seeman, J.I. (2022). Diverse Views in the Assignment of Credit for Research Discoveries. *ACS Omega*, 7, 1-4. doi:[10.1021/acsomega.1c04845](#)

Seeman, J.I. (2022). The Ways of Science Through the Lens of the Woodward-Hoffmann Rules. The Stories Begin. *Chem. Rec.*, 22, 1-22. doi:[10.1002/tcr.202100211](#)

Seeman (2022). History of the Woodward-Hoffmann Rules. The No-Mechanism Puzzle, *Chem. Rec.*, 22, 1-22. doi:[10.1002/tcr.202100212](#)

Seeman, J.I. (2022). A Sleeping Beauty in Chemistry. Oosterhoff, Havinga and Schlattermann, Four Years Before "The Woodward-Hoffmann Rules". *Chem. Rec.*, 22, 1-26. doi:[10.1002/tcr.202100245](#)

Young, M.T. (2022). From epistemology to policy: reorienting philosophy courses for science students. *Euro Jnl Phil Sci* 12, 26.

doi:[10.1007/s13194-022-00454-0](#)

## Recent HPS&ST Related Books

Al-Khalili, J. (2022). *The Joy of Science*. Princeton, NJ: Princeton University Press.

ISBN: 978-0-691-21157-2

"Today's world is unpredictable and full of contradictions, and navigating its complexities while trying to make the best decisions is far from easy. The Joy of Science presents 8 short lessons on how to unlock the clarity, empowerment, and joy of thinking and living a little more scientifically.

"In this brief guide to leading a more rational life, acclaimed physicist Jim Al-Khalili invites readers to engage with the world as scientists have been trained to do. The scientific method has served humankind well in its quest to see things as they really are, and underpinning the scientific method are core principles that can help us all navigate modern life more confidently. Discussing the nature of truth and uncertainty, the role of doubt, the pros and cons of simplification, the value of guarding against bias, the importance of evidence-based thinking, and more, Al-Khalili shows how the powerful ideas at the heart of the scientific method are deeply relevant to the complicated times we live in and the difficult choices we make.

"Read this book and discover the joy of science. It will empower you to think more objectively, see through the fog of your own preexisting beliefs, and lead a more fulfilling life." (From the Publishers)

More information available [here](#).

Deslauriers, M. (2022). *Aristotle on Sexual Difference: Metaphysics, Biology, Politics*. Oxford, UK: Oxford University Press.

ISBN: 978-0-197-60618-6



“Aristotle’s remarks about the differences between the sexes have become infamous for their implications for the social status of women. In his observations on female biology, Aristotle claims that “the female nature is, as it were, a deformity.” In describing women’s role in the public sphere, he claims that women are naturally subordinate because, while they possess a deliberative faculty, that capacity is “without authority.” While both claims express the “inferiority” of female bodies/women relative to male bodies/men, it is not self-evident that the defects Aristotle identifies in female biology have cognitive or moral manifestations that would justify the rule of men over women in political life. Marguerite Deslauriers here aims to construct a coherent picture of Aristotle’s views on sexual and gender-based difference from these remarks and to show the extent to which his views on female biology and women’s role in politics are causally connected.

“Without exculpating Aristotle from charges of misogyny, Deslauriers contextualizes his explanations of the role and origin of female animals in his biology and the role of women in his political philosophy; she shows how Aristotle developed these views and the importance they hold for his wider philosophical commitments. She then explores how Aristotle might have seen the link between the physiology of sex and the bearing it has on political life. She ultimately argues that in Aristotle’s conception of sexual difference in biology and politics, there is a tension between his view of the inferiority of female bodies and women and his commitment to the idea that females and women are valuable both for generation and for the political life characteristic of human beings. In this tension she finds a difference between Aristotle and his predecessors: while previous accounts associate sexual difference with affliction, Aristotle sees sexual difference as a benefit, both to a species and a political community. This volume will be of interest to philosophers and students interested in ancient philosophy, feminist philosophy, as well as those studying moral and

political philosophy.” (From the Publisher)

More information available [here](#).

Fleetwood, L. (2022). *Science on the Roof of the World: Empire and the Remaking of the Himalaya* (Science in History). Cambridge: Cambridge University Press. ISBN: 978-1-009-12811-7

“When, how, and why did the Himalaya become the highest mountains in the world? In 1800, Chimborazo in South America was believed to be the world’s highest mountain, only succeeded by Mount Everest in 1856. *Science on the Roof of the World* tells the story of this shift, and the scientific, imaginative, and political remaking needed to fit the Himalaya into a new global scientific and environmental order. Lachlan Fleetwood traces untold stories of scientific measurement and collecting, indigenous labour and expertise, and frontier-making to provide the first comprehensive account of the East India Company’s imperial entanglements with the Himalaya. To make the Himalaya knowable and globally comparable, he demonstrates that it was necessary to erase both dependence on indigenous networks and scientific uncertainties, offering an innovative way of understanding science’s global history, and showing how geographical features like mountains can serve as scales for new histories of empire.” (From the Publisher)

More information available [here](#).

Garson, J. (2022). *Madness: A Philosophical Exploration*. Oxford, UK: Oxford University Press. ISBN: 978-0-197-61383-2

“Since the time of Hippocrates, madness has typically been viewed through the lens of disease, dysfunction, and defect. Madness, like all other disease, happens when something in the mind, or in

the brain, does not operate the way that it should or as nature intended. In this paradigm, the role of the healer is simply to find the dysfunction and fix it. This remains the dominant perspective in global psychiatry today.

“In *Madness: A Philosophical Exploration*, philosopher of science Justin Garson presents a radically different paradigm for conceiving of madness and the forms that it takes. In this paradigm, which he calls madness-as-strategy, madness is neither a disease nor a defect, but a designed feature, like the heart or lungs. That is to say, at least sometimes, when someone is mad, everything inside of them is working exactly as it should and as nature intended. Through rigorous engagement with texts spanning the classical era to Darwinian medicine, Garson shows that madness-as-strategy is not a new conception. Thus, more than a history of science or a conceptual genealogy, *Madness* is a recovery mission. In recovering madness-as-strategy, it leads us beyond today’s dominant medical paradigm toward a very different form of thinking and practice.

“This book is essential reading for philosophers of medicine and psychiatry, particularly for those who seek to understand the nature of health, disease, and mental disorder. It will also be a valuable resource for historians and sociologists of medicine for its innovative approach to the history of madness. Most importantly, it will be useful for mental health service users, survivors, and activists, who seek an alternative and liberating vision of what it means to be mad.” (From the Publisher)

More information available [here](#).

Gordin, M. D. (2022). *Einstein in Bohemia*. [New in Paperback] Princeton, NJ: Princeton University Press. ISBN: 978-0-691-20382-9

“In the spring of 1911, Albert Einstein moved with his wife and two sons to Prague, the capital of Bohemia, where he accepted a post as a professor of

theoretical physics. Though he intended to make Prague his home, he lived there for just sixteen months, an interlude that his biographies typically dismiss as a brief and inconsequential episode. Einstein in Bohemia is a spellbinding portrait of the city that touched Einstein’s life in unexpected ways—and of the gifted young scientist who left his mark on the science, literature, and politics of Prague.

“Michael Gordin’s narrative is a masterfully crafted account of a person encountering a particular place at a specific moment in time. Despite being heir to almost a millennium of history, Einstein’s Prague was a relatively marginal city within the sprawling Austro-Hungarian Empire. Yet Prague, its history, and its multifaceted culture changed the trajectories of Einstein’s personal and scientific life. It was here that his marriage unraveled, where he first began thinking seriously about his Jewish identity, and where he embarked on the project of general relativity. Prague was also where he formed lasting friendships with novelist Max Brod, Zionist intellectual Hugo Bergmann, physicist Philipp Frank, and other important figures.

“*Einstein in Bohemia* sheds light on this transformative period of Einstein’s life and career, and brings vividly to life a beguiling city in the last years of the Austro-Hungarian Empire.” (From the Publishers)

More information available [here](#).

Harold, F. M. (2022). *On Life: Cells, Genes, and the Evolution of Complexity*. Oxford, UK: Oxford University Press. ISBN: 978-0-197-60454-0

“All creatures, from bacteria and redwoods to garden snails and humans, belong to a single biochemical family. We all operate by the same principles and are all made up of cells, either one or many. We flaunt capacities that far exceed those of inanimate matter, yet we stand squarely within the material world. So what is life, anyway? How do living things function, and how did they come into

existence? Questions like these have baffled philosophers and scientists since antiquity, but over the past half-century answers have begun to emerge.

“Offering an inside look, Franklin M. Harold makes life accessible to readers interested in the biological big picture. The book traces how living things operate, focusing on the interplay of biology with physics and chemistry. He asserts that biology stands apart from the physical sciences because life revolves around organisation—that is, purposeful order.

“*On Life* aims to make life intelligible by giving readers an understanding of the biological landscape; it sketches the principles as biologists presently understand them and highlights major unresolved issues. What emerges is a biology bracketed by two stubborn mysteries: the nature of the mind and the origin of life. This portrait of biology is comprehensible but inescapably complex, internally consistent, and buttressed by a wealth of factual knowledge.” (From the Publisher)

More information available [here](#).

Howard, N. (2022). *Loath to Print: The Reluctant Scientific Author, 1500–1750*. Baltimore, MD: Johns Hopkins University Press.

ISBN: 978-1-421-44368-3

“While there is no denying the importance of the printing press to the scientific and medical advances of the early modern era, a closer look at authorial attitudes toward this technology refutes simplistic interpretations of how print was viewed at the time. Rather than embracing the press, scientific authors often disliked and distrusted it. In many cases, they sought to avoid putting their work into print altogether.

“In *Loath to Print*, Nicole Howard takes a fresh look at early modern printing technology from the perspective of the natural philosophers and physicians

who relied on it to share ideas. She offers a new perspective on scientific publishing in the early modern period, one that turns the celebration of print on its head. Exploring both these scholars’ attitudes and their strategies for navigating the publishing world, Howard argues that scientists had many concerns, including the potential for errors to be introduced into their works by printers, the prospect of having their work pirated, and most worrisome, the likelihood that their works would be misunderstood by an audience ill-prepared to negotiate the complexities of the ideas, particularly those that were mathematical or philosophical.

“Revealing how these concerns led authors in the sciences to develop strategies for controlling, circumventing, or altogether avoiding the broad readership that print afforded, *Loath to Print* explains how quickly a gap opened between those with scientific knowledge and a lay public—and how such a gap persists today. Scholars of the early modern period and the history of the book, as well as those interested in communication and technology studies, will find this an accessible and engaging look at the complexities of sharing scientific ideas in this rich period.” (From the Publisher)

More information available [here](#).

Jones, E. D. (2022). *Ancient DNA: The Making of a Celebrity Science*. New Haven, CT: Yale University Press. ISBN: 978-0-300-24012-2

“Ancient DNA research—the recovery of genetic material from long-dead organisms—is a discipline that developed from science fiction into a reality between the 1980s and today. Drawing on scientific, historical, and archival material, as well as original interviews with more than fifty researchers worldwide, Elizabeth Jones explores the field’s formation and explains its relationship with the media by examining its close connection to de-extinction, the science and technology of resurrect-

ing extinct species. She reveals how the search for DNA from fossils flourished under the influence of intense press and public interest, particularly as this new line of research coincided with the book and movie Jurassic Park. Ancient DNA is the first account to trace the historical and sociological interplay between science and celebrity in the rise of this new research field. In the process, Jones argues that ancient DNA research is more than a public-facing science: it is a celebrity science.” (From the Publisher)

More information available [here](#).

Maienschein, J., & MacCord, K. (2022) *What Is Regeneration?* Chicago, IL: The Chicago University Press. ISBN: 978-0-226-81656-2

“In punishment for his stealing fire, the Greek gods chained Prometheus to a rock, where every day an eagle plucked out his liver, and every night the liver regenerated. While Prometheus may be a figure of myth, scholars today ask whether ancient Greeks knew that the human liver does, in fact, have a special capacity to regenerate. Some organs and tissues can regenerate, while others cannot, and some organisms can regenerate more fully and more easily than others. Cut an earthworm in half, and two wiggly worms may confront you. Cut off the head of a hydra, and it may grow a new head. Cut off a human arm, and the human will be missing an arm. Why the differences? What are the limits of regeneration, and how, when, and why does it occur?

“In this book, historians and philosophers of science Jane Maienschein and Kate MacCord explore biological regeneration, delving into a topic of increasing interest in light of regenerative medicine, new tools in developmental and neurobiology, and the urgent need to understand and repair damage to ecosystems brought on by climate change. Looking across scales, from germ, nerve, and stem cells to individual organisms and complex systems, this short

and accessible introduction poses a range of deep and provocative questions: What conditions allow some damaged microbiomes to regenerate where others do not? Why are forests following a fire said to regenerate sometimes but not always? And in the face of climate change in the era called the Anthropocene, can the planet regenerate to become healthy again, or will the global ecosystem collapse?” (From the Publisher)

More information available [here](#).

Meincke, A. N., & Dupré, J. (Eds.) (2022). *Biological Identity: Perspectives from Metaphysics and the Philosophy of Biology*. Abington, UK: Routledge

“Analytic metaphysics has recently discovered biology as a means of grounding metaphysical theories. This has resulted in long-standing metaphysical puzzles, such as the problems of personal identity and material constitution, being increasingly addressed by appeal to a biological understanding of identity. This development within metaphysics is in significant tension with the growing tendency amongst philosophers of biology to regard biological identity as a deep puzzle in its own right, especially following recent advances in our understanding of symbiosis, the evolution of multi-cellular organisms and the inherently dynamical character of living systems. Moreover, and building on these biological insights, the broadly substance ontological framework of metaphysical theories of biological identity appears problematic to a growing number of philosophers of biology who invoke process ontology instead.

“This volume addresses this tension, exploring to what extent it can be dissolved. For this purpose, the volume presents the first selection of essays exclusively focused on biological identity and written by experts in metaphysics, the philosophy of biology and biology. The resulting cross-disciplinary



dialogue paves the way for a convincing account of biological identity that is both metaphysically constructive and scientifically informed, and will be of interest to metaphysicians, philosophers of biology and theoretical biologists.” (From the Publisher)

More information available [here](#).

Melville, W., & Kerr, D. (2022). *Virtues as Integral to Science Education: Understanding the Intellectual, Moral, and Civic Value of Science and Scientific Inquiry*. Abingdon, UK: Routledge.

ISBN: 978-0-367-54555-0

“By investigating the re-emergence of intellectual, moral, and civic virtues in the practice and teaching of science, this text challenges the increasing professionalisation of science; questions the view of scientific knowledge as objective; and highlights the relationship between democracy and science.

“Written by a range of experts in science, the history of science, education and philosophy, the text establishes the historical relationship between natural philosophy and the Aristotelian virtues before moving to the challenges that the relationship faces, with the emergence, and increasing hegemony, brought about by the professionalisation of science. Exploring how virtues relate to citizenship, technology, and politics, the chapters in this work illustrate the ways in which virtues are integral to understanding the values and limitations of science, and its role in informing democratic engagement. The text also demonstrates how the guiding virtues of scientific inquiry can be communicated in the classroom to the benefit of both individuals and wider societies.

“Scholars in the fields of Philosophy of Science, Ethics and Philosophy of Education, as well as Science Education, will find this book to be highly useful.” (From the Publisher)

More information available [here](#).

Minelli, A. (2022). *Forms of Becoming: The Evolutionary Biology of Development*. Princeton, NJ: Princeton University Press.

ISBN: 978-1-400-83305-4

“What comes first, form or function? Trumpeted as the future of biological science, evolutionary developmental biology (or “evo-devo”) answers this fundamental question by showing how evolution controls the development of organisms. In *Forms of Becoming*, Alessandro Minelli, a leading international figure in the field, takes an in-depth and comprehensive look at the history and key issues of evo-devo. Spirited and insightful, this book focuses on the innovative ways animal organisms evolve through competition and cooperation.

“Minelli provides a complete overview of conceptual developments — from the fierce nineteenth-century debates between the French biologists Geoffroy and Cuvier, who fought over questions of form versus function — to modern theories of how genes dictate body formation. The book’s wide-ranging topics include expression patterns of genes, developmental bias, the role of developmental genes, and genetic determinism. Drawing from diverse examples, such as the anatomy of butterflies, giraffes, Siamese twins, and corals, Minelli extends and reformulates important concepts from development, evolution, and the interplay between the two.

“Presenting the accessible and cutting-edge ideas of evolutionary developmental biology, *Forms of Becoming* is fascinating reading for anyone interested in genetics and the animal form.” (From the Publisher)

More information available [here](#).

Nassar, D. (2022). *Romantic Empiricism: Nature, Art, and Ecology from Herder to Humboldt*. Ox-

ford, UK: Oxford University Press.

ISBN: 978-0-190-09543-7

“In *Romantic Empiricism*, Dalia Nassar distinguishes and explores an understudied philosophical tradition that emerged in Germany in the late eighteenth and early nineteenth centuries, traces its development, and argues for its continued significance. Moving from the late Kant’s notion of reflecting judgment, to Herder’s articulation of the idea of “animal worlds,” Goethe’s explication of the obligations of the scientist, and Alexander von Humboldt’s aesthetic science, Nassar demonstrates how these thinkers developed a sophisticated empirical approach to the natural world, which focuses on the phenomenon while also recognizing the creative role of the knowing subject and the cognitive value of art and aesthetic experience. She explores how these four thinkers worked together—sometimes as rivals, but more often than not as teachers and collaborators—and illustrates how their search for a new methodology culminated in a new, ecological understanding of the world and the human place within it.

“Revisiting their thought, especially their distinctive approach to the study of nature, Nassar demonstrates, has the potential to redirect contemporary environmental debates and respond to urgent ecological questions in new and productive ways.” (From the Publisher)

More information available [here](#).

Ramharter, E. (Ed.) (2022). *The Vienna Circle and Religion*. Cham: Springer.

ISBN: 978-3-030-76151-6

“This book is the first systematic and historical account of the Vienna Circle that deals with the relation of logical empiricists with religion as well as theology. Given the standard image of the Vienna Circle as a strong anti-metaphysical group and

non-religious philosophical and intellectual movement, this book draws a surprising conclusion, namely, that several members of the famous Moritz Schlick-Circle - e.g., the left wing with Rudolf Carnap, Otto Neurath, Philipp Frank, Edgar Zilsel, but also Schlick himself - dealt with the dualisms of faith/ belief and knowledge, religion and science despite, or because of their non-cognitivist commitment to the values of Enlightenment. One remarkable exception was the philosopher and Rabbi Joseph Schächter, who wrote explicitly on religion and philosophy after the linguistic turn. The book also covers another puzzling figure: the famous logician Kurt Gödel, who wrote on theology and the ontological proof of God in his so far unpublished notebooks. The book opens up new perspectives on the Vienna Circle with its internal philosophical and political pluralism and is of value to philosophers, historians and anybody who is interested in the relation between science and religion.” (From the Publisher)

More information available [here](#).

Reynolds, A. (2022). *Understanding Metaphors in the Life Sciences (Understanding Life)*. Cambridge: Cambridge University Press.

ISBN: 978-1-108-93877-8

“*Understanding Metaphors in the Life Sciences* takes us from genes to cells, and up to the vast evolutionary tree of life, showing how science depends overwhelmingly on metaphor for understanding, for advance, for communication. A very important book.” – Michael Ruse, Florida State University, USA

“Covering a range of metaphors from a diverse field of sciences, from cell and molecular biology to evolution, ecology, and biomedicine, *Understanding Metaphors in the Life Sciences* explores the positive and negative implications of the widespread

use of metaphors in the biological and life sciences. From genetic codes, programs, and blueprints, to cell factories, survival of the fittest, the tree of life, selfish genes, and ecological niches, to genome editing with CRISPR's molecular scissors, metaphors are ubiquitous and vital components of the modern life sciences. But how exactly do metaphors help scientists to understand the objects they study? How can they mislead both scientists and laypeople alike? And what should we all understand about the implications of science's reliance on metaphorical speech and thought for objective knowledge and adequate public policy informed by science? This book will literally help you to better understand the metaphorical dimensions of science." (From the Publisher)

More information available: [here](#).

Richards, E. (2022). *Ideology and Evolution in Nineteenth Century Britain: Embryos, Monsters, and Racial and Gendered Others in the Making of Evolutionary Theory and Culture*. Abingdon, UK: Routledge. ISBN: 978-0-367-50182-2

"Written over several decades and collected together for the first time, these richly detailed contextual studies by a leading historian of science examine the diverse ways in which cultural values and political and professional considerations impinged upon the construction, acceptance and applications of nineteenth century evolutionary theory. They include a number of interrelated analyses of the highly politicised roles of embryos and monsters in pre- and post- Darwinian evolutionary theorising, including Darwin's; several studies of the intersection of Darwinian science and its practitioners with issues of gender, race and sexuality, featuring a pioneering contextual analysis of Darwin's theory of sexual selection; and explorations of responses to Darwinian science by notable Victorian women intellectuals, including the crusading anti-feminist

and ardent Darwinian, Eliza Lynn Linton, the feminist and leading anti-vivisectionist Frances Power Cobbe, and Annie Besant, the bible-bashing, birth-control advocate who confronted Darwin's opposition to contraception at the notorious Knowlton Trial." (From the Publisher)

More information available [here](#).

Shinozuka, J. N. (2022). *Biotic Borders: Transpacific Plant and Insect Migration and the Rise of Anti-Asian Racism in America, 1890–1950*. Chicago, IL; The University of Chicago Press. ISBN: 978-0-226-81733-0

"In the late nineteenth century, increasing traffic of transpacific plants, insects, and peoples raised fears of a "biological yellow peril" when nursery stock and other agricultural products shipped from Japan to meet the growing demand for exotics in the United States. Over the next fifty years, these crossings transformed conceptions of race and migration, played a central role in the establishment of the US empire and its government agencies, and shaped the fields of horticulture, invasion biology, entomology, and plant pathology. In *Biotic Borders*, Jeanie N. Shinozuka uncovers the emergence of biological nativism that fuelled American imperialism and spurred anti-Asian racism that remains with us today.

"Shinozuka provides an eye-opening look at biotic exchanges that not only altered the lives of Japanese in America but transformed American society more broadly. She shows how the modern fixation on panic about foreign species created a linguistic and conceptual arsenal for anti-immigration movements that flourished in the early twentieth century. Xenophobia inspired concerns about biodiversity, prompting new categories of "native" and "invasive" species that defined groups as bio-invasions to be regulated—or annihilated. By highlighting these

connections, Shinozuka shows us that this story cannot be told about humans alone—the plants and animals that crossed with them were central to Japanese American and Asian American history. The rise of economic entomology and plant pathology in concert with public health and anti-immigration movements demonstrate these entangled histories of xenophobia, racism, and species invasions.” (From the Publisher)

More information available [here](#).

Verburgt, L. M. (2022). *John Venn: A Life in Logic*. Chicago, IL: The University of Chicago Press. ISBN: 978-0-226-81551-0

“John Venn (1834–1923) is remembered today as the inventor of the famous Venn diagram. The post-mortem fame of the diagram has until now eclipsed Venn’s own status as one of the most accomplished logicians of his day. Praised by John Stuart Mill as a “highly successful thinker” with much “power of original thought,” Venn had a profound influence on nineteenth-century scientists and philosophers, ranging from Mill and Francis Galton to Lewis Carroll and Charles Sanders Peirce. Venn was heir to a clerical Evangelical dynasty, but religious doubts led him to resign Holy Orders and instead focus on an academic career. He wrote influential textbooks on probability theory and logic, became a fellow of the Royal Society, and advocated alongside Henry Sidgwick for educational reform, including that of women’s higher education. Moreover, through his students, a direct line can be traced from Venn to the early analytic philosophy of G.E. Moore and Bertrand Russell, and family ties connect him to the famous Bloomsbury group.

“This essential book takes readers on Venn’s journey from Evangelical son to Cambridge don to explore his life and work in context. Drawing on Venn’s key writings and correspondence, published and unpublished, Lukas M. Verburgt unearths the

legacy of the logician’s wide-ranging thinking while offering perspective on broader themes in religion, science, and the university in Victorian Britain. The rich picture that emerges of Venn, the person, is of a man with many sympathies—sometimes mutually reinforcing and at other times outwardly and inwardly contradictory.” (From the Publisher)

More information available [here](#).

Walters, L., & Siegfried, B. (Eds.). (2022). *Margaret Cavendish: An Interdisciplinary Perspective*. Cambridge: Cambridge University Press.

“Margaret Cavendish’s prolific and wide-ranging contributions to seventeenth-century intellectual culture are impossible to contain within the discrete confines of modern academic disciplines. Paying attention to the innovative uses of genre through which she enhanced and complicated her writings both within literature and beyond, this collection addresses her oeuvre and offers the most comprehensive and multidisciplinary resource on Cavendish’s works to date. The astonishing breadth of her varied intellectual achievements is reflected through elegantly arranged sections on History of Science, Philosophy, Literature, Politics and Reception, and New Directions, together with an Afterword by award-winning novelist Siri Hustvedt. The first book to cover nearly all of Cavendish’s major works in a single volume, this collection brings together a variety of expert perspectives to illuminate the remarkable ideas and achievements of one of the most fascinating and prolific figures of the early modern period.” (From the Publisher)

More information available [here](#).



## Coming HPS&ST Related Conferences

June 9-11, 2022, 30th Baltic Conference on the History and Philosophy of Science, University of Oulu, Finland  
Details [here](#).

June 19, 2022, Celebrating the Life, Science, Music, and Legacy of William Herschel (1738-1822), University of York.  
Information: [Rachel Cowgill](#)

June 30-July 2, 2022, 4th International Conference on Science & Literature, Girona, Spain.  
Details from [Carlos Manuel Gamez Perez](#)

July 2-4, 2022, Society for Philosophy of Science in Practice (SPSP) Ninth Biennial Conference Ghent University, Belgium  
Details [here](#).

July 3-7, 2022, IHPST 16th International Conference, University of Calgary, Canada  
Details from Glenn Dolphin:  
[glenn.dolphin@ucalgary.ca](mailto:glenn.dolphin@ucalgary.ca).

July 18-22, 2022, 'Objects of Understanding: Historical Perspectives on Material Artefacts in Science Education', Europa-Universität Flensburg, Germany  
Details: Roland Wittje, [roland.wittje@gmail.com](mailto:roland.wittje@gmail.com) and [here](#).

July 24-29, 2023, 17th DLMPST Congress, University of Buenos Aires  
Information: Pablo Lorenzano, [pablo@unq.edu.ar](mailto:pablo@unq.edu.ar).

September 7-10, 2022, 10th European History of Science Society Conference, Brussels. 'Science Policy and the Politics of Science'.  
Information [here](#).

September 19-23, 2022, 41st Symposium of the Scientific Instrument Commission, Athens.  
Details, [George N. Vlahakis](#).

July 24-29, 2023, 17th DLMPST Congress, University of Buenos Aires" Information: [Pablo Lorenzano](#).

## 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

[ISHEASTME](#) – International Society for the History of East Asian History of Science Technology and Medicine

[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

[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 [HERE](#).

HPS&ST-related organisations wishing their web page to be added to the list should contact assistant editor Paulo Maurício ([paulo.asterix@gmail.com](mailto:paulo.asterix@gmail.com))

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