

HPS&ST Note

June 2019

Introduction

This HPS&ST monthly note is sent direct to about 7,600 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/>

History, Philosophy and Science Teaching (HPS&ST) Research: Its Scope and Utilization

Since Ernst Mach's educational writings and interventions in the late nineteenth century, there has been a strong tradition of scholarship and research bringing the history and philosophy of science (HPS) to bear in addressing theoretical, curricular and pedagogical issues in science teaching. This is labelled the 'HPS&ST' research tradition.

Historians, philosophers and educators from numerous countries in all continents have contributed to it throughout the twentieth and into the present century. In the USA, John Dewey in the 1920s explicitly addressed HPS&ST issues; the questions were later taken up in the 1950s and 1960s by, among others, James Conant, Gerald Holton, Stephen G. Brush, Leo Klopfer, Robert S. Cohen, Joseph Schwab and Arnold Arons. In the UK, HPS&ST issues were addressed from the 1920s in books and articles by Frederick Westaway, Eric Holmyard and James Partington; and subsequently by John Bradley, Joan Solomon and others. There have been many contributors in the Spanish, Portuguese, French, German, Italian, Finnish and other traditions.

This HPS&ST research tradition was given considerable contemporary impetus with the creation of the International History, Philosophy and Science Teaching Group (IHPST Group) in 1989 and the publication in 1992 of the Kluwer journal *Science & Education: Contributions from History, Philosophy and Sociology of Science and Mathematics* for which Volume 28 is currently being published.

Something of the intellectual and institutional history of contemporary HPS&ST scholarship is documented in the Introduction to the 3-volume *International Handbook of Research in History, Philosophy and Science Teaching* (Springer 2014). This Introduction can be downloaded [here](#).

Over the past month Springer have released download figures for the *Handbook* and two other anthologies of HPS&ST research. The Springer communications are reproduced below. These figures are very encouraging and indicate that a reas-

onable portion of the science education community are attentive to fundamental philosophical and historical issues when conducting research on theoretical, curricular and pedagogical questions in science education; and doubtless attentive to HPS in their own teaching. Good writing and research in the field is being attended to, and has consequences for the intellectual formation of educators, and their research and teaching. Hopefully this eventually has some beneficial impact on the public understanding of science.

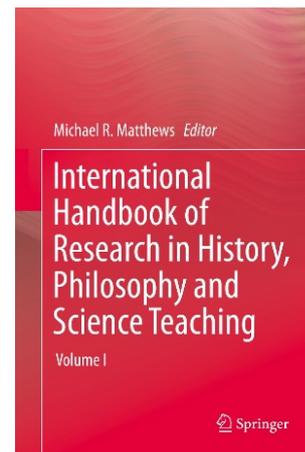
International Handbook of Research in History, Philosophy and Science Teaching
(2014)

3 volumes, 75 chapters

<https://www.springer.com/gp/book/9789400776531>

Year	Usage
2018	48523
2017	52720
2016	56476
2015	51647
2014	32926

Since its online publication on Aug 07, 2014, there have been a total of 242, 292 chapter downloads on SpringerLink. The table above shows the download figures for the last year(s). This amounts to about 1,000 chapter-downloads per week over five years.



Science, Worldviews and Education (2009)

15 chapters

<https://www.springer.com/gp/book/9789048127788>

Year	Usage
2018	1343
2017	1431
2016	1581
2015	1786
2014	1866
2013	1267
2012	495
2011	556
2010	629
2009	414

History, Philosophy and Science Teaching: New Perspectives (2017)

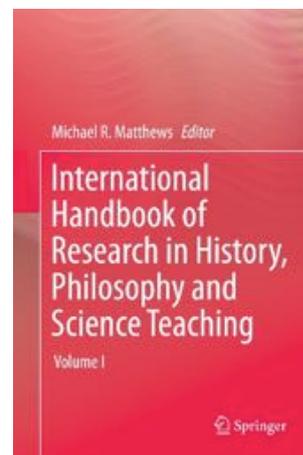
12 chapters

<http://www.springer.com/gp/book/9783319626147>

Year	Usage
2018	3302
2017	729

Since its online publication on Oct 17, 2017, there have been a total of 4,031 chapter downloads on Springer-Link. The table above shows the download figures for the last year(s).

The monograph *Science Teaching: The Contribution of*



History and Philosophy of Science (Routledge 2015) has been translated and published in Korean, Chinese, Spanish, Greek and Turkish. (www.routledge.com/9780415519342).

The IHPST-associated journal *Science & Education: Contributions from History, Philosophy and Sociology of Science* is now in its 28th year of publication, with an ever-rising Impact Factor (currently 1.265). <https://link.springer.com/journal/11191>

Apart from publications, there has been a 30-year tradition of well-attended and substantial HPS&ST international and regional conferences organised by the IHPST Group and by others. The programme of the 15th IHPST biennial conference being held in Thessaloniki (July 15-19) is given below. A link to the abstract book for 200 presentations at a recent Portuguese conference on ‘History of Science and Science Teaching’ is also given below. The annual, and large, NARST conference (<http://www.narst.org/>) has a designated strand for HPS&ST research.



Education is clearly a field in which the expertise of historians, philosophers and educators can fruitfully and collaboratively be brought to bear on the many routine issues facing science teachers, curriculum writers, textbook authors and administrators. It is one of the most significant fields for applied HPS.

An important and necessary part of the collaborative mix, but rarely included, is the philosophy of education. This is because so many basic questions and educational decisions depend upon reflection and commitment to positions in the philosophy of education. A comprehensive review of this linkage is given by Roland Schulz in chapter 39 of the *HPS&ST Handbook*.

15th International History, Philosophy and Science Teaching Group (IHPST) Biennial Conference, Programme

The conference will take place at the Aristotle University of Thessaloniki, July 15-19, 2019.

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. The conference will conclude on Friday after lunch. Throughout the conference, there will be scheduled opportunities to visit cultural sites and events in Thessaloniki.

Conference Website: <http://ihpst2019.eled.auth.gr>

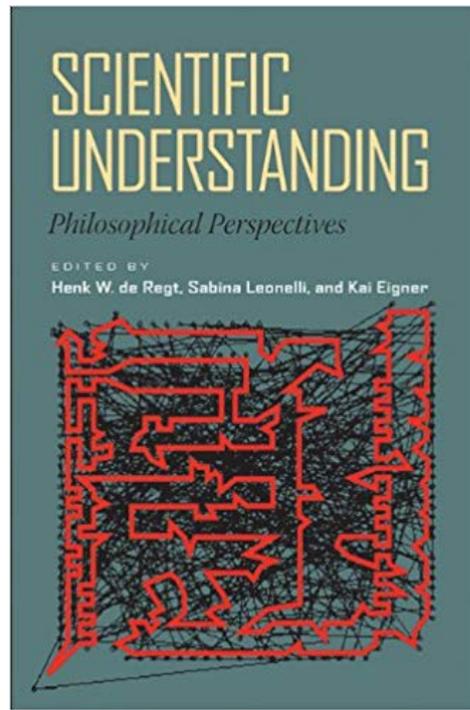
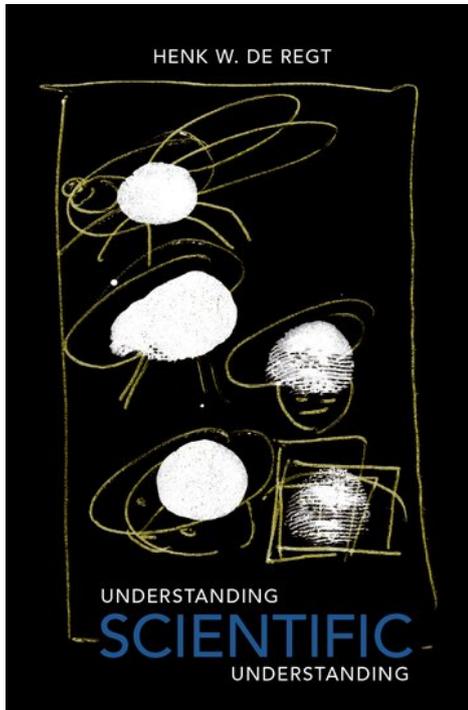
Full Programme available [here](#).

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

Lakatos Book Award 2019

The London School of Economics and Political Science (LSE) is pleased to announce the winner of the 2019 Lakatos Award, which goes to Henk W. de Regt for his book *Understanding Scientific Understanding* (Oxford University Press, 2017).

The [Lakatos Award](#) is given for an outstanding contribution to the philosophy of science, broadly construed, in the form of a book published in English during the previous five years. The Lakatos Award was made possible by a generous endowment from the Latsis Foundation, in memory of the former LSE professor Imre Lakatos. It is administered by an international Management Committee, which is organised from the LSE but entirely independent of LSE's Department of Philosophy, Logic and Scientific Method. The Committee decides the outcome of the Award competition on the basis of advice from an anonymous panel of Selectors who produce detailed reports on the shortlisted books.



Understanding Scientific Understanding is praised by the Selectors as “a remarkable book”. It is “a long-anticipated book that does important work reframing our own philosophical aims and norms of intelligibility”. De Regt’s work is “is a magnificent example of how history and philosophy of science can be productively integrated”, making its point through historical case studies that are “scholarly and insightful”. The book is “a serious, carefully argued work, on a neglected but important topic in the philosophy of science”.

IHPST Election Results

Results of the recent IHPST election have been announced. The newly elected members of Council, who will be joining Andreia Guerra (President) and Pierre Boulos (Past-President) are:

Fanny Seroglou, Greece (President-Elect)
Ami Friedman, USA (Secretary)



Andrea Guerra
President



Fanny Seroglou
President-Elect



Pierre Boulos
Past-President

Lori Maramante, USA (Treasurer)

Agustín Adúriz-Bravo, Argentina (Director)

Lena Hansson, Sweden (Director)

Anna Leci, Greece (Student Member)

Cristiano Moura, Brazil (Teacher Member)

A new Nominating Committee was also elected:

Ana Couló, Argentina

Jinwoong Song, South Korea

Arne Dittmer, Germany

Charbel N. El-Hani, Brazil

Proceedings of the International Congress on the History of Science in Education, Vila Real, Portugal

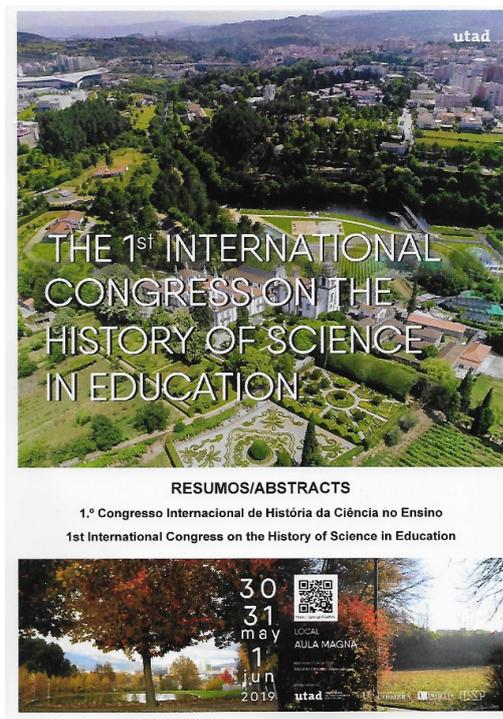
The Congress on History of Science in Education has held at Universidade de Trás-os-Montes e Alto Douro, Portugal, May 30-June 1. There were 200 presentations and about 250 participants.

The 200pp Abstracts Book (Portuguese/English) is now on web [here](#).

Further information from Congress organizer:

Prof. Isilda Teixeira Rodrigues,
isilda@utad.pt.

[Wine drinkers might recognize a familiar landmark on the cover: Mateus Palace and vineyard.]



Structuring Nature: An Interdisciplinary and Intercultural Summer School, Berlin, 28 July – 3 August 2019

Does the structure of nature inform the structure of our knowledge of nature, or do our own (artificial) divisions of science affect the way in which we divide the natural world?

Questions concerning the structure of nature, and the structure of our knowledge

of the natural world have long occupied philosophers and scientists working in the Western tradition, up until the present day. Especially in the ancient, medieval and early modern periods, Greek, Arabic, and Latin writers have developed a variety of approaches to construct ordered, rule-based frameworks to divide and study nature in all of its complexity.

As a result of enduring interest and continual developments, in both theoretical and practical knowledge of nature, various thinkers from these traditions have introduced novel criticisms to these systems, and others have shown through experiment and observation that long-standing preconceptions about the natural world, and our knowledge of it, do not stand up to scrutiny.

Over the course of one week, this interdisciplinary summer school will provide a conspectus of some of the many historical and modern problems associated with any attempt to formalise boundaries between minerals and other inert substances, plants, animals, and humans. It will also consider how some thinkers pushed the epistemological limits of natural science, attempting to fit new abstract theories and mathematical approaches to the study of the natural world.

“Structuring Nature” brings together a wide range of experts from ancient and medieval philosophy, classical philology, and the history of science, whose research addresses these problems in a number of language traditions, across a wide historical range. These experts will introduce students to the foundational thematic and methodological reflections on the structures of nature from antiquity to early-modern philosophy and science.

By bringing together historians of the scientific and philosophical traditions that have developed on the shores of the Mediterranean Basin, the summer school will provide the students with a unique opportunity to appreciate the historical contingencies of approaches, methods, and perspectives in the human attempts at understanding the structure of nature. In the closing discussions of each day, students will have the opportunity to critically reflect on ways of combining different methods and approaches that may eventually overcome current fragmentations and departmentalisations in the academy.

Application Process

Graduate and undergraduate students are welcomed to apply. Interested students must submit an updated CV and a short cover letter describing their research, methods, and aims by 15 May 2019 at the following email address: structuring.nature@yahoo.com. Applicants who plan on applying for external funding should specify that on their applications.

Organisers and Sponsoring Institutions

The summer school is organised by Nicholas Aubin (HU Berlin), Vincenzo Carlotta (HU Berlin), Mattia Cipriani (FU Berlin), Katja Krause (MPIWG), Nicola Polloni (HU Berlin). Sponsoring Institutions are the RTG “Philosophy, Science and the Sciences,” the Max-Planck-Institut für Wissenschaftsgeschichte, and the Alexander-von-Humboldt-Stiftung.

Details available at: <http://structuringnature.wordpress.com>

Journal Thematic Issue: What are the Philosophical and Interdisciplinary Foundations of STEM Education?

Science & Education Journal invites papers investigating the interdisciplinary underpinnings of STEM (short for science, technology, engineering and mathematics) and STEM education. The interdisciplinary underpinnings can include historical, philosophical and sociological approaches. In recent years there has been increasing emphasis on STEM education in international curriculum and policy documents (National Science and Technology Council, 2013; The Royal Society Science Policy Centre, 2014). A key argument in the proposals for STEM education is that science, technology, engineering and mathematics workers play a pivotal role in economic growth and STEM education produces critical thinkers, scientifically literate professionals and citizens, and enables the next generation of innovators. The infusion of “engineering practices” in the Next Generation Science Standards in the USA signals curriculum policy level argument for STEM teaching and learn-

ing that integrates related domains to science teaching and learning. Furthermore, there has been plethora of journals, research centres and community organisations that have made STEM a central educational goal, and many funding agencies are supporting research and development efforts to make STEM education effective.

But what exactly does STEM mean? Is the concept of “STEM” authentic? Is there a particular nature to STEM or are there disciplinary variations across science, technology, engineering and mathematics? What are the epistemic, cognitive, cultural and social underpinnings of STEM and what do they imply for STEM education? The journal invites theoretical and empirical papers that address related questions that include but are not exclusive to the following:

- What are the community practices of professionals in STEM fields and what do these practices imply for STEM education?
- What is the impact of incorporating STEM practices in education on learners and teachers?
- What professional development programmes can be designed to improve pre-service and in-service teachers’ understanding of the nature of STEM and STEM disciplines?
- What are the epistemological aims and values of science, technology, engineering and mathematics? Do these aims and values overlap or are they distinct in each discipline?
- Are the arguments for the collective and interdisciplinary teaching of science, technology, engineering and mathematics justified from an epistemological point of view?
- What informal learning opportunities are there to encourage understanding of the historical, philosophical and sociological accounts of STEM?
- What are the implications of potential epistemological variation in the STEM disciplines for teaching and professional development of teachers?

- What can scholarship in history, philosophy, sociology and related meta-perspectives on science contribute to policy studies on STEM education?

Editorial team

The following editorial team will manage the review process for this special issue:

Editor-in-Chief: Sibel Erduran, University of Oxford, United Kingdom

Associate Editor: Olivia Levrini, University of Bologna, Italy

Associate Editor: Maurício Pietrocola, University of São Paulo, Brazil

Book Reviews Editor: Gábor Áron Zemplén, Budapest University of Technology and Economic, Hungary

Deadline for submission of papers: October 30th, 2019

Submission procedure

Instructions for the preparation and submission of manuscripts can be accessed [here](#).

Scientific Literacy for All, Beijing Normal University, Oct. 29-30, 2019

The Collaborative Innovation Center of Assessment toward Basic Education Quality (CICA-BEQ) at Beijing Normal University will host a conference on 'Improving Scientific Literacy for All', Tuesday, Oct. 29 – Wednesday, Oct. 30, 2019

Scientific literacy is evolving as an essential literacy for modern citizens, due to the rapid development of science and technology in the 21st century. To clarify this fundamental aspect of science education in this new era, we need to rethink and redefine the concept of scientific literacy. Driven by the evolution of scientific literacy, systemic reforms embedded in data-driven and technology-based approaches are needed to improve science education quality. The AISL 2019 conference examines four essential topics to guide research and practice in scientific literacy:

1. Scientific literacy in the 21st century;
2. Teaching, learning and assessment;
3. Curriculum and digital resources;
4. Science teacher professional development.

Keynote Speakers:

Richard A. Duschl, Lyle School of Engineering, Southern Methodist University
Sibel Erduran, Department of Education, Oxford University
Joseph Krajcik, CREATE for STEM Institute, Michigan State University

For More Information see [here](#).

Email: bnukxts@126.com.

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Email: bnukxts@126.com.

Opinion Page

The Two Darwins: Erasmus and Charles on Evolution

Ron Good, Professor Emeritus, Louisiana State University, rgood@lsu.edu

Provide the following information to most people and they will identify the person as Charles Darwin, the author of *On the Origin of Species*.

- Father's name is Robert Darwin;
- Attended Cambridge University in England and Edinburgh Medical College in Scotland;
- Abhorred slavery;
- Loved plants;
- Recognized common descent of organisms from a single living filament;
- Became skeptical of religion and its supernatural claims;
- Understood that life probably originated in water and then evolved to land;
- Saw that selective breeding of domesticated animals is analogous to natural selection;
- Wrote about the expression of emotions in animals;



- Became a member of The Royal Society in England;
- Loved and wrote poetry.

However, the correct answer is Erasmus Darwin, Charles' grandfather who lived in England from 1731 to 1802. Eliminate "Loved and wrote poetry" from the list of characteristics and Charles Darwin would be a correct response. Much is known and has been written about Charles Darwin as the father of the scientific theory of evolution, but few know of his father's father, Erasmus. Although it has been 160 years since the publication of Charles Darwin's *On the Origin of Species*, it is curious that his grandfather remains unknown by most people today.

Erasmus Darwin scholar Desmond King-Hele (1999) says, "It has been said of Erasmus Darwin (1731-1802) that no one from his day to ours has ever rivaled him in his achievements in such a wide range of fields." This is quite a statement, considering the many outstanding people who have achieved so much in so many fields, but as one reads King-Hele's account of Erasmus Darwin it becomes clear that Erasmus accomplished many outstanding things in a wide variety of fields, including evolution. Among some of those accomplishments are the following:

1. Recognized as one of England's leading physicians during the latter part of the 18th century;
2. One of the intellectual leaders of England's industrial age;
3. Scientific poet without equal;
4. Inventor of numerous mechanical devices;
5. Spokesman for equal rights, including education, for women;
6. Spokesman against slavery;
7. A leading scientific thinker in numerous fields;

8. A leading naturalist who embraced evolution and free-thought, rejecting superstition and supernatural myths.

In reference to 7. and 8. above, King-Hele says, “The most striking of Darwin’s many talents was his extraordinary scientific insights in physics, chemistry, geology, meteorology and all aspects of biology—his deepest insight being his evolutionary theory of life.” It is his insight in evolution, and how it compares to that of Charles Darwin, that is the focus of the remainder of this paper.

The common story associated with Charles Darwin’s discovery of natural selection as the mechanism that explains evolution of life on Earth goes something like this: During a five-year voyage aboard the H.M.S. Beagle they stopped at the Galapagos Islands and Darwin noticed certain interesting characteristics among finches, tortoises, and other animals and then, a few years later, while reading a book by Thomas Malthus on population, he realized that natural selection explained the origin of species. Apart from his long voyage aboard H.M.S. Beagle, the influences on Darwin that prepared him to be able to recognize the importance of Malthus’ ideas for evolution of species are seldom discussed in most accounts of his life. Included among these influences are Charles’ love of the outdoors, his family’s influence on his habits of mind, his university years at Edinburgh and Cambridge, the reading he did prior to Thomas Malthus’ *An Essay on the Principle of Population*, and the discussions he had with people like Robert Grant at Edinburgh, John Henslow and Adam Sedgwick at Cambridge, and Charles Lyell and John Gould in London.

The influences of grandfather Erasmus on Charles’ ideas about evolution were more indirect since their lives did not overlap. As a late teenager Charles read and admired *Zoonomia*, his grandfather’s best-known book (vol. 1, 1794; vol. 2, 1796) that included a great number of facts about animal classification and diseases as well as ideas on evolution. A quote from *Zoonomia* (vol. 1, p. 504) regarding evolution helps one to see how it could have influenced Charles’ later ideas in his theory of evolution:

Some birds have acquired harder beaks to crack nuts, as the parrot.

Others have acquired beaks adapted to break harder seeds, as sparrows. Others for the softer seeds of flowers, or the buds of trees, as of finches...All which seem to have been gradually produced during many generations by the perpetual endeavour to supply the want of food.

Erasmus also noted that many species have adapted to ensure better security (e.g., camouflage, speed, hard shells) and that the males of many species developed adaptations to compete for the attention of females. Similar ideas on evolution also appeared in his earlier work (*The Botanic Garden*, 1789) and later work (*The Temple of Nature*, 1803, published a year after his death). In both books, *Botanic Garden* and *The Temple of Nature*, Erasmus uses poetry to express his feelings and his thoughts about the living world:

Organic Life beneath the shoreless waves
Was born and nurs'd in Ocean's pearly caves;
First forms minute, unseen by spheric glass,
Move on the mud, or pierce the watery mass;
These, as successive generations bloom,
New powers acquire, and larger limbs assume;
Whence countless groups of vegetation spring,
And breathing realms of fin, and feet, and wing.
(*The Temple of Nature*, Canto I, lines 295-302)

In related notes throughout *The Temple of Nature* Erasmus explains in more conventional terms what his poetry means, in this case the meaning of the previous eight lines: "The earth was originally covered with water, as appears from some of its highest mountains, consisting of shells cemented together by a solution of a part of them, as the limestone rocks of the Alps. It must be therefore concluded that animal life began beneath the sea."

By using the combination of poetry and related notes that provide explanation and

background, Erasmus is able to convey his feelings as well as his thoughts about nature in its wonderful complexity, beauty, and mystery.

King-Hele (1999, p. 363) finds many parallels between Erasmus and his grandson Charles: “Belief in evolution, passed on to his son Robert and reincarnated in his grandson Charles, can be seen as the finest of Erasmus’s legacies.” Although their outward lives were very different, King-Hele (1999, p. 363) notes, “The mental affinity between Charles Darwin and his grandfather emerges most clearly from their books. The first similarity is that for both of them the scientific book was their favoured vehicle of expression: Erasmus published more than a million words in eleven volumes; Charles two million in twenty-three volumes. For both, these books are ‘a faithful monument and true mirror’ of their minds.”

Many specific examples of parallels between Erasmus and Charles are identified by King-Hele, including the following:

- Both were fascinated by the fertilization processes in plants;
- Both suggested a kind of ‘sensibility’ in plants;
- Both wrote about geology and the living rocks of worm-built coral;
- Both saw that their ideas about evolution ran counter to the prevailing religious dogma of their times;
- Both saw that sexual selection was an important part of evolution;
- Both saw that geographical dispersal was an important part of evolution;
- Both were somewhat confused about the possible role of the inheritance of acquired traits in evolution.

As one reads the books by both Darwins it is not difficult to see the parallels that King-Hele talks about, even though Charles says in his *Autobiography* he was not influenced by his grandfather’s ideas in *Zoonomia*. Perhaps he was not consciously aware of Erasmus’ contributions to his own ideas on evolution, but there are too

many similarities between the ideas of these two Darwins to accept Charles' comment without question. It is clear that Charles read *Zoonomia* carefully, making many notations in his own copy, and that he was aware of Erasmus' other contributions related to evolution. Moreover, Charles was familiar enough with his grandfather's life and writing to write and publish his biography, *The Life of Erasmus Darwin*, in 1879. In his excellent 1997 article, 'Steps on the Path to the Origin of Species', Richard Keynes notes that a letter from [Charles] Darwin to Charles Lyell in 1863 supports Keynes' claim when Charles says:

Plato, Buffon, my grandfather, before Lamarck and others, propounded the obvious view that if species were not created separately they must have descended from other species, and I can see nothing else in common between *The Origin* and Lamarck. (Keynes, p. 468)

There is no doubt that Charles amassed many more facts regarding evolution than did his grandfather and Charles' ideas about natural selection were far more detailed and better argued. Of the many books and articles written by scientists and other Darwin scholars, *One Long Argument: Charles Darwin and the Genesis of Modern Evolutionary Thought* (1991) by noted evolutionary biologist, Ernst Mayr, is my favorite for its detailed look at Charles' ideas on evolution. In chapter seven, "What Is Darwinism?" Mayr explains the nuances in Charles' ideas about evolution, saying "Darwinism is not a monolithic theory that rises or falls depending on the validity or invalidity of a single idea" (p. 90). Mayr points out that Darwin was not always consistent in his writings about such things as the role of Lamarckism (inheritance of acquired traits) in explaining descent with modification. To help clarify the various meanings of "Darwinism," Mayr describes nine different ways in which Darwinism was used:

1. As *Anti-creationism*. Much of the argument in the *Origin* is directed against special creation rather than for natural selection. Mayr notes, "In his correspondence Darwin referred to his manuscript always as his 'species book,' not his book on natural selection.

2. As *Anti-ideology*. Not only were special creation and intelligent design beliefs opposed by Darwinism, other ideologies like essentialism and finalism or teleology were refuted as well, at least within the scientific community. We can see that even today, 150 years after the *Origin* was published, there are many believers who continue to embrace ID/creationism.
3. As *Selectionism*. Mayr notes that although modern biologists understand that Darwinism "...stands for a belief in the importance of natural selection in evolution" (p. 97), it took until about 1940 before all serious biologists fully embraced natural selection as the main mechanism.
4. As *Variational Evolution*. Many scientists, including some of Charles Darwin's collaborators like Lyell and Sedgwick, continued to embrace aspects of essentialism after the *Origin* appeared, making it difficult to accept wide variation within populations that eventually led to new species.
5. As the *Creed of the Darwinians*. Although there were many important differences in how Charles' fellow scientists like Lyell, Wallace, Huxley, and Hooker viewed Darwinism, the one thing they agreed on was their rejection of creationism. They agreed, in general, that evolution is a natural phenomenon. However, Mayr observes that even here a few of Darwin's supporters like Lyell and Wallace wanted to exclude humans from the natural selection theory. Surely, they thought, if a god exists, he would treat his most important "creation" differently.
6. As a *New Worldview*. Some philosophers and sociologists in the 1860s and '70s saw Darwin's *Origin* as the beginning of a new worldview that focused on competition and struggle in the human arena. Herbert Spencer is probably the best known within this group but Darwin apparently did not share this worldview. Spencer's ideas about evolution included teleology and an inheritance of acquired traits and Mayr concludes, "To claim that Darwin and Spencer supported the same paradigm is a clear falsification of history" (p. 103).
7. As a *New Methodology*. Darwin used different methodologies in the *Origin* to support his conjectures. Sometimes he followed hypothetico-deductive

methods and at other times he used inductive methods. However, at all times he understood the importance of having evidence to support his ideas. As Mayr observes, "...the ultimate validation of most of Darwin's theories did not result from the victory of his methodology but from additional facts and the gradual refutation of opposing ideologies" (p. 105). This was Darwin's "one long argument."

8. As *Evolutionism*. As a historical theory evolution was already in existence, when the *Origin* was published, in fields like linguistics and sociology, but not in physics or mathematics. Mayr says, "Clearly, Darwin was not the father of evolutionism, even though he brought about its victory" (p. 93).
9. As *Darwin's Theory of Evolution*. When this phrase was used it could have referred to a number of things, not simply natural selection. Among Darwin's theories, in addition to natural selection, were pangenesis, effects of use and disuse, blending inheritance, and the frequency of sympatric speciation (Mayr, p. 92).

It is not difficult to see why there was confusion after 1859 about the "real" meaning of Darwin's theory of evolution. Some of these sources of confusion were common during Erasmus Darwin's time as well and even though the *Origin* offered convincing evidence for natural selection, it took another 75 or so years before biologists agreed on the various meanings of Darwinism. Charles Darwin was the main source of natural selection theory but his own uncertainty and confusion over such ideas as effects of use and disuse (Lamarckism) helped to maintain existing misconceptions.

Summary

Charles Darwin deserves the title of greatest biologist of the 19th century and perhaps of all time. Some scientists, like Ernst Mayr, say he was the greatest scientist of all time, in part because of the reach of evolutionary theory into so many fields. However, as Isaac Newton observed long ago, all scientists stand on the shoulders of others who have gone before them and Erasmus Darwin deserves more credit for generating ideas about evolution than he usually gets, which is close to none.

It was the theory of common descent that linked humans to the rest of the animal world and this is what many people saw as highly objectionable in the *Origin*. As a freethinker, Erasmus Darwin was not constrained by the common religious dogma of his time so he was able to interpret evidence in a way that allowed him to see the obvious relationships between humans and other primates, for example. Once religious blinders are removed the tree of life is much easier to see.

In *Zoonomia* and *Temple of Nature* it is clear that Erasmus understands the inter-relatedness of all life and as a freethinker the causes had to be natural not supernatural. Until Charles was no longer constrained by creationist dogma, he was not free to see that Malthus' ideas on populations held the key to natural selection. When Charles first read Erasmus' *Zoonomia* he said he was not influenced by it, but that is very likely because his thinking was constrained by his religious beliefs and his lack of real-world experiences. It took encounters with freethinkers like Robert Grant, a five-year voyage where he encountered many kinds of evidence for evolution, reading books like Lyell's on geology of an old Earth, and finally the catalyst of Malthus' book on populations before he was ready to see that natural selection was the cause of the origin of species and the great diversity of life on Earth. In one sense, Charles Darwin was finally where his grandfather had been over 50 years before him. It is what Charles did after he arrived at this point in 1838 that really sets him apart from his science colleagues and his grandfather. From 1838 until the *Origin* was published in 1859 he worked on and thought continuously about his big idea, natural selection.

Like all of us Charles Darwin was influenced by his life experiences and the most important was his voyage aboard the H.M.S. Beagle, including his trips across the countryside when he was not on the vessel. Without that voyage it is very unlikely he would have been prepared to see the importance of Malthus' book on populations. Also, had he continued to wear the blinders of creationist dogma, it is unlikely that he would have seen that supernatural explanations are unnecessary to explain the origin of species and common descent. The exact nature of the influence of his grandfather's ideas on evolution and on free-thought will probably never be known, but it is reasonable to conclude that Charles Darwin's theory of

evolution by natural selection was influenced by those ideas and Erasmus Darwin deserves more recognition than he typically receives.

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Acknowledgement: This essay is partially based on an unpublished manuscript (*The Role of Evidence in the Evolutionary Theories of Erasmus Darwin and His Grandson Charles Darwin*) co-authored with Dr. Lisa Martin-Hansen, Professor & Chair, Science Education, Long Beach State University.

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/>.

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Lucie Laplane, Paolo Mantovani, Ralph Adolphs, Hasok Chang, Alberto Mantovani, Margaret McFall-Ngai, Carlo Rovelli, Elliott Sober, and Thomas Pradeu: [Why Science Needs Philosophy](#) (April 2019)

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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).

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

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PhD Theses in HPS&ST Domain: Veli Virmajoki, University of Turku

Name: Veli Virmajoki

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Institution: University of Turku, Finland

Supervisors: Jouni-Matti Kuukkanen; Joseph Almog; Olli Koistinen

Title: “Title: Cementing Science. Understanding Science through Its Development” (2016)

Abstract: I defend the present-centered approach in historiography of science (i.e. study of the history of science), build an account for causal explanations in historiography of science, and show the fruitfulness of the approach and account in when we attempt to understand science.

The present-centered approach defines historiography of science as a field that studies the developments that led to the present science. I argue that the choice of the targets of studies in historiography of science should be directly connected to our values and preferences in an intersubjective process. The main advantage of this approach is that it gives a clear motivation for historiography of science and avoids or solves stubborn conceptual and practical problems within the field.

The account of causal explanations is built on the notions of counterfactual scenarios and contrastive question-answer pairs. I argue that if and only if we track down patterns of counterfactual dependencies, can we understand history. Moreover, I define the notions of historical explanation, explanatory competition, explanatory depth, and explanatory resources.

Finally, I analyze the existing historiography of science with the framework built in the previous chapter, and I show that this framework clarifies many first-order (i.e. concerning the history of science) and meta-level issues (i.e. concerning the

nature of science in general) that historians and philosophers tackle. As an illustration of the philosophical power of the framework, I explicate the notion of local explanation and analyze the question of whether the developments of science were necessary or contingent.

Web link: <https://www.utupub.fi/handle/10024/147334>

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Biggs, N. (2019) Thomas Harriot on the coinage of England. *Archive for History of Exact Sciences*, 1-23. doi:[10.1007/s00407-019-00228-w](https://doi.org/10.1007/s00407-019-00228-w)

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- Cofré, H., Núñez, P., Santibáñez, D. et al. (2019) A Critical Review of Students' and Teachers' Understandings of Nature of Science. *Science & Education*, 1-44. doi:[10.1007/s11191-019-00051-3](https://doi.org/10.1007/s11191-019-00051-3) online first
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Werner, R.F. & Farrelly, T. (2019) Uncertainty from Heisenberg to Today. *Foundations of Physics*, 1-32. doi:[10.1007/s10701-019-00265-z](https://doi.org/10.1007/s10701-019-00265-z) online first

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Dardashti, Radin, Dawid, Richard & Thébault, Karim (Eds.) (2019) *Why Trust a Theory? Epistemology of Fundamental Physics*. Cambridge, UK: Cambridge University Press. ISBN: 9781108470957

“Do we need to reconsider scientific methodology in light of modern physics? Has the traditional scientific method become outdated, does it need to be defended against dangerous incursions, or has it always been different from what the canonical view suggests? To what extent should we accept non-empirical strategies for scientific theory assessment? Many core aspects of contemporary fundamental physics are far from empirically well-confirmed. There is controversy on the epistemic status of the corresponding theories, in particular cosmic inflation, the multiverse, and string theory. This collection of essays is based on the high profile workshop ‘Why Trust a Theory?’ and provides interdisciplinary perspectives on empirical testing in fundamental physics from leading physicists, philosophers and historians of

science. Integrating different contemporary and historical positions, it will be of interest to philosophers of science and physicists, as well as anyone interested in the foundations of contemporary science.” (From the Publishers)

More information available [here](#).

Dotts, Brian W. (2019) *Educational Foundations: Philosophical and Historical Perspectives*. Cambridge, UK: Cambridge University Press. ISBN: 9781316648896

“This educational foundations book offers a comprehensive overview of American education history and a variety of classical, Enlightenment, and contemporary educational philosophers. While *Educational Foundations* includes a history of American education, it also looks at numerous policies, constitutional law cases, events, and political, religious, and social conflicts for students to consider while learning their subject matter. The text is divided into two sections: the first is a look at a broad array of philosophical influences from the Western canon, while the second is an exploration of the history of American education, focusing on a few specific eras. With strong and helpful pedagogical features and resources, such as class activities, suggested files, chapter objectives, and sidebar questions, this textbook is an excellent resource for students. It is useful for undergraduate and graduate courses in educational foundations.” (From the Publishers)

More information available [here](#).

Glasgow, Joshua et al. (Eds.) *What Is Race? Four Philosophical Views*. Oxford, UK: Oxford University Press. ISBN: 9780190610180

“Across public discourse, in the media, politics, many branches of academic inquiry, and ordinary daily interactions, we spend a lot time

talking about race: race relations, racial violence, discrimination based on race, racial integration, racial progress. It is fair to say that questions about race have vexed our social life. But for all we speak about race, do we know what race is? Is it a social construct or a biological object? Is it a bankrupt holdover from a time before sophisticated scientific understanding and genetics, or can it still hold up in biological, genetic, and other types of research? Most fundamentally, is race real? “In this book, four prominent philosophers and race theorists debate how best to answer these difficult questions, applying philosophical tools and the principles of social justice to cutting-edge findings from the biological and social sciences. Each presents a distinct view of race: Sally Haslanger argues that race is a socio-political reality. Chike Jeffers maintains that race is not only political but also, importantly, cultural. Quayshawn Spencer pursues the idea that race is biologically real. And Joshua Glasgow argues that either race is not real, or if it is, it must be real in a way that is neither social nor biological. Each offers an argument for their own view and then replies to the others. Woven together, the result is a lively debate that opens up numerous ways of understanding race. Above all, it is call for sophisticated and principled discussion of something that significantly permeates our lives.” (From the Publishers)

More information available [here](#).

Malabou, Catherine (2019) *Morphing Intelligence: From IQ Measurement to Artificial Brains* (C. Shread, Trad.). New York, NY: Columbia University Press. ISBN: 9780231187367

“In this remarkable book Catherine Malabou focuses on the transformations of “intelligence” as it moves from genetics to epigenetics to automatism. Historically grounded, philosophically astute, and engagingly written, this book is highly recommended for anyone interested

in intelligence–artificial and natural–and in contemporary configurations of what counts as human.” – N. Katherine Hayles, author of *Unthought: The Power of the Cognitive Nonconscious*

“Catherine Malabou is one of the rare philosophers who seriously engages contemporary biological research in her explorations of human experience. In this book, she turns her attention to the core question of intelligence, and with spectacular results. At stake is the very future of human thought, and Malabou is led to reflect on machine intelligence for the first time, generating singular insights. As ever, Malabou’s prose is precise and elegant, deftly expressed in Carolyn Shread’s fluid translation.” – David Bates, author of *Plasticity and Pathology: On the Formation of the Neural Subject*

More information available [here](#).

Milam, Erika Lorraine (2019) *Creatures of Cain: The Hunt for Human Nature in Cold War America*. Princeton, New Jersey: Princeton University Press. ISBN: 9780691185095

“After World War II, the question of how to define a universal human nature took on new urgency. *Creatures of Cain* charts the rise and precipitous fall in Cold War America of a theory that attributed man’s evolutionary success to his unique capacity for murder.

“Drawing on a wealth of archival materials and in-depth interviews, Erika Lorraine Milam reveals how the scientists who advanced this “killer ape” theory capitalized on an expanding postwar market in intellectual paperbacks and widespread faith in the power of science to solve humanity’s problems, even to answer the most fundamental questions of human identity. The killer ape theory spread quickly from colloquial science publications to late-night television, classrooms, political debates, and Hollywood films. Behind the scenes, however,

scientists were sharply divided, their disagreements centering squarely on questions of race and gender. Then, in the 1970s, the theory unraveled altogether when primatologists discovered that chimpanzees also kill members of their own species. While the discovery brought an end to definitions of human exceptionalism delineated by violence, Milam shows how some evolutionists began to argue for a shared chimpanzee-human history of aggression even as other scientists discredited such theories as sloppy popularizations. “A wide-ranging account of a compelling episode in American science, *Creatures of Cain* argues that the legacy of the killer ape persists today in the conviction that science can resolve the essential dilemmas of human nature.” (From the Publisher)

More information available [here](#).

Moura, Breno Arsioli (2019) *A filosofia natural de Benjamin Franklin: Traduções de Cartas e Ensaios sobre a Eletricidade e a Luz*. [Benjamin Franklin's Natural Philosophy: Translations of Letters and Essays on Electricity and Light]. São Bernardo do Campo, Brasil: EdUFABC. ISBN: 9788568576908.

“In this book, I present translated versions to Portuguese of seven letters and essays of Franklin, concerning electricity and light. This is the first time Franklin's papers are translated to this language. Among the letters and essays, the readers will find his famous ‘Opinions and conjectures,’ where Franklin presented his most important ideas on electricity, including a deep discussion on the power of points and the famous sentry-box experiments. Furthermore, the reader will find his thoughts on the nature of light, including a defense of a vibrational theory. The translations are preceded by two introductory chapters on the studies on electricity and optics in the eighteenth-century.”

More information available [here](#).

Pennock, Robert T. (2019) *An Instinct for Truth: Curiosity and the Moral Character of Science*. Cambridge, MA: The MIT Press. ISBN: 9780262042581

“*An Instinct for Truth* is a very important book. A pioneering exercise in what the author calls ‘virtue philosophy of science,’ and also, thanks to the empirical research, a groundbreaking exercise in experimental philosophy, Robert Pennock’s book explores with much learning and sensitivity the values that guide the scientific mind, showing how great science is a deeply moral endeavor, in great part because the practitioners recognize and respect both the opportunities and restraints of empirical research. This is essential reading for philosophers across the spectrum, epistemologists and ethicists both.” – Michael Ruse, Lucyle T. Werkmeister Professor of Philosophy, Florida State University

“The sculpting of virtuous character is not incidental to doing science right. Objectivity in research requires refined moral dispositions without which our trust in science is unjustifiable. As Robert Pennock demonstrates in this elegant and well-argued work, there is hardly a virtuous habit whose cultivation cannot contribute to the enhancement of science as an honorable and truthful profession. I hope many scientists will read this book. Attending assiduously to Pennock’s argument will not only make them better scientists, it will also make them better persons.” – John F. Haught, Distinguished Professor of Theology at Georgetown University; author of *The New Cosmic Story: Inside Our Awakening Universe*

“Pennock uses virtue theory to provide valuable new perspectives on philosophy of science and research ethics. All humans are somewhat curious about various aspects of the world, but in science that curiosity is organized and there is independent testing of what individuals have discovered. Not only does science have many practical applications, the moral values at its core can inspire a greater respect for

truth-seeking in society at large.” – Noretta Koertge, Emeritus Professor, Department of History and Philosophy of Science and Medicine, Indiana University

More information available [here](#).

Rieppel, Lukas (2019) *Assembling the Dinosaur: Fossil Hunters, Tycoons, and the Making of a Spectacle*. Cambridge, MA: Harvard University Press. ISBN 9780674737587

“A brilliant, original history of dinosaurs set within the landscape of American science, capitalism, and culture. Rieppel integrates the practices and ambitions of vertebrate paleontologists, the patronage they found among wealthy industrialists, and the public’s fascination with these colossal creatures from the deep past—from the discovery of fossil remains in the American West at the turn of the twentieth century through their assembly in emergent museums of natural history. Resting on extensive archival research and apt illustrations, *Assembling the Dinosaur* is an altogether authoritative and captivating work.” – Daniel J. Kevles, *Living Properties: Making Knowledge and Controlling Ownership in the History of Biology*

“This innovative book reinterprets the discovery of dinosaurs in the American West as a compelling aspect of the country’s culture at a time of dramatic economic expansion. Highly recommended as a stimulating account of science during the Gilded Age and beyond.” – Janet Browne, author of *Charles Darwin: Voyaging*

“The nineteenth century saw the simultaneous rise of industrial capitalism and the discovery of dinosaurs. These hulking creatures, expensive to excavate and to display, became a perfect match for the self-presentation of the rising economic elite in the United States. Connecting the history of capitalism and the history of science, this important book traces how the shifting presentation of these fossils—from

massive, slow moving, and solitary to agile and social—mirrored the transition from giant corporations to nimble startups.” – Sven Beckert, author of *Empire of Cotton: A Global History*

“Resting on broad erudition and an expansive historical imagination, *Assembling the Dinosaur* explores the relationship of science, culture, and economy in the Gilded Age. It is a unique contribution to our understanding of the making of modern America.” – Michael Zakim, author of *Accounting for Capitalism: The World the Clerk Made*

More information available [here](#).

Rothschild, Rachel Emma (2019) *Poisonous Skies: Acid Rain and the Globalization of Pollution*. Chicago, IL: The University of Chicago Book Press. ISBN: 9780226634715

“The climate change reckoning looms. As scientists try to discern what the Earth’s changing weather patterns mean for our future, Rachel Rothschild seeks to understand the current scientific and political debates surrounding the environment through the history of another global environmental threat: acid rain.

“The identification of acid rain in the 1960s changed scientific and popular understanding of fossil fuel pollution’s potential to cause regional—and even global—environmental harms. It showed scientists that the problem of fossil fuel pollution was one that crossed borders—it could travel across vast stretches of the earth’s atmosphere to impact ecosystems around the world. This unprecedented transnational reach prompted governments, for the first time, to confront the need to cooperate on pollution policies, transforming environmental science and diplomacy. Studies of acid rain and other pollutants brought about a reimagining of how to investigate the natural world as a complete entity, and the responses of policy makers, scientists, and the public set

the stage for how societies have approached other prominent environmental dangers on a global scale, most notably climate change.

“Grounded in archival research spanning eight countries and five languages, as well as interviews with leading scientists from both government and industry, *Poisonous Skies* is the first book to examine the history of acid rain in an international context. By delving deep into our environmental past, Rothschild hopes to inform its future, showing us how much is at stake for the natural world as well as what we risk—and have already risked—by not acting.”

More information available [here](#).

Schotte, Margaret E. (2019) *Sailing School: Navigating Science and Skill, 1550-1800*. Baltimore, MD: Johns Hopkins University Press. ISBN: 9781421429533

“Throughout the Age of Exploration, European maritime communities bent on colonial and commercial expansion embraced the complex mechanics of celestial navigation. They developed schools, textbooks, and instruments to teach the new mathematical techniques to sailors. As these experts debated the value of theory and practice, memory and mathematics, they created hybrid models that would have a lasting impact on applied science.

“In *Sailing School*, a richly illustrated comparative study of this transformative period, Margaret E. Schotte charts more than two hundred years of navigational history as she investigates how mariners solved the challenges of navigating beyond sight of land. She begins by outlining the influential sixteenth-century Iberian model for training and certifying nautical practitioners. She takes us into a Dutch bookshop stocked with maritime manuals and a French trigonometry lesson devoted to the idea that “navigation is nothing more than a right triangle.” The story culminates at the close of the eighteenth century with

a young British naval officer who managed to keep his damaged vessel afloat for two long months, thanks largely to lessons he learned as a keen student.

“This is the first study to trace the importance, for the navigator’s art, of the world of print. Schotte interrogates a wide variety of archival records from six countries, including hundreds of published textbooks and never-before-studied manuscripts crafted by practitioners themselves. Ultimately, *Sailing School* helps us to rethink the relationship among maritime history, the Scientific Revolution, and the rise of print culture during a period of unparalleled innovation and global expansion.” (From the Publisher)

More information available [here](#).

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Coming HPS&ST Related Conferences

July 7-12, 2019, International Society for the History, Philosophy and Social Studies of Biology meeting (ISHPSSB), Oslo, Norway.

Abstracts deadline: 18 January 2019

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 25-27, 2019, Learning From Empirical Approaches to HPS 2019 (LEAHPS 2019), Leibniz University, Hannover, Germany

Details at: <https://leaphs2019.wordpress.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](#).

July 28 – August 3, 2019, 'Structuring Nature. An Interdisciplinary and Intercultural Summer School', Humboldt Universität zu Berlin, Institut für Philosophie

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](#).

August 25-September 1, 2019, Formal Epistemology, Statistics, and Game Theory: Bayes-by-the-Sea, Summer School, Ancona, The Marche, Italy

Details: s.oreficini@staff.univpm.it.

August 27-30, 2019, 12th International Whitehead Conference, University of Brasilia, Brazil.

Details at: <https://www.whitehead2019.org/>.

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

More information: EuroCogSci2019@rub.de.

September 9-12, 2019, xxxix National Congress of the Italian Society for the History of Physics and Astronomy (SISFA), Pisa

Details available [here](#).

September 19-21, 2019, Experimental Philosophy Conference, University of Bern, Switzerland.

More information available [here](#).

October 29-30, 2019, 'Scientific Literacy for All' Conference, Beijing Normal University, China.

More information available [here](#).

Email: bnukxts@126.com.

October 30 – November 1, 2019, Bucharest Colloquium in Early Modern Science, University of Bucharest.

Details: Ovidiu Babeş (ovidiu.babes@icub.unibuc.ro).

November 5-7, 2019, 'Values in Modelling and Decision Analyses', Society for Decision Making under Deep Uncertainty (DMDU), Delft University of Technology

Information available [here](#).

December 7-11, 2019, Philosophy of Education Society of Australasia (PESA) Annual Conference, University of Hong Kong.

More information: <https://pesa.org.au/conference>.

January 3-6, 2020, epISTEME 8, conference, Mumbai, India

Details available [here](#).

March 15-18, 2020, NARST Annual Conference, Portland OR, USA

More information available [here](#).