

HPS&ST NEWSLETTER



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The HPS&ST NEWSLETTER is emailed monthly to about 8,400 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 25+ 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: <http://www.hpsst.com/>

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Mario Bunge: Physicist, Philosopher, Champion of Science, and Citizen of the World (1919-2020)

Mario Bunge, the centenarian Argentine/Canadian physicist/philosopher passed away in the loving company of his wife Marta and children Eric and Silvia on 24th February 2020 in Montreal.

He was one of the outstanding figures in 20th century philosophy of science; few others approached the scope, depth, and detail of his contributions to the discipline. He was a cosmopolitan scholar at ease listening, speaking, reading and writing in English, Spanish, French, and German, and only slightly less at ease in a number of other languages.



When Bunge was aged 65-years, Bernulf Kanitscheider, a German philosopher of science, wrote:

Few extraordinary personalities have the chance to decisively shape the intellectual geography of a scientific epoch. Mario Augusto Bunge belongs to the small circle of important philosophers of science whose works have already become land-

marks in the spiritual landscape of world philosophy. (Droste 2019, p.78)

Subsequently Bunge published a further 20 books and 200+ articles. That none of his works have become landmarks in Anglo-American philosophy is an enduring puzzle. Many less-substantial works, by less-careful and less-informed scholars have become landmarks. This is more the pity for students who have less opportunity to examine whether the 'landmarks' have feet of clay.

The core of his scientific/philosophical work since its beginnings in Argentina in the mid-1940s, was the conviction that philosophy and science should be done in tandem:

Physics cannot dispense with philosophy, just as the latter does not advance if it ignores physics and the other sciences. In other words, science and sound (i.e., scientific) philosophy overlap partially and consequently they can interact fruitfully. Without philosophy, science loses in depth; and without science philosophy stagnates. (Bunge 2000, p.461)

Most competent commentators concur with this judgement: Can metaphysics, epistemology, ontology, cosmology, or ethics be sensibly pursued independently of science?

Bunge's uncommon distinction was that he himself did both in tandem; he researched and published in physics whilst formulating an integrated 'scientific' philosophical system. Of the latter he says:

... scientific philosophy is essentially critical and self-correcting, requiring that its assertions be put to the test. Philosophy ... deserves to be called 'scientific' solely to the extent to which its hypotheses are somehow testable – whether directly (by their

logical compatibility with a given set of principles) or indirectly by the verifiable consequences such ideas may have on practical human activity and on scientific research (Bunge 1979, p.xxviii)

Bunge was a prolific and serious researcher across a staggering range of fields. In 70 books (including many translations and revised editions) and 540 articles, written over an 80-year span, he made substantial contributions to physics, philosophy of physics, metaphysics, methodology and philosophy of science, philosophy of mathematics, philosophy of psychology, philosophy of social science, philosophy of biology, philosophy of technology, moral philosophy, social and political philosophy, medical philosophy, criminology, legal philosophy and education. More information about Bunge's publications are available [here](#). At age 98 he published on the philosophical, specifically ontological, implications of the discovery of the gravitational waves that were predicted in Einstein's 1916 Theory of General Relativity. A digital copy of the publication is available [here](#).

Twenty years ago, Martin Mahner, a German philosopher/biologist who worked with Bunge at the McGill Foundations and Philosophy of Science Unit, published a collection of 30 of Bunge's philosophy papers ranging over nine different fields (Mahner 2001). Conveniently, a number of Bunge's papers are now available on the web [here](#).

In terms of breadth, depth and coherence of scholarship Bunge was a standout in 20th century scientific and philosophical communities. He was a Renaissance scholar, a Citizen of the World; a convinced universalist who thought that not only were there truths in science, but also truths in ethics and politics which could be identified and defended. And although these truths were formulated within cultures having certain linguistic,

mathematical, political and technical components, the truth of the formulations was independent of their parental culture.

Bunge rejected all popular multi-science options. Sciences were good, bad or bogus; addition of a national, racial, religious or political appellation – Christian, Nazi, Soviet, Maoist, Aboriginal, Islamic, Chinese, Maori, Indigenous serves an anthropological, cultural or sociological purpose, but the appellation does not confer special tests or exemptions for truth claims. All of these cultural enterprises contain truths and useful procedures, but this does not convert the enterprise into modern science. He vigorously defended the legitimacy and utility of the concept of pseudoscience. It was not just a rhetorical slogan, it was central to his life-long critique of Freudianism and psychoanalysis, and later critiques of parapsychology, rational-choice theory and alternative medicines. More information is available [here](#).

Bunge was born in Buenos Aires on September 21, 1919. His father Augusto Bunge was a medical doctor and for 20 years the sole Socialist member of Argentina's parliament. His mother Mariechen was a German-educated nurse. They wanted their son to be 'a citizen of the world'; to not be defined and limited by the haphazard geography of his birth. In this they assuredly succeeded.

From an early age he was set a demanding regime of reading literature in six languages: Spanish, English, French, Italian, German and Latin, with Chinese read in translation. His parents' socialist-cosmopolitanism formed Mario's character and outlook; it set him on his life's path. His early multi-lingualism was of inestimable benefit to his education, allowing him to read the classic and the best modern authors of science, philosophy and literature in their own words. It freed

him from dependence on commercial, political, religious and ideological judgements about what books would be translated and published in Argentina. To the end he thought that if an author were worth reading, they were worth reading in their own words, not second-hand in translations of doubtful veracity.

From the beginning he was concerned with education. At age 22, whilst a physics and mathematics undergraduate student at Universidad Nacional de La Plata, he founded a Workers School (the Universidad Obrera Argentina). A fellow teacher was Arturo Frondizi a future President of Argentina. During this time, he wrote his first book, *Temas de Educación Popular* (Bunge 1943), dealing with the principles and practice of workers education. In his *Memoirs* he said of this initiative:

I replaced the traditional lecture with self-study in groups of four. The teacher was available for consultations. To implement this didactic change, I replaced the classical classroom with small desks and chairs for four persons each. The students read the lecture notes, discussed them among themselves, and asked the teacher for help only when none of the four could resolve a difficulty. (Bunge 2016, p.68)

Under combined pressure from the Argentina Communist Party, the Catholic Church and the Peronists, the government closed the school in 1943 when 1,000 students were enrolled. Reactionary bodies then, as always, could not tolerate independent centres for adult education and thinking.

Bunge graduated in physics from La Plata in 1942. In 1943 he started to work on problems of nuclear and atomic physics under the guidance of Guido Beck an Austrian refugee who had been an assistant of Heisenberg in Leipzig. Beck was the in-

ventor of the layer model of the atomic nucleus, the first to propose the existence of the positron, and pioneered the study of beta decay. Bunge thought that had Beck been in the northern hemisphere, he would have received the physics Nobel prize. He thanked Beck for 'teaching me not to allow politics to get in the way of my science' (Bunge 1991, p.524). By the mid-1940s he had published on electron spin, neutron-proton scattering, and nuclear forces in the international journals *Nature* and *The Physical Review* and Argentine physics journals.

There followed a decade of graduate studies, research, teaching, political upheavals and being jailed briefly in 1951 for 'illegal' union activity. In this period he published a 20-page paper in *Science & Society* on '[What is Chance?](#)' that contains the philosophical roots of his much-contested renunciation of the use of Bayesian probability theory in scientific decision making. A digital version is available [here](#).

Bunge was granted his PhD in physics in 1952 for a dissertation on the kinematics of the relativistic electron. This was published as a book in 1960. He wrote: 'My doctoral diploma did me no good, because it was not accompanied by the Peronist party card without which I could not even get a job as a dogcatcher' (Bunge 2016, p.89).

At this time, Bunge began what would be decades of writing on a defining problem: namely refuting the orthodox, non-realist, positivist interpretation of quantum physics proposed by the dominant and dominating Copenhagen School. Briefly he thought he could collaborate with David Bohm, another quantum and political dissident, and travelled to Brazil in 1953 to do so. There was no collaboration.

Bunge was stunned that Bohm had produced a

philosophical muddle mixing three mutually independent categories: realism, causality and classicism (Bunge 2016, p.92). And worst was to follow when Bohm embraced Hegel (in English translation), idealist holism, and went on international lecture tours sponsored by the Hare Krishna sect. The whole experience reinforced his contention that good science and good philosophy are interdependent, and consequently that bad philosophy results in poor science.



Bunge & David Bohm, Buenos Aires, 1954

The failed Bohm collaboration lay behind his 1961 paper on '[Cosmology and Magic](#)' where he pointed to the philosophical problems of then 'new' steady-state cosmology which for Bunge solved a riddle by creating a mystery'.

For many, Bunge's realist interpretation of

quantum mechanics was his major contribution to modern physics. In 2003 he surveyed the arguments in his '[Twenty-Five Centuries of Quantum Physics: From Pythagoras to Us, and from Subjectivism to Realism](#)'. In a journal double-issue, ten physicists and philosophers laid out and appraised his 'signature' account of quantum mechanics, with Bunge replying [here](#).

Bunge held chairs in physics and philosophy at the University of Buenos Aires and Universidad Nacional de La Plata. His appointments and funding rose and fell with changes in Peronist and military governments.

Bunge made his international philosophical debut at age 37 years at the 1956 Inter-American Philosophical Congress in Santiago, Chile. Willard Van Orman Quine, in his Autobiography, mentions attending this congress, and the only thing about the congress that he thought worth recording was:

The star of the philosophical congress was Mario Bunge, an energetic and articulate young Argentinian of broad background and broad, if headstrong, intellectual concerns. He seemed to feel that the burden of bringing South America up to a northern scientific and intellectual level rested on his shoulders. He intervened eloquently in the discussion of almost every paper. (Quine 1985, p.266)

In support of Quine's surmise about Bunge's disciplinary 'vocation', it can be noted that Bunge was the only Latin American contributor to the first three congresses of the Division of Logic, Methodology and Philosophy of Science (DLMPST) of the International Union for History and Philosophy of Science (IUHPS): Stanford University (1960), Jerusalem (1964), and Amsterdam (1967). Thereafter, many distinguished Latin American philosophers of science contributed to this international community. Bunge was the harbinger.



Bunge's first major book in philosophy was his 1959 *Causality: The Place of the Causal Principle in Modern Science* (Bunge 1959). The book, endorsed by Quine, was an instant success and put Bunge, and Latin American philosophy of science, firmly on the international map. In 400 pages it appraised over 200 significant English, French and German works on determinism and causality. It came out of the philosophical 'left field': it was, at the time, among the few books written by Latin American philosophers of science to receive international recognition.

The book concludes:

The causal principle reflects or reconstructs only a few aspects of determination. Reality is much too rich to be compressible once and for all into a framework of categories elaborated during an early stage of rational knowledge, which consequently cannot account for the whole variety of types of determination, the number of which is being increased by

scientific research and by philosophical reflection upon it. (Bunge 1979, p.352)

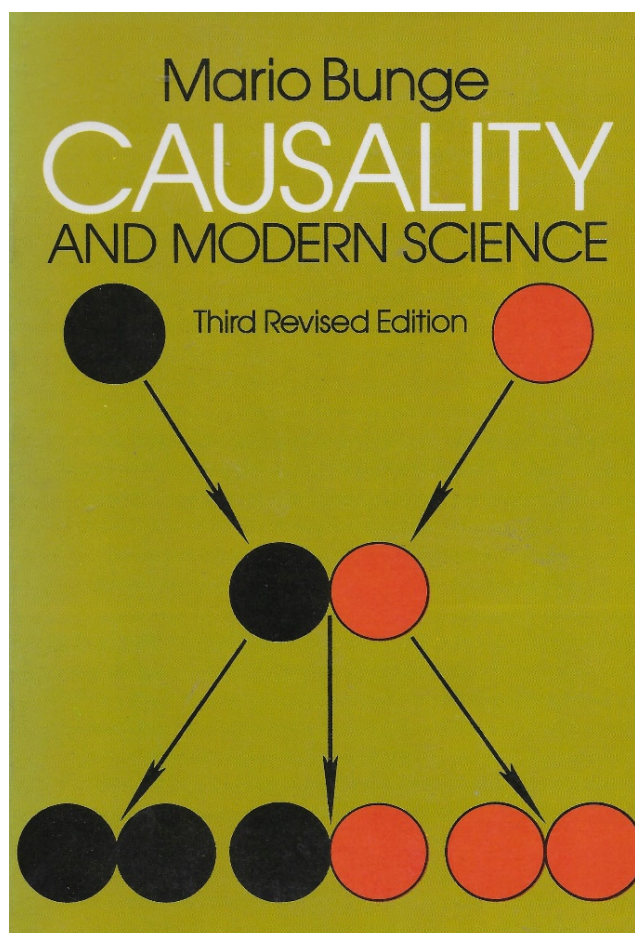
The work was translated and published in German, Hungarian, Italian, Japanese, Polish, Russian and Spanish editions. When the Russian edition arrived in Buenos Aires, the police wanted explanations from him.

The book was not published in French. Bunge remarks:

At that time, Paris had long ceased to be the City of Light, and its faculties of philosophy had become the homes of the most obscurantist and reactionary of all schools: Nietzsche, phenomenology, existentialism, Lévi-Strauss's structuralism, Lacan's psychoanalysis, Althusser's version of Marxism, hermeneutics, and general semiotics. (Bunge 2016, p.127).

Twenty years later, a third, revised edition was published as a Dover paperback, *Causality and Modern Science* (Bunge 1979). William Wallace, the Catholic priest, Thomist philosopher, and writer on causation, wrote of this edition: 'I regard it as a truly seminal work in this field'.

That the arguments of this ground-breaking, detailed anti-Aristotelian, contra Humean-empiricist, and scientifically-informed book are ignored in major contemporary surveys and handbooks on the philosophy of causation is another matter for sociologists of philosophy to investigate. What is the relevant contribution of internal factors (coherence and philosophical worth) and external factors (politics, reputation, geography, etc.) to disciplinary recognition?



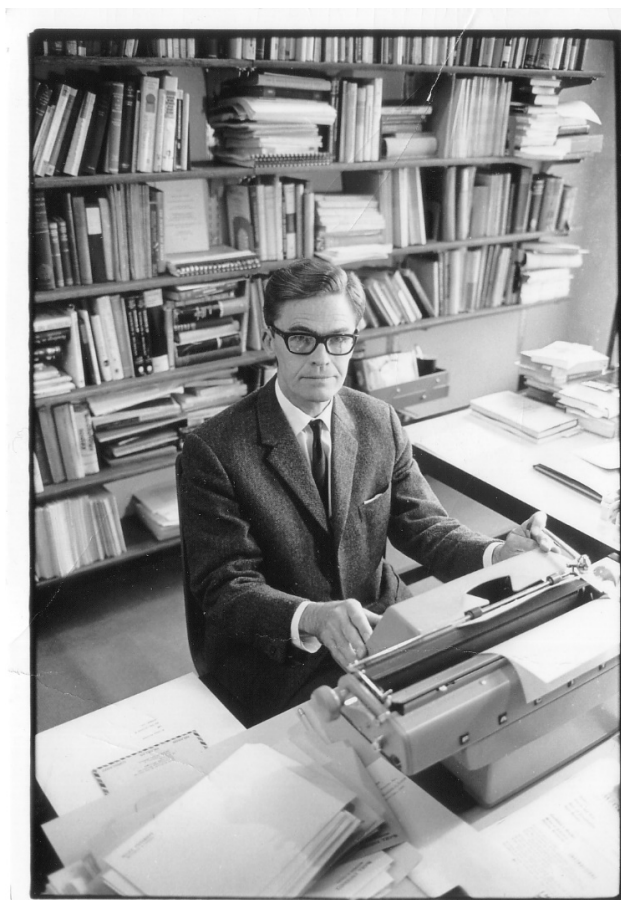
Bunge *Causality* 1979 (original 1959)

In 1962 the Argentine generals ousted President Frondizi and instituted tighter and tighter control over universities, prompting Bunge and his mathematician wife Marta to seek to leave Argentina and pursue their research careers elsewhere. Despite having four major philosophy books published (*Causality*, Harvard University Press, 1959; *Metascientific Queries*, Charles C. Thomas, 1959; *Intuition and Science*, Prentice-Hall, 1962; *The Myth of Simplicity*, Prentice Hall, 1963) and 67 articles in physics and philosophy journals, and the support of Quine, his applications for philosophy chairs in England went nowhere. He was told by one esteemed university: “we prefer to hire our own even when unpublished” (Bunge 2016, p.155). Needless to say, this left a lasting and negative impression on Bunge. He had suffered a decade or more of such venal and corrupt ‘academic’

decision making in Argentina; such decisions violated his very idea of a university.

But the USA came to the rescue. In 1963 he was offered and took a temporary position in philosophy at University of Texas, Austin. It was a great contrast to everything hitherto in his working life: ‘I found myself immediately surrounded by philosophers, biologists, anthropologists, and historians who were active in research and who looked to me to debate philosophical problems’ (Bunge 2016, p.158).

The same lively and congenial experiences followed with short-term appointments at University of Delaware, University of Pennsylvania and Temple University before his appointment as professor of philosophy at McGill University in Montreal in 1966 where he remained to the end.



Bunge at McGill, 1967

Physicists have acknowledged the impact of Bunge's work. In 1989 the *American Journal of Physics* asked its multi-thousand readers to vote for their favourite papers from the journal, from its founding in 1933 to 1989. In the resulting 1991 list of most memorable papers, alongside classics from Nobel Prize winners and luminaries such as Bridgman, Compton, Dyson, Fermi, Kuhn, Schwinger, Wheeler, and Wigner, was Bunge's 1956 'Survey of the Interpretations of Quantum Mechanics'. In 1993, the journal repeated the exercise, asking readers for the most influential papers in the journal's first 60 years. In this list, Bunge's 1966 paper – 'Mach's Critique of Newtonian Mechanics' – took its place alongside his 1956 article. This recognition of a philosopher/physicist by the world's largest body of physics teachers and researchers is noteworthy.

Also noteworthy is that Bunge is one of only two philosophers listed in the American Association for the Advancement of Science (AAAS) Hall of Fame. The other is Bunge's boyhood hero, Bertrand Russell.

Susan Haack lamented of contemporary philosophy that: 'Our discipline becomes every day more specialized, more fragmented into cliques, niches, cartels, and fiefdoms, and more determinedly forgetful of its own history' (2016). Through his long-life Bunge stood against every narrowing and narrow-minded tendency that Haack lamented.

Bunge was a systematist for whom the natural and social worlds were causally interconnected and so knowledge of those worlds needed to be interconnected; there could be no isolated or orphan disciplines; no academic silos. His philosophical system is laid out in detail in his monumental eight-volume *Treatise on Basic Philosophy* (1974-1989).

In a 2012 journal special issue, a group of economists, sociologists, mathematicians, philosophers and cognitive scientists evaluated his systematicity as applied to their own disciplines.

Bunge believed that the lessons learnt from the hard-won successes of natural science should be applied to social science; that the inquiry template forged by the best of natural science can and should be applied to the social and psychological worlds. This is the 18th century Enlightenment position. He was an unashamed defender of scientism though a critic of all ill-informed, shallow, reductionist pseudo-scientisms. More information is available [here](#).

Bunge's intellectual position can be more deeply appreciated when viewed alongside that of [Abner Shimony](#) (1928-2015) one of the few other stand-out philosopher/scientists who shared Bunge's concern for intellectual coherence and systematisation, and also Bunge's Enlightenment convictions and optimistic fallibilism about science, knowledge and improvement of the world.

Bunge had a life-long commitment not just to research, but also to the social and cultural responsibility of academics; he was never seduced by the 'Ivory Tower' option, comfortable though it would have been at many stages of his life. He was a Public Intellectual, and dramatically so in the Spanish world.

It was natural that he address the question of science and religion and did so in a long, detailed, [closely argued essay](#) co-authored with the German philosopher Martin Mahner. The essay was responded to by six theologians, philosophers and educators, with Bunge and Mahner responding [here](#). The whole exchange manifests the importance of clarity, relevant knowledge, and personal respect for the advancement of understanding.

The unifying thread of Bunge's life and research is the constant and vigorous advancement of the Enlightenment project that brings science and philosophy together for the advancement of human welfare. He expended the same energy on criticism of cultural and academic movements that deny or devalue the core principles of the project: naturalism; the search for objective, transpersonal, non-subjective truth; the universality of science; the value of rationality; and respect for individuals (Bunge 1996). This thread is explicit in his many contributions to the Boston Studies in Philosophy of Science series initiated by Marx Wartofsky and Bob Cohen in 1961.



Marx Wartofsky, Joseph Agassi & Mario Bunge,
Boston University, 1969

Bunge at age 95 wrote a [500-page autobiography](#). By drawing upon his prodigious memory for decades-old readings, events and conversations, it laid out in fascinating detail his personal, family, cultural and scholarly life. As he says in the Preface: 'When I started writing this book, I could not stop: contrary to my expectations, my memories poured out effortlessly – perhaps a sign that I had enjoyed living even in hard times.' The *Memoir* is enormously educative and a delight to read. It has 1,200 entries in its Name Index. He manages to

say something insightful about the life and work of nearly every person there mentioned. It is a 'Who's Who' of modern South American, Anglo-American, and European physics and philosophy. Additionally, the *Memoirs* contain a touching and informative appendix 'My Life with Mario' – written by his mathematician wife Marta Bunge.

Pleasingly, a pre-publication pdf version of the *Memoirs* is available gratis [here](#). Hopefully readers of the file might recommend [the Springer book](#) for purchase by their institution to ensure its availability for future generations of researchers and students. The *Memoirs'* [final 'Summary' chapter](#) is a brief 5-page account of what Mario saw as his main contributions to physics, philosophy of physics and philosophy of science. It emphasises the systematism that unifies his ontology, epistemology, ethics and politics. The book with ample quotations is reviewed [here](#).

As to be expected, in personal dealings Bunge was polite, attentive and concerned with the well-being of those about him. Office staff in the School of Education at UNSW where he spent a semester's leave in 2001, said he was the most polite, considerate and courteous visitor that the School had ever had. His academic dealings were different.

In matters of academic debate Bunge believed that arguments should be stated as clearly and exactly as possible; and stated whenever warranted. Lights should not be kept under bushels, and spades should be called spades. He had no regard for 'soft-focus' writing or argument. Instead of saying 'It could be thought that there is a weakness in your argument', he prefers the more direct 'Your argument is weak'; instead of warm, pleasant and collegial agreement about claims that cannot be tested, he sought clear, specific hypotheses that can be tested against evidence. His exchanges with

Bohm, Heisenberg, Piaget, Popper, Kuhn, Quine, Gould, Lakatos, von Weizsäcker and so many others – exemplify that conviction. Many lesser but popular figures – Heidegger, Husserl, Garfinkel, Latour, Huntington, Bloor, Feyerabend – after appraising their work, he dismissed as ‘charlatans’ (Bunge 1996). Bunge here violated certain understandings of academic ‘good manners’. Between the rise of postmodernist conceptual incoherence, and rightful concern about giving offence to individuals, the practice of direct and clear academic argument struggles.

In 1978 there was a celebrated occasion involving Bunge which is still remembered by many who were present, and that made the front page of a German city newspaper. It was the International Congress of Philosophy held in Düsseldorf Germany, and Sir John Eccles – the famous Australian neurophysiologist who collaborated with Karl Popper in articulating a ‘trialist’ but interactionist theory of mind, and who had been awarded the Nobel Prize was invited to give the opening plenary address. Instead of the customary deference that might be expected to be given to a newly-minted Nobel laureate, Bunge, who was in the audience, stood up and accused Eccles (and Popper) of philosophical incoherence and of retarding the scientific study of mind. Many philosophers, including those who agreed with Bunge’s views, thought that it was not the occasion for the arguments to be aired. Bunge thought differently; he has a different style. Doubtless over the decades, his argumentative ‘style’ impacted his reputation in the profession.

A 30-page account of Bunge’s life, achievements and central philosophical positions can be read [here](#). His scientific, philosophical, social and educational positions are elaborated and appraised in a recent 41-chapter *Festschrift*.

Beyond physics, philosophy, psychology, biology and his other scholarly pursuits, Bunge had wide, if selective, cultural appreciations. In his *Memoirs* he writes of literature, that:

I am a fan of great literature, from the towering triad made up by Don Quijote, War and Peace, and La comédie humaine, to Chinua Achewe, Jorge Amado, Margaret Atwood, Saul Bellow, Giovanni Boccaccio, Anthony Burgess, Dino Buzzatti, Italo Calvino, Peter Carey, Alejo Carpentier, Rosario Castellanos, J. M. Coetzee, Miguel Delibes, Alfred Döblin, Fiodor Dostoyevski, George Eliot, John Galsworthy, Anatole France, Carlos Fuentes, Eduardo Galeano, Robert Graves, William Henry Hudson, Ismail Kadaré, Franz Kafka, J. M. G. Le Clézio, Primo Levi, Sinclair Lewis, Naguib Mahfuz, Hilary Mantel, Rohinton Mistry, Haruki Murakami, V. S. Naipaul, R. K. Narayan, Michael Ondaatje, Orhan Pamuk, Benito Pérez Galdós, Eça de Queirós, Mordechai Richler, Romain Rolland, Philip Roth, Salman Rushdie, José Saramago, Leonardo Sciascia, Vikram Seth, Wole Soyinka, Bruno Traven, Anthony Trollope, Mario Vargas Llosa, Kurt Vonnegut, Edith Wharton, Marguerite Yourcenar; and several others – such as Jane Austen, Umberto Eco, Henry Fielding, Thomas Hardy, Manuel Mujica Láinez, Machado de Assis, Vladimir Nabokov, Michael Ondaatje, Horacio Quiroga, M. J. Vassanji, Voltaire, and so on. (Bunge 2016, p.403)

And of poetry, that:

I am no longer enthusiastic about poetry, except for Homer’s Odyssey, Lucretius, Omar Khayyam, the Spanish romanceros, John Donne, Goethe, Heine, Shelley, Walt Whitman, Roberto Ledesma, and Antonio Machado. My knowledge of Italian history is insufficient to understand Dante, and my English too poor to fully appreciate Shakespeare: I only understand his popular plays. I dislike the latter Joyce’s hermeticism, and T.S. Eliot for trying hard to be

quotable as well as a pro-fascist English gentleman. (Bunge 2016, p.403)

Of playwrights, that:

My favorite playwrights are Aristophanes, Athol Fugard, Carlo Goldoni, Henrik Ibsen, Lope de Vega, Christopher Marlowe, Arthur Miller, Molière, Eugene O'Neill, J.B. Priestley, George Bernard Shaw, Jean-Paul Sartre, Tom Stoppard, Oscar Wilde, and Tennessee Williams. But the darkness and pomposity of the ancient-Greek, French, and Spanish tragedies don't move me, and hence I fail to understand Marx's admiration for Calderón de la Barca. (Bunge 2016, p.403)

He concludes:

my artistic tastes are middle-brow. I have never been carried away by cleverness, style, or technical virtuosity alone. And I never read art critics or book reviewers, except for A.A. Alvarez, the most supportive of all. (Bunge 2016, p.403)

Bunge's passing is a loss for his family and the scholarly world. Hopefully some in the succeeding generations of philosophers, physicists and educators will be inspired to emulate his example of a wide-ranging, in-depth, cosmopolitan approach to the advancement of knowledge and the formation of a more just and equitable society. These Enlightenment ideals are also those of liberal education.

Obituaries in the Spanish press can be read [here](#), [here](#) and [here](#); in French [here](#); and a memorial appraisal from the University of Oulu of Bunge as a philosopher of social science is [here](#).

Mario had countless dear friends and colleagues throughout the world. Hundreds are named and

their views elaborated upon in his *Memoirs*. It was my own privilege and pleasure to have known Mario for the past 25 years. As with nearly all who met and engaged with him, the experience was intellectually and personally enriching, but also challenging. One hesitates to use the term 'genius', but if the word has any currency or reference, then Mario Bunge was assuredly one; or, to use a 'fudge' qualifier that he would disdain, at least close to being one.



Bunge at 100, Montreal, 2019

The source of the unlikely interaction of an Australian science educator with a renowned physicist/philosopher can be found in the 1968 completion of a compulsory course on philosophy of education in a University of Sydney teacher-education degree. Perhaps there are some [general lessons](#) about the value of philosophy in science-teacher training that can be learnt from this experience.

Michael R. Matthews
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Biographical Memoirs of the Royal Society

The Biographical Memoirs of the Royal Society are now free to access from the date of publication. These are an invaluable resource - detailed biographies of leading scientists written by people who know the science and the person.

There's a blog about the new access [here](#) (along with a video from the Editor-in-Chief, physicist and astronomer Malcolm Longair).

The Biographical Memoirs can be accessed [here](#).

6th European Advanced Seminar in the Philosophy of the Life Sciences, September 7-11 2020, KLI, Klosterneuburg, Austria

Dealing with Complexity in the Life Sciences

Directors: Guido Caniglia (Konrad Lorenz Institute) & Marcel Weber (University of Geneva)

From Sep. 7 to Sep. 11, 2020 the Konrad Lorenz Institute (KLI) will host the 6th European Ad-

vanced School in the Philosophy of the Life Sciences.

Young scholars (PhD students and early post-doctoral researchers) in the history, philosophy and social studies of the biological, biomedical, and environmental sciences are invited to apply.

Dates of event: **September 7-11, 2020**

Deadline for Application: **February 28, 2020**



If you are interested in applying to the summer school, you can find the full Call for Application [here](#).

Applications should be sent to the following email address: easpls2020@kli.ac.at. Please send a single pdf file (labelled: 'LastName-Firstname-easpls2020.pdf') containing:

- Letter of motivation (max 500 words)
- Title and Abstract (max 500 words) for a poster
- Short Curriculum Vitae (max 3 pages)

The deadline for applications is **March 27th, 2020**. Applicants will be notified of decisions by late May 2020.

Costs and travel grants: The registration fee is €350. The summer school will cover lunches and

the opening dinner at the KLI. Participants will take care of their own accommodation and travel expenses but several travel grants are available. To apply for a travel grant, please send your submitted abstract, a short CV, and a letter of motivation why you want to participate in the event to easpls2020@kli.ac.at by **April 15th, 2020**. We will notify the successful applicants by the end of May.

International Conference on Science and Technology Education STE 2020, Porto, October 8-9, 2020

The conference will take place in Porto, Portugal, 8-9 October 2020 (www.fe.up.pt/ste2020). The conference venue is Sheraton Porto Hotel.

The conference is co-chaired by António Ferreira (University of Porto, Portugal) and Claudio Brito (COPEC, Brazil). The Science and Education Research Organization (COPEC) and the International Institute of Education (IIE) support this conference. The focus is on education in science and technology.

The conference welcomes abstracts/papers related to the following topics:

- science and technology epistemologies (what makes science and technology thinking and knowledge),
- science and technology learning mechanisms (how people develop knowledge and competencies),
- science and technology learning systems (institutional practices),

- science and technology diversity and inclusiveness (how society in general contributes to science and technology processes and products), and
- science and technology assessment (development and use of assessment methods, instruments, and metrics).



Scholars who wish to make a presentation (oral or poster) are requested to submit a short abstract (one single A4 page possibly with a diagram and references) in English, by 4 May 2020. The abstracts should be sent electronically to lucas@fe.up.pt. The abstract template can be downloaded from the conference web site (www.fe.up.pt/ste2020).

Models and Simulations 9th Conference, Klagenfurt, Austria, September 16-18, 2020

The Department of Science Communication and Higher Education Research is hosting the 9th Models and Simulations Conference (MS9) at the University of Klagenfurt, Austria. This continues a successful series of meetings focusing on the role of modeling, simulation, and computational approaches in the natural and social sciences, in medicine and engineering.

Of interest are not only the development and use of models and simulations in research and technology but also the roles they play in other societal domains (e.g. politics, health, administration, finance and business). The MS Conferences aim at lively discussions among participants representing different disciplinary, theoretical and empirical approaches. This includes philosophers, historians, and social scientists (respectively HPS and STS scholars) with an interest in models and simulations as well as practicing scholars who model or simulate in their own research.

Abstract submission Single paper abstracts and symposia proposals are to be submitted through EasyChair [here](#). For single papers, please submit a short abstract of 100 words and an extended abstract of 500 words (upload in PDF format). The abstracts should be prepared for blind review.

For symposia proposals, please submit (1) a short (100-word) and an extended (500 word) abstract which offers an overall description of the proposed symposium, (2) a 250 word abstract for each of the individual papers, and (3) names and very short CVs for all speakers (max. 1 page in total). **Deadline:** April 3, 2020. We aim to communicate our decision by mid-May 2020. For further information, please contact MS9-Office@gmx.at.

Dibner Award for Excellence in Museum Exhibits

Nominations are open for the Society for the History of Technology's Dibner Award. The Dibner Award for Excellence in Museum Exhibits was established in 1985, through the generosity of Bern Dibner, to recognise excellence in museums and museum exhibits that interpret the history of technology, industry, and engineering to the general public. Winning exhibits, in addition to being well designed and produced, should raise pertinent historical issues. Artefacts and images should be used in a manner that interests, teaches, and stimulates both the general public and historians. The award consists of a plaque and up to \$1,000 to cover expenses for a member of the design team to accept the award at the SHOT awards banquet.

Exhibits are eligible for this award if they have been open to the public for no more than 24 months before the deadline for nominations on 15 April 2020.

The Society especially encourages nominations from local and regional historical societies. Virtual exhibits are not eligible for the award.

Further information about the prize, including nomination forms, a list of past recipients, and the members of the Dibner Award Committee can be found on the SHOT website [here](#).

Should any questions arise while completing the nomination form, please feel free to contact Robert Bud at Robert.Bud@SCIENCEMUSEUM.AC.UK.

Lakatos Award, 2021

Applications are invited for the 2021 Lakatos Award, with a strict deadline of **Tuesday 1 September 2020**. The 2021 award will be for a monograph in the philosophy of science broadly construed, either single authored or co-authored, published in English with an imprint from 2015 to 2020, inclusive. Anthologies and edited collections are not eligible. Any person of recognised standing within the philosophy of science or an allied field may nominate a book. Nominations must include a statement explaining the nominator's reasons for regarding the book prizeworthy. Self-nominations are not allowed.

Please address nominations, or any requests for further information, to the Award Administrator, Tom Hinrichsen, at t.a.hinrichsen@lse.ac.uk.

Opinion: Discovery in the Everyday Practice of Science: Abduction and the Logic of Unintended Experiments

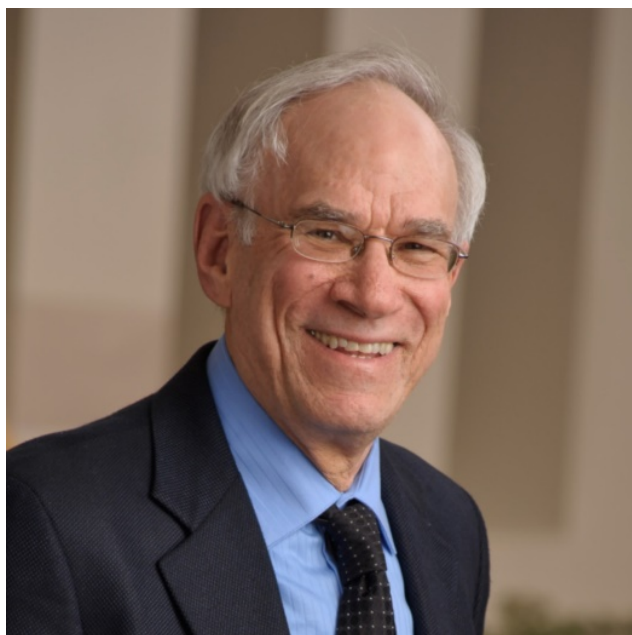
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Introduction

Generating new ideas – innovation and novelty – is central to what those of us practicing science hope to accomplish. We call it research, but what we really aim for is new-search – discovering new things about the world and how it works. Contrary to the idealised view of science practice typically portrayed in science education, it is important for students to understand that the path to discovery tends to be an adventure, highly ambiguous and convoluted. When scientists write their research papers, they recast these adventures into stories that follow a linear path from hypothesis to discovery and, as a result, hide the real-world complexity of practice. The plot of every good science paper is the scientific method (Grinnell 2009).

Surprisingly, some of the most important experiments leading to discoveries are unintended. The American philosopher and logician Charles Peirce, inventor of pragmatism, gave the name “abduction” to what he described as the only logical operation that introduces any new idea. Peirce’s logic of abduction,



The surprising fact, C, is observed.

But if A were true, then C would be a matter of course.

Hence, there is reason to suspect that A is true. (CP 5.189, EP 2:231, 1903)

corresponds exactly to what I think of as the logic of unintended experiments.

The Conventional View of Abduction and Sherlock Holmes

One longstanding view in philosophy equates abduction with the idea of inference to the best explanation (IBE) (Harman 1965, Lipton 2003). Not all philosophers agree. Some argue that in his later writing Peirce meant to emphasise abduction as generating rather than testing explanatory hypotheses, whereas IBE is more concerned with evaluating hypotheses that have already been generated (Minnameier 2004, Campos 2011, Mcauliffe 2015). Others suggest that abduction is neither generating nor evaluating, but rather selecting which hypotheses should be evaluated, i.e., which are pursuit worthy (Laudan 1978, McKaughan 2008). And yet another point of view is that Peirce meant all of the above, i.e., abduction as insight and inference combined (Anderson 1986).

Sherlock Holmes’ reasoning is often mentioned as representative of abductive thinking (Fann 1970, Eco and Sebeok 1983). Here is an example from the story “Silver Blaze” (Doyle 1905):

Colonel Ross still wore an expression which showed the poor opinion which he had formed of my companion’s [Holmes] ability, but I [Watson] saw by the inspector’s face that his attention had been keenly aroused.

Inspector: Is there any point to which you would

wish to draw my attention?

Holmes: To the curious incident of the dog in the night-time.

Inspector: The dog did nothing in the night-time.

Holmes: That was the curious incident.

Rewritten in the format of Peirce's logical scheme of abduction, the story becomes:

The surprising fact C (the dog did nothing in the night-time) is observed.

But if A (the dog was familiar with the killer) were true, then C would be a matter of course.

Hence, there is reason to suspect that A (the dog was familiar with the killer) is true.

In the Sherlock Holmes story, the hypothesis – the dog was familiar with the killer – fits all three ways of understanding abduction – (i) a new hypothesis; (ii) a new hypothesis worth pursuing; and (iii) a likely explanation for what had happened (IBE). It is of particular importance for the discussion in this paper that in all three cases the surprising fact and corresponding abductive reasoning occurs within a particular context. Holmes was consulted to figure out who stole the race horse and committed the murder. He begins with a problem at hand, and he solves just that problem.

Lewis Thomas and the Case of the Floppy-Eared Rabbits

The following example from the history of science illustrates a different way to understand abduction. In April 1956, biomedical scientist Lewis Thomas published a report in the *Journal of Experimental Medicine* entitled “Reversible collapse of rabbit ears after intravenous papain, and prevention of recovery by cortisone” (Thomas 1956). The article begins:

For reasons not relevant to the present discussion rabbits were injected intravenously with a solution of crude papain, and the following reactions occurred with unfailing regularity: Within 4 hours after injection, both ears were observed to be curled over at their tips. After 18 hours they had lost all of their normal rigidity and were collapsed limply at either side of the head, rather like the ears of spaniels. After 3 or 4 days, the ears became straightened and erect again.

The published paper included figure to illustrate the rabbit ears before and after papain treatment. The paper goes on to report additional experiments that showed that ear collapse was associated with a change in ear cartilage matrix; that similar changes occurred in all the other cartilage tissues of the rabbit's body; and that when the ears returned to normal shape, the cartilage matrix also had returned to its original characteristics.

When asked how the research had come about that led to this work, Thomas commented that five years earlier,

I was trying to explore the notion that the cardiac and blood vessel lesions in certain hypersensitivity states may be due to release of proteolytic enzymes. It's an attractive idea on which there's little evidence... [Injecting several different enzymes including papain into rabbits intravenously was intended to test the hypothesis.] [W]hat papain did was always produce these bizarre cosmetic changes. It was one of the most uniform reactions I'd ever seen in biology. It always happened. And it looked as if something important must have happened to cause this reaction. (Barber and Rox 1958)

As in the case *Silver Blaze*, the case of the floppy-eared rabbits can be rewritten according to the logic of abduction.

The surprising fact C (i.v. papain injection caused rabbit ear flop) is observed.

But if A (rabbit ear rigidity depends on a papain-sensitive mechanism) were true, then C would be a matter of course.

Hence, there is reason to suspect that A (rabbit ear rigidity depends on a papain-sensitive mechanism) is true.

The abductive format is the same as in the Sherlock Holmes case but incorporates an important added feature. Unlike Holmes and the mystery of Silver Blaze, the surprising fact of the ear flop was irrelevant to the question at hand, viz., the role of i.v. proteolytic enzymes in cardiac and blood vessel lesions in hypersensitivity states. Instead, the surprising fact suggested a new problem – the mechanism underlying rabbit ear rigidity – a question that Thomas had not thought about before observing the surprising experimental results. His findings about rabbit ear flop contributed to the emergence of a new problem and research field – proteinases and destruction of cartilage matrix – a potential mechanism of osteoarthritis.

Peirce described the connecting link between perception and abduction as a gestalt switch. The gestalt switch in Lewis Thomas's experience can be understood as follows: Thomas began with an intended hypothesis to test – do i.v. enzymes cause cardiac and blood vessel lesions such as occur in hypertension? Since the observation didn't advance understanding of blood vessel lesions in any obvious way, Thomas could have simply moved on to experiments that focused on other possible puzzle pieces (e.g., other enzymes or other potential causes of damage). The abductive moment – gestalt switch – came about when Thomas re-framed the unexpected observation in the context of a different question – does the mechanism of rabbit ear rigidity depend on an i.v. papain sensit-

ive mechanism? If one were interested in the latter question, then injecting i.v. papain would have been a very good experiment to carry out. The surprising rabbit ear flop observation would no longer be surprising in the context of the second research puzzle. Thomas had carried out an unintended experiment.

As I will discuss later, for Lewis Thomas (or any researcher) to follow up the results of an unintended experiment is a potentially risky choice. Peirce embraced the value of accepting this risk when he contrasted hypotheses that offered security (likely correctness) with those that offer uberty (fruitful potential). As the Editors of EP 2 put it, "Deductive reasoning provides the most security, but little uberty, while abduction provides much uberty but almost no security" (EP 2:463, 1913).

In "On the Logic of Drawing History from Ancient Documents," Peirce describes abduction as leading to discovery of entirely new research problems. The scientific impulse will always be in the position of striving to reconcile the new to the old. "Thus it is," he writes,

that all knowledge begins by the discovery that there has been an erroneous expectation of which we had before hardly been conscious. Each branch of science begins with a new phenomenon which violates a sort of negative subconscious expectation, like the frog's legs of Signora Galvani. (CP 7.188, EP 2:88, 1901)

Abduction in the Larger Scheme of Research

In his dialogue Meno, Plato has the title character ask: "How will you look for it, Socrates, when you do not know at all what it is?" (§80d) Discovery at the edge of knowledge means looking for something without being exactly sure what it looks like

and guessing what might be the answer (Tschaepé 2013).

Conducting an experiment to test a hypothesis begins with an investigator's explicit and implicit assumptions. Explicit assumptions concern the experimental question to be tested and the imagined likely results to be obtained. Implicit assumptions concern the adequacy of the experimental design and methodology selected to accomplish the research. Since the answer is not known in advance, every experiment tests both explicit and implicit assumptions.

Because of the ambiguity of experimental design, failure to get the expected results might be the result of a wrong hypothesis or inadequate experimental design. Max Delbrück, a winner of the 1969 Nobel Prize in Physiology or Medicine and one of the founders of modern molecular genetics, called this ambiguity the principle of limited sloppiness – sloppiness in the sense that our knowledge about any system under investigation is always muddy – never completely clear (Hayes, 1982 #42). As a result, during our experiments, we sometimes test unintended questions as well as those explicitly intended.

Experiments typically fit into one of three categories: heuristic, demonstrative, and failed (Fleck, 1979 #35). Heuristic experiments offer researchers new insights into the problem under investigation. Demonstrative experiments clarify heuristic findings into a form suitable for making discovery claims public, what philosophers typically call the logic of justification. Failed experiments, perhaps the most common, are those that yield results that are inconclusive or uninterpretable, which may occur for many reasons including technical errors, mistaken assumptions about methods, and poor study design. As a result, in research publications,

ten research notebooks frequently can be represented by ten figures.

Surprising observations, at least initially, typically are assumed to be failed experiments.

Are you sure the dog did nothing in the nighttime?
Are you sure something else didn't happen to the rabbits besides papain injection?
Are you sure the culture dishes weren't dirty?

Even once observed and confirmed, surprising observations sometimes will be ignored as technical problems to be overcome. Experienced researchers know – Don't give up a good hypothesis just because the data do not fit.

Surprising facts that become moments of abduction are often labeled instances of serendipity in science. Sir Peter Medawar, who in 1960 won a Nobel Prize in Physiology or Medicine for his work on transplantation immunology, liked to point out that there is a big difference between finding a winning lottery ticket and buying one. The researcher who buys a lot of tickets puts himself in the winning way – creates opportunities for discovery to occur (Medawar 1984). Serendipity is all about opportunity. Abduction goes further and requires noticing and making the gestalt switch.

Understanding the impact of unintended experiments is important not only to following the history of science, but also to promoting the likelihood of a researcher's success in the laboratory or field. Becoming self-aware and open to noticing the unexpected will facilitate discovery. Nothing noticed – novelty lost!

Why “Surprise” Matters

Most philosophers don’t take seriously the “surprise” in Peirce’s abduction scheme. Why do I say that? When Gilbert Harman (1965) writes that IBE corresponds to approximately what others have called “abduction,” he uses examples in which surprise doesn’t figure. Peirce, on the other hand, takes surprise very seriously. Jaime Nubiola (2005) counted 127 appearances of the word “surprise” in the Collected Papers and suggested calling abduction the logic of surprise.

Surprise is critical to the sense of abduction that I am describing for two reasons. The first reason is that the surprising fact must be sufficiently surprising to attract a researcher’s attention. Results that fall outside a researcher’s expectations will often go unnoticed. Things haven’t changed since Claude Bernard, one of the founders of modern biomedical research, wrote 150 years ago that,

[m]en who have excessive faith in their theories or ideas are not only ill prepared for making discoveries; they also make very poor observations. Of necessity, they observe with a preconceived idea, and when they devise an experiment, they can see, in its results, only a confirmation of their theory. In this way they distort observations and often neglect very important facts because they do not further their aim. (Bernard 1957)

Most of us are not like Sherlock Holmes. His ability to notice everything is what makes him so appealing. The rest of us, like Watson, tend to overlook the unexpected or sometimes the absence of the expected.

The second reason that surprise is critical to the sense of abduction that I am describing is that the surprising fact must be sufficiently intriguing to

overcome the resistance of a researcher to considering focusing on a new problem for investigation. When one decides to study a research problem, they take for granted important assumptions: that there is a question unanswered; that the question will be worthwhile answering; and that the infrastructure, personnel, and financial resources necessary to succeed are available. Time, energy and money are limiting resources in laboratory life. Starting something new is risky. Investing in one project almost always means that something else will not be accomplished. Failure could slow down or even end one’s career in science. The surprising fact and new research problem that it brings to mind must be sufficiently surprising to abduct the researcher’s mind away from the initial problem at hand to pursue studies on a new project.

Final Comment

In conclusion, I am suggesting that incorporating the idea of abduction and unintended experiments into science education represents an important means to introduce science students to the adventure of science. That is, to understand that for a research scientist doing experimental work, abduction sometimes describes the logic of a surprising observation that becomes reconfigured as an unintended experiment about an entirely new research problem. The consequences can be transformative, leading to a new research trajectory. Looking back on one’s life in science, researchers often will be able to understand their experiences as histories of abductive moments gained or (in retrospect) lost.

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This opinion piece is adapted from Grinnell, F. (2019). Abduction in the Everyday Practice of Science: The Logic of Unintended Experiments. *Transactions of the Charles S. Peirce Society*, 55(3), 215–227. doi:[10.2979/trancharpeirsoc.55.3.01](https://doi.org/10.2979/trancharpeirsoc.55.3.01)

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Contributions can be sent direct to [Michael Matthews](#) or [Nathan Oseroff-Spicer](#).

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

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

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- Abstract of 100-300 words
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Michael Matthews, School of Education, UNSW (m.matthews@unsw.edu.au) has edited the newsletter since its inception. For the past number of years there have been two assistant editors: Paulo Maurício (Education, Lisbon) with responsibility of the web site and for providing each month the invaluable 'Recent Articles' and 'Recent Books' listings; and Nathan Oseroff-Spicer (Philosophy, London) with responsibility for newsletter design, formatting, and the important task of sourcing suitable Opinion Page essays that are an appreciated resource for the diverse readership.

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Strządała, A. The New Biology as an Example of Newspeak: The Case of Polish Zoology, 1948–1956. *Journal of the History of Biology*. doi:[10.1007/s10739-020-09594-6](https://doi.org/10.1007/s10739-020-09594-6) online first

Wei, B., & Chen, Y. (2020). The meaning of 'experiment' in the intended chemistry curriculum in China: the changes over the period from 1952 to 2018. *International Journal of Science Education*. doi:[10.1080/09500693.2020.1723181](https://doi.org/10.1080/09500693.2020.1723181) online first.

Recent HPS&ST Related Books

Cat, Jordi & Tuboly, Adam Tamas (2019) *Neurath Reconsidered: New Sources and Perspectives*. (BSPS, volume 336). Springer: Cham. ISBN: 978-3-030-02127-6

"This highly readable book is a collection of critical papers on Otto Neurath (1882-1945). It

comprehensively re-examines Neurath's scientific, philosophical and educational contributions from a range of standpoints including historical, sociological and problem-oriented perspectives. Leading Neurath scholars disentangle and connect Neurath's works, ideas and ideals and evaluate them both in their original socio-historical context and in contemporary philosophical debates. Readers will discover a new critical understanding.

"Drawing on archive materials, essays discuss not only Neurath's better-known works from lesser-known perspectives, but also his lesser-known works from the better-known perspective of their place in his overall philosophical oeuvre. Reflecting the full range of Neurath's work, this volume has a broad appeal. Besides scholars and researchers interested in Neurath, Carnap, the Vienna Circle, work on logical empiricism and the history and philosophy of science, this book will also appeal to graduate students in philosophy, sociology, history and education. Readers will find Neurath's thoughts described and evaluated in an accessible manner, making it a good read for those beyond the academic world such as social leaders and activists.

"The book includes the edited 1940-45 Neurath-Carnap correspondence and the English translation of Neurath's logic papers." (From the Publisher)

tices like music-making to which we are personally drawn. In this work of 'populated philosophy' (copiously illustrated by literary and 'real life' examples), a cherishing life is presented as hard and irreducibly individual. The idea of cherishing, says the author, points towards intimate, unreasonable layers of the ethical life, as well as the deepening of wisdom and connection. It also points towards incomparable satisfactions, reminding us who we are and who we want to be." (From the Publisher)

"Ruth Cigman develops a style of thinking that attempts to get to the pith of what may be most at stake for children inside and outside classrooms. Her book will be of special interest to teachers and parents who are sensitive to the singularity of... children and the daunting difficulty that their lives often present to themselves and to others... Cigman deftly exposes the misplaced confidence driving several currently favoured reform agendas. And she shows why helping young people to thrive may require us not to ward off troubling intuitions but (in Iris Murdoch's words, which she quotes) to 'complicate, alter and deepen' them. This is a rare and welcome kind of philosophical writing... engaged and engaging, deeply humane and vividly persuasive." – Joseph Dunne, Cregan Professor of Philosophy and Education

More information available [here](#).

Cigman, Ruth (2020). *Cherishing and the Good Life of Learning: Ethics, Education, Upbringing*. London: Bloomsbury. ISBN: 978-1-350-15163-5

"What is a good human life? A life of duty? Virtue? Happiness? This book weaves a path through traditional answers. We live well, suggests the author, not primarily by pursuing goods for ourselves, but by cherishing other people and guiding them towards lives of cherishing. We cherish objects too – the planet, my grandfather's watch – and prac-

More information available [here](#).

Dawson, Gowan, Lightman, Bernard, Shuttleworth, Sally & Topham, Jonathan R. (Eds.) (2020). *Science Periodicals in Nineteenth-Century Britain: Constructing Scientific Communities*. Chicago, IL: University of Chicago Press. ISBN: 978-0-226-68346-1

"Periodicals played a vital role in the developments in science and medicine that transformed nineteenth-century Britain. Proliferating from a mere handful to many hundreds of titles, they

catered to audiences ranging from gentlemanly members of metropolitan societies to working-class participants in local natural history clubs. In addition to disseminating authorised scientific discovery, they fostered a sense of collective identity among their geographically dispersed and often socially disparate readers by facilitating the reciprocal interchange of ideas and information. As such, they offer privileged access into the workings of scientific communities in the period.

“The essays in this volume set the historical exploration of the scientific and medical periodicals of the era on a new footing, examining their precise function and role in the making of nineteenth-century science and enhancing our vision of the shifting communities and practices of science in the period. This radical rethinking of the scientific journal offers a new approach to the reconfiguration of the sciences in nineteenth-century Britain and sheds instructive light on contemporary debates about the purpose, practices, and price of scientific journals.” (From the Publisher)

More information available [here](#).

de Regt, Henk (2020). *Understanding Scientific Understanding*. Clarendon, UK: Oxford University Press. ISBN: 978-0-197-51026-1

“It is widely acknowledged that a central aim of science is to achieve understanding of the world around us, and that possessing such understanding is highly important in our present-day society. But what does it mean to achieve this understanding? What precisely is scientific understanding? These are philosophical questions that have not yet received satisfactory answers. While there has been an ongoing debate about the nature of scientific explanation since Carl Hempel advanced his covering-law model in 1948, the related notion of understanding has been largely neglected, because most philosophers regarded understanding as

merely a subjective by-product of objective explanations. By contrast, this book puts scientific understanding centre stage. It is primarily a philosophical study, but also contains detailed historical case studies of scientific practice. In contrast to most existing studies in this area, it takes into account scientists’ views and analyses their role in scientific debate and development.

“The aim of *Understanding Scientific Understanding* is to develop and defend a philosophical theory of scientific understanding that can describe and explain the historical variation of criteria for understanding actually employed by scientists. The theory does justice to the insights of such famous physicists as Werner Heisenberg and Richard Feynman, while bringing much-needed conceptual rigour to their intuitions. The scope of the proposed account of understanding is the natural sciences: while the detailed case studies derive from physics, examples from other sciences are presented to illustrate its wider validity.” (From the Publisher)

More information available [here](#).

Devoy, Louise (Ed.) (2020). *On the Line: The Story of The Greenwich Meridian*. Chicago, IL: Chicago University Press. ISBN: 978-1-906-36761-9

“The Royal Observatory at Greenwich is home to both time and space: Greenwich Mean Time (GMT) and the Prime Meridian. But have you ever stopped to ask what the Prime Meridian is, and why it’s in Greenwich? Why are all time zones across the world based on GMT? What is the longitude? Why is the meridian moving?

“A succinct history of the Meridian Line and its importance in defining international time standards, *On the Line: The Story of the Greenwich Meridian* breaks down complex topics in manageable articles, accompanied by eighty colour illustrations and fun trivia to aid understanding. This insightful,

concise guide reveals why international time standards are based around the Greenwich meridian—Longitude 0°—where east meets west, and details the important discoveries made at Greenwich that led to time as we know it.” (From the Publisher)

More information available [here](#).

Faye, Jan & Folse, Henry (2019). *Niels Bohr and the Philosophy of Physics: Twenty-First-Century Perspectives*. London: Bloomsbury.

ISBN: 978-1-350-10903-2

“An important volume edited by two outstanding Bohr scholars, who also make perceptive contributions of their own. The excellent essays here bring perspectives on Bohr into the twenty-first century, both in terms of scholarship and in connection with current developments in the foundations of physics. A must read for anyone who wants to understand how the great debates in the early years of quantum physics relate to scientific and philosophical thinking today.” – Arthur Fine, Professor Emeritus, University of Washington, USA.

“The thoughtful essays in this rich collection make clear that Niels Bohr’s earnest, dogged efforts to grapple with the conceptual implications of quantum theory retain the power to inspire — and provoke — new generations of scholars. The essays look back to Bohr’s own intellectual roots, even as they focus on still-open questions at the heart of quantum theory. Brimming with insights, this book will be of interest to physicists, philosophers, and historians of science.” – David Kaiser, Germeshausen Professor of the History of Science and Professor of Physics, MIT.

“This book brings together the top historical, philosophical, and scientific experts on Niels Bohr. They approach the subject both critically and charitably, providing a fair assessment of Bohr’s contributions to the foundations of quantum physics. This book

represents the cutting edge in scholarship on Niels Bohr’s lasting contributions to the foundations of physical science. Bohr’s ideas about quantum physics are subtle, and frequently misunderstood; this book provides the clearest picture yet of what Bohr was saying, and of its relevance for the ongoing progress of physics.” – Hans Halvorson, Stuart Professor of Philosophy, Princeton University.

More information available [here](#).

Gaukroger, Stephen (2020). *Civilization and the Culture of Science: Science and the Shaping of Modernity, 1795-1935*. Clarendon, UK: Oxford University Press. ISBN: 978-0-198-84907-0

“How did science come to have such a central place in Western culture? How did cognitive values—and subsequently moral, political, and social ones—come to be modelled around scientific values? In *Civilization and the Culture of Science*, Stephen Gaukroger explores how these values were shaped and how they began, in turn, to shape those of society. The core nineteenth- and twentieth-century development is that in which science comes to take centre stage in determining ideas of civilisation, displacing Christianity in this role. Christianity had provided a unifying thread in the study of the world, however, and science had to match this, which it did through the project of the unity of the sciences. The standing of science came to rest or fall on this question, which the book sets out to show in detail is essentially ideological, not something that arose from developments within the sciences, which remained pluralistic and modular. A crucial ingredient in this process was a fundamental rethinking of the relations between science and ethics, economics, philosophy, and engineering.

In his engaging description of this transition to a scientific modernity, Gaukroger examines five of the issues which underpinned this shift in detail:

changes in the understanding of civilisation; the push to unify the sciences; the rise of the idea of the limits of scientific understanding; the concepts of 'applied' and 'popular' science; and the way in which the public was shaped in a scientific image." (From the Publisher)

More information available [here](#).

Gielen, Joris (2020). *Dealing with Bioethical Issues in a Globalized World: Normativity in Bioethics*. Springer: Cham. ISBN: 978-3-030-30431-7

"This book addresses the complexity of talking about normativity in bioethics within the context of contemporary multicultural and multi-religious society. It offers original contributions by specialists in bioethics exploring new ways of understanding normativity in bioethics. In bioethical publications and debates, the concept of normativity is often used without consideration of the difficulties surrounding it, whereas there are many competing claims for normativity within bioethics. Examples of such competing normative bioethical discourses can be perceived in variations and differences in bioethical arguments within individual religions, and the opposition between bioethical arguments from specific religions and arguments from bioethicists who do not claim religious allegiance. We also cannot merely assume that a Western understanding of normative bioethics will be unproblematic in bioethics in non-Western cultures and religions. Through an analysis of normativity in Christian, Hindu, Buddhist, Islamic, and Jewish bioethics, the book creates awareness of the complexity of normativity in bioethics.

"The book also covers normative bioethics outside an explicitly religiously committed context, and specific attention is paid to bioethics as an interdisciplinary endeavor. It reveals how normativity relates to empirical and global bioethics, which challenges it faces in bioethics in secular pluralistic

society, and how to overcome these. By doing that, this book fills an important gap in bioethics literature." (From the Publisher)

More information available [here](#).

Heard, Stephen B. (2020). *Charles Darwin's Barnacle and David Bowie's Spider: How Scientific Names Celebrate Adventurers, Heroes, and Even a Few Scoundrels*. (Illustrations by Emily S. Damstra). New Haven, CT: Yale University Press. ISBN: 978-0-300-23828-0

"Ever since Carl Linnaeus's binomial system of scientific names was adopted in the eighteenth century, scientists have been eponymously naming organisms in ways that both honour and vilify their namesakes. This charming, informative, and accessible history examines the fascinating stories behind taxonomic nomenclature, from Linnaeus himself naming a small and unpleasant weed after a rival botanist to the recent influx of scientific names based on pop-culture icons—including David Bowie's spider, Frank Zappa's jellyfish, and Beyoncé's fly.

"Exploring the naming process as an opportunity for scientists to express themselves in creative ways, Stephen B. Heard's fresh approach shows how scientific names function as a window into both the passions and foibles of the scientific community and as a more general indicator of the ways in which humans relate to, and impose order on, the natural world." (From the Publisher)

"Stephen Heard, one of our great science storytellers, brings his passion, curiosity and deep knowledge of biodiversity to sharing insights about our world and how it came to be. In his hands, species names become a window into a much larger world of scientific discovery and the workings of human nature. His gentle, yet passionate prose

makes this a book to savour.” – Neil Shubin, paleontologist.

“*Charles Darwin’s Barnacle and David Bowie’s Spider* is carefully researched, well-written, and contains a wealth of insightful comments. Stephen Heard is a talented writer with a good sense of humour, and he knows how to tell a story.” – Paul Faber, Oregon State University

More information available [here](#).

Hon, Giora & Goldstein, Bernard R. (2020). *Reflections on the Practice of Physics: James Clerk Maxwell’s Methodological Odyssey in Electromagnetism*. Abingdon, UK: Routledge.
ISBN: 978-0-367-36728-2

“This monograph examines James Clerk Maxwell’s contributions to electromagnetism to gain insight into the practice of science by focusing on scientific methodology as applied by scientists. First and foremost, this study is concerned with practices that are reflected in scientific texts and the ways scientists frame their research. The book is therefore about means and not ends.” (From the Publisher)

More information available [here](#).

Jones, Jan-Erik (Ed.) (2019). *The Bloomsbury Companion to Robert Boyle*. London: Bloomsbury. ISBN: 978-1-350-02935-4

“Robert Boyle, well known in scientific circles, has still not received the credit he deserves in philosophy. A leader in experimental philosophy, his interests range from morality and philosophy of religion to epistemology and the philosophy of science. *The Bloomsbury Companion to Robert Boyle* brings together the latest work on the lesser known aspects of Boyle’s philosophy, alongside some of his

best known views, and surveys the full range of his philosophy for the first time.

“Situating Boyle within the philosophical and scientific traditions and introducing his zeal for experiment and commitment to the improvement of humanity, chapters reveal how crucial chemistry and alchemy are to his philosophy of science. They take up the metaphysical and ontological consequences of his philosophy and discuss his influence in the 17th and 18th centuries. Highlighting the importance of his moral theory and theological commitments for his philosophy of science, metaphysics and epistemology, chapters show how they motivate Boyle’s philosophical positions and practices.

“For students or researchers looking to better understand Boyle’s contribution to philosophy *The Bloomsbury Companion to Robert Boyle* is a comprehensive and invaluable guide. By taking into account the last thirty years of scholarship and pointing towards the next thirty years it presents the best of the current research on Boyle’s philosophy and significance today.” (From the Publisher)

More information available [here](#).

MacEwen, Philip (Ed.) (2019). *Idealist Alternatives to Materialist Philosophies of Science*. Brill: Leiden. ISBN: 978-9-004-41526-3.

“*Idealist Alternatives to Materialist Philosophies of Science* (ed. Philip MacEwen) makes the case that there are other, and arguably better, ways of understanding science than materialism. Philosophical idealism leads the list of challengers but critical realism and various forms of pluralism are fully articulated as well. To ensure that the incumbent is adequately represented, the volume includes a major defence of materialism/naturalism from Anaxagoras to the present. Contributors include Leslie Armour, John D. Norton, and Fred Wilson with a Foreword by Nicholas Rescher. For anyone interested in whether materialism has a monopoly

on science, this volume presents a good case for materialism but a better one for its alternatives.” (From the Publisher)

More information available [here](#).

Nahin, Paul J. (2020). *Hot Molecules, Cold Electrons: From the Mathematics of Heat to the Development of the Trans-Atlantic Telegraph Cable*.

Princeton, NJ: Princeton University Press.

ISBN: 978-0-691-19172-0

“Heat, like gravity, shapes nearly every aspect of our world and universe, from how milk dissolves in coffee to how molten planets cool. The heat equation, a cornerstone of modern physics, demystifies such processes, painting a mathematical picture of the way heat diffuses through matter. Presenting the mathematics and history behind the heat equation, *Hot Molecules, Cold Electrons* tells the remarkable story of how this foundational idea brought about one of the greatest technological advancements of the modern era.

“Paul Nahin vividly recounts the heat equation’s tremendous influence on society, showing how French mathematical physicist Joseph Fourier discovered, derived, and solved the equation in the early nineteenth century. Nahin then follows Scottish physicist William Thomson, whose further analysis of Fourier’s explorations led to the pioneering trans-Atlantic telegraph cable. This feat of engineering reduced the time it took to send a message across the ocean from weeks to minutes. Readers also learn that Thomson used Fourier’s solutions to calculate the age of the earth, and, in a bit of colorful lore, that writer Charles Dickens relied on the trans-Atlantic cable to save himself from a career-damaging scandal. The book’s mathematical and scientific explorations can be easily understood by anyone with a basic knowledge of high school calculus and physics, and MATLAB code is included to aid readers who would like to solve the heat equation themselves.

“A testament to the intricate links between mathematics and physics, *Hot Molecules, Cold Electrons* offers a fascinating glimpse into the relationship between a formative equation and one of the most important developments in the history of human communication.” (From the Publisher)

More information available [here](#).

O’Connor, Cailin & Weatherall, James Owen (2020). *The Misinformation Age: How False Beliefs Spread*. New Haven, CT: Yale University Press.

ISBN: 978-0-300-25185-2

“Why should we care about having true beliefs? And why do demonstrably false beliefs persist and spread despite bad, even fatal, consequences for the people who hold them?

“Philosophers of science Cailin O’Connor and James Weatherall argue that social factors, rather than individual psychology, are what’s essential to understanding the spread and persistence of false beliefs. It might seem that there’s an obvious reason that true beliefs matter: false beliefs will hurt you. But if that’s right, then why is it (apparently) irrelevant to many people whether they believe true things or not?

“*The Misinformation Age*, written for a political era riven by “fake news,” “alternative facts,” and disputes over the validity of everything from climate change to the size of inauguration crowds, shows convincingly that what you believe depends on who you know. If social forces explain the persistence of false belief, we must understand how those forces work in order to fight misinformation effectively.” (From the Publisher)

”Fake news has revealed a dark side of networks: an almost unstoppable ability to spread false and misleading information, changing people’s perception of reality and shaking the political establishment.

The Misinformation Age is a timely, engaging narrative of how this happened and how the mix of fake news and networks is changing our world.” – Albert-László Barabási

”In this perilous moment—when knowledge is powerfully eroded by new and effective campaigns of misinformation—O’Connor and Weatherall offer a critically important philosophical defense of evidence, facts, and above all, the truth.” – Allan M. Brandt, Harvard University

“*The Misinformation Age* is the best book I’ve read on why the fake-news epidemic is afflicting us and what we can do about it. It offers in-depth reporting and provocative analysis delivered in lively prose, a rare combination.” – John Horgan, director of the Center for Science Writings, Stevens Institute of Technology

More information available [here](#).

Rickles, Dean (2020). *Covered with Deep Mist: The Development of Quantum Gravity (1916-1956)*. Clarendon, UK: Oxford University Press
ISBN: 978-0-199-60295-7

“The problem of quantum gravity is often viewed as the most pressing unresolved problem of modern physics: our theories of spacetime and matter, described respectively by general relativity (Einstein’s theory of gravitation and spacetime) and quantum mechanics (our best theory of matter and the other forces of nature) resist unification. *Covered with Deep Mist* provides the first book-length treatment of the history of quantum gravity, focusing on its origins and earliest stages of development until the mid-1950s. Readers will be guided through the impacts on the problem of quantum gravity resulting from changes in the two ingredient theories, quantum theory and general relativity, which were themselves still under construction in the years studied. We examine how several of the core ap-

proaches of today were formed in an era when the field was highly unfashionable.

“The book aims to be accessible to a broad range of readers and goes beyond a merely technical examination to include social and cultural factors involved in the changing fortunes of the field. Suitable for both newcomers and seasoned quantum gravity professionals, the book will shine new light on this century-old, unresolved problem.” (From the Publisher)

More information available [here](#).

Schuster, Radek (Ed.) (2020). *The Vienna Circle in Czechoslovakia*. Springer: Cham.
ISBN: 978-3-030-36382-6

“This book explores the remarkable interconnections of the Czechoslovak environment and the work and legacy of the Vienna Circle on the philosophical, scientific and artistic level. The Czech lands and later Czechoslovakia were the living and working space for the predecessors and catalysts for Logical Empiricism, such as Bernard Bolzano, Ernst Mach and Albert Einstein, along with key figures in the Vienna Circle such as Philipp Frank and Rudolf Carnap. Moreover, Prague hosted important academic events in which Logical Empiricism was presented to the public, such as the September 1929 1st Conference on the Epistemology of the Exact Sciences, which launched the key manifesto, *The Vienna Circle. The Scientific Conception of the World*. In addition, this book investigates both the positive and negative receptions of Logical Empiricism within Czech and Slovak intellectual circles.

“The volume features a selection of contributions to the international conference, The Vienna Circle in Czechoslovakia, held in Pilsen, Czech Republic, in February 2015. These essays are supplemented by two texts of vivid personal memoirs by Nina Holton and Ladislav Tondl. The book is of interest

to scholars and researchers interested in the history of philosophy and science in central Europe and the philosophy of science and the Logical Empiricism of the Vienna Circle.” (From the Publisher)

More information available [here](#).

Teicher, Amir (2020) *Social Mendelism: Genetics and the Politics of Race in Germany, 1900–1948*. Cambridge, UK: Cambridge University Press. ISBN: 978-1-108-49949-1

“Who was the scientific progenitor of eugenic thought? Amir Teicher challenges the preoccupation with Darwin’s eugenic legacy by uncovering the extent to which Gregor Mendel’s theory of heredity became crucial in the formation – and radicalization – of eugenic ideas. Through a compelling analysis of the entrenchment of genetic thinking in the social and political policies in Germany between 1900 and 1948, Teicher exposes how Mendelian heredity became saturated with cultural meaning, fed racial anxieties, reshaped the ideal of the purification of the German national body and ultimately defined eugenic programs. Drawing on scientific manuscripts and memoirs, bureaucratic correspondence, court records, school notebooks and Hitler’s table talk as well as popular plays and films, *Social Mendelism* presents a new paradigm for understanding links between genetics and racism, and between biological and social thought.” (From the Publisher)

More information available [here](#).

Winner, Langdon (2020) *The Whale and the Reactor: A Search for Limits in an Age of High Technology* (2nd Edition). Chicago, IL: The University of Chicago Press. ISBN: 978-0-226-69268-5

“In an age in which the inexhaustible power of scientific technology makes all things possible, it remains to be seen where we will draw the line, where we will be able to say, here are possibilities that wisdom suggest we avoid.”

“First published to great acclaim in 1988, Langdon Winner’s groundbreaking exploration of the political, social, and philosophical implications of technology is timelier than ever. He demonstrates that choices about the kinds of technical systems we build and use are actually choices about who we want to be and what kind of world we want to create—technical decisions are political decisions, and they involve profound choices about power, liberty, order, and justice. A seminal text in the history and philosophy of science, this new edition includes a new chapter, preface, and postscript by the author.”

”*The Whale and the Reactor* is the philosopher’s equivalent of superb public history. In its pages an analytically trained mind confronts some of the most pressing political issues of our day.” – Isis

More information available [here](#).

Wassarman Paul M. (2020) *A Place in History: The Biography of John C. Kendrew*. Clarendon, UK: Oxford University Press. ISBN: 978-0-199-73204-3

“John C. Kendrew (1917-1997) was a pioneer in structural biology and a catalyst for the emergence of molecular biology in the second half of the twentieth century. He was the first person to determine the three-dimensional structure of a protein at atomic resolution and, for this, was awarded the Nobel Prize in Chemistry in 1962. Kendrew ultimately became an international organiser, administrator, and advocate for science, and his expansive legacy lives on today.

“In this book, Paul M. Wassarman, a postdoctoral

fellow with Kendrew in the late 1960s, delves into Kendrew's personal and scientific life to uncover the background, traits, and experiences of the man responsible for so many achievements within science and beyond. Wassarman shares previously unpublished stories of Kendrew, including his vital role in the rise of molecular biology at three world-famous scientific institutions: the Cavendish Laboratory, Laboratory of Molecular Biology, and European Laboratory of Molecular Biology.

"Kendrew was an unwavering advocate for British and European science and one of the most gifted, influential, and accomplished figures in twentieth century science. A Place in History is a groundbreaking account of Kxendrew's life that is perfect for anyone interested in learning about the person behind the many achievements." (From the Publisher)

More information available [here](#).

Authors of HPS&ST-related papers and books are invited to bring them to attention of [Paulo Maurício](#) or [Nathan Oseroff-Spicer](#) for inclusion in these sections.

Coming HPS&ST Related Conferences

March 30 – April 1, 2020, Rudolf-Carnap-Lectures & Graduate Workshop 2020. Ruhr-University Bochum. Germany.

More information available [here](#).

April 3-4, 2020, Mid-South Philosophy of Science (MSPS) 2020 Meeting. Virginia Tech Blacksburg, VA, USA.

Inquiries to Justin Donhauser at jdonhau@bgsu.edu with "MSPS 2020" in the subject line.

April 16-17, 2020, Alternative Approaches to Scientific Realism, Munich Center for Mathematical Philosophy

Details available [here](#).

And Joe Dewhurst (J.Dewhurst@lmu.de)

April 17-18, 2020, Joint Atlantic Seminar for the History of East Asian Science, Technology, and Medicine. John Hopkins University, Baltimore, MD, USA.

Details at: <https://jaseastm.org/>

May 11-14, 2020, Sixth International Conference on the Nature and Ontology of Spacetime. Albena, Bulgaria.

More information available [here](#).

May 13-15, 2020, Public Engagement with Science, Workshop. University of Cincinnati

Details: <https://ucengagingscience.org/workshop/>.

May 15-16, 2020, Public History of Science Conference, Railway Museum, York, UK

Details available [here](#).

June 8-12, 2020, Philosophy of Biology at the Mountains (POBAM), Workshop, University of Utah.

Details available [here](#).

June 16-17, 2020, International Workshop on Disciplinary Identity: Insights from the History and Philosophy of Chemistry. Hebrew University of Jerusalem, Israel.

Details available [here](#).

June 17-19, 2020, Fourth International History of Physics Conference, Trinity College Dublin

Details available [here](#).

June 29 – July 3, 2020, Objects of Understanding: Historical Perspectives on Material Artefacts and Practices in Science Education. Europa-

Universität, Flensburg, Germany.

Inquiries at OoU-conference@uni-flensburg.de

June 29 – July 1, 2020, Measurement at the Crossroads 2020 – Measuring and Modeling. Milan, Italy.

More information available [here](#).

June 30 – July 2, 2020, 7th annual conference of the International Association for Philosophy of Time. Barcelona, Spain.

Inquiries at iapt7barcelona@gmail.com

July 1-3, 2020, 'STEMM and Belief in Diverse Contexts: Publics, Praxis, Policy and Pluralism', Stellenbosch, South Africa

Details available [here](#).

July 2-4, 2020, 4th International Conference on Science and Literature, University of Girona, Spain.

Details at: <http://icscienceandliterature.com/>

July 7-10, 2020, Society for Philosophy of Science in Practice (SPSP) Eighth Biennial Conference, Michigan State University, USA

Details available [here](#).

July 8-11, 2020, British Society for History of Science Annual Conference, Aberystwyth University, Wales.

Information at: <http://bshsaberystwyth2020.info/>

July 9-11, 2020, 6th International STEM in Education Conference, Vancouver, Canada.

Details at: www.stem2020.ubc.ca

July 15-17, 2020, 8th Integrated History and Philosophy of Science Conference (&HPS8). Virginia Tech, Blacksburg VA.

Information: Lydia Patton (critique@vt.edu) or Jutta Schickore (jschicko@indiana.edu)

July 21-23, 2020, 24th Conference of the International Society for the Philosophy of Chemistry. Buenos Aires, Argentina.

More information available [here](#).

July 27-31, 2020, Summer School on “Open science”: ambivalences and tensions - New borderlands between science, technology and society (Donostia-San Sebastian, Spain.

Details available [here](#) or

Lilia Bolz (lilia.bolz@humtec.rwth-aachen.de).

August 10-14, 2020, Bayesian Epistemology: Perspectives and Challenges. MCMP, LMU Munich.

Details available [here](#).

August 18-21, 2020, EASST + 4S Joint Conference, Prague Details available [here](#).

August 31 – September 3, 2020, European Society for History of Science Biennial Conference, Bologna

Details available [here](#).

November 19-22, 2020, Twenty-Seventh Biennial Meeting of the PSA. Baltimore, Maryland.

Details at: <https://psa2020.philsci.org/>

September 14-19, 2020, 39th annual symposium of the Scientific Instrument Commission, London Details available [here](#).

September 16-18, 2020, Models and Simulations 9th Conference, Klagenfurt, Austria

Details available [here](#).

October 8-9, 2020 Conference on Science & Technology Education, Porto, Portugal

Details available [here](#).

October 8-11, 2020, History of Science Society Annual Conference, New Orleans

Details available [here](#).

November 19-22, 2020, Twenty-Seventh Biennial Meeting of the PSA. Baltimore, Maryland
Details available [here](#).

July 4-8, 2021, IHPST 16th International Conference, University of Calgary, Canada
Details from Glenn Dolphin:
glenn.dolphin@ucalgary.ca.

July 25-31, 2021, 26th International Congress of History of Science and Technology (DHST), Prague
Information: <https://www.ichst2021.org/>

September 20-22, 2021, 'Developing Mario Bunge's Scientific-Philosophical Programme', Huaguang Academy of Information Science, Wuhan, China
Details from Zongrong LI 2320129239@qq.com.

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

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

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

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)

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