HPS&ST Note

November 2018

Introduction

This HPS&ST monthly note is sent direct to about 7,450 individuals who directly or indirectly have expressed 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 and more engaging and effective teaching of the history and philosophy of science. The note 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 20+ years.

The note 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 note (publications, conferences, opinion pieces, etc.) are welcome and should be sent direct to the editor:

Michael R. Matthews, UNSW, m.matthews@unsw.edu.au.

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

http://www.hpsst.com/

16th Congress of Logic, Methodology and Philosophy of Science and Technology (DLMPST), Czech Technical University, Prague, August 5-10

Czech Technical University, Prague, Czechia, 5–10 August 2019 The International Congress of Logic, Methodology and Philosophy of Science and Technology (CLMPST) is organized every four years under the auspices of the Division for Logic, Methodology and Philosophy of Science and Technology of the International Union for History and Philosophy of Science and Technology (DLMPST/IUHPST).

http://clmpst2019.flu.cas.cz/

The Institute of Philosophy of the Czech Academy of Sciences is proud to host the 16th CLMPST in the summer of 2019.

Submission deadline: 15 December 2018 CLMPST 2019 will host three plenary lectures, delivered by Heather Douglas, Joel D. Hamkins, and Sandra D. Mitchell, and over twenty invited lecturers including: Anna Alexandrova, Atocha Aliseda Llera, Christina Brech, Anna Brożek, Alex Broadbent, Valentin Goranko, Gerhard Heinzmann,

Gürol Irzık, Tarja Knuuttila, Jan Krajíček, Sabina Leonelli, Maryanthe Malliaris, Michael Matthews, Jonathan Okeke Chimakonam, Dunja Šešelja, Heinrich Wansing, and Sang Wook Yi. CLMPST 2019 calls for contributed papers and contributed symposia in 20 thematic sections grouped within fields:

- Logic
- General Philosophy of Science
- Philosophical Issues of Particular Disciplines

Contributed papers

Please submit, in EasyChair here an abstract of 500 words (including the references) prepared for anonymous review. Indicate to which section you submit the paper (tick the appropriate box).

The allocated time for each contributed paper is 30 minutes (including discussion).

All questions about submissions should be directed to the congress secretary, Mr. Martin Zach, at clmpst2019@flu.cas.cz.

The members of the programme committee are listed here.

Responsible Officials

Hanne Andersen (Chair of the Programme Committee)

Benedikt Löwe (Secretary General of the DLMPST/IUHPST)

Tomáš Marvan (Head of the Local Organizing Committee)

Mario Bunge Symposium at DLMPST: Contributors Invited

There is an opportunity to contribute to a proposed DLMPST congress symposium Appraising the Philosophical Contributions of Mario Bunge.

A 500-word abstract will be required to be submitted to the symposium organizer by December 1, and intention to do so, should be communicated in advance. Contributors cannot be making another presentation at the congress, and they must register for the congress.

Further information from Michael R. Matthews (m.matthews@unsw.edu.au)

International Congress on the History of Science in Education, May 30 – June 1, 2019, Vila Real, Portugal

The International Congress on the History of Science in Education is a joint organization of the University of Trás-os-Montes and Alto Douro (UTAD), University of Porto (UP), University of Coimbra (UC) and University of S. Paulo (USP), and it will take place on May 30, 31 and June 1, 2019, at Polo 1 of the School of Human and Social Sciences of UTAD, Portugal.

The 1ICHSE rises following the 1st Meeting of History of Science in Teaching and 2nd Meeting of History of Science in Teaching held at UTAD and UC, in 2015 and 2017, respectively, and it will take place every two years alternating between the universities involved.

The 1ICHSE aims to bring together researchers, professors and students, interested in the history and teaching of Biology, Geology, Chemistry, Physics and Mathematics, as well as Educational Sciences, Engineering, Medicine, Pharmacy, Biochemistry, Anthropology, Astronomy, Psychology, Economics, Sociology, Ecology, Molecular Biology and Nanosciences, among others, in a multi-centered and multidisciplinary debate.

In addition to works focused on teaching, education, didactics and dissemination of sciences, 1ICHSE seeks to bring together reflections and studies of a more general, disciplinary or interdisciplinary nature, in the history of culture, technology and industry, as well as epistemological, historiographic, biographical or prosopographic. Other topics relevant to the history of science and teaching, such as gender

studies, the teaching of science in a foreign language and, in general, the various aspects of the interactions between science, technology and the humanities are very important welcome to the dialogue space that 1ICHSE seeks to create.

Plenary Speakers:

- Carlos Fiolhais, Physics, Universidade de Coimbra
- Jorge Varanda, Anthropology, University of Coimbra
- Maria Elice Prestes, Biology, Universidade de São Paulo
- Michael Matthews, Education, University of New South Wales

Abstract submission: January 31, 2019

Full text submission; March 31, 2019

Conference Chair:

- Isilda Rodrigues, isilda@utad.pt

Depart. Education and Psychology,

University of Trás-os-Montes e Alto Douro, UTAD, Vila Real, Portugal.

Information available here.

15th International History, Philosophy and Science Teaching Group (IHPST) Biennial Conference, Thessaloniki, July 15-19, 2019

12th Cent. White Tower

School of Education, Aristotle University

The conference will take place at the Aristotle university of Thessaloniki which was founded in 1925 and occupies an area of 33 hectares in the city centre.

The conference will open on Monday afternoon with registration, an opening session and a welcome reception. On Tuesday, Wednesday and Thursday there will be full-day presentations. There will be scheduled opportunity to visit cultural sites and events in Thessaloniki.

Important Dates:

Abstract submission: January 20, 2019

Final paper submission: March 20, 2019

Full conference information available here.

Conference Chair: A/Professor Fanny Seroglou: ihpst2019@eled.auth.gr

Joseph Novak Autobiography: Free and Downloadable

Joseph Novak's Autobiography is available gratis here.

Novak was a leading figure in the thriving constructivist studies of children's thinking about nature their 'proto-scientific' concepts that begun in the 1970s and 1980s and was known as 'Conceptual Change Research' (Driver, Guesne & Tiberghien 1985).

In 1983 Novak hosted the first international 'Misconceptions in Science and Mathematics' research conference at Cornell University with 60 presentations (Helm & Novak 1983); the second conference was held in 1987 with 150 presentations (Novak 1987); the third conference was held in 1993 with many more presentations (Novak & Abrams 1993).

Novak guided work at Cornell University where in the decade after 1977 over 100 graduate students were enrolled, and where over his whole career he supervised or contributed to 300+ graduate students and visiting scholars. His distinct contribution was the creation and utilisation of Concept Mapping as a research and pedagogical tool (Novak & Gowin 1984).

Novak and the constructivist tradition rejected the then dominant behaviourist accounts of learning, and also the competing Piagetian cognitive accounts. He maintained:

> Piaget's views on developmental psychology minimize the importance of language and instruction. Ausubel's theory emphasizes concepts as components of cognitive organization and their role in assimilation of new knowledge. (Novak 1977, p.45)

He embraced and co-authored a second edition of David Ausubel's *The Psychology of Meaningful Verbal Learning* (Ausubel, Novak & Hanesian 1978). Typical research questions were: How do children conceptualise and understand the natural world (objects, events and processes) before they enter science classes? How does this 'native' understanding and conceptualisation change in response to instruction? Are there identifiable barriers to scientific understanding? Are there cultural differences in children's science? How do students construct knowledge when they work in groups?' How do students negotiate meaning? And, what is involved in forming consensus?

This research tradition was largely empirical, descriptive, and phenomenological. The most recent version of the authoritative 'constructivism and research' bibliography prepared by Reinders Duit and colleagues at the University of Kiel is available on line and contains 8,400 entries (Duit 2009).

Novak, along with the entire constructivist tradition believed that Kuhn's account of theory change in science illuminated children's learning of science; and further that Kuhn's relativist epistemology and idealist ontology best captured the nature of science. Many have pointed out that this embrace of Thomas Kuhn by science education had detrimental intellectual and pedagogical consequences (Matthews 2004, 2015 sect.10).

Novak's autobiography weaves a rich account of the personal, academic, scholarly and family domains of his life, complete with many photos of family and colleagues. It includes comments about Herbert Feigl's philosophy of science course that he took as a student at the University of Minnesota. Novak's failure to take the occasion of an autobiography to revisit and re-appraise his Kuhnian enthusiasms of forty years ago will be a disappointment to some readers, but that aside, his story illuminates many pages of the past sixty years of science education research.

Ausubel, D.P., Novak, J.D. & Hanesian, H.: 1978, *Educational Psychology: A Cognitive View* (second edition), Holt, Rinehart & Winston, New York.

Duit, R.: 2009, *Bibliography – STCSE*, http://www.ipn.uni-kiel.de/aktuell/stcse/stcse.html.

Driver, R. Guesne, E. & Tiberghien, A. (eds.): 1985, *Children's Ideas in Science*, Open University Press, Milton Keynes.

Helm, H. & Novak, J.D. (eds.): 1983, *Proceedings of the International Seminar on Misconceptions in Science & Mathematics*, Education Department, Cornell University, Ithaca.

Matthews, M.R.: 2004, 'Thomas Kuhn and Science Education: What Lessons can be Learnt?' *Science Education* 88 (1), 90-118.

Matthews, M.R.: 2015, 'Reflections on 25-Years of Journal Editorship', *Science & Education*, 24(5-6), 749-805.

Novak, J.D. (ed.): 1987, *Misconceptions and Educational Strategies in Science and Mathematics*, 3 vols., Cornell University, Ithaca, NY.

Novak, J.D. & Abrams, R. (eds.): 1993, *Proceedings of the Third International Seminar on Misconceptions and Educational Strategies in Science and Mathematics* (August 1-4), Published Electronically, Internet Access here.

Novak, J.D. & Gowin, D.B.: 1984, *Learning How to Learn*, Cambridge University Press, New York.

Novak, J.D.: 1977, *A Theory of Education*, Cornell University Press, Ithaca. Paperback edition, 1986.

International Seminar Material Culture in the History of Physics

The seminar will be funded by the Wilhelm and Else Heraeus Foundation. There is a theoretical e-learning section, and a practical hands-on attendance section, which will take place from February 18th to 22nd 2019 at the Deutsches Museum in Munich. There the students will learn how to work with historical instruments in the environment of the museum. Accommodation will be funded as well as travel costs up to 80 euros for students from Germany, and up to 300 euros for students

from abroad. The seminar is intended for Master students and PhD students in the History of Science and Technology, Physics, and Didactics of Physics, but we would also like to encourage trainees in science museums to apply for participation.

For further details concerning the structure of the seminar, deadlines etc, please see here.

2019 IUHPST Essay Prize in History and Philosophy of Science

The International Union of History and Philosophy of Science and Technology (IUHPST) invites submissions for the 2019 IUHPST Essay Prize in History and Philosophy of Science. This prize competition, planned to continue on a biennial basis, seeks to encourage fresh methodological thinking on the history and philosophy of science as an integrated discipline.

Entries in the form of an essay of 5,000-10,000 words in English are invited, addressing this year's prize question: "What is the value of history of science for philosophy of science?" This question is intended as a counterpart to the question for the inaugural run of the prize in 2017, which asked about the value of philosophy of science for history of science. The 2017 prize was won by Theodore Arabatzis of the National and Kapodistrian University of Athens, for his essay "What's in it for the historian of science?", which can be viewed here.

All entries should contain original work that has not previously been published. For entries written originally in another language, an English translation should be submitted, with an indication of the translator. Entries will be judged on the following criteria, in addition to general academic quality: a direct engagement with this year's prize question, an effective integration of historical and philosophical perspectives, and the potential to provide methodological guidance for other researchers in the field.

The author of the winning entry will be invited to present the work at the 16th Congress of Logic, Methodology and Philosophy of Science and Technology (CLMPST

2019) to be held at the Czech Technical University, Prague, Czechia, 5-10 August 2019. Presenting at the Congress will be a condition of the award.

The award will carry a cash prize of 1,000 U.S. dollars and, in addition, a waiver of the Congress registration fee.

Other strong entries will also be considered for presentation at the Congress. In order to ensure this consideration, entrants should submit the entry also as an individual paper proposal for the Congress by the deadline of 15 December 2018, following the standard instructions indicated on the Congress website here.

Entries for this essay prize are invited from anyone, without restriction of age, nationality or academic status. Co-authored work will be considered, but if the winning entry is a co-authored work the cash prize will need to be shared out among the authors.

This prize is administered by the Joint Commission of the IUHPST, whose remit is to make links between the work of the two Divisions of the IUHPST: the DHST (Division of History of Science and Technology) and the DLMPST (Division of Logic, Methodology and Philosophy of Science and Technology). For further information about IUHPST, see:

IUHPS

Entries for the prize competition should be submitted in pdf format by e-mail to the Chair of the Joint Commission, Prof. Hasok Chang, Department of History and Philosophy of Science, University of Cambridge (hc372@cam.ac.uk). Any queries should also be directed to him. **The deadline for submission is 15 December 2018.**

Philosophy of Science with Children

A growing number of science educators are doing philosophy with children as they learn science. Philosophical questions can ignite students' interests in science and

expand their perspectives on science, reality and society. The philosopher Matthew Lipman observed that philosophical inquiry stimulates critical and creative thinking among students, and recent research has found a positive impact of doing philosophy on a range of outcomes for children. In the context of science education, philosophical dialogue may contribute to the discussion of big ideas such as substance, classification, the nature of science and ethically or culturally sensitive issues arising in the science class such as the theory of evolution or sexuality.

On 18th - 19th March 2019 the National STEM Learning Centre (UK), will host a 2 day event to explore philosophical dialogue in science education. The aim of the meeting is to share and reflect on approaches to doing philosophy in science education, and research on doing philosophy in science education.

To find out more please click here or contact Lynda Dunlop at York University at lynda.dunlop@york.ac.uk.

To contribute a paper, workshop or philosophical provocation, complete the form here.
(deadline 20th December).

Engineering: Its Social and Cultural Dimensions

The editorial staff of the journal *Engineering Studies* is seeking manuscripts on social and cultural aspects of engineers and engineering broadly defined. Our mission is:

> to advance critical analysis in historical, social, cultural, political, philosophical, rhetorical, and organizational studies of engineers and engineering;
>
> to help serve diverse communities of researchers interested in engineering studies;
>
> to link scholarly work in engineering studies with broader discussions

> and debates about engineering education, research, practice, policy, and representation.

The editors of *Engineering Studies* are interested in papers that consider the following questions:

> How does this paper enhance critical understanding of engineers or engineering?
>
> What are the relationships among the technical and nontechnical dimensions of engineering practices, and how do these relationships vary over time and space?

We invite works from humanists and social scientists studying the historical, political, philosophical, rhetorical, organizational, geographic, literary, or other dimensions of engineering. Practitioners in technical communication, technical work, engineering education, and policy studies are also invited to submit research which brings critical analysis to bear on the ideologies and assumptions underlying engineering's culture and practice.

Engineering Studies publishes regular research articles, systematic literature reviews, reports, book reviews, and Critical Participation pieces. The latter should make an intervention in the engineering studies and/or engineering communities. Regular research articles will be double-blind reviewed and Critical Participation articles single-blind by expert referees under the guidance of an Associate Editor. For information on style, scope, formatting, and how to submit a manuscript, see here.

Engineering Studies is the journal of the International Network for Engineering Studies. Please contact the editor in chief, Cyrus Mody (c.mody@maastrictuniversithy.nl) with further queries regarding *Engineering Studies*.

Downloadable and Gratis Book: *Being Modern: The Cultural Impact of Science in the Early Twentieth Century*

University College London Press (UCLP) announces the publication of a new open access book *Being Modern: The Cultural Impact of Science in the Early Twentieth Century*, edited by Robert Bud, Paul Greenhalgh, Frank James and Morag Shiach.

Download free here.

In the early decades of the twentieth century, engagement with science was commonly used as an emblem of modernity. This phenomenon is now attracting increasing attention in different historical specialities. Being Modern builds on this recent scholarly interest to explore engagement with science across culture from the end of the nineteenth century to approximately 1940.

Addressing the breadth of cultural forms in Britain and the western world from the architecture of Le Corbusier to working class British science fiction, *Being Modern* paints a rich picture. Seventeen distinguished contributors from a range of fields including the cultural study of science and technology, art and architecture, English culture and literature examine the issues involved.

The book will be a valuable resource for students, and a spur to scholars to further examination of culture as an interconnected web of which science was a critical part, and to supersede such tired formulations as 'Science and culture'.

Opinion Page

Teaching research integrity – Using history and philosophy of science to introduce ideas about the ambiguity of research practice

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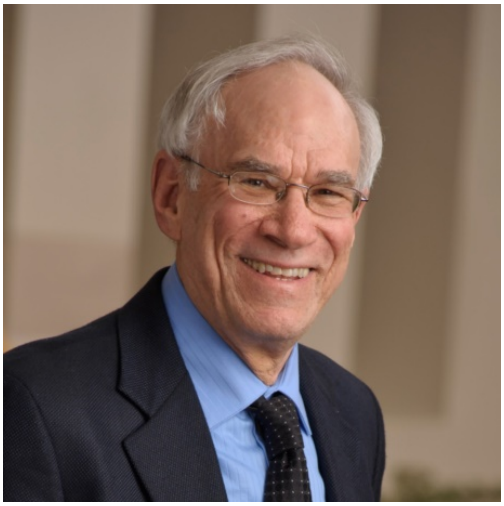

Having worked in science and philosophy of science for 50 years, I can say that in my experience these two disciplines fit perfectly the stereotype of two cultures. Mostly, they don't talk to each other. Trying to do interdisciplinary work has been an ongoing challenge. Ironically, the best opportunity that I have had to share ideas from history and philosophy of science (HPS) with science students (in graduate school and medical school) is when I teach them about research integrity. I use examples from HPS to emphasize the ambiguities inherent in everyday practice of science. Achieving research integrity requires learning to recognize and manage those ambiguities.

How did I get this opportunity?

My introduction to research integrity in science began in 1966 shortly after entering graduate school in the biochemistry department at Tufts University School of Medicine. We were told that one of the members of the external review group evaluating the department's graduate program had a former graduate student who had fabricated a series of experiments first as a graduate student and then as a postdoctoral fellow. In one series of experiments, the student claimed to have discovered a ribonucleic acid intermediate in the synthesis of the tripeptide glutathione. Our department chair Alton Meister was a leader in the glutathione field, and Meister did not believe the published work. Shortly after papers appeared retracting the fabricated findings, Meister published a sarcastic conference abstract formatted so that the first letter of each line made up an acrostic that read "no ribonucleic acid." The message was clear to us. If you commit fraud, you are going to get caught. And if someone in your lab commits fraud, you are going to be very embarrassed. Don't do it, and don't let it happen to you. The scientific community was committed to research integrity. At the time, however, aberrations were managed as internal family matters.

After doing postdoctoral work, I developed my own research laboratory in the cell biology department at UT Southwestern Medical Center. In addition to my research work, I had started teaching a philosophy of science course to our graduate students using an unlikely combination of writings by William James, Ludwik Fleck, Alfred Schutz, and David Hull. In 1987, I published my first book about the philosophy and sociology of science called *The Scientific Attitude* (Westview Press, 1987), which was based on my course. Although research integrity was the subject of a 1981 Congressional hearing entitled *Fraud in science*, the topic still was perceived as an internal matter by the science community. In the first addition of *The Scientific Attitude*, I devoted only one and a half pages to fraud in science. Subsequently, things changed rapidly. During 1988-1990, research integrity became the focus of multiple governmental and science society meetings. From many points of view, the question arose: "Was misconduct threatening the health of the scientific enterprise?"

How to define research misconduct was controversial. In addition to fabrication (making up the data), falsification (changing the data to fit the hypothesis), and plagiarism, the National Institutes of Health proposed a definition that included the clause, "deception or other practices that seriously deviate from those that are commonly accepted within the scientific community for proposing, conducting or reporting research." The biomedical research community represented by the Federation of American Scientists for Experimental Biology rejected that clause

It is our view that this language is vague, and its inclusion could discourage unorthodox, novel, or highly innovative approaches which in the past have provided the impetus for major advances in science. It hardly needs pointing out that brilliant, creative, pioneering research deviates from that commonly accepted within the scientific community.

It was clear to me that ambiguity inherent in the practice of science was central to the controversy about what should count as misconduct. I argued for that idea first in a 1996 editorial in *Science Magazine* and frequently since.

After 1989, NIH made it a requirement for NIH supported graduate programs to teach principles of research integrity. Two years later, our dean asked me to convert my philosophy of science course for the cell biology graduate students into a research integrity introduction for all our graduate students. I agreed to do so. Also, I updated *The Scientific Attitude*. In the 2nd edition (Guilford Press, 1992), the one and a half pages devoted to fraud morphed into a full chapter about research misconduct and was the starting place for my research integrity lectures.

Introducing ambiguity

Science students and scientists in general rarely reflect on the philosophical ideas underpinning their work. To introduce ideas about ambiguity requires challenging them to engage with and re-examine their taken for granted assumptions about the nature of science. Now I like to offer students the following paradox. The 2010 Singapore Statement on Research Integrity calls for the principle *Honesty in all aspects of research*. But in a 1962 essay called *Is the scientific paper a fraud?*, Sir Peter

Medawar writes that research publications distort science and represent "a totally mistaken conception, even a travesty, of the nature of scientific thought." I suggest that both ideas are correct; how is that possible?

Science comes in three versions: textbook, linear model, and everyday practice. From the first two versions, one can learn a lot about the theory of science but not so much about what actually happens in the laboratory or the field. *Honesty in all aspects of research* reflects the linear model of science, which is typical of science education. According to the linear model, the path from hypothesis to discovery follows a direct line guided by objectivity and logic; facts are waiting to be observed and collection; researchers can be objective and dispassionate observers. *The scientific paper is a fraud* is part of everyday practice of science. Reading science autobiography such as Watson's *The Double Helix*, quickly makes it clear that the path to discovery is anything but linear, and that the researchers involved are anything but disinterested!

In what follows, I will describe what I think are some of the most important ambiguities that I share with my students to challenge their taken for granted assumptions about science. I present science to them making a distinction between what I call the two circles of science, discovery and credibility. Discovery emphasizes the cognitive features of science and includes not only what philosophers typically call discovery, but also justification. That is, if discoveries are not adequately justified, then they will not get past the peer review oversight process to become discovery claims made public. Credibility emphasizes the social features of science. Once a discovery claim becomes public, the credibility process begins and corresponds to the path by which discovery claims become discoveries and sometimes textbook facts.

Discovery

In everyday practice of science, the path to discovery is convoluted with lots of dead ends. Failure is frequent. Why is discovery so hard? The Greek philosopher Plato argued that discovery is not just difficult, but impossible. In the *Dialogues*, in response to Meno's question about discovery, Socrates responds…"that a man

cannot search either for what he knows or for what he does not know. He cannot search for what he knows – since he knows it, there is no need to search – nor for what he does not know, for he does not know what to look for." In practice, discovery requires searching for what is beforehand unknown and not yet recognizable, but how is that possible I ask the students?

Plato's paradox captures the problem that every researcher encounters. Already known and expected knowledge can act as an impediment to discovery by constraining investigators from seeing and thinking anything more. Claude Bernard, one of the first experimental physiologists, emphasized that typical outcome in his 1865 classic, *An Introduction to the Study of Experimental Medicine*, "Men who have excessive faith in their theories or ideas are not only ill prepared for making discoveries, they also make very poor observations."

Research experiments can be divided into three categories: heuristic, demonstrative, and – most common – failed. Heuristic experiments offer researchers new insights into the problem under investigation. Demonstrative experiments re-work heuristic findings, if necessary, into a form suitable for making discovery claims public (i.e., adequate justification). Failed experiments arise when results are inconclusive or uninterpretable, which may occur for many reasons including technical errors, uncertain methods, or poor study design.

Given the extent of failed experiments, published papers typically contain only a small portion of the data collected. Ten notebooks frequently can be reduced to ten figures. Why is it ok, I ask the students, to be so selective and discard so much data? In addition to presenting only a selected set of data, research papers also typically rewrite history to present a logical and internally consistent account of the studies. Just as failed experiments are omitted, so will be failed hypotheses that have been discarded and older experiments at one time believed to be demonstrative but reinterpreted or discarded in light of later findings.

Francois Jacob in *The Statue Within: An Autobiography* (1988) notes that:

> Writing a paper is to substitute order for the disorder and agitation that

> animate life in the laboratory …To replace the real order of events and discoveries by what appears as the logical order, the one that should have been followed if the conclusions were known from the start.

Rather than the scientific adventure, the plot of research papers is the scientific method. The challenge is to make sure that one's papers are intellectually honest knowing that in an absolute sense, they are false!

Moreover, the pressure to produce is great. Deciding to study a particular research question takes it for granted that that prior research was somehow incomplete or incorrect; that adequate methodological, infrastructure, personnel, and financial resources are available in the laboratory to answer the question; and that finding a new answer will be worth the effort. Because resources of time, money and personnel are limiting, carrying out one project almost always means that something else will not be accomplished. Being wrong ultimately can result in failure in one's career aspirations as a scientist. Reflecting on the potential impact of failure helps students understand the difficulty of being objective and dispassionate in the way imagined by the linear model of science.

Experimental Design

Because the answer is not known in advance, carrying out an experiment requires guessing what will be the outcome. The guess becomes the basis for study design. Every experiment tests the investigator's explicit hypothesis about how things are/will turn out and at the same time the implicit hypotheses about adequacy of the methodology and design selected. Observing an answer different from that expected could be because the hypothesis is wrong, or the experimental design is wrong. Consequently, conclusions always will be potentially ambiguous. Don't give up a good hypothesis just because the data do not fit, at least not at first. Popper's ideas about falsification might be relevant to linear science, but in everyday practice of science the significance of falsifiability is aspirational, i.e., researchers being open to the possibility of being wrong.

Ironically, when an investigator's implicit assumptions about experimental design

and methodology turn out to be incorrect, unexpected results sometimes provide important opportunities for discovery if the unexpected results are noticed as potentially useful. Max Delbrück facetiously attributed useful unintended experiments to the *principle of limited sloppiness* meaning lack of clarify (i.e., muddiness) about an experimental system – not carelessness. Charles Peirce had these sorts of experimental results in mind when he introduced abduction as the logic of discovery. (I find the conventional view of philosophers that abduction means inference to the best explanation much less interesting.)

Further complicating interpretation of experimental findings is that at the edge of discovery distinguishing data from noise rarely is clear-cut. Although heuristic principles can be helpful, an investigator's experience and intuition often will determine what counts and what does not. In any particular case, the way the results are selected by one investigator might appear arbitrary and self-serving to another– even an example of misconduct. In the 1984 Sigma Xi Research Society pamphlet *Honor in Science*, Robert Millikan's oil drop experiments are held up as an example of falsification. Several years later, when Sigma Xi awarded its annual Science and Society Award to physicist David Goodstein, Goodstein's award lecture presented a defense of Millikan focused on the definition of what should be counted as data.

Credibility

Once a discovery claim is made public, the credibility process can begin. Because researchers bring biography and personality to their work, i.e., what Fleck calls thought styles, discovery claims are inherently subjective. For a discovery claim to become a scientific discovery, the researcher must turn towards the larger community.

Making a discovery claim public allows individual researchers to transcend their own subjectivity through intersubjectivity. Intersubjectivity is at the base of all social interactions. If two individuals interchange places, then they will (sort of) see, hear, think similar things – what Alfred Schutz called reciprocity of perspectives. In science, intersubjectivity means that researchers will be able to verify and validate each others' work if it is correct. Through the credibility process, the in-

dividual researcher's existential me/here/now becomes the scientific community's anyone/anywhere/anytime. Objective knowledge is the goal, not the starting point. Paraphrasing William James' pragmatic conception of truth, "Credibility happens to a discovery. It becomes credible, is made credible by events." The community rather than the individual provides the source of objectivity in science.

And here is the final idea the I want students to consider. The more novel a discovery claim, the more likely it will challenge prevailing scientific beliefs, which instead of confirmation by reciprocity of perspectives can lead to skepticism and rejection. The history of Nobel Prizes includes many examples of novel discoveries that were either ignored or disputed for years. Albert Szent Györgyi characterized discovery as seeing what everybody else has seen and thinking what nobody else has thought, an idea captured in René Magritte's 1936 oil painting Perspicacity.

The painting shows the seated artist staring at a solitary egg on a draped table but painting a bird in full flight on the canvas. When skepticism leads one's research findings to be ignored or denigrated, success sometimes requires the individual to become an advocate – even a passionate advocate – for the work. How to become a passionate advocate for one's work and yet remain intellectually honest becomes the challenge. And in the end the community might be right.

Final Comment

If science really were a linear process based on logic and carried out by objective observers following the scientific method, then aspirational documents about re-

search integrity along with courses based on theory of science would be sufficient for research integrity training. However, because practice of science is a more ambiguous enterprise, a more nuanced approach to research integrity education is required, one that acknowledges and makes explicit the ambiguities inherent in practice and the ethical challenges to which they give rise. Achieving research integrity requires creating a research environment that openly recognizes and engages these ethical challenges and makes explicit their sources. Accomplishing that goal in my opinion depends on introducing students to ideas from history and philosophy of science.

Further Reading

Grinnell, F. (1987,1992) *The Scientific Attitude*, 1st Edition, Westview Press, Boulder, Co.; 2nd Edition, Guilford Press, New York, NY.

Grinnell, F. (1996) Ambiguity in the practice of science. *Science*, 272:333.

Grinnell, F. (2009) *Everyday Practice of Science: Where Intuition and Passion Meet Objectivity and Logic*, Oxford University Press, New York, N.Y.

Grinnell, F. (2013) Research integrity and everyday practice of science. *Science and Engineering Ethics*. 9: 685-701.

Invitation to Submit Opinion Piece

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

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

Note.

They will be archived in the OPINION folder at the HPS&ST web site:

http://www.hpsst.com/.

Previous HPS&ST Note Opinion Pieces at http://www.hpsst.com/

New York Times, Creeping Bias in Research: Negative Results Are Glossed Over (October 2018)

Michael Matthews, School of Education, UNSW, An Occasion to Celebrate: Mario Bunge's 99th Birthday (September 2018)

Cormac Ó Raifeartaigh, Waterford Institute of Technology, Ireland, History of Science in Schools (July 2018)

Hugh Lacey, Philosophy Department, Swarthmore College, Appropriate Roles for Ethics and Social Values in Scientific Activity (June 2018)

Gerald Holton, Physics Department, Harvard University, Tracing Tom Kuhn's Evolution: A Personal Perspective (April/May 2018)

Monica H. Green, History Department, Arizona State University, On Learning How to Teach the Black Death (March 2018).

Stephen Pinker, Psychology Department, Harvard University, The Intellectual War on Science (February 2018).

Michael Ruse, Philosophy Department, Florida State University, Does Life Have Meaning? Or is it Self-Deception at Best and Terrifyingly Absurd at Worst? (January 2018).

Mario Bunge, Philosophy Department, McGill University, In Defence of Scientism (December 2017).

Susan Haack, Philosophy and Law Departments, University of Miami, The Future of Philosophy, the Seduction of Scientism (November 2017).

Nicholas Maxwell, University College London, What's Wrong with HPS and What Needs be Done to Put it Right? (June 2017).

Heinz W. Drodste, An Interview with Mario Bunge (May 2017).

Nicholas Maxwell, University College London, The Crisis of Our Times and What to do About It (April 2017).

Eric Scerri, UCLA, Bringing Science Down to Earth (March 2017).

Robert Nola, University of Auckland, Fake News in the Post-Truth World, (February 2017).

Michael D. Higgins, President of Ireland, The Need to Teach Philosophy in Schools (December 2016).

Philip A. Sullivan, University of Toronto, What is wrong with Mathematics Teaching in Ontario? (July 2016).

Gregory Radick, Leeds University, How Mendel's legacy holds back the teaching of science (June 2016).

Matthew Stanley, New York University, Why Should Physicists Study History?

PhD Theses in HPS&ST Domain

This will be a new section of the monthly HPS&ST Note. The Note is the ideal medium for publicizing and making known submitted and awarded doctoral theses in the HPS&ST domain.

The following details should be submitted to the editor at m.matthews@unsw.edu.au:

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

Recent HPS&ST Research Articles

Hyle. International Journal For Philosophy Of Chemistry (Vol. 24, Number 1, October 2018) Special Issue "Ethical Case Studies of Chemistry", Part III, edited by Tom Børsen and Joachim Schummer, http://www.hyle.org/journal/issues/24-1/

Bächtold, M., & Munier, V. (2018) Teaching energy in high school by making use of history and philosophy of science. *Journal of Research in Science Teaching*, 1-32. doi:10.1002/tea.21522 online first

Cardoso, A., Ribeiro, T, & Vasconcelos, C. (2918) What Is Inside the Earth? Children's and Senior Citizens' Conceptions and the Need for a Lifelong Education. *Science & Education*, 1-22. doi:10.1007/s11191-018-0003-y online first

Heering, P., & Kremer, K. (2018). Nature of Science. In D. Krüger, I. Parchmann, & H. Schecker (Eds.), *Theorien in der naturwissenschaftsdidaktischen Forschung* (pp. 105-119). Berlin: Springer. doi:10.1007/978-3-662-56320-5_7

Ideland, M. (2018) Science, Coloniality, and "the Great Rationality Divide": How Practices, Places, and Persons Are Culturally Attached to One Another in Science Education. *Science & Education*, 1-21. doi:10.1007/s11191-018-0006-8 online first

Lessl, T. (2018) Naïve Empiricism and the Nature of Science in Narratives of Conflict Between Science and Religion. *Science & Education*, 1-12. doi:10.1007/s11191-018-0002-z

Maeng, J. L., Bell, R. L., Clair, T. S. et al. (2018): Supporting elementary teachers' enactment of nature of science instruction: a randomized controlled trial, *International Journal of Science Education*, doi:10.1080/09500693.2018.152864 online first

Mayes, C., Williams, J., Kerridge, I., & Lipworth, W. (2018) Scientism, conflicts of interest, and the marginalization of ethics in medical education. *Journal of Evaluation in Clinic Practice*, 24(5), 939-944. doi:10.1111/jep.12843

Niiniluoto, I. (2018). Explanation by Idealized Theories. *Kairos. Journal of Philosophy & Science*, 20(1), 43-63. doi:10.2478/kjps-2018-0003

Nyléhn, J. & Ødegaard, M. (2018). The "Species" Concept as a Gateway to Nature of Science: Species Concepts in Norwegian Textbooks. *Science & Education*, 1-30. doi:10.1007/s11191-018-0007-7 online first

Owens, D.C., Pear, R.S.A., Alexander, H.A. et al. (2018). Scientific and Religious Perspectives on Evolution in the Curriculum: an Approach Based on Pedagogy of Difference. *Research in Science Education*, 1-16. doi:10.1007/s11165-018-9774-z online first

Pleasants, J., Olson, J. K. (2018) What is engineering? Elaborating the nature of engineering for K-12 education. *Science Education*, 1-22. doi:10.1002/sce.21483 online first

Přibyl, J., Eisenmann, P. & Gunčaga, J. (2018). The Phenomenon of False Assumption in Historical and Educational Texts. *Science & Education*, 1-31. doi:10.1007/s11191-018-0005-9 online first

Renn, J. (2018). The Evolution of Knowledge: Rethinking Science in the Anthropocene, *HoST – Journal of History of Science and Technology*, 12(1), 1-22.

doi:10.2478/host-2018-0001

Vosniadou, S., & Skopeliti, I. (2018) Evaluating the effects of analogy enriched text on the learning of science: The importance of learning indexes. *International Journal of Science Education*, 1-33. doi:10.1002/tea.21523 online first

Recent HPS&ST Related Books

Angeloni, Roberto (2018) *History of Science as a Facilitator for the Study of Physics: A Repertoire of Quantum Theory*. Newcastle upon Tyne, UK: Cambridge Scholars Publishing. ISBN: 978-1-5275-1639-7

> "This book serves to enhance scientific and technological literacy, by promoting STEM (Science, Technology, Engineering, and Mathematics) education with particular reference to contemporary physics. The study is presented in the form of a repertoire, and it gives the reader a glimpse of the conceptual structure and development of quantum theory along a rational line of thought, whose understanding might be the key to introducing young generations of students to physics.
>
> "The recurrent theme here is that the conceptual extension of the concept of natural radiation (symbolized by the constant h) allows an easy method of charting the conceptual development of quantum theory. The repertoire focuses on some momentous events of quantum theory, including the discovery of the constant h, which is one of the fundamental constants of nature and the key to understanding quantum mechanics; the discovery of the photon by Albert Einstein; and Niels Bohr's model of the hydrogen atom; the experiments which led to disclosing the structure of atomic nuclei in the 1930s; and the discovery of quantum mechanics and quantum electrodynamics, which constitute the basis of contemporary particle physics." (From the Publisher)

More information available here.

Bedau, Mark A., and Cleland, Carol E. (Eds.) (2018) *The Nature of Life: Classical and Contemporary Perspectives from Philosophy and Science*. Cambridge, UK: Cambridge University Press. ISBN: 9781108722063

> "Bringing together the latest scientific advances and some of the most enduring subtle philosophical puzzles and problems, this book collects original historical and contemporary sources to explore the wide range of issues surrounding the nature of life. Selections ranging from Aristotle and Descartes to Sagan and Dawkins are organised around four broad themes covering classical discussions of life, the origins and extent of natural life, contemporary artificial life creations and the definition and meaning of 'life' in its most general form. Each section is preceded by an extensive introduction connecting the various ideas discussed in individual chapters and providing helpful background material for understanding them. With its interdisciplinary perspective, this fascinating collection is essential reading for scientists and philosophers interested in astrobiology, synthetic biology and the philosophy of life." (From the Publishers)

More information available here.

Coventry, Angela M., Sager, Alexander (Eds.) (2018) *The Humean Mind*. Abingdon, UK: Routledge. ISBN: 9781138909878

> "David Hume (1711–1776) is widely acknowledged as one of the most important philosophers in the English language, with his work continuing to exert major influence on philosophy today. His empiricism, naturalism, and psychology of the mind and the passions shape many positions and approaches in the sciences and social sciences.

"*The Humean Mind* seeks to provide a comprehensive survey of his work, not only placing it in its historical context but also exploring its contemporary significance. Comprising 38 chapters by a team of international contributors the Handbook is divided into four sections:

- Intellectual context
- Hume's thought
- Hume's reception
- Hume's legacy

"This handbook includes coverage of all major aspects of Hume's thought with essays spanning the full scope of Hume's philosophy. Topics explored include Hume's reception in the eighteenth and nineteenth centuries; Hume's legacy in the twentieth and twenty-first centuries; Hume's history, including an essay on Hume as historian, as well as essays on the relevance of history to Hume's philosophy and his politics, and an updated treatment of Hume's Legal Philosophy. Also included are essays on race, gender, and animal ethics.

"Essential reading for students and researchers in philosophy, Hume's work is central to epistemology, metaphysics, philosophy of mind, philosophy of science, ethics, legal philosophy and philosophy of religion" (From the Publisher)

More information available here.

Greenslade, Thomas B (2018) *Adventures with Lissajous Figures*. San Rafael, CA: Morgan & Claypool Publishers. ISBN: 978-1-6432-7010-4

"Lissajous Figures are produced by combining two oscillations at right angles to each other. The figures, drawn by mechanical devices called harmonographs, have scientific uses, but are also enjoyed for their own

beauty. The author has been working with harmonographs since his undergraduate days, building several of them, lecturing on them and has written articles about them. This book is intended for people who enjoy physics or art or both." (From the Publishers)

More information available here.

Hardin, Jeff, Numbers, Ronald L., and Binzley, Ronald A. (Eds.) (2018) *The Warfare between Science and Religion: The Idea That Wouldn't Die*. Baltimore, MD: Johns Hopkins University Press. ISBN: 9781421426181

"The 'conflict thesis'–the idea that an inevitable and irreconcilable conflict exists between science and religion–has long been part of the popular imagination. In *The Warfare between Science and Religion*, Jeff Hardin, Ronald L. Numbers, and Ronald A. Binzley have assembled a group of distinguished historians who explore the origin of the thesis, its reception, the responses it drew from various faith traditions, and its continued prominence in public discourse.

"Several essays in the book examine the personal circumstances and theological idiosyncrasies of important intellectuals, including John William Draper and Andrew Dickson White, who through their polemical writings championed the conflict thesis relentlessly. Other essays consider what the thesis meant to different religious communities, including evangelicals, liberal Protestants, Roman Catholics, Eastern Orthodox Christians, Jews, and Muslims. Finally, essays both historical and sociological explore the place of the conflict thesis in popular culture and intellectual discourse today.

"Based on original research and written in an accessible style, the essays in *The Warfare between Science and Religion* take an interdisciplinary approach to question the historical relationship between science and religion. This volume, which brings much-needed perspective to an often bitter controversy, will appeal to scholars and students

of the histories of science and religion, sociology, and philosophy." (From the Publishers)

More information available here.

Hentschel, Klaus (2018) *Photon. The History and Mental Models of Light Quanta*. New York: Springer, ISBN 978-3-319-95251-2 (hardcover) and ISBN 978-3-319-95252-9 (ebook).

"This book focuses on the gradual formation of the concept of 'light quanta' or 'photons', as they have usually been called in English since 1926. The great number of synonyms that have been used by physicists to denote this concept indicates that there are many different mental models of what 'light quanta' are: simply finite, 'quantized packages of energy' or "bullets of light" (Compton)? 'Atoms of light' or 'molecules of light'? 'Light corpuscles' or 'quantized waves'? Singularities of the field or spatially extended structures able to interfere? 'Photons' in G.N. Lewis's sense, or as defined by QED, i.e. virtual exchange particles transmitting the electromagnetic force? The term 'light quantum' made its first appearance in Albert Einstein's 1905 paper on a "heuristic point of view" to cope with the photoelectric effect and other forms of interaction of light and matter, but the mental model associated with it has a rich history both before and after 1905. Some of its semantic layers go as far back as Newton and Kepler, some are only fully expressed several decades later, while others initially increased in importance then diminished and finally vanished. In conjunction with these various terms, several mental models of light quanta were developed–six of them are explored more closely in this book. It discusses two historiographic approaches to the problem of concept formation: (a) the author's own model of conceptual development as a series of semantic accretions and (b) Mark Turner's model of 'conceptual blending'. Both of these models are shown to be

> useful and should be explored further. This is the first historiographically sophisticated history of the fully fledged concept and all of its twelve semantic layers. It systematically combines the history of science with the history of terms and a philosophically inspired history of ideas in conjunction with insights from cognitive science." (abstract from the Publisher)

More information available here.

Novak, Joseph (2018) *A Search to Create a Science of Education: The Life of an Ivy League Professor, Business Consultant, and Research Scientist*. Institute for Human and Machine Cognition. (autobiography). Retrieved here.

> "This book and the videos present the story of my life-long search for better ways to help people learn. It begins with the story of my early family life that shaped and sustained my commitment to improve educating by building better theoretic foundations and better tools to understand and facilitating learning. Some of the academic challenges I faced are also discussed, as well as some of the successes we have had, especially with the development of the concept map tool now used in schools, businesses and organizations all around the world. My wife, Joan, my children, and my students have played an important role in my work, and some of their stories are included. I have chosen to publish these stories on the WWW so it would be available to anyone who is interested at no cost." (From the author)

Freely available here.

Piazza, Mario & Pulcini, Gabriele (2018) *Truth, Existence and Explanation. FilMat 2016 Studies in the Philosophy of Mathematics*. Dordrecht: Springer. (Boston Studies in the Philosophy and History of Science, Vol. 334). ISBN: 978-3-319-93341-2

> "This book contains more than 15 essays that explore issues in truth, existence, and explanation. It features cutting-edge research in the philosophy of mathematics and logic. "Renowned philosophers, mathematicians, and younger scholars provide an insightful contribution to the lively debate in this interdisciplinary field of inquiry. The essays look at realism vs. anti-realism as well as inflationary vs. deflationary theories of truth. The contributors also consider mathematical fictionalism, structuralism, the nature and role of axioms, constructive existence, and generality. In addition, coverage also looks at the explanatory role of mathematics and the philosophical relevance of mathematical explanation.
>
> "The book will appeal to a broad mathematical and philosophical audience. It contains work from FilMat, the Italian Network for the Philosophy of Mathematics. These papers collected here were also presented at their second international conference, held at the University of Chieti-Pescara, May 2016."

More information available here.

Ramírez, Paul (2018) *Enlightened Immunity: Mexico's Experiments with Disease Prevention in the Age of Reason*. Bloomington, IN: Stanford University Press. ISBN: 9781503604339

> "Enlightened Immunity is the sort of book that should shape our field: a deeply researched, wholly original, and well-executed study with something important to say. Ramírez deftly illuminates multiple contexts that shaped responses to epidemic disease in New Spain, including Atlantic communities of learning, political networks, and local knowledge." – Karen Melvin, Bates College
>
> "In rich and imaginative prose, Enlightened Immunity immerses readers in the highly mediated world of preventive health in late colonial

> Mexico, with its smells of candle wax in processions, the sound of trumpets heralding the arrival of vaccine, the cookies and coins given the poor to entice their cooperation, the rumors and political rituals, indigenous vaccinators, barbers and clerics. This is a tour de force–a great read with great insight into the history of inoculation and vaccination, the immense complexities of suffering in late colonial Mexico, and the confusion and contradictions of the ordinary and extraordinary attempts to prevent it." – Steven Palmer, University of Windsor

More information available here.

Warde, Paul, Robin, Libby and Sörlin, Sverker (2018) *The Environment: A History of the Idea*. Baltimore, MD: Johns Hopkins University Press ISBN: 9781421426792

> "Impressive in the freshness of its argument, the depth of its coverage, and the seamlessness with which its authors, each a distinguished environmental historian, have managed to collaborate in its production. This book will appeal to anyone with a serious intellectual or practical interest in environmental issues. It is hard to imagine that anyone, no matter how extensive their familiarity with the subject, will not learn from this book." – Harriet Ritvo, Massachusetts Institute of Technology
>
> "The Environment is intellectual history of the highest order. Through careful research and extraordinarily wide source material, the authors deftly and expertly unravel the complex and fascinating genealogy of one of the most powerful and influential concepts of the modern era." – Jane Carruthers, University of South Africa
>
> "The team of Warde, Robin, and Srlin offer a compact, clear, and crisp intellectual history of the concept of the environment. Ranging across the Anglophone world and sometimes beyond, they bring insight and historical context to their analysis of the crucial thinkers, ideas, and

debates in environmental science as it evolved since the 1940s." – J.R. McNeill, Georgetown University

"What distinguishes this book's approach to intellectual history–in this case, the history of the idea of 'environment'–is the authors' meticulous and unwavering attention to histories of expertise, institutional power, and dominant imaginaries that influence the public career of an influential idea. A must read for those debating the environment today." –Dipesh Chakrabarty, The University of Chicago

More information available here.

Wright, John (2018) *An Epistemic Foundation for Scientific Realism: Defending Realism Without Inference to the Best Explanation*. Dordrecht: Springer. ISBN 978-3-030-02217-4

"This monograph develops a new way of justifying the claims made by science about phenomenon not directly observable by humans, such as atoms and black holes. It details a way of making inferences to the existence and properties of unobservable entities and states of affairs that can be given a probabilistic justification. The inferences used to establish realist claims are not a form of, and neither do they rely on, inference to the best explanation.

"Scientific Realism maintains that scientific theories and hypotheses refer to real entities, forces, and relations, even if one cannot examine them. But, there are those who doubt these claims. The author develops a novel way of defending Scientific Realism against a range of influential attacks. He argues that in some cases, at least, we can make probabilistically justifiable inferences from observed data to claims about unobservable, theoretical entities. He shows how this enables us to place some scientific realist claims on a firmer epistemological footing than has previously been the case. This also makes it possible

to give a unified set of replies to the most common objections to Scientific Realism.

"The final chapters apply the developed conceptual apparatus to key cases from the history of science and from recent science. One example concerns realism with respect to atoms. Another looks at inferences from recent astronomical data to conclusions about the size and shape of those parts of the universe lying beyond that which we can observe." (From the Publisher)

More information available here.

Authors of HPS&ST-related papers and books are invited to bring them to attention of the Note's assistant editors, Paulo Maurício at paulo.asterix@gmail.com or Nathan Oseroff at nathanoseroff@gmail.com for inclusion in these sections.

Coming HPS&ST Related Conferences

November 15-17, 2018, 7th Making of the Humanities conference, University of Amsterdam, The Netherlands.
More information available here.

November 16-17, 208, Indiana Philosophical Association's Fall 2018 meeting, Indiana University, Bloomington, IN, USA.
Details at: https://ipa.hanover.edu/

November 23-28, 2018, East Asian Science Education Association (EASE) annual conference, National Dong Hwa University, Hualien Taiwan.
Details at: http://new.theease.org/conference2018.php

November 28-30, 2018, 29th Novembertagung on the History of Mathematics: "History of Mathematical Concepts and Conceptual History of Mathematics",

University of Seville, Spain.
Details available here.

November 30 – December 1, 2018, CYBERSPACE 2018, Brno, Czech Republic
Details available here.

December 5-7, 2018, First Annual Meeting of The Australasian Society for Philosophy and Psychology, Macquarie University, Sydney, Austalia.
Details available here.

January 9-10, 2019. Philosophy in Progress Postgraduate Conference. University of Nottingham, UK.
Details available here.

January 17-18, 2019. Double-Helix History: DNA and the past Abstract deadline: 15 September
Details available here.

January 29-29, 2019. The Philosophy of Logical Atomism 1918-2018. Complutense University of Madrid, Madrid, Spain
Deadline for submission of abstracts: September 20th, 2018.
For further inquiries: Javier Cumpa (jcarteseros@ucm.es)

February 25-27, 2019, Third International Conference of the German Society for Philosophy of Science (GWP.2019), Cologne, Germany.
More information available here.

March 29-30, 2019, The Philosophy of Ian Hacking. Institute of Philosophy, Research Centre for the Humanities, Hungarian Academy of Sciences
Inquiries to Dr. Akos Sivado, akos.sivado@gmail.com

March 31 – April 3, 2019, NARST Annual Conference, Baltimore, USA
Details at: https://www.narst.org/

April 1-4, 2019, Evolution Evolving: Process, Mechanism and Theory, Churchill College, University of Cambridge, UK

Details at: https://evolutionevolving.org/

April 24-26, 2019, British Society for the History of Philosophy Annual Conference, King's College London. Strand Campus, London, UK.
Details available here.

May 13-16, 2019, Second Hermann Minkowski Meeting on the Foundations of Spacetime Physics, Albena, Burgaria
Details available here

May 24-27, 2019, American Symposium on the History of Logic: Validity throughout History, University of California, Los Angeles, US.
For further information: Graziana Ciola (grazianaciola@g.ucla.edu)

May 29-31, 2019, Plastics Heritage: History, Limits and Possibilities. Museu da Famácia (Pharmacy Museum) in Lisbon, Portugal
Details available here

July 15-19, 2019, International History, Philosophy and Science Teaching Group, Biennial Conference, Thessaloniki, Greece.
Details from conference chair, Fanny Seroglou, fannyseroglou@gmail.com

July 22-26, 2019, The 46th Annual Hume Society Conference, University of Nevada, Reno, NV, USA.
Details available here.

July 26-28, 2019, 4th International Periodic Table Conference: 'Mendeleev 150', ITMO University, St Petersburg, Russia
Details available here.

August 5-10, 2019, 16th Congress of Logic, Methodology and Philosophy of Science and Technology (CLMPST), Prague, Czech Republic.
For updates and details see here.

September 2-4, 2019. European Conference for Cognitive Science (EuroCogSci 2019), Ruhr-Universität Bochum, Germany.

More information: EuroCogSci2019@rub.de.