

HPS&ST NEWSLETTER



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JUNE 2022

The HPS&ST NEWSLETTER is emailed monthly to about 10,000 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, &c.) are welcome and should be sent direct to the editor: Michael R. Matthews, UNSW (m.matthews@unsw.edu.au).

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

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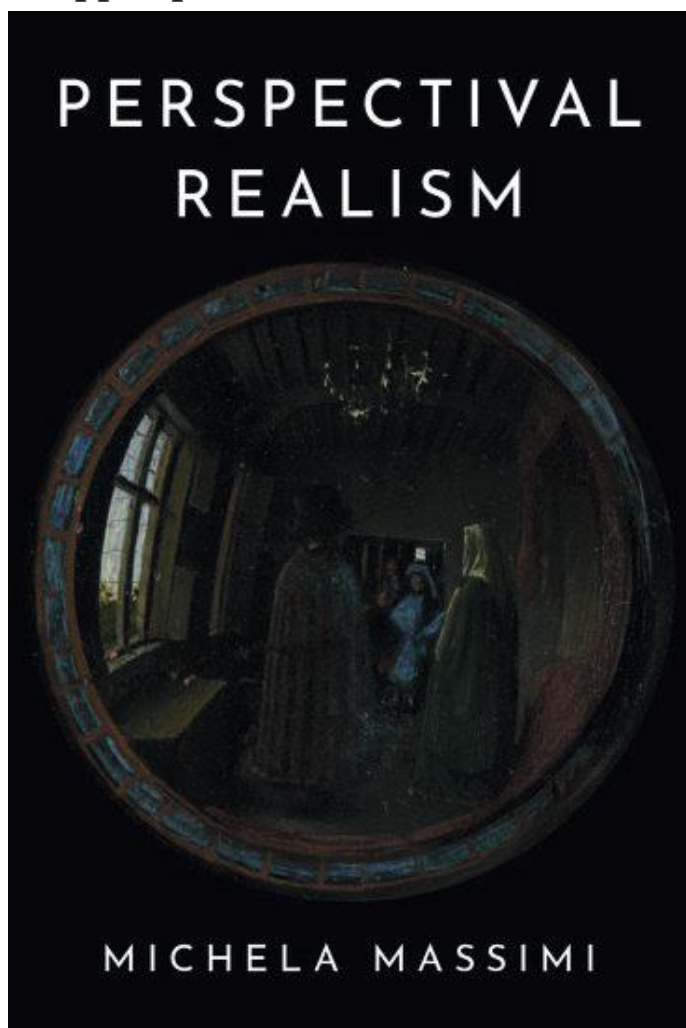
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Michela Massimi, *Perspectival Realism*, Oxford University Press, 2022, 416pp, Open Access



The book offers an original view concerning realism in science; explains the link between the reliability of science and a plurality of scientific perspectives; analyses scientific knowledge as modal knowledge and presents perspectival models as inferential blueprints; provides novel accounts of phenomena and natural kinds; celebrates the social and multicultural nature of scientific knowledge.

This is an open access title available under the terms of a CC BY-NC-ND 4.0 International license.

Perspectival Realism offers a realist view that takes the multicultural nature of science seriously and couples it

with cosmopolitan duties about how one ought to think about scientific knowledge and the distribution of benefits gained from scientific advancements. (From the Publisher)

Book, details and more information [here](#).

Table of Contents: [here](#).

From series: [Oxford Studies in Philosophy of Science](#).

Bulletin for the History of Chemistry,
Open Access Centenary Issue



The Division of the History of Chemistry of the American Chemical Society (HIST) is 100 years old in 2022. HIST is the home within ACS for chemists interested in the history of their discipline. Among its activities is publication of a peer-reviewed journal in history of chemistry, the *Bulletin for the History of Chemistry*.

In this anniversary year, we have prepared an extra issue of the Bulletin (2022, vol.47, no.1), available electronically to anyone (open access).

Prominent chemists and historians of chemistry were invited to contribute essays on the theme “Novel Insights in the History of Chemistry: Looking Back Yet Mostly Looking Forward.” We invite readers to peruse this commemorative issue online at http://acshist.scs.illinois.edu/bulletin_open_access/bull22-vol47-1.php

In addition, 30 years of open-access issues of the Bulletin, which are free to all after a three-year window of access exclusively by HIST members and subscribers, can be found at http://acshist.scs.illinois.edu/bulletin_open_access/bull-index.php

More information about HIST is available at <http://acshist.scs.illinois.edu/index.php>

China, Science Curriculum Standards for Compulsory Education (2022)

In April 2022, the Ministry of Education of the People's Republic of China issued *Compulsory Education Curriculum Plan (2022 Edition)* and 16 curriculum standards for compulsory education in various learning areas, which will be implemented nationwide starting from the fall semester of 2022.

In order that, there is vertical connection between science curriculum in primary school and science curriculum in physics, chemistry, biology and other field in junior high school. The new standards provide a vertical connection and horizontal coordination between the elementary science curriculum and the junior high school curriculum in the areas of physics, chemistry, and biology.

The new curriculum proposes four discipline core competencies of science: 'scientific concepts inquiry and practice' 'attitude and responsibility' and 'scientific thinking'. The content of the curriculum set 13 discipline core ideas, through learning these core concepts, students will understand the cross-disciplinary concepts of substance and energy, structure and function, systems and models, and stability and change.

History and Philosophy of Science (HPS) is built into the new curriculum standard. It emphasizes the understanding of the nature of science and 'the relationship between science, technology, society, and the environment' in the 'curriculum objectives'. The 'curriculum content' involves a large number of history of science and technology topics, human environmental responsibility, and other subjects.

History of science, philosophy of science and sociology of science integrated into the science curriculum will enable students to better understand the nature of science and to implement the development of core competencies.

Click [here](#) for curriculum document (choose English).

Academic Seminar in Commemoration of the 110th Anniversary of Chien-shiung Wu's Birth, May 31 2022



On May 31, 2022, Southeast University and the People's Government of Taicang city, Chien-shiung Wu's hometown, jointly organized the "Academic Seminar in Commemoration of the 110th Anniversary of Chien-shiung Wu's Birth", bringing together the world's top Chinese scientists online and offline. At the seminar, Chen-Ning Yang, Tsung-Dao Lee, Samuel Chao Chung Ting and other world's top Chinese scientists, academicians of the Academy of Sciences and masters of humanities all recalled this lady's scientific spirit and humanistic quality in their speeches.

Ms. Wu (May 31, 1924 -- February 16, 1997) made remarkable contributions to the cause of science, es-

pecially physics. In 1956, Dr. Chien-shiung Wu used experiments to overturn the conclusion of “Law of Parity Conservation” under weak interaction. This experiment shocked the world of physics and resulted in her Columbia University co-workers Dr. Tsung-Dao Lee and Dr. Chen-Ning Yang being awarded the Nobel Prize in Physics in 1957. Despite her co-workers nominating her seven times for the prize, she never received it. In 1978 she was honoured with the inaugural award of Israel’s Wolf Prize. Chien-shiung Wu has created numerous “firsts” of Asian women in science, and looked forward to the development of science education and the training of young scientists in China.

Details of the seminar can be found [here](#).

First GEMATEC Online Seminar on Analogies, Metaphors and Models (A&M) in Psychology.



The Research Group on Analogies, Metaphors and Models in Technology, Education and Science - AMTEC, together with the Study Group on Analogies, Metaphors and Models (AMM) in Technology, Education and Science - GEMATEC, both linked to the program in Master in Technological Education at the Federal Center for Technological Education of Minas Gerais - CEFET/MG will hold, in September 2022, the First GEMATEC Online Seminar on Analogies, Metaphors and Models (AMM) in Psychology.

The event (in Portuguese language) is coordinated by, Prof. MSc. Maria de Fátima Marcelos, will take place on Thursday mornings from 8:00 am to 10:00 am. Registration will be for the listener mode only and will begin in the first week of August.

Schedule:

First day: 09/02/2022

Title: ANALOGIES, METAPHORS AND MODELS: CULTURAL TOOLS FOR THE MEDIATION OF HUMAN ACTION

Prof. Dr. Alexandre da S. Ferry – Doctor in Education – Universidade Federal de Minas Gerais (Federal University of Minas Gerais)

Second day: 09/08/2022

Title: SYSTEMATIC AND METHODOLOGICAL ANALYSIS OF THE “COMPARISON” BETWEEN A TREE AND COGNITIVE MODEL OF COGNITIVE BEHAVIORAL THEORY

Prof. MSc. Maria de Fátima Marcelos – Master in Technological Education – Centro Federal de Educação Tecnológica de Minas Gerais

Third day: 09/15/2022

A STUDY ON THE COGNITIVE STATUS OF METAPHORS

Prof. MSc. Cinthia M. Gomes e Silva - Master in Technology – Centro Federal de Educação Tecnológica de Minas Gerais

Fourth day: 09/22/2022

ANALOGIES AND METAPHORS IN PSYCHOLOGY: A LOOK AT AFFECTS AND REASON IN DIFFERENT CONTEXTS

Prof. Dr. Anderson Arthur Rabello – Doctor in Electrical Engineering (UFMG); Electrical Engineer - Pontifícia Universidade Católica de Minas Gerais.

Fifth day: 09/29/2022

CONSTRUCTING NEW MEANINGS WITH THE USE OF METAPHORS IN NARRATIVE THERAPY

Prof. MSc. Valéria Nicolau Paschoal – Master in Clinical Psychology - Pontifícia Universidade Católica de São Paulo (Pontifical Catholic University of São Paulo) –

Sponsors:

AMTEC/CEFET-MG/CNPq research group
<http://dgp.cnpq.br/dgp/espelhogrupo/11325>

GEMATEC/CEFET-MG study group.
<https://www.gematec.cefetmg.br>

Organizing Team:

Coordination: Prof. MSc Maria de Fátima Marcelos
 Vice-coordination: Prof. Dr. Alexandre da Silva Ferry;
 Prof. Dr. Ronaldo Luiz Nagem

AMTEC Psychology Team: Prof. Dr. Anderson Arthur Rabelo; Prof. MSc. Cinthia M. Gomes e Silva; Prof. MSc. Maria de Fátima Marcelos; Prof. Dr. Ricardo Luís Aguiar Assis; Master's student Josie Barcelos
 Scientific Committee: Prof. MSc Maria de Fátima Marcelos; Prof. Dr. Alexandre da Silva Ferry; Prof. Dr. Ronaldo Luiz Nagem; Prof. Dr. Ricardo Luís Aguiar Assis; Master's student Josie Barcelos

Technical Team: Prof. Dr. Délcio Julião Emar de Almeida (Designer); Prof. MSc. Andréa Cristina Maggi (Reviewer); Prof. MSc. Wilbert Viana Barbosa (Technological Support).

Registration link: <https://www.even3.com.br/seminariogematecpsi2022/>

Integrated History and Philosophy of Science, 9th conference, University of South Carolina, March 16-18, 2023

The Committee for Integrated History and Philoso-

phy of Science, together with the [Ann Johnson Institute for Science, Technology, and Society](#), invites the submission of individual paper and poster abstracts for “&HPS9”, the 9th conference in the series Integrated History and Philosophy of Science.



Contributions are sought that genuinely integrate the historical and philosophical analysis of science (i.e., the physical sciences, life sciences, cognitive sciences, and social sciences), discuss methodological issues surrounding the prospects and challenges of integrating history and philosophy of science.

Conference details: [here](#).

Keynote speakers: Alisa Bokulich (Boston University) and Gregory Radick (Leeds)



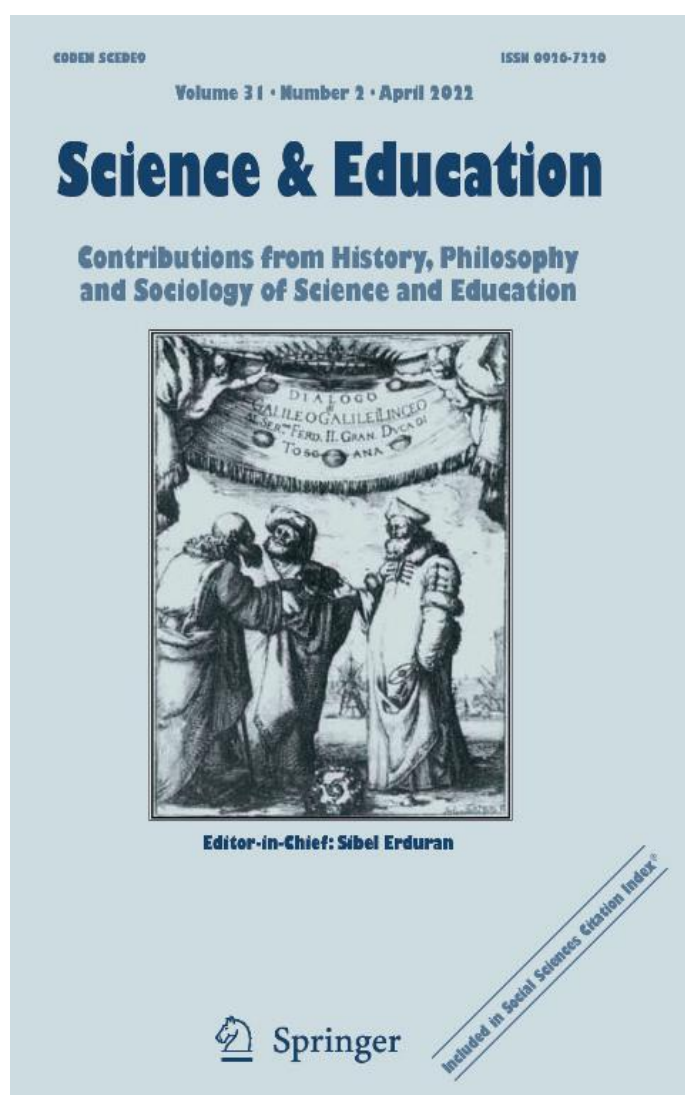
For information about Integrated History and Philosophy of Science and previous conferences, see <http://integratedhps.org>

Abstracts should be submitted via EasyChair, where further instructions are available: <https://easychair.org/cfp/HPS9>.

Deadline for submission of paper and poster abstracts:
August 1st, 2022

Inquiries to Agnes Bolinska (bolinska@mailbox.sc.edu), Michael Stoeltzner (stoeltzn@sc.edu), or Lydia Patton (critique@vt.edu).

Science & Education Journal, New Metrics



Clarivate published journal citation reports for 2021 on June 28th, 2022. According to the reports, the impact factor of *Science & Education* journal has increased to **2.921** (2021) up from 2.114 (2020) and 1.262 (2019). The 5 Year impact factor has also increased from **2.786** (2021) up from 2.232 (2020) and

1.426 (2019).

A key change for the journal is that it has jumped a quartile to (Q2) in Social Sciences Citation Index for the first time in its history in the Education & Educational Research category. The journal is now ranks 92/267 in Q2 and 65.73 JIF Percentile (2021) up from 152/265 Q3 and 42.83 JIF Percentile (2020).

The journal has maintained its top quartile (Q1) presence and moved up the list in History and Philosophy of Science category, ranking 4/62 Q1 and 94.35 JIF Percentile (2021) up from 7/63 Q1 and 89.68 JIF Percentile (2020). The metrics indicate an upward trajectory for the impact of the journal.

The Editorial team thanks all authors and reviewers for their contributions to and support of the journal.

Course Syllabi: “Teaching Philosophy of Science in the World”

The Philosophy of Science Association invites submissions of course syllabi that showcase effective and creative teaching of the philosophy of science that reaches beyond the Anglophone mainstream. We are seeking to build a library of new ideas and good practices from around the world that will help those who are trying to internationalize the subject and introduce it to new audiences. All submissions that meet the eligibility criteria below will be made available on the syllabus repository that can be accessed freely via the PSA website.

Any members of the PSA may make a submission; non-members wishing to submit an entry are encouraged to apply for membership through the PSA’s Sponsor-a-Scholar program, if they have financial need. Entries may be syllabi of courses specifying a schedule of sessions and reading lists, or descriptions of learning activities that do not fit the traditional notion of “course.” Teaching plans at any level from secondary school to PhD programs are eligible. Entries must refer to courses or other activities that have already run at least once. They can be in any language (or mix

of languages), but for an entry that is not in English, please submit an English translation alongside the original version. Submissions will be reviewed by the PSA International Relations Committee, consulting appropriate external experts as needed.

Innovations displayed by courses may include:

- Crafting of learning activities that adapt traditional issues in the philosophy of science to the sensibilities and conditions of the countries and communities in which the course is taught.
- Selection (or creation) of teaching materials (print or online) with the same purpose;
- Comparative study or synthesis of traditions of philosophy of science from different parts of the world, or from different languages, cultures, or religions.
- Application of insights from various non-Anglophone and non-analytic traditions of philosophy to the philosophy of science.
- Critical examination of the legacies of colonialism and other aspects of international and intercultural politics in the philosophy of science.
- Philosophical examination of interactions between European-origin science (and technology and medicine) and non-European traditions of knowledge.
- Productive combination of mainstream English-language sources with non-English sources.

All entries will be considered for an annual prize to be awarded at the biennial PSA conference or at a separate online event, where the prize-winner(s) will be invited to discuss the content of the winning entry. The prize will also carry a cash award of \$500.

Entries may be submitted at any time to the Chair of the PSA International Relations Committee, Prof. Hasok Chang, University of Cambridge, by e-mail to: hc372@cam.ac.uk. The deadline for submission of syllabi to be considered for the 2022 prize is **15 July 2022**. Entries submitted after that date will be considered for the 2023 competition.

HPS&ST in Latin America

Events

Echoes of Scientific Thought in Society - The late 19th century - early 20th century “race science” in Argentina and Brazil”. This online meeting will bring together several scholars to discuss how the racial thought leads to impact in social constructs as diverse as education, literature and others, in Brazil and Argentina. It will also host paper presentation sessions (graduate students are especially encouraged to engage). **Sept. 19-23, 2022**. Information may be accessed [here](#).

xx IOSTE Symposium (International Organization for Science and Technology Education) will be held in Federal University of Pernambuco and Mar Hotel Conventions, Recife, Brazil, from **July 25-29, 2022**. 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/>

The Science, Education and Diversity Research Group of the Universidad del Valle in Colombia, invites you to participate in the National Colloquium on History, Philosophy and Science Education to be held at the University of Valle, Cali, Colômbia from **July 28-29, 2022**.

In this edition, the central theme of the meeting will be the contributions, trends and challenges of history, philosophy and science education in the new demands of the XXI century. Information is available a <https://ceydunivalle.wordpress.com/vicoloquio/>

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

Opinion Page: Creativity and Constraint in Science and the Arts, Tom McLeish, University of York



Tom McLeish is Professor of Natural Philosophy, Department of Physics, University of York.

His broadly interdisciplinary research ranges from the theoretical physics of soft and biological matter to the medieval history of science, and the theology, sociology and philosophy of science. He is the author of *Faith and Wisdom in Science* (OUP 2014), *Let There Be Science* (Lion Hudson 2016) and *The Poetry and Music of Science: Comparing Creativity in Science and Art*. (OUP 2019, 2022).

His earlier newsletter essay ‘Science + Religion’ is available [here](#).

This essay is extracted from Chapter One of [The Poetry and Music of Science](#) (OUP 2022). It is reproduced with generous permission from Oxford University Press

Different Descriptions

Creativity, Inspiration, Passion, Form, Imagination, Composition, Representation—this powerful list of words leads a reader’s mind inevitably into the world of the arts. Perhaps it conjures up the shaping of a block of stone into the form of supple limbs and torso, or layering darkly tinted oil paints onto canvas to tease the eye into imagining a moonlit forest at night.

Others may think of a composer scoring a symphony’s climax—she summons the horns to descend as from a distant mountain peak to meet a harmonically ascending string bass-line in a satisfying resolution. A poet at his desk wrestles with meter and rhyme as he filters the streams of words, metaphors, and allusions that clamour for place on the page. The double miracle of art is not only that it allows humans to draw meaning from the world, but also that it reaches out to its listeners, viewers, and readers so that they may re-create for themselves something new and personal in response. Both by words and by images we are changed, troubled, made more aware as art enriches us in small ways or great. To engage in art by creation or reception and re-creation is to exercise one of the capacities that make us human. Indeed, the academic study of art’s products and process falls under the class of disciplines we call the ‘humanities.’

Experiment, Design, Formulation, Method, Theory, Observation, Hypothesis, Computation, Trial, Error—another list of words might lead to a different world of activity. These are more associated with disciplines we term ‘the sciences.’ Their energy seems to be of a different sort—we are not, perhaps, as emotionally moved by these terms; they do not suggest as much wild, unpredictable outcome. Are we encouraged to think, perhaps, of a laboratory setting—a careful mixing of liquids and a measuring of their temperature? Is the mental picture one of an observer carefully preparing a microscope, or calculating by computer the orbit of a distant planet? If the artistic associations are as likely to disturb as to excite, are the scientific associations more reassuring (the French cubist Georges Braque thought that, ‘*L’art est fait pour troubler, la science rassure*’¹)? Or do they disturb in a different way? Very likely this is a world that is unfamiliar and strange, less accommodating than the arts and, dare we admit it, less ‘human’ in some way (we do not class the sciences as ‘humanities’ after all).

Similar Practices

But there are other voices that choose the same lan-

1 Art is made to disturb, science to reassure.

guage to talk about art and science, and even in the same breath. Philosopher of science Karl Popper once wrote: 'A great work of music, like a great scientific theory, is a cosmos imposed upon chaos — in its tensions and harmonies inexhaustible even for its creator.'² This richly layered and dense commentary on music and science will need some background work to uncover Popper's meaning—its allusions immediately fail to intersect with the quite distinct word-lists that spring from usual talk of art and science. But it raises suspicions. Is a dualistic division into arts and science really faithful to our history, our capacities and needs? Does it spring from a deep understanding of what these twin human projects attempt to do—is it faithful, dare we ask, to their purpose? And if not, are we right to ask of our children, 'are they on the science-side or the arts-side?' or to reinforce the well-worn narrative of C. P. Snow that there are 'Two Cultures'³ at work in our late- modern world, non-overlapping, mutually incomprehensible, and doomed to conflict?

If we are wrong to categorize culture, let alone people themselves in this way, then to make exclusive educational decisions based on such a dualistic assumption will be to trigger a process of atrophy in one or other aspect of those children's development, and in adult life to have closed off one or other world of expression, contemplation, creativity, enrichment—of complementary ways of being human.

Doubts intensify about a neat cultural divide if we take the all too unusual step of listening to an artist, or to a scientist, talk candidly about their creative journeys from early ideas to a finished work. For when we do that, the language-clouds of the arts and the sciences start to collide and overlap. It is much less common to discuss the long process of realization in art than to talk about the final article, composition, theory, or painting. Why this is, is hard to say. The famous ex-

ceptions (such as the evolution of Picasso's *Guernica*⁴, the candid reflections of novelists Henry James⁵ and Elena Ferrante⁶) underline the question.

If art is shy about the sweat and tears of working out the form of an original idea, then science is almost silent about its epiphanies and moments of inspiration. Popper himself, celebrated for the most detailed modern outworking of a scientific method in his *Logic of Scientific Discovery*, wrote at length on how hypotheses may be refuted, but remained quiet on how they might be imagined in the first place. While acknowledging the vital necessity of such imaginative preconception, Popper declared that, as essentially non-methodological, he had nothing to say about it. There is some degree of logic and process in the testing and evaluating of a scientific idea, but there are no such recipes for conceiving them.

Nobel Laureate Sir Peter Medawar lays some of the blame for our blindness to the role of imagination in science at the feet of John Stuart Mill's *System of Logic*. Mill writes as if he believed 'that a scientist would have already before him a neatly ordered pile of information ready-made—and to these he might quite often be able to apply his rules.'⁷ If science gathers to itself a narrative more weighted towards method, and art is more vocal about creative origins, then these retellings of partial truths will conspire to drive an illusory distance between them.

Inspiration vs Rationality

The contrasting traits of silence within the community of science on its imaginative energies, and of art on its workaday reckoning with material reality, is not

2 Karl Popper (1976 [2002]), *Unended Quest: An Intellectual Autobiography*. London and New York: Routledge.

3 C. P. Snow (1959 [1998]), *The Two Cultures*. Cambridge: Cambridge University Press.

4 Rudolf Arnheim (1963) *The Genesis of a Painting: Picasso's Guernica* Berkeley: The University of California Press.

5 Henry James (1934), *The Art of the Novel*. Chicago: University of Chicago Press (2011).

6 Elena Ferrante trans. Anne Goldstein (2016) *Frantumagli*. New York: Europa editions

7 Peter Medawar (1984), 'An essay on sciens,' in *The Limits of Science*. Oxford: OUP.

restricted to our own times. William Blake, the eighteenth-century poet, artist, and engraver, famously inveighed against what he perceived was the destructive dehumanizing of ‘natural philosophy’, the term used for the quantified and experimental understanding of nature we would term ‘science’ today. He wrote of his own task:

‘in the grandeur of Inspiration to cast off Rational Demonstration . . . to cast off Bacon, Locke and Newton’; I will not Reason and Compare — my business is to Create.’⁸

For Blake, inspiration has no place in Newton’s work, and reason none in his own. There is some buried personal dissonance here given what we know of his own painstaking technical developments in copper engraving. He was not without cause for complaint against those early modern philosophers: John Locke, in his *Essays Concerning Human Understanding*⁹ had identified ‘the imagination’ as the source of false and fantastical ideas, as opposed to experience, the reliable guide to the true. Yet there are other voices within the nineteenth century, that witness to a very different vision. One is Ada Lovelace, poet and mathematical collaborator of Charles Babbage, who in an essay from 1841 wrote in powerfully metaphorical terms about the power of imagination in the sciences, and of the sense of exploration in pursuing them:

Those who have learned to walk on the threshold of the unknown worlds, by means of what are commonly termed par excellence the exact sciences, may then with the fair white wings of Imagination hope to soar further into the unexplored amidst which we live.¹⁰

8 William Blake, *Milton* (1804), book 2, pl. 41; Jerusalem, ch 1, pl. 10.

9 John Locke (2015), *The Clarendon Edition of the Works of John Locke*, Oxford: Oxford University Press, *An Essay Concerning Human Understanding Book II*.

10 Ada Lovelace (1841), quoted in Sam Illingworth (2019), *A Sonnet to Science*. Manchester: Manchester University Press.

Yet it is Blake’s and Locke’s compartmentalized assignments of inspiration and rationality that I find at work today among British high-school pupils. When participating in ‘general studies’ discussions of science in society, or the importance of interdisciplinary thinking, I like to ask advanced students who have not chosen to study science subjects (when from their intellectual engagement with the material it is clear that they could master anything they wished) why they made that choice. Among the brightest of them, I never receive the complaint that the sciences seem too difficult, but rather that they appear to lack avenues for creativity and the exercise of imagination. The conversation sometimes also reflects the expectation of a more playful engagement with the humanities, contrasting with impressions of seriousness and narrowness in the sciences.

I find this personally painful, and doubly saddening that these young people have been offered no insight into the immense fields for imagination offered by science, and that scientists have failed in communicating its call on creativity. As pioneer of science-art project curator and commentator, Sian Ede writes:¹¹

Compared with the cool rationalism of science with its material belief in wholeness, the theories employed by thinkers in the arts and humanities seem part of a playful circular game in which the truth is never to be privileged in one direction or another and is always out of reach.

These echoes of Blake in the words of today’s brightest young people are painful to hear. They speak to the urgency of a project that goes beyond the confrontational assumptions of the ‘Two Cultures’ to deeper levels of human motivation, desire, experience—one that recognizes the dual qualities of rationality and inspiration, of seriousness and playfulness, of imagination and constraint, but challenges their automatic alignment with the axes of humanities and sciences, exploring instead how they play out in both.

11 Sian Ede (2005), *Art and Science*. London I. B. Taurus.

Inspiration in Science

Here is Einstein on the two components of scientific creativity:¹²

The mere formulation of a problem is far more essential than its solution,
which may be merely a matter of mathematical or experimental skills.

To raise new questions, new possibilities,
to regard old problems from a new angle, requires creative imagination
and marks real advance in science.

~

I am enough of an artist to draw freely upon my imagination.

Imagination is more important than knowledge. Knowledge is limited.

Imagination encircles the world.

Thomas Kuhn famously coined the notion of ‘paradigm shifts’ to denote discontinuous changes in the scientific framework for understanding nature. They entail revolutions in entire sets of presuppositions and current mutually supporting scientific ideas. They typically witness the entry of new ideas not deducible from prior reasoning.¹³ Classic examples are the Copernican revolution in cosmology and the shift from classical to quantum physics. Beyond identifying the growing dissatisfaction with the existing framework, however Kuhn made no suggestions concerning the provenance of the new set of ideas—they are the protoplasm of his revolutions but seed no methodology.

The formulation of the fruitful question, posed in the right way, constitutes the great imaginative act in science. It requires a developed sense of the current era of scientific thought, of timing. Historian of science and chemist Lawrence Principe¹⁴ has pointed out the

12 Albert Einstein and Leopold Infeld (1938), *The Evolution of Physics*. London: Cambridge University Press.

13 Thomas Kuhn (1966), *The Structure of Scientific Revolutions*. Chicago: Chicago University Press.

14 Lawrence Principe (2013), *The Scientific Revolution: A Very Short Introduction*. Oxford: Oxford University Press.

appropriateness of questioning the structure of the solar system at the turn of the seventeenth century, when Tycho Brahe’s meticulous observations of planetary motion and Copernicus’ inspired partial solution to the new paradigm had opened up a field of potential progress. Johannes Kepler’s deductions together with Thomas Harriot’s and Galileo’s new telescopic observations of the heavens, made asking about the dynamical consequences of gravity among the sun and the planets fruitful in a sense that it had not in any previous century.

If the scientific imagination is fed by the creative and timely question, it also needs the nourishment of the discontinuous, of leaps in thinking that receive their impulse from some other source than the worthy process of logical deduction. A generation on from the establishment of the orbits of the moon and planets within a heliocentric structure of the solar system, Newton’s great imaginative conception was to contemplate a world in which the fall of an apple sprung from the same universal field of force as the monthly procession of the moon.

The presence of the creatively formulated question in as ancient a source as the Book of Job¹⁵ (undatable other than to place it within the first half of the first millennium BCE) within the Semitic tradition, carries another salutary message to us late moderns. Alongside the complex history of ancient Hellenistic science from 500 BCE, it surely erodes any idea that science is in any way exclusively modern, beginning rootless at the enlightenment and blowing away the cobwebs of centuries of darkness, magic, superstition and alchemy. Sadly, much popular narrative of science history has it so, but claiming science as an exclusive property of the modern world removes the deep and slow cultural development of an imaginative and creative engagement with nature that develops, at least chronologically, alongside the story of art in its own

15 For a magisterial survey of the *Book of Job*, see the three-volume work by David Clines, Thomas Nelson pubs. We will encounter an explicit example of scientific inspiration drawn from reading it in the story of the rainbow, told in Chapter 8.

multitude of forms.¹⁶

Communities of Appreciation of the Arts and Science

On the other hand, if a distorted impression of creativity arises in part from selective silences on the part of their practitioners, then perhaps the same is true of their reception. Comment on the effect and the enjoyment of art is commonplace. It speaks of a healthy continuum from artist and performer to receiver and listener. We may not be able to paint or to sing like the great exponents of art and oratorio, but we are not silenced as a result from speaking, or even from critically appraising, paintings or performances.

There is understood to be a 'ladder' of participation and reception in the arts. In music, for example, the lower rungs are occupied by those of us who enjoy concerts, who pick up instruments in the company of forgiving amateur friends. We would never presume to perform in public, but nevertheless can confidently express an opinion on which recording of a symphony we prefer. The upper rungs are occupied by the performers on those very recordings.

It is harder to find comparable examples of reception and affect, in scientific creation. But this is not because of a lack of inherent appeal to human desire and need. The 'ladder of access' that we identified in a creative art such as music is not (as observed by Barzun in different terms) present in our current culture in science. This was not always the case—Shelley, Coleridge, and Wordsworth all thought that science could, and would inspire poetry (though Shelley foresaw that the inspirational beauty of science would be a hidden one). So, for articulated contemporary reception of science, we must usually listen to the scientists themselves.

16 For a more complete and integrated account of the history of science, see the now classic work by David Lindberg (2010), *The Beginnings of Western Science: The European Scientific Tradition in Philosophical, Religious, and Institutional Context, Prehistory to A.D. 1450*, Second Edition, Chicago: Chicago University Press.

Here cosmologist Subrahmanyan Chandrasekhar describes in remarkable terms an example of the moments of transport for which science longs:¹⁷

In my entire scientific life, extending over forty-five years, the most shattering experience has been the realization that an exact solution of Einstein's equations of general relativity, discovered by New Zealand mathematician Roy Kerr, provides the absolutely exact representation of untold numbers of massive black holes that populate the universe. This 'shuddering before the beautiful', this incredible fact that a discovery motivated by a search after the beautiful in mathematics should find its exact replica in Nature, persuades me to say that beauty is that to which the human mind responds at its deepest and most profound.

The cosmologist is speaking of the extraordinarily simple yet utterly strange idea of a 'black hole'. For many years pure conjecture, observational evidence from stellar evolution and highly luminous galactic cores has pointed increasingly to the inevitable existence of these bizarre and terrible objects. Black holes are places in the cosmos where the local presence of matter is so great that gravity generates its runaway collapse towards a point where density becomes formally infinite, surrounded by a finite region of space in which the tug of gravity is so great that no light can escape. Possessing a terrifying and austere beauty, these objects are as near to instantiated mathematics as one could imagine. They can have no other properties than mass, spin and electric charge. All other attributes that their original matter once possessed are lost in its irreversible in-fall. The normal role of mathematics within theoretical physics is to provide approximate descriptions of natural objects, but in this case the attribution of a black hole's triplet of properties is complete.

The experience Chandrasekhar describes is a rarefied and extreme form of a precious wonder. Einstein put it thus: 'the most inexplicable thing about the universe is that it is explicable' and Eugene Wigner pointed out 17 Subrahmanyan Chandrasekhar (1987), *Truth and Beauty: Aesthetics and Motivations in Science*. Chicago: University of Chicago Press.

towards it in the title of his celebrated essay *The Unreasonable Effectiveness of Mathematics in the Natural Sciences*.¹⁸

All this is not to deny a tradition of research and writing on the topic of creativity itself that includes scientific examples—far from it. Major edited collections of essays and research from psychologists¹⁹ on creativity have recently spawned a subfield of cognitive neuroscience. The genre has even produced a ‘Cambridge Handbook’ on creativity.²⁰

Imagination in Science and in Science Education

There is little discussion, however, of the way that imagination plays out in the experience of the thousands of people engaged in the scientific and artistic work that adds colour to our communities and national lives. There is also almost total silence within the educational formation of scientists on the topic of imagination, of the creative formulation of questions and hypotheses, or of the experience of scientific ideation. There may not be a method for this most vital of all scientific processes, but there are accounts, practices, and a communal experience that ought to be more widely and openly shared both within and without the scientific community.

I have suggested elsewhere²¹ that, because of the ‘missing rungs’ in scientific ladder of reception, it is lamentably less common for non-practitioners of science to experience the intensity of aesthetic response to a new understanding of nature, than for the scientists whose professional training has taken them to the ladder’s higher footholds that still exist. But it is not

impossible and could be as common as the learning of a new tune or appreciating an unfamiliar painting for the first time.

In a moving personal example, a friend told me of the moment when, gazing up at the moon one evening, he suddenly understood how its phases worked. A life of familiarization with the monthly cycle of crescent, half, full, and gibbous moon was not equivalent to ‘seeing’ how these shapes served as the signature of an illuminated orb. On that moonlit night shortly after sunset he allowed the two-dimensional screen of the sky to become, in his mind, a vast three-dimensional structure. The moon became a solid sphere, illuminated by a much more distant sun from different angles on different days, as seen from the centre of its orbit on the Earth. The celestial geometry and its circling dynamics found a home in his imagination—releasing an experience of pure joy. He described feeling present to the world in a deeper sense than before, and knowing that this stronger relationship was, once found, not going to be lost.

The Purpose of Science and Art

Experiences of such reception in science or in art, achieve at their most profound such an intensity of emotion and of felt transformation, that they must draw our exploration to a third level of parallel comparison—that of the human function of creative engagement with nature and, if we dare talk of it, of purpose. A nest of questions confronts us here: why do art, and early science, arise in pre-history? What do they achieve socially and psychologically today? Where do art and science appear, both explicitly and hidden, in the complex of cultural narratives? How do they receive, and provide, value and virtue? The humanities discipline of theology comes to aid here, for no other reason than that it is comfortable with the category and narrative of purpose. Recent writers have attempted to articulate a ‘theology of’ music (Begbie²²), of art (Wolterstorff²³), of science (the

18 Eugene Wigner (1960), *Communications in Pure and Applied Mathematics*, 13, No. I. New York: John Wiley & Sons, Inc.

19 James C. Kaufman and Robert J. Steinberg, eds. (2010), *The Cambridge Handbook of Creativity*. Cambridge: Cambridge University Press.

20 Robert J. Steinberg, ed. (1988), *The Nature of Creativity*. Cambridge: Cambridge University Press.

21 Tom McLeish, *Faith and Wisdom in Science* (OUP 2014).

22 Jeremy Begbie (2014), *Theology, Music and Time*. Cambridge: Cambridge University Press.

23 Nicholas Wolterstorff (1987), *Art in Action To-*

present writer²⁴), and found that this trailhead leads to a fruitful landscape within which such questions of purpose can be attempted.

Exploration of a possible parallel purpose at the deepest level for art and science will steer our trajectory into headlong collision with those who have perceived an irreconcilable antithesis between the two. To navigate these stormy waters will need some historical perspective, for an oppositional framing seems to reawaken, at least in the modern period, with each generation. Forty years previous to the late twentieth-century combatants of the 'Science Wars', public intellectuals engaged in angry words over the 'Two Cultures'. But half a century before C. P. Snow and F. R. Leavis locked horns, a gentler but equally incisive debate, anticipating some of the later rancour between the arts and the sciences, was engaged by Matthew Arnold and Thomas Henry Huxley.²⁵ Before them, romanticism drove home with force the charge that science does precisely the opposite of (at least narrative and poetic) art in the meeting of human creative need. Blake's dismissal of reason as the antithesis of creation was by no means a solitary one. In his long poem narrating the story of the mythical serpent Lamia, John Keats complains of science—for him 'cold philosophy':

Do not all charms fly
At the mere touch of cold philosophy?
There was an awful rainbow once in heaven:
We know her woof, her texture; she is given
In the dull catalogue of common things.
Philosophy will clip an angel's wings,
Conquer all mysteries by rule and line,
Empty the haunted air, and gnomed mine
Unweave a rainbow.

ward a Christian Aesthetic. Grand Rapids: Eerdmans.

24 Tom McLeish, *Faith and Wisdom in Science* (OUP 2014).

25 For a discussion of this debate see E. S. Schaef-fer (1994), How many cultures had Lady MacBeth? in L. Gustafsson et al., eds., *Science and the Powers. Hasselby Castle: Swedish Ministry of Science and Education*, pp. 136-92.

Historical locus is important. Retrospective projection of arguments from our own times, such as simplistic assurances that the romantic poets had nothing to worry about concerning the draining of wonder from the world, will not get to the root of their disquiet. William Whewell coined, around 1836, the term 'scientist', which gathered currency first in America and then Britain throughout the century. Faraday and Maxwell both rejected the label, insisting on the older 'natural philosopher', yet the adoption of 'scientist' was complete by the end of the century. Momentously, the discoveries and theories of geology (Lyell's gradualist and ancient formation of geological strata) and of biology (Darwin's evolution by natural selection) were utterly transforming understanding of relationships between the human race and other species on Earth. The period of romanticism swept in a fragmentation of disciplines and a further distancing of 'the inhuman otherness of matter' unprecedented in thought.

A journey into the purpose of science, and of art, must learn from the misunderstandings and the mutual pain of fragmented disciplines. It must, finally, move from talk about relationship into a practice of it. If we do find familial fellowship between science and art in a deeper reappraisal, then we will surely notice a structural imprint of their shared cultural DNA as we proceed. Returning to our first perspective—the comparative practice of creative imagination—suggests the lines of a possible framework. No art results from unconstrained exercise of imagination. The poet's vision and communicated emotion take shape within the constraining form of sonnet or quatrain. The composer lets thematic material expand, combine, and develop within sonata form or rondo. The painter conjures with light, colour, representation, but only successfully when she observes the material properties of oil on canvas, or of watercolour on board. It is the tension between imagination and constraint, of idea within form, which focusses creative energy into artistic creation itself. The greater the imaginative impulse, the tighter the form is needed to channel and shape it.

Seen in this light, science no longer looks quite so strange. For if its task is to re-conceive the universe,

to create a mental map of its structure, the inter-relationships of force and field, of the evolution of structure and complexity, to understand the patterns of matter from the earliest moments of time to its closing aeons, from the smallest fluctuation of space-time to the immensities of the cosmos, and to reconcile all this inhuman otherness to the finitude of our minds, then what task could possibly call on higher powers of imagination? What could demand a greater act of human creation? But what greater form, what more focussing constraint, could be supplied than the way we observe the universe to be? If writing a sonnet is the collision of creativity within constraint of expressing within a tight form and with new potency the human experience of the world, then science also becomes the conception of imagination within constraint. We re-create the universe by imagination within the constraint of its own form. Science becomes the writing of an immense poem.

Creativity and Constraint

Cousinly creativity with constraint—that is a starting hypothesis for a journey through art and science. It will be one with a listening ear. We need to spend time in the workshops of artists and of scientists and look without prejudice at the way their work is, or could be, received emotionally as well as cerebrally. We will need to stand back from our own time and look at longer narratives, and at other ways of differentiating disciplines. Reflection from the high medieval centuries will join as a continuous conversation partner to contemporary voices. The journey will require some close, even technical, readings of great creative examples of art, music, mathematics, and science. The choice of which imaginative voices in all these avenues we listen to closely will be a personal one but will be guided by the requirement that they should have reflected on the process of creativity itself. In such company, our journey will explore the hope that science might re-weave a rainbow in a way that Keats might have recognized as poetic, true, and constitutive of the human.

Invitation to Submit Opinion Piece

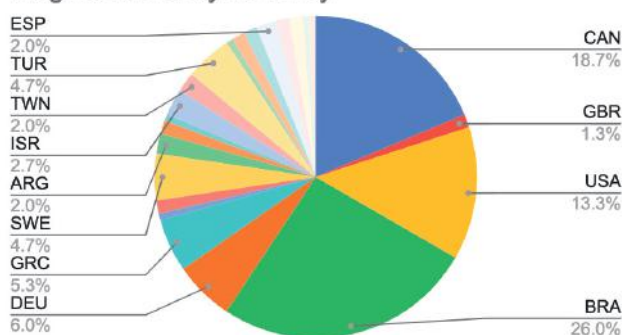
In order to make better educational use of the wide geographical and disciplinary reach of this HPS&ST Note, invitations are extended for readers to contribute opinion or position pieces or suggestions about any aspect of the past, present or future of HPS&ST studies.

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

They will be archived, and downloadable, in the OPINION folder at the HPS&ST web site [HERE](#):

IHPST 16th Biennial Conference Calgary, Report

Registrations by Country



The conference was held **3-7 July 2022** in Calgary. There were 103 participants (48 in person, 55 virtual) An original play, Formations, written specifically for the conference, was performed. It was a collaborative effort among historians, philosophers and sociologists of science, scientists, and the University of Calgary School of Creative and Performing Arts. The dramatic persona were four famous women in the geosciences.

Eunice Foote (1819–1888), First to discover that CO₂

in the atmosphere would cause warming of the atmosphere

Dollie Radler Hall (1897–1995), First to use seismic waves to prospect for oil

Marie Tharp (1920–2006), Mapper of the world's oceans, discovered the mid oceanic rifts which helped usher in the theory of plate tectonics

Florence Bascom (1862–1945), First woman to work for the USGS. Most known for teaching the next generation of women geologists



An optional field trip was held to the Cretaceous-Paleogene (K-Pg) boundary led by Dr. Alan Hildebrand. His work made the eventual connection between the end Cretaceous extinction, the clay layer, and the Chicxulub crater. He presented an “insider’s” perspective on the generation of science knowledge within this context.



17th Biennial Conference, Buenos Aires, September, 2024

Chair: Agustín Adúriz-Bravo

Varia

- *Thomas Kuhn Lowell Lectures* (1951), *The Quest for Physical Theory* (George Reisch, ed.). These hitherto unpublished eight lectures (170 pp) were the foundation for Kuhn's *Structure of Scientific Revolutions* (1962). Reisch has provided an informed 25 pp introduction to the Lectures and more generally to Kuhn's work.

Available gratis [here](#).

- Walter Jung (1926–2011). German HPS-informed physics educator and researcher. He was a major figure in post-war German science education whose research and writing was informed by his teachers Theodor Ardorno, Hans-Georg Gadamer and Charles Hartshorne. Unfortunately, his work was little known among Anglo-American science educators.

Obituary available [here](#).

- Patricia Rice Doran argues that Constructivism, which has served as the theoretical and conceptual basis for much educational practice and reform agendas, provides an unstable foundation for understanding objective reality and, as a result, is an untenable approach to help students understand meaning in the world.

Essay available [here](#).

- Gustavo Rodrigues Rocha, review of Michael R. Matthews *History, Philosophy and Science Teaching: A Personal Story* (2021) in *Transversal: International Journal for the Historiography of Science*

Review available [here](#).

- 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 **15-17 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/>

- AERA President Rich Milner discusses the importance and aims of the 2023 Annual Meeting Presidential Program theme, “Interrogating Consequential Education Research in Pursuit of Truth,” and encourages scholars to push the boundaries of ideas, methods, and collaborations in preparing paper or session submissions. Video available [here](#).

The [Call for Submissions](#) is now open and will close on **July 27 at 11:59 p.m. PT**.

- *European Journal for Philosophy of Science* Open Access Articles (139) [here](#).
- *Science & Education* Open Access Articles (96) [here](#).

PhD Award in HPS&ST

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

Recent HPS&ST Research Articles

Transversal: International Journal for the Historiography of Science (Number 12, 2022)

Topic: Michel Foucault and the Historiography of Science

Editor: Marlon Salomon

<https://periodicos.ufmg.br/index.php/transversal/issue/view/1860>

Allzén, S. (2022). From Unobservable to Observable: Scientific Realism and the Discovery of Radium. *J Gen Philos Sci*. <https://doi.org/10.1007/s10838-022-09614-5> online first

Browne, J. (2022). Reflections on Darwin Historiography. *J Hist Biol*. <https://doi.org/10.1007/s10739-022-09684-7> online first

[022-09686-5](https://doi.org/10.1007/s10763-022-10296-0) online first

Erumit, B. A., Yuksel, T. (2022). Developing and Using Physical Dynamic Models On Socioscientific Issues to Present Nature Of Science Ideas. *Int J of Sci and Math Educ*. <https://doi.org/10.1007/s10763-022-10296-0> online first

Fernández-Carro, R., Vílchez, J.E., Vílchez-González, J.M. et al. (2022). Multivariate Analysis of Beliefs in Pseudoscience and Superstitions Among Pre-service Teachers in Spain. *Sci & Educ*, 1-17. <https://doi.org/10.1007/s11191-022-00354-y> online first

Gericke, N., Högström, P. & Wallin, J. (2022) A systematic review of research on laboratory work in secondary school. *Studies in Science Education*. <https://doi.org/10.1080/03057267.2022.2090125> online first

Herman, B.C., Poor, S.V., Oertli, R.T. et al. (2022). Promoting Young Learners' NOS Views Through Place-Based ssi Instruction. *Sci & Educ*. <https://doi.org/10.1007/s11191-022-00353-z> online first

Katzav, J., and Vaesen, K. (2022). The Rise of Logical Empiricist Philosophy of Science and the Fate of Speculative Philosophy of Science. *HOPOS: The Journal of the International Society for the History of Philosophy of Science*. <https://doi.org/10.1086/721135> Just accepted.

Li, B., Sjöström, J., Ding, B. et al. (2022). Education for Sustainability Meets Confucianism in Science Education. *Sci & Educ*, 1-30. <https://doi.org/10.1007/s11191-022-00349-9> online first

Lightman, B. (2022). The Darwin Correspondence Project and Pedagogy. *J Hist Biol*. <https://doi.org/10.1007/s10739-022-09684-7> online first

Margócsy, D. (2022). Malinowski and malacology: Global value systems and the issue of duplicates. *The British Journal for the History of Science*, 1-21. <https://doi.org/10.1007/s10739-022-09684-7>

doi.org/10.1017/S0007087422000255 online first

Maxwell, Nicholas (2022) *The World Crisis and the Key to Its Resolution*, in Robert White and Stephanie Chitpin, eds., *Leading Under Pressure, Epilogue*, Emerald Publishing, pp. 199-203.

(2021) How Universities Can Best Respond to the Climate Crisis and Other Global Problems, Editorial, Special Issue, From the Acquisition of Knowledge to the Promotion of Wisdom, *Philosophies*, 23 December, 2021, <https://www.mdpi.com/2409-9287/7/1/1/pdf>

(2021) Universities Betray Reason and as a Result Betray Humanity, *Journal Of Anthropological And Archaeological Sciences*, Volume 4, issue 5, August 06, 2021, pp. 562-564.

(2022) Steven Pinker defends a damagingly irrational conception of reason, *Metascience*, 20 January 2022, published online: <https://doi.org/10.1007/s11016-022-00730-y>

Mork, S.M., Haug, B.S., Sørborg, Ø. Ruben, S.P., & Erduran, S. (2022) Humanising the nature of science: an analysis of the science curriculum in Norway. *International Journal of Science Education*. <https://doi.org/10.1080/09500693.2022.2088876> online first

Norton, J.D. (2022). How analogy helped create the new science of thermodynamics. *Synthese* 200, 269. <https://doi.org/10.1007/s11229-022-03708-9>

Ochiai, H. (2022). Philosophical grounds for designing invisible molecules. *Found Chem*. <https://doi.org/10.1007/s10698-022-09433-y> online first

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Schriebl, D., Müller, A. & Robin, N. (2022). Modeling Authenticity in Science Education.

Sci & Educ, 1-28. <https://doi.org/10.1007/s11191-022-00355-x> online first

Sharpley, C.F., Koehn, C. (2022). Frequency and Content of the Last Fifty Years of Papers on Aristotle's Writings on Biological Phenomena. *J Hist Biol*, 1-23. <https://doi.org/10.1007/s10739-022-09683-8> online first

Poliseli, L., Coutinho, J.G. ., Viana, B. et al. (2022). Philosophy of science in practice in ecological model building. *Biol Philos* 37, 21. <https://doi.org/10.1007/s10539-022-09851-4>

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White, P. (2022). The Many Lives of Darwin's Letters. *J Hist Biol*. <https://doi.org/10.1007/s10739-022-09685-6> online first

Recent HPS&ST Related Books

Axyonova, V., Kohstall, F., & Richter, C. (Eds.) (2022). *Academics in Exile: Networks, Knowledge Exchange and New Forms of Internationalization*. New York, NY: transcript publishing. ISBN: 978-3-837-66089-0

"Restrictions on academic freedom, persecution and armed conflict have forced many scholars into exile. So far, the professional trajectories of these scholars and their contributions to knowledge exchange have not been studied comprehensively. The contributors to this volume address the situations and networks of scholars in exile, the challenges they face in their host countries and the opportunities they use. These issues are highly relevant to discussions about the moral economies of higher education institutions and support programs. Although the contributions largely focus on Germany as a host country, they also offer telling examples of forced mobility in the Global South, including both contemporary and historical perspectives." (From the Publishers)

More information at: <https://cup.columbia.edu/book/academics-in-exile/9783837660890>

Bishop, R. C., Silberstein, M., & Pexton, M. (2022). *Emergence in Context: A Treatise in Twenty-First Century Natural Philosophy*. Oxford, UK: Oxford University Press.

“Science, philosophy of science, and metaphysics have long been concerned with the question of how order, stability, and novelty are possible and how they happen. How can order come out of disorder? This book introduces a new account, contextual emergence, seeking to answer these questions. The authors offer an alternative picture of the world with an alternative account of how novelty and order arise, and how both are possible.

“Contextual emergence is grounded primarily in the sciences as opposed to logic or metaphysics. It is both an explanatory and ontological account of emergence that gets beyond the impasse between “weak” and “strong” emergence in the emergence debates. It challenges the “foundationalist” or hierarchical picture of reality and emphasizes the ontological and explanatory fundamentality of multiscale stability conditions and their contextual constraints, often operating globally over interconnected, interdependent, and interacting entities and their multiscale relations. It also focuses on the conditions that make the existence, stability, and persistence of emergent systems and their states and observables possible. These conditions and constraints are irreducibly multiscale relations, so it is not surprising that scientific explanation is often multiscale. Such multiscale conditions act as gatekeepers for systems to access modal possibilities (e.g., reducing or enhancing a system’s degrees of freedom).

“Using examples from across the sciences, ranging from physics to biology to neuroscience and beyond, this book demonstrates that there is an empirically well-grounded, viable alternative to ontological reductionism coupled with explanatory anti-reductionism (weak emergence) and ontological disunity coupled with the impossibility of robust scientific explanation (strong emergence). Central metaphysics of science concerns are also addressed.” (From the Publisher)

More information at: <https://tinyurl.com/32txacpp>

Herschthal, Eric (2021). *The Science of Abolition: How Slaveholders Became the Enemies of Progress*. New Haven, CT: Yale University Press.
ISBN: 978-0-300-23680-4

“In the context of slavery, science is usually associated with slaveholders’ scientific justifications of racism. But abolitionists were equally adept at using scientific ideas to discredit slaveholders.

“Looking beyond the science of race, *The Science of Abolition* shows how Black and white scientists and abolitionists drew upon a host of scientific disciplines—from chemistry, botany, and geology, to medicine and technology—to portray slaveholders as the enemies of progress. From the 1770s through the 1860s, scientists and abolitionists in Britain and the United States argued that slavery stood in the way of scientific progress, blinded slaveholders to scientific evidence, and prevented enslavers from adopting labor-saving technologies that might eradicate enslaved labor.

“While historians increasingly highlight slavery’s centrality to the modern world, fueling the rise of capitalism, science, and technology, few have asked where the myth of slavery’s backwardness comes from in the first place. This book contends that by routinely portraying slaveholders as the enemies of science, abolitionists and scientists helped generate that myth.” (From the Publisher)

More information at: <https://yalebooks.yale.edu/book/9780300236804/the-science-of-abolition/>

Jenner, R. (2022). *Ancestors in Evolutionary Biology: Linear Thinking about Branching Trees* (Systematics Association Special Volume Series). Cambridge: Cambridge University Press.
ISBN: 978-1-316-22666-7

“Phylogenetics emerged in the second half of the nineteenth century as a speculative storytelling discipline dedicated to providing narrative explanations for the evolution of taxa and their traits. It coincided with lineage thinking, a process that mentally traces character evolution along lineages of hypothetical ancestors. *Ancestors in Evolutionary Biology* traces the history of narrative phylogenetics and lineage thinking to the present

day, drawing on perspectives from the history of science, philosophy of science, and contemporary scientific debates. It shows how the power of phylogenetic hypotheses to explain evolution resides in the precursor traits of hypothetical ancestors. This book provides a comprehensive exploration of the topic of ancestors, which is central to modern biology, and is therefore of interest to graduate students, researchers, and academics in evolutionary biology, palaeontology, philosophy of science, and the history of science.” (From the Publisher)

More information at: <https://tinyurl.com/bdhpcs2e>

Kragh, Helge (2022). *Niels Bohr: On the Constitution of Atoms and Molecules*. Birkhäuser: Cham.
ISBN: 978-3-030-97664-4

“Niels Bohr’s atomic theory of 1913 is one of the absolute highlights in the history of modern science. It was only with this work that physicists realized that quantum theory is an essential ingredient in atomic physics, and it was also only with this work that Rutherford’s nuclear model dating from 1911 was transformed into a proper theory of atomic structure. In a longer perspective, Bohr’s quantum atom of 1913 gave rise to the later Heisenberg-Schrödinger quantum mechanics and all its marvellous consequences. This book is a detailed account of the origin of the Bohr atom centred around his original scientific articles of 1913 which are here reproduced and provided with the necessary historical background. In addition to the so-called trilogy – the three papers published in Philosophical Magazine – also two other and less well-known yet important papers are included.

“The present work starts with a condensed biographical account of Bohr’s life and scientific career, from his birth in Copenhagen in 1885 to his death in the same city 77 years later. It then proceeds with a chapter outlining earlier ideas of atomic structure and tracing Bohr’s route from his doctoral dissertation in 1911 over his stays in Cambridge and Manchester to the submission in April 1913 of the first part of the trilogy. The reproduction of Bohr’s five articles is followed by notes and comments directly related to the texts, with the aim of clarifying some of the textual passages and to explicate names and subjects that may not be clear or well known. The reception of Bohr’s radically new theory by contemporary physicists and chemists is discussed in a final chapter,

which deals with the immediate reactions to Bohr’s theory 1913-1915 mostly among British, German and American scientists.

“Historians of science have long been occupied with Bohr’s atomic theory, which was the subject of careful studies in connection with its centenary in 2013. The present work offers an extensive source-based account of the original theory aimed at a non-specialist audience with an interest in the history of physics and the origin of the quantum world. In 1922 Bohr was awarded the Nobel Prize for his theory. The coming centenary will undoubtedly cause an increased interest in how he arrived at his revolutionary picture of the constitution of atoms and molecules.” (From the Publisher)

More information at: <https://link.springer.com/book/10.1007/978-3-030-97664-4>

Obiedat, A.Z. (2022). *Modernity and the Ideals of a Arab-Islamic and Western-Scientific Philosophy: The Worldviews of Mario Bunge and Taha Abd al-Rahman*. London, UK: Palgrave Macmillan

“This is the first study to compare the philosophical systems of secular scientific philosopher Mario Bunge (1919-2020), and Moroccan Islamic philosopher Taha Abd al-Rahman (b.1945). In their efforts to establish the philosophical underpinnings of an ideal modernity these two great thinkers speak to the same elements of the human condition, despite their opposing secular and religious worldviews. While the differences between Bunge’s critical-realist epistemology and materialist ontology on the one hand, and Taha’s spiritualist ontology and revelational-mystical epistemology on the other, are fundamental, there is remarkable common ground between their scientific and Islamic versions of humanism. Both call for an ethics of prosperity combined with social justice, and both criticize postmodernism and religious conservatism. The aspiration of this book is to serve as a model for future dialogue between holders of Western and Islamic worldviews, in mutual pursuit of modernity’s best-case scenario.

“This book fills a significant lack. The world of learning’s paucity of detailed information about the relationships between Arab-Islamic and Western Scientific philosophy is both real and unfortunate. Professor Obiedat’s instructive discussion provides an informative step to-

wards repairing this regrettable omission.” — Nicholas Rescher, Distinguished University Professor of Philosophy, University of Pittsburgh, USA

“This is the first comparative study ever to engage the impressive oeuvres of Mario Bunge and Abdurrahman Taha. Obiedat, however, has his own perspective on things, finding both philosophers lacking in some respects. This is a provocative book that has as one of its virtues the opening of crucial space for bringing Western and Islamic philosophical voices into dialogue with one another.” — Wael Hallaq, Avalon Foundation Professor in the Humanities at Columbia University, USA

“Professor Obiedat takes us in an exciting journey to the universal religious, secular, and scientific points of views. He aims at exploring their broad lines and surpassing their partial differences. Thereby, he uses a modern philosophical approach by which he attempts to eliminate the dialectical gap between the Arab-Islamic and the Western worlds. Finally, he tests the boundaries of the philosophical vision that has dominated our understanding of the world for a very long time!” — Salah Osman, Professor of Logic and Philosophy of Science at Menoufia University, Egypt

More information at: <https://link.springer.com/book/9783030942649>

Massimi, Michela (2022). *Perspectival Realism*. Oxford, UK: Oxford University Press.
ISBN: 978-0-197-55562-0 [Open Access]

“What does it mean to be a realist about science if one takes seriously the view that scientific knowledge is always perspectival, namely historically and culturally situated? In *Perspectival Realism*, Michela Massimi explores how scientific knowledge grows and evolves thanks to a plurality of epistemic communities occupying a number of scientific perspectives. The result is a philosophical view that goes under the name of “perspectival realism”, and it offers a new lens for thinking about scientific knowledge, realism and pluralism in science.

“*Perspectival Realism* begins with an exploration of how epistemic communities often resort to several models and a plurality of practices, drawing on examples from nuclear physics, climate science, and developmental psychology. Massimi explains the perspectival nature of

scientific representation, the role of scientific models as inferential blueprints, and the variety of scientific realism that naturally accompanies such a view. Perspectival realism is realism about phenomena (rather than about theories or unobservable entities). This novel realist view places epistemic communities and their situated knowledge center stage. The result is a portrait of scientific knowledge as a collaborative inquiry, where the reliability of science is made possible by a plurality of historically and culturally situated scientific perspectives. Along the way, Massimi offers insight into the nature of scientific modelling, scientific knowledge qua modal knowledge, data-to-phenomena inferences, and natural kinds as sortal concepts.

“*Perspectival Realism* offers a realist view that takes the multicultural nature of science seriously and couples it with cosmopolitan duties about how one ought to think about scientific knowledge and the distribution of benefits gained from scientific advancements.” (From the Publisher)

More information at: <https://tinyurl.com/5n6b8wfm>

Morgan, M., Hajek, K., & Berry, D. (Eds.). (2022). *Narrative Science: Reasoning, Representing and Knowing since 1800*. Cambridge: Cambridge University Press. ISBN: 978-1-009-00432-9 [Open Access]

“Through a mosaic of case studies from the natural and social sciences, this remarkable collection investigates the many ways in which scientists use narratives as modes and sites of sense-making, representation, and reasoning. The Narrative Science approach imaginatively reconfigures the relationship between philosophy, narratology and scientific practice, enriching each of these fields of inquiry as a result.” - Chiara Ambrosio - University College London

“This rich collection makes a broad-ranging examination of scientific practices, revealing the ubiquitous presence and diverse functions of narratives. An important and illuminating emphasis is on the key role of narrative as a ‘technology of sense-making’. This path-breaking volume will have far-reaching implications for science studies, with deep philosophical implications.” - Hasok Chang - University of Cambridge

“*Narrative Science* examines the use of narrative in sci-

entific research over the last two centuries. It brings together an international group of scholars who have engaged in intense collaboration to find and develop crucial cases of narrative in science. Motivated and coordinated by the Narrative Science project, funded by the European Research Council, this volume offers integrated and insightful essays examining cases that run the gamut from geology to psychology, chemistry, physics, botany, mathematics, epidemiology, and biological engineering. Taking in shipwrecks, human evolution, military intelligence, and mass extinctions, this landmark study revises our understanding of what science is, and the roles of narrative in scientists' work. This title is also available as Open Access." (From the Publisher)

More information at: <https://tinyurl.com/9bz5wrff>

Newfield, C., Alexandrova, A., & John, S. (Eds.) (2022). *Limits of the Numerical: The Abuses and Uses of Quantification*. Chicago IL: The University of Chicago Press. ISBN: 978-0-226-81715-6

"Numbers are both controlling and fragile. They drive public policy, figuring into everything from college rankings to vaccine efficacy rates. At the same time, they are frequent objects of obfuscation, manipulation, or outright denial. This timely collection by a diverse group of humanists and social scientists challenges undue reverence or skepticism toward quantification and offers new ideas about how to harmonize quantitative with qualitative forms of knowledge.

"*Limits of the Numerical* focuses on quantification in several contexts: climate change; university teaching and research; and health, medicine, and well-being more broadly. This volume shows the many ways that qualitative and quantitative approaches can productively interact—how the limits of the numerical can be overcome through equitable partnerships with historical, institutional, and philosophical analysis. The authors show that we can use numbers to hold the powerful to account, but only when those numbers are themselves democratically accountable." (From the Publisher)

More information at: <https://press.uchicago.edu/ucp/books/book/chicago/L/bo146791774.html>

Reisch, George A. (2020) *The Politics of Paradigms*:

Thomas S. Kuhn, James B. Conant, and the Cold War "Struggle for Men's Minds". Albany, NY: SUNY Press. ISBN: 978-1-438-47366-6

"*The Politics of Paradigms* shows that America's most famous and influential book about science, *The Structure of Scientific Revolutions* of 1962, was inspired and shaped by Thomas Kuhn's political interests, his relationship with the influential cold warrior James Bryant Conant, and America's McCarthy-era struggle to resist and defeat totalitarian ideology. Through detailed archival research, Reisch shows how Kuhn's well-known theories of paradigms, crises, and scientific revolutions emerged from within urgent political worries—on campus and in the public sphere—about the invisible, unconscious powers of ideology, language, and history to shape the human mind and its experience of the world." (From the Publisher)

"The book is ... full of new information, new insights and thought-provoking connections. It should be required reading for everyone interested in Kuhn's *Structure*, its sources and its political and cultural background." — *Metascience*

"Impressive archival research into the entirety of Kuhn's publications, manuscript drafts, and letters exposes how his understanding of scientific revolutions was assembled ... Highly recommended." — CHOICE

"This book raises and explores important questions about the ideological background of some of the most important work in the philosophy of science in the twentieth century. It challenges conventional wisdom about the ideological neutrality of that work." — Peter S. Fosl, editor of *The Big Lebowski and Philosophy: Keeping Your Mind Limber with Abiding Wisdom*

More information at: <https://sunypress.edu/Books/T/The-Politics-of-Paradigms2>

Reisch, G. A. & Tuboly, A. T. (Eds.) (2022). *The Humanistic Background of Science*. Albany, NY: The Suny Press. ISBN: 978-1-438-48552-2

"Philipp Frank (1884–1966) was an influential philosopher of science, public intellectual, and Harvard educator whose last book, *The Humanistic Background of Sci-*

ence, is finally available. Never published in his lifetime, this original manuscript has been edited and introduced to highlight Frank's remarkable but little-known insights about the nature of modern science—insights that rival those of Karl Popper and Frank's colleagues Thomas Kuhn and James Bryant Conant. As a leading exponent of logical empiricism and a member of the famous Vienna Circle, Frank intended his book to provide an accessible, engaging introduction to the philosophy of science and its cultural significance. The book is steadfastly true to science; to aspirations of peace, unity, and human flourishing after World War II; and to the pragmatic philosophies of Charles S. Peirce, William James, and John Dewey that Frank embraced in his new American home.

“Amidst the many recent surveys and retrospective analyses of mid-century philosophy of science, *The Humanistic Background of Science* offers an original, first-hand view of Frank's post-European life and of intellectual dramas then unfolding in Chicago, New York City, and Boston.”

More information at: <https://sunypress.edu/Books/T/The-Humanistic-Background-of-Science2>

Scarth, Alwyn (2022). *Vesuvius: A Biography*. Princeton, NJ: Princeton University Press.
ISBN: 978-1-400-83343-6

“Capricious, vibrant, and volatile, Vesuvius has been and remains one of the world's most dangerous volcanoes. In its rage, it has destroyed whole cities and buried thousands alive. In its calm, its ashes have fertilized the soil, providing for the people who have lived in its shadows. For over two millennia, the dynamic presence of this volcano has fascinated scientists, artists, writers, and thinkers, and inspired religious fervor, Roman architecture, and Western literature. In *Vesuvius*, Alwyn Scarth draws from the latest research, classical and eyewitness accounts, and a diverse range of other sources to tell the riveting story of this spectacular natural phenomenon.

“Scarth follows Vesuvius across time, examining the volcano's destruction of Pompeii and Herculaneum in 79 A.D., its eruptions during the Counter-Reformation that were viewed as God's punishment of sinners, and the building of the world's first volcano observatory on Ve-

suvius in the 1840s. Scarth explores the volcano's current position overlooking a population of more than three million people and the complex attitudes maintained by the residents, at once reverent, protective, and fearful. He also considers the next major eruption of Vesuvius, which experts have indicated could be the most powerful since 1631. The longer Vesuvius remains dormant, the more violent its reawakening will be, and despite scientific advances for predicting when this might occur, more people are vulnerable than ever before.

“Exploring this celebrated wonder from scientific, historical, and cultural perspectives, *Vesuvius* provides a colorful portrait of a formidable force of nature.” (From the Publisher)

More information at: <https://press.princeton.edu/books/ebook/9781400833436/vesuvius>

Thagard, Paul (2022). *Balance: How It Works and What It Means*. New York, NY: Columbia University Press. ISBN: 978-0-231-20558-0

“Living is a balancing act. Ordinary activities like walking, running, or riding a bike require the brain to keep the body in balance. A dancer's poised elegance and a tightrope walker's breathtaking performance are feats of balance. Language abounds with expressions and figures of speech that invoke balance. People fret over work-life balance or try to eat a balanced diet. The concept crops up from politics—checks and balances, the balance of power, balanced budgets—to science, in which ideas of equilibrium are crucial. Why is balance so fundamental, and how do physical and metaphorical balance shed light on each other?

“Paul Thagard explores the physiological workings and metaphorical resonance of balance in the brain, the body, and society. He describes the neural mechanisms that keep bodies balanced and explains why their failures can result in nausea, falls, or vertigo. Thagard connects bodily balance with leading ideas in neuroscience, including the nature of consciousness. He analyzes balance metaphors across science, medicine, economics, the arts, and philosophy, showing why some aid understanding but others are misleading or harmful. Thagard contends that balance is ultimately a matter of making sense of the world. In both literal and metaphorical senses, bal-

ance is what enables people to solve the puzzles of life by turning sensory signals or an incongruous comparison into a coherent whole.

“Bridging philosophy, psychology, and neuroscience, Balance shows how an unheralded concept’s many meanings illuminate the human condition.” (From the Publisher)

More information at: <https://cup.columbia.edu/book/balance/9780231205580>

Winther, R. (2022). *Our Genes: A Philosophical Perspective on Human Evolutionary Genomics*. Cambridge: Cambridge University Press.
ISBN: 978-1-316-75632-4

“Situated at the intersection of natural science and philosophy, *Our Genes* explores historical practices, investigates current trends, and imagines future work in genetic research to answer persistent, political questions about human diversity. Readers are guided through fascinating thought experiments, complex measures and metrics, fundamental evolutionary patterns, and in-depth treatment of exciting case studies. The work culminates in a philosophical rationale, based on scientific evidence, for a moderate position about the explanatory power of genes that is often left unarticulated. Simply put, human evolutionary genomics - our genes - can tell us much about who we are as individuals and as collectives. However, while they convey scientific certainty in the popular imagination, genes cannot answer some of our most important questions. Alternating between an up-close and a zoomed-out focus on genes and genomes, individuals and collectives, species and populations, *Our Genes* argues that the answers we seek point to rich, necessary work ahead.” (From the Publisher)

More information at: <https://tinyurl.com/5dur8hnm>

Tarrant, Neil (2022). *Defining Nature’s Limits: The Roman Inquisition and the Boundaries of Science*. Chicago, IL: University of Chicago Press.
ISBN: 978-0-226-81942-6

“Neil Tarrant challenges conventional thinking by looking at the longer history of censorship, considering a five-hundred-year continuity of goals and methods

stretching from the late eleventh century to well into the sixteenth.

“Unlike earlier studies, *Defining Nature’s Limits* engages the history of both learned and popular magic. Tarrant explains how the church developed a program that sought to codify what was proper belief through confession, inquisition, and punishment and prosecuted what they considered superstition or heresy that stretched beyond the boundaries of religion. These efforts were continued by the Roman Inquisition, established in 1542. Although it was designed primarily to combat Protestantism, from the outset the new institution investigated both practitioners of “illicit” magic and inquiries into natural philosophy, delegitimizing certain practices and thus shaping the development of early modern science. Describing the dynamics of censorship that continued well into the post-Reformation era, *Defining Nature’s Limits* is revisionist history that will interest scholars of the history science, the history of magic, and the history of the church alike.” (From the Publishers)

More information at: <https://press.uchicago.edu/ucp/books/book/chicago/D/bo153693514.html>

Coming HPS&ST Related Conferences

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.

See [here](#) for information.

July 3rd-7th, 2022, IHPST 16th International Conference, University of Calgary, Canada

Details [here](#)

July 13-15, 2022, Thomas Kuhn and the 21st Century

Philosophy of Science, University of Kent.

Details [here](#)

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 and [here](#)

August 17-19, 2022 East European Network for Philosophy of Science (EENPS) 2022 Conference, University of Tartu

Details [here](#)

August 29-Sept.3, 2011, ESERA Summer School, University of Utrecht, The Netherlands

Details [here](#)

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](#)

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

Details [here](#)

HPS&ST Related Organisations and Websites

[IUHPST](#) – International Union of History, Philosophy, Science, and Technology

[DLMPST](#) – Division of Logic, Mathematics, Philosophy, Science, and Technology

[DHST](#) – Division of History, Science, and Technology

[IHPST](#) – International History, Philosophy, and Science Teaching Group

[NARST](#) – National Association for Research in Science Teaching

[ESERA](#) – European Science Education Research Association

[ASERA](#) – Australasian Science Education Research Association

[ICASE](#) – International Council of Associations for Science Education

[UNESCO](#) – Education

[HSS](#) – History of Science Society

[ESHS](#) – European Society for the History of Science

[AHA](#) – American History Association

[ACS HIST](#) – American Chemical Society Division of the History of Chemistry

[GWMT](#) – Gesellschaft für Geschichte der Wissenschaften, der Medizin und der Technik

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

[EASE](#) – East-Asian Association for Science Education

[BSHS](#) – British Society for History of Science

[EPSA](#) – European Philosophy of Science Association

[AAHPSSS](#) – The Australasian Association for the History, Philosophy, and Social Studies of Science

[HOPOS](#) – International Society for the History of Philosophy of Science

[PSA](#) – Philosophy of Science Association

[BAHPS](#) - Baltic Association for the History and Philosophy of Science

[BSPS](#) – The British Society for the Philosophy of Science

[SPSP](#) - The Society for Philosophy of Science in Practice

[ISHPSB](#) - The International Society for the History, Philosophy, and Social Studies of Biology

[PES](#) – The Philosophy of Education Society (USA)

The above list is updated and kept on the HPS&ST website [HERE](#)

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

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