



*History and Philosophy of Technoscience*

# **THE PAST, PRESENT, AND FUTURE OF INTEGRATED HISTORY AND PHILOSOPHY OF SCIENCE**

Edited by

Emily Herring, Kevin Matthew Jones,  
Konstantin S. Kiprijanov and Laura M. Sellers



# **The Past, Present, and Future of Integrated History and Philosophy of Science**

Integrated History and Philosophy of Science (IHPS) is commonly understood as the study of science from a combined historical and philosophical perspective. Yet, since its gradual formation as a research field, the question of how to suitably integrate both perspectives remains open. This volume presents cutting edge research from junior IHPS scholars, and in doing so provides a snapshot of current developments within the field, explores the connection between IHPS and other academic disciplines, and demonstrates some of the topics that are attracting the attention of scholars who will help define the future of IHPS.

**Emily Herring, Kevin Matthew Jones, Konstantin S. Kiprijanov, and Laura M. Sellers** are postgraduate researchers based at the Centre for the History and Philosophy of Science at the University of Leeds.

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# Contents

<i>List of figures</i>	vii
<i>List of contributors</i>	viii
<i>Acknowledgements</i>	xii
Introduction	1
Origins, trends, methodologies and divisions – reflections on the past, present and future of iHPS: A keynote interview with Jon Hodge	7
<b>PART 1</b>	
<b>Problematising the relationship between history of science and philosophy of science</b>	17
1 Scientonomy: A bold new vision for an integrated history and philosophy of science GREGORY RUPIK	19
2 Understanding past research practice: A case for iHPS CATERINA SCHÜRCH	38
3 Narrative explanations in integrated History and Philosophy of Science CLAUDIA CRISTALLI	61
4 Is a normative historically oriented Philosophy of Science possible?: A new horizon for integrated History and Philosophy of Science (iHPS) EUGENIO PETROVICH	77
5 Historical epistemology and the ‘marriage’ between History and Philosophy of Science MATTEO VAGELLI	96

- 6 Obligation to judge or judging obligations: The integration of philosophy and science in Francophone Philosophy of Science 113  
MASSIMILIANO SIMONS

**PART 2**

**iHPS in practice 131**

- 7 Experimentalist as spectator: The phenomenology of early modern experimentalism 133  
MARK THOMAS YOUNG
- 8 Teleology: A case study in iHPS 150  
ANDREA GAMBAROTTO
- 9 The cybernetic origins of enactivism and computationalism 167  
JOE DEWHURST
- 10 Towards a mutually beneficial integration of History and Philosophy of Science: The case of Jean Perrin 186  
KLODIAN COKO
- 11 Revitalising a nineteenth century debate about life (which has been done to death): Or, how to live with historiographical pluralism 210  
ALEX AYLWARD
- 12 Between realism and constructivism: A sketch of pluralism for science education 228  
WONYONG PARK AND JINWOONG SONG

*Index* 248

# Figures

1.1	Dynamic method thesis	23
1.2	Relationship between new methods and new theories	27
1.3	Four laws of scientific change	28
1.4	Scientonomy workflow	30
2.1	Schematic representation of how past research practice can be analysed and explained in terms of research problems. Research actions are directed towards solving the problem, whereas the problem is determined by the scientists' resources, abilities, goals and norms. BArch, Bild 183-K1004-0002 / Helmut Schaar / CC-BY-SA 3.0.	43
4.1	Exemplary logic diagram: The exemplary logic in Science Policy discourse (left) and in Popperian normative historically oriented iHPS (right). The typical circularity of this logic is clear in the diagram. The upper area of the diagram concerns the History of Science, while the bottom part the Philosophy of Science.	89



# Contributors

**Alex Aylward** is currently working towards his PhD in the Centre for History and Philosophy of Science at the University of Leeds, UK. His research focuses upon the influential British statistician and geneticist R. A. Fisher (1890–1962), and in particular the writing and reception of his *The Genetical Theory of Natural Selection* (1930), considered by some to be the most important book on evolution since Charles Darwin's *Origin*. Alex's interests lie mainly in the history and philosophy of the biological sciences, but also extend to historiography, and the relations between history of science and philosophy of science.

**Klodian Coko's** research focuses on the historical emergence and development of scientific methods. He is currently a postdoctoral associate in the Rotman Institute of Philosophy, at the University of Western Ontario. He has previously been a postdoctoral fellow in the Edelstein Center for the History and Philosophy of Science, Technology and Medicine, at the Hebrew University of Jerusalem (2016–2017), and a predoctoral fellow at the Max Planck Institute for the History of Science (2014). In December 2015, he was awarded a PhD in History and Philosophy of Science from Indiana University Bloomington.

**Claudia Cristalli** is currently doing a PhD at UCL, London. Her thesis, 'The Philosophical Psychology of Charles S. Peirce', addresses a neglected aspect of Peirce's engagement with science and explores how Peirce's pragmatist philosophy shaped his inquiry in cognitive psychology. She recently published 'Experimental Psychology and the Practice of Logic' in the *European Journal of Pragmatism and American Philosophy*. Her interests include philosophy of science, philosophy of history, philosophy of science in practice, philosophy of the social sciences, feminist epistemology. Outside academia, Claudia's commitment to philosophy includes facilitating philosophical discussion and presenting philosophical topics at Stuart Low Trust Philosophy Forum.

**Joe Dewhurst** is currently a Postdoctoral Fellow at the Munich Center for Mathematical Philosophy, where he is working on developing a moderately perspectival account of mechanistic functions in biology and cognitive

science. He was awarded his PhD in 2017 from the University of Edinburgh, where his doctoral research looked at the relationship between common-sense intuitions and scientific theories in contemporary cognitive science. His other research interests include the philosophy of computation, philosophy of mind and cognition more generally, and the history of cognitive science.

**Andrea Gambarotto** completed a Cotutelle Doctoral Degree Program under the joint supervision of the Istituto Italiano di Scienze Umane (Florence) and the Institut d'histoire et de philosophie des sciences et des techniques (Paris). He is currently a post-doctoral researcher at the Université Catholique de Louvain, where he is developing a project on Hegel's 'philosophy of biology'.

**Emily Herring** studied philosophy at the Sorbonne and is now completing a PhD at the University of Leeds on the reception of French philosopher Henri Bergson's theories among British biologists.

**Jon Hodge** is Senior Fellow in History and Philosophy of Science at the University of Leeds. His books include *Origins and Species* (1991) and two volumes of papers, *Before and After Darwin: Origins, Species, Cosmogonies and Ontologies* (2008) and *Darwin Studies: A Theorist and His Theories in Their Contexts* (2008). Jon has also edited the *Routledge Companion to the History of Modern Science* (1996) with Geoffrey Cantor, John Christie and Roger Olby, and the *Cambridge Companion to Darwin* with Greg Radick (2nd edition, 2009).

**Kevin Matthew Jones** is a postgraduate researcher at the University of Leeds, researching topics within the history and philosophy of psychiatry, in particular attempts made to standardize psychiatric classification in the United Kingdom c.1800–1950. He has published on the history of psychiatric and psychological concepts, popular representations of psychiatric concepts, and the history of psychology. His most recent paper looked at intersections between psychiatry and psychology within the British Psychological Society's section on Medical Psychology, and the implications of its disappearance at the end of the 1950s. He has also written about music, and recently contributed a chapter to *Fight Your Own War: Power Electronics and Noise Culture*.

**Konstantin S. Kiprijanov** is a postgraduate researcher at the Centre for the History and Philosophy of Science, University of Leeds. His research focuses on the history and philosophy of chemistry, broadly construed. Konstantin's PhD thesis investigates the making of the modern chemical notation from an interdisciplinary and transnational perspective. Konstantin also has strong research interests in the epistemology of visual representations, Soviet science, and the role of communication practices in the making of scientific knowledge. His most recent article investigates the history of the so-called Belousov-Zhabotinsky reaction and its contribution to the nascent research field of nonlinear science.

**Wonyong Park** is a graduate student at the Department of Physics Education, Seoul National University, Korea, where he earned a bachelor's degree and was trained as a physics teacher. His research focuses on the intersection of history, philosophy, sociology of science and education theory, modern physics curriculum and science teacher education. His recent work on the implications of Goethe's natural philosophy for practical science education was published in the *Science & Education* journal. During his master's programme, he has received scholarships and research grants from Seoul National University and NARST International Committee.

**Eugenio Petrovich** is Research Fellow at the Department of Political Economy and Statistics of the University of Siena (Italy), where he is working on a research project on the impact of research evaluation exercises on the publication and citation habits of scientists. Previously, he was a PhD candidate at the Doctoral School in Philosophy and Human Sciences of the University of Milan (Italy). His research is at the interface between quantitative studies of science, philosophy of science, and science policy.

**Gregory Rupik** is a PhD candidate at the University of Toronto's Institute for the History and Philosophy of Science and Technology. He specializes in the history and philosophy of Romantic-era biology, and his dissertation tracks the influences of Romantic biology on contemporary shifts in evolution theory. Gregory has also worked closely with Hakob Barseghyan to establish and grow the community of scientonomy at the University of Toronto and is an editor for the peer-reviewed journal *Scientonomy*.

**Caterina Schürch** studied History of Science, Philosophy of Science, and Biology in Berne and Munich. She currently works at Ludwig-Maximilians-University's Department for History of Science on a dissertation concerned with cross-disciplinary research collaborations in the 1920s and 1930s.

**Laura M. Sellers** has a BA and MA in history and philosophy of science from the University of Leeds. She completed her PhD in 2018, also from the University of Leeds, which explored the impact of medicine and psychiatry on Victorian British convict prisons and sciences related to crime. Her research focuses on history of medicine, psychiatry, science, institutions, and crime. She currently works in museums and heritage.

**Massimiliano Simons** is an FWO PhD fellow at the Institute of Philosophy (HIW), KU Leuven. His main interests are situated in the sociology, history and philosophy of science, especially focusing upon recent shifts within contemporary life sciences such as metagenomics and synthetic biology. He has published on the philosophy of science and technology of Thomas Kuhn, Gaston Bachelard, Michel Serres and Bruno Latour.

**Jinwoong Song** is a Professor at the Department of Physics Education, Seoul National University, Korea. He took his BA in physics and MEd in science education at Seoul National University and received PhD in science

education at King's College London (1990). His research interests cover a wide range of topics in science education, including the contextual dimension of physics learning and teaching, informal science education, socio-scientific issues, science culture, history of science education, and linking history and philosophy of science to science education.

**Matteo Vagelli** holds a BA and an MA in philosophy from the University of Pisa. He obtained his PhD in philosophy from the Université Paris 1 Panthéon-Sorbonne and the Scuola Alti Studi Fondazione San Carlo. He has done research at the University of Chicago, the Goethe Universität Frankfurt am Main and the Centre Marc Bloch in Berlin. He coordinates the research network 'Epistémologie historique: history and methods of historical epistemology'. In 2017 he held the Chair 'Pensées françaises contemporaines' at the European University Viadrina (Frankfurt an der Oder) and he is currently a post-doc at the FMSH (Paris).

**Mark Thomas Young** is a PhD candidate in the philosophy department at the University of Bergen and is currently working on a dissertation in the History and Philosophy of Science. His research concerns scientific instruments, craft practices and tacit knowledge in the history of science, with a particular focus on the early modern period.

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# Introduction

In 2016–2017 the Centre for History and Philosophy of Science at the University of Leeds celebrated its 60th anniversary. Since 1956, the Centre has been one of the few institutions promoting the study of science from a combined historical and philosophical perspective (other such departments include the HPS departments in Cambridge, Indiana, and Pittsburgh, and the IHPST in Paris and Toronto, to name a few).<sup>1</sup> The editors of this volume viewed this anniversary as an opportunity to reflect on the legacy, the current state, and the future of Integrated History and Philosophy of Science (iHPS).

We decided to organise a conference with two main goals in mind. First, we wished to bring together researchers interested in the rich heritage of iHPS, the current issues that it faces and the new potentials for research that lie in wait. In the call for papers, we intentionally construed iHPS broadly, as the study of science from a combined historical and philosophical perspective, in order to be inclusive of a wide range of approaches and traditions (including those which do not label themselves iHPS, such as the historical epistemology tradition). Second, we wanted to offer better visibility to those who, like ourselves, were nearer the beginning of their career. We therefore explicitly aimed to showcase the works of early career iHPS scholars.

We received an overwhelming response to our initial call for papers. The high quality of the abstracts for presentations enabled us to host in January 2017 ‘The Past, Present and Future of iHPS: An International Postgraduate Forum’. Over the course of two days, early career researchers from across the world discussed theoretical ideas surrounding the relationship between the History of Science (HS) and the Philosophy of Science (PS), the fine texture of the case studies they were working on, the methodological specifics of their research, and a number of other topics. The keynotes, which were delivered by Chiara Ambrosio and Jon Hodge, took stock of the past and present conditions of iHPS, and were inspiring to the early career delegates interested in realising its future.

We have organised the volume into two main parts. The first part, ‘Problematising the Relationship Between History of Science and Philosophy of Science’, contains chapters emphasising and attempting to solve methodological problems to do with the relationship and the integration of history and philosophy

## 2 Introduction

of science. The second part, 'iHPS in Practice', showcases chapters which put the integrated approach into practice through various examples and case-studies.

Reflections about existing obstacles to the effective integration of HS and PS run through the first part of the volume. Several contributors note that there is a tension between the apparently incompatible approaches employed by HS and PS to study science, with the former supposedly taking on a descriptive approach to scientific thought, and the latter providing normative models for how science should develop. The chapters in this section attempt to resolve such tensions by proposing novel ways of thinking about the relationship between HS and PS.

In the first chapter of the volume, Greg Rupik outlines how scientonomy, an empirical science of science, provides an opportunity for a new method of integrating HS and PS. This centres on a general theory of scientific change first formulated by Hakob Barseghyan in his 2015 *The Laws of Scientific Change*. This approach seeks to combine PS and HS by proposing four laws that govern scientific change, and as such creating a metascience which can integrate HS and PS by bringing together the descriptive and normative approaches to the study of scientific development. Rupik argues then that HS and PS each provide the observational and theoretical components to this empirical meta-study of the study of science.

Caterina Schürch picks up on some of the problems the integration of HS and PS presents by asking whether iHPS is feasible and desirable, and considering both the arguments of those who see the project of iHPS fail, and the arguments of those who instead believe that history can provide insights into philosophical questions, and that philosophy can bolster historiographical analyses. Schürch argues that iHPS is the method of choice whenever we deal with metascientific problems that refer to interrelated philosophical and historiographical questions. A prime example of a research problem suited to iHPS is the issue of understanding past research practice. Schürch illustrates this point by confronting the historiographical work on the integration of physico-chemical and biological methods in the early decades of the twentieth century with some key assumptions of the new mechanical philosophy and argues that an integration of the two accounts would strengthen them both.

Claudia Cristalli addresses narrative-based explanations in the sciences, focusing on palaeontology and geology, the so-called historical sciences. She looks at how an integrated approach to narrative explanations is necessary to understand how this form of explanation functions. As in Rupik's chapter, Cristalli attempts to understand the ways in which scientific change occurs, and achieves this through an interrogation of the use of narrative to formulate and advance the research questions of these scientific disciplines. By carrying out a philosophical and historical analysis of the role of explanation in the historical sciences, Cristalli, with reference to the work of Hempel, Whewell and Pierce, claims that an integration of HS and PS is necessary in order to fully understand the role of narrative in the historical sciences. Cristalli concludes that this integrated approach can provide the beginnings of a narrative

interpretation of explanation that can be applied to fields other than the historical sciences, and can be used more generally by iHPS scholars.

Eugenio Petrovich uses an investigation of science policy to address what Richard Giere called the marriage between HS and PS, which is parsed out by asking whether it was a marriage of convenience or an intimate relationship. According to Petrovich, this question is as important as it was when Giere first posed the question in the 1960s, and this translates itself into the identity, goals, and theoretical basis of iHPS. The chapter frames Kuhnian, neo-positivist and Popperian approaches to HPS in a Hegelian dialectic that respectively represent a thesis, an antithesis and a synthesis, and it is the logic of Popper's approach that is present in the formulation of science policy. Petrovich provides a series of case examples which demonstrate this, and goes on to offer a research methodology which can provide a new synthesis of HS and PS.

Picking up on addressing Giere's metaphor of marriage to describe the relationship between HS and PS, Matteo Vagelli in Chapter 5 claims that this is a problem for Anglophone HPS, and that French historical epistemology can provide important solutions that can help the integration of the two. The work of some of the principal figures in historical epistemology, namely Gaston Bachelard and Georges Canguilhem, predates that of the historical turn that was signalled by the publication of Kuhn's work. Despite some interest in historical epistemology from the Anglophone world, it has often been understood as being a form of Science and Technology Studies (STS), and the unique formulation of the research programme has not properly been considered. More particularly, Vagelli contrasts the naturalising trend prevalent in certain areas of the Anglophone debate with the 'normative turn' instantiated by Bachelard and Canguilhem. In highlighting the important differences between STS and historical epistemology, Vagelli brings light to a poorly understood movement in Anglophone iHPS, which, given proper treatment, provides insight into an effective integration of HS and PS.

In the third of our trio of historical epistemologists, Massimiliano Simons builds upon the outline of historical epistemology provided by Matteo Vagelli in order to take up Imre Lakatos's famous play upon Kant's phrase in the *Critique of Pure Reason*: that HS is blind without PS, and PS is empty without HS. Simons reaffirms Lakatos's belief that empirical HS problems cannot be resolved without some recourse to PS, and that philosophical questions need some empirical data to provide a field for experiment. Focusing on the work of Bachelard, Simons argues that French historical epistemology can help us develop a finer grained understanding of what the relationship between HS and PS could and ought to be. Bachelard's work is important because it provides a methodological framework which prioritises the practice of science over the philosophy of science in attempts to understand how scientific research operates but at the same time is not afraid to make normative judgments about the ways in which scientific research ought to operate. This tradition still exists in the work of current French epistemologists, and Simons



#### 4 *Introduction*

show how this innovative method of integrating HS and PS is demonstrated in the work of Isabelle Stengers.

The chapters in the second section put the integrated approach into practice by presenting cases which, while often well-known in HS or PS scholarship, strongly benefit from being reevaluated from an iHPS perspective.

In the first chapter in the section, and the seventh in the volume, Mark Thomas Young draws upon the existential phenomenology of Martin Heidegger in order to investigate the relations between craft knowledge and the emergence of experimental research during the early modern period. Young calls into question the strong continuities that have been drawn between the two, and utilises Heidegger's ideas in order to understand how the development of decontextualised knowledge guided the development of experimental practice and theory by the Royal Society, and although feted as being a break with craft-based forms of knowledge, in fact played into an epistemological tradition that had existed within Western philosophy since antiquity. Young's chapter then seeks to provide a picture of iHPS that uses existential philosophy to provide a valuable insight into a historiographical debate from HPS, and thereby provides a powerful model for iHPS.

Andrea Gambarotto draws upon recent work carried out by Uljana Feest and Friedrich Steinle to provide a conceptual history of teleology. Feest and Steinle argue that iHPS has two tasks: first, it outlines the historical processes by which concepts of scientific thought are developed in order to demonstrate the evolution of scientific knowledge, and second, that it creates philosophies of science which provide a faithful treatment of the ways in which scientific practice is actually conducted. This is in contrast to the normative models of science that are often proposed by philosophers of science. Taking this lead, Gambarotto proposes a history of the concept of teleology that commences with the early modern conception centred around Cartesian mechanism, before harking back to Aristotelian thought in order to uncover an archive of theoretical alternatives to those that we have become accustomed to in the modern period. The final section of the chapter then provides a case study that outlines how Hegel drew upon the Aristotelian conception of teleology in order to demonstrate how the history of science can be employed in the service of the philosophy of science. In this way then, Gambarotto provides a model which enables conceptual histories and the history of ideas to provide fuller accounts of the concepts used by philosophers of science, providing modern examples of the related concept, purposiveness, from the work of the cyberneticists Humberto Maturana and Francisco Varela.

Picking up on this thread of the recent work in the history and philosophy of cybernetics, Joe Dewhurst provides a history of the cybernetic origins of enactivism and computationalism. Dewhurst seeks to question the preconceived notion that these two schools of thought are in opposition by carrying out a philosophical analysis informed by a historical charting of the origins of the two schools to the first order cybernetics developed by Norbert Wiener and a number of other individuals. Dewhurst claims that during this time, the notions of

biological homeostasis and neural computation were able to co-exist, but goes on to state that the two schools diverged due to the development of the enactivist notion of autonomy, which although having its roots in biological homeostasis, found its development through Maturana's autopoietic theory to the modern enactivism. In tracing this history, Dewhurst seeks to argue that the enactivist notion of autonomy is incompatible with computationalism if it is understood as a semantic phenomenon, and that by looking at the history of both schools, it is possible to reconcile these opposing philosophical schools.

Klodian Coko examines the well-studied but often misrepresented case of French physicist Jean Perrin's argument for molecular reality through the lens of a Hermeneutic-Historicist approach to the integration of HS and PS. This approach provides Coko with the framework to move beyond the conflicting philosophical interpretations of Perrin's work and to analyse and contextualise important structural elements of Perrin's argument, uncovering that it was based on the employment of the epistemic strategy of multiple determination. In addition, Perrin's case can be used to develop a conceptual framework for dealing with the structure and epistemic import of the multiple determination strategy in general. On the one hand, this conceptual framework can be used to understand the structure and epistemic import of other cases of multiple determination from past or current science. On the other hand, it can be enriched and further developed in contact with historical material. Coko therefore argues that a Historicist-Hermeneutic approach paves the way for a 'mutually beneficial' interaction between HS and PS.

The final two chapters tackle the issue of pluralism, in historiography and science education, respectively. Alex Aylward argues that when we possess several differing historical accounts of the same scientific episode, they are often viewed as 'competing'. The persistence of historiographic pluralism with respect to any particular case-study is usually conceived as an obstacle to be overcome in pursuit of the (one) 'true' historical account. Using a case study from the London Royal College of Surgeons he urges that we adjust our attitudes to pluralism in the History of Science, in response to lessons from the perspectivism movement in the Philosophy of Science. We should actively pluralise our historiographical perspectives upon particular scientific episodes, in the pursuit of greater completeness, along with a host of other historical and philosophical benefits.

Wonyong Park and Jinwoong Song's chapter concerns the relationship between science education and iHPS. Sparked by decades of scholarship in science studies, 'science as practice' has recently begun to attract growing attention from science educators, who find teaching 'the scientific method' to no longer be valid in school setting. Recent curricular reforms such as the US Next Generation Science Standards also support such a 'practice turn' by proclaiming the teaching of scientific practices as their key objective. Consequently, philosophers have come to notice that there rarely exists a single correct account which fully explains the entire natural phenomena, but more commonly found is a plurality of theories, models, and explanations that are often incompatible with one

## 6 *Introduction*

another. The authors therefore set out to make a case for using iHPS to rethink educational practices, by examining how realist forms of scientific pluralism illuminate the dilemma between realism and constructivism in science education.

With these twelve chapters, originally papers delivered by early career researchers at our conference, this volume intends to contribute to the further advancement of iHPS by providing a snapshot of some of the most recent developments in iHPS scholarship and gesturing optimistically toward its future.

### **Note**

- 1 Although iHPS has been relatively recently established as an institutionalized field of research, at Leeds and beyond, one could trace the origins of the integration of historical and philosophical considerations about the study of nature as far back as Aristotle. This prehistory of iHPS is explored in the preface to this volume, which is comprised of an interview with the first of our keynote speakers, Dr. Jon Hodge, who is a long-time fixture within the Centre for the History and Philosophy of Science at the University of Leeds.

# **Origins, trends, methodologies and divisions – reflections on the past, present and future of iHPS: A keynote interview with Jon Hodge**

Before the iHPS forum the editors sat down to chat with Emeritus Fellow Dr Jon Hodge who has been based in the Division, later Centre, for HPS since 1974. Jon still offers insights to many students passing through Leeds and offered his thoughts on the past, present and future of iHPS for the forum. This interview was presented as a keynote at the forum and what follows below are revised excerpts from the conversation he had with the editors of this volume.

## **0.1 The origins of IHPS**

### ***0.1.1 Prefatory warnings***

Four comments in advance: first, I am often drawing on unreliable memories here, memories sometimes tracing to rumours and gossip; second, while I have some credentials as a professional historian of science, my philosophical and social studies credentials are amateurish; third, I have long been aware that the relation between history and philosophy of science has been a disputed topic discussed by such people as Larry Laudan and Ron Giere: but I have only very recently learned about the current issues associated with the labels ‘hyphenated HPS’ and ‘integrated HPS’, and addressed in publications by Hasok Chang and others and taken up at our conference. Finally, let me take this chance to thank the conference team for giving me this interview opportunity and for valued help in revising the original transcript.

### ***0.1.2 What were the origins of the field, when and why did it come about as a field, and could you then discuss some of the reasons why this occurred specifically in Leeds?***

Those are challenging questions. You used the word ‘field’, and I think that that is appropriately vague. If we ask when did hyphenated HPS become a profession, then we’d be talking really about the last fifty or sixty years; that is when there were first standard ways to get trained in hyphenated HPS, that is when there have been programmes officially devoted to its studies and hirings in it; and you might say that another word comes into play here, the word

‘discipline’; for yes, we’ve had a discipline of hyphenated HPS for the last fifty, sixty, seventy years; but in a broad sense, as a topic rather than a field or a discipline, hyphenated HPS goes a long way back; you can make a good case for Aristotle doing hyphenated HPS, for when he gets into a number of questions about science, he asks what are the opinions of the many and the wise, and how long have various beliefs been held and by whom and for what reasons and so how much credence to give them and so on.

When people became self-conscious about modernity, around the time of Isaac Newton, a famous controversy broke out between the ancients and moderns, that ushered in another way of integrating the history and philosophy of science; because people had theories about how progress takes place in the sciences, and they wanted to say that there had been progress in the modern age, progress beyond where the ancients left things.

Then you fast forward again to the 1830s and you have Auguste Comte in France and William Whewell in this country [the UK], who were really developing general theories of change and progress and reinforcing those by drawing upon philosophical resources. Very strikingly, Comte seems to draw upon English and Scottish resources, John Locke, Francis Bacon and David Hume; while Whewell, although he certainly draws upon Bacon, draws more than anyone else upon Immanuel Kant.

In so far as Whewell has been a father for HPS in the English-speaking world, he’s been a German father; whereas Comte, the father of a lot of *épistémologie de la vie* in France, was more English and Scottish. So, the nationalistic issues surrounding the origins and boundaries of iHPS (integrated or hyphenated HPS) are complicated.

So, it’s probably generally agreed that hyphenated HPS was not recognised as an academic specialty, discipline and professional category, in the English-speaking world at least, until the 1950s. And it was mostly understood as drawing on Germanic philosophical inspiration, especially Hegel and Kant (and the later Wittgenstein) and in its Hegelian and Kantian alignment it was seen to be in opposition to the dominant analytic philosophy of science, logical positivism.

### ***0.1.3 What were the origins of iHPS in Leeds?***

It helps here to focus on four people: Mary Hesse, a Protestant Christian mathematician – she was in our maths department in the 1950s; Ted Caldin – a Roman Catholic chemist; and Stephen Toulmin, a boy wonder, who had studied at the feet of Ludwig Wittgenstein during Wittgenstein’s later years. (Wittgenstein, rumour has it, only had a chair for himself in his room; his students had to sit on the floor at his feet.) At Leeds too, there was Peter Alexander who was a historian of philosophy, particularly of Locke, and who was fascinated by Locke’s debts to Robert Boyle and the new mechanical philosophy of the seventeenth century. Lately I have been reading a marvellous book on the history of atomism from Democritus to Newton by his protegee Andrew Pyle

Together, these four people lobbied to get HPS going, and it was given a home right here in this department in Leeds presumably because Toulmin was head of the department at that time ...

#### ***0.1.4 On first arriving at Leeds HPS...***

Geoffrey Cantor and I came just after the ‘Golden Age’, and the Golden Age people were really a hard collective act to follow: especially Charles Webster, Ted Maguire, Maurice Crosland, Charles Schmitt, Piyo Rattansi; they were all at Leeds in the years before 1974 – which is about when Geoffrey and I arrived. And they had gone off to various prominent positions around the world; but, notoriously, there was one not so good thing about those golden years: there had been factions, I’m sorry to report; there was a polarisation and the gossip was that if the Leeds group were in the pub, then there were two tables (I won’t name names), such were the divisions.

But peace had broken out when Geoffrey and I arrived, not because we were peacemakers, but because some of the more divisive folk had gone. There was a real ideological issue in their divisions. One cluster was very much for historical scholarship, and the other cluster wanted to be politically engaged, and take up green issues and issues about freedom and oppression in scientific life and so on. But, as I say, that division did lessen, and peace is still with us, I am glad to report. The other point I would make is that the operation was in the mid-seventies very small; there were only very few students and a handful of postgraduates at any one time. As for teachers there were Jerry Ravetz, Geoffrey Cantor, Bob Olby, John Christie and me: just a team of five, whereas the number today would be twelve or fifteen – there has been a huge increase. Then when Jerry retired, we were down to four people and were so when we collaborated in producing what we called the ‘Leeds Companion’ to the history of modern science. So, this expansion, in the last twenty years, is hugely welcomed by people like myself who can remember those pinched and struggling years.

#### ***0.1.5 Can you tell us about the balance between History of Science and Philosophy of Science in Leeds HPS?***

The programme at Leeds got off to a rather lop-sided start. It’s probably true to say that Steven French was the first fully qualified philosopher of science to teach HPS at Leeds: prior to that, philosophy of science was taught to undergraduates, but it was taught by historians like myself who were amateurs and self-taught and were not doing research in philosophy of science. And it is good to see that the balance is better now, even Stevens – sorry for the joke; and it’s been made even more even, now that Ellen Clarke has arrived, a specialist philosopher of biology whose first encounter with her special field was probably as an undergraduate at Leeds in an amateurish course of mine.

## 0.2 Trends in iHPS

### 0.2.1 *Do you think there are trends in iHPS?*

Trend is a good word, because it has a serious meaning, and we know that there are trends. But it also has a slightly derogatory meaning, where to say that someone is being trendy is a bit of a put down. I was once told that trends in HPS last around eight years, but of course, some, not always the best ones, last quite a lot longer than that.

I'll give you an example of a trend: twenty or thirty years ago, people started talking about the body, and there was a volume of essays put out on science incarnate, a volume all to do about how the bodies of scientists influenced their practices, and obvious examples. Dalton was red-green colour blind, and maybe this makes a difference to the way that he did science. I think that body-language trend burned itself out in around eight years, and now it sounds rather old fashioned to talk about the body. The language came much more from history of science than philosophy of science: people talked a lot about the *body politic* in the 1970s and body talk became fashionable in a number of areas, and I think that this is a fashion or a trend that has gone; it was useful in its day.

I would say the biggest long-run trend that I have witnessed, is the decline and fall of positivism in the English-speaking world. Of course, the foremost form of positivism that was dominant in the English-speaking world was logical positivism, Vienna circle positivism, that really was very dominant in the 1950s: it dominated in the philosophy of science and was influential in the history of science. Logical positivism was analytic philosophy of science and had arisen partly as part of the Gottlob Frege-inspired analytic swing away from late nineteenth century Hegel-dominated idealist philosophy.

A leading logical positivist was Rudolph Carnap, one-time student of Frege. He once spent some time at Harvard; and, legend has it, when he arrived, Bernard Cohen did the decent thing as the main man there in the history of science and invited Carnap to give a talk in one of their History of Science seminars; and Carnap, who was one of the nicest guys ever, said spontaneously that he would be very happy to do that. Also, one of the most honest guys ever, a few days later he got in touch with Cohen and said that he should not have accepted the invitation because he had no interest in the history of science. And that was probably around the mid-50s. Now, fast forward ten or fifteen years only, and almost no young philosopher of science would say that he or she had no interest in the history of science; and it is well known which Anglophone people were responsible for that shift: Stephen Toulmin, Thomas Kuhn, Russell Hanson, Paul Feyerabend, Imre Lakatos, and several others who intrigued and provoked logical positivist philosophers, and gave them something new to think about. Most of these historicist HPS pioneers had of course done important historical case studies and had theories about the long run of progress and change in science, and it quite quickly became widely thought that it was a

weakness of logical positivism as a philosophy of science, and of analytic philosophy itself, that neither had much to say about progress and change, and those historical issues.

Even now, I find myself waging war against, if not logical positivist, but definitely broadly positivist views about Darwin, for example; and it was well said by Hilary Putnam that positivism is science's philosophy in that it is the philosophy that scientists love best. And that's no coincidence: it was designed in the nineteenth century to legitimate the new profession of science, and it does it in a very self-congratulatory way by holding that science has more authority and more scope than anything else. To put it crudely, as a positivist you could really claim that there is science and there is rubbish, and you are either doing one or the other. Only scientists should be judging and planning science, and that's music to scientists' ears and often leads to a very triumphalist, internalist and Whiggish history of science. I won't name names, but I would be prepared to say that there are a number of people of good reputation who are Darwin buffs and who are still listening if not dancing to that tune.

But of course, among professional philosophers of science, positivism in all its forms, including logical positivism, has simply not been a career option for decades now. There was reputedly a famous moment I think in the early seventies, when someone, Clark Glymour I believe, was accused at a philosophy of science meeting in the USA of being a logical positivist, and he stood up and announced that he was happy to be labelled a logical positivist, and the whole room rose and applauded, not because they thought it was a good thing, but because it was a gutsy move to make at the time.

So, yes, I would say that this movement away from logical positivism has been a very big trend and consequential change, as is evident from the attention now given by historians of the philosophy of science to the rise and fall of that whole way of thought.

### ***0.2.2 Do you think there are geographic and linguistic influences upon trends within iHPS?***

There's a way of looking at this question which is geographic and historical. I am prepared to say that after about 1800, all Western philosophy has been predominantly Germanic, and that includes Austrian. And so, what are the great divides? Well we are often told that there is a great divide between continental philosophy and analytic philosophy. In fact, insofar as that is a division, it really is one that exists within Germanic traditions. To put it in a nutshell, what we call continental philosophy looks more to Hegel and Friedrich Nietzsche than it does to Gottlob Frege and to Moritz Schlick. What we call analytic philosophy looks to this latter pair of figures. All those are Germanic names, and I'm sorry to say things which dent Anglophone self-respect and indeed French self-respect, but if you look at the big names of French philosophy, then they are all drawing massively on Hegel, Nietzsche, Husserl and Heidegger and so on, and throughout the last century in Paris



they have almost all agreed that they don't want to know about Frege and Schlick and Carnap, whereas in the Anglo world, Frege and Wittgenstein, another Germanic name, they are the fathers; and I would say that a big shift in the English speaking work is that it no longer costs you career points to have a copy of Nietzsche sticking out of your briefcase, as it would forty years ago, when I first started working in this department.

### **0.3 Different traditions and methods within iHPS**

#### ***0.3.1 What are your thoughts on iHPS's traditions?***

I've been impressed when looking at some of the recent literature on integrated HPS, that there is what I think is a very healthy pluralism. Let's take a book like Jean Gayon's book, *Darwin's Struggle for Survival*: Jean is the grandchild of Canguilhem, because intellectually he's a child of François Dagognet who was Georges Canguilhem's pupil. But I'm reliably informed that Imre Lakatos was a considerable influence on that book. Who was Lakatos? Well he was Popper's successor, and you could say that he was a Hungarian Popperian, but he was also a Hegelian due to his Hungarian education. And as a Hegelian he was very much a historicist; he was famous for saying that all theories are born refuted, and they need to get over those initial refutations, and that's how Jean tells the story of the theory of natural selection – that it was not a reasonable theory to accept in 1859, it only really becomes reasonable to accept it in the twentieth century: so then why did it survive until it could become acceptable, and why didn't it die in its first refuted form? The answer is that people thought it had promise, and they were working on refuting the refutations, but they only succeeded on refuting the refutations in the twentieth century.

Now that is an example of a historiographical-philosophical tradition, if you like, and a stance that is rather different from anything Whewell ever came up with, and anything that may have been done in the English-speaking world. Jean Gayon's stance is an interesting synthesis, if you like, of Lakatos's combination of Germanic Popperianism with a residual Hungarian-Germanic Hegelianism and the French tradition influenced by Canguilhem.

#### ***0.3.2 What do you think about methodologies within iHPS?***

I've struggled with this issue of methodology; I've not signed up with Feyerabend in being against method, but it's not a word I find myself applying to my own work, or the work of other historians, except in a very general way. I suppose two people could be said to differ in their method in integrated HPS, if one of them doesn't really talk about people, doesn't really talk about authors, doesn't really talk about actors, but talks about concepts and texts, whereas the other person does talk about authors and actors and so on. That's in a broad sense a methodological difference, a

matter of what you are going to let in to your account. And I'm on record as saying that I find the Canguilhemist tradition impoverished because it does not really allow for people, and institutions, and ideologies, to come into the story: in that tradition, the history of science is the history of concepts, that is the mantra. And if that's a method stance, then I must say I find it that's an impoverishing one.

More and more I've come to the feeling that if methods carry with them prohibitions, then I'm against those methods; it seems to me that one thing we learn from doing the history of science is that sooner or later we may need all sorts of things to come in. In understanding why high energy physics went the way it did in the 1950s in the US, then you have to take the Cold War into account, and if we are interested in why Darwin went on the *Beagle* voyage, we have to look at who paid for that voyage (ultimately the British national government) and what they were going to get out of it (informal imperialist and hegemonic commercial advantages). These are old fashioned, even vulgar Marxist questions, and none the worse for that; for if we just say that a Darwinian text came out of that voyage, then that's very impoverishing. Camille Limoges, when a young Canguilhemist, wrote a remarkable book called *Natural Selection, The Constitution of a Concept* in which he goes through Darwin's notebooks as though they weren't written by anyone in particular, and they are just there and you can just watch this concept being *constituted* towards the end of notebook D, and it has nothing to do with who Darwin was inspired by or talking with at the time, what his ambitions were and who he was trying to impress and who he was trying to discredit. In other words, it's history of science with the people left out. I don't like leaving the people out. So, I have disagreements with historians who are wary of including stories about influences and intentions in their histories of science, because I think influences and intentions and especially influences on intentions are what make people interesting and intelligible. It's like good journalism which tells you on Sunday why some politicians did something on Tuesday. They were influenced in certain ways and had certain ambitions and goals, and you realise this is beginning to make sense. To me, if we are trying to make sense not of what some politicians did a few days ago, but what some scientists did several hundred years ago, then again, we want to take the influences and intentions into account. Post-modernism and post-structuralism have taboos across those areas, just as analytic philosophy and behaviourism and eliminative materialism do.

### ***0.3.3 What are the relationships between methods within iHPS and other branches of history?***

We always have to remember that many historians of science work in history departments. I've worked in history departments, and there's quite a lot of pressure to recognise some of the traditions. For instance, in history departments that I was in in the 1960s and '70s, the *Annales* view of history was hugely influential, and Ferdinand Braudel was the master. And it was inspiring stuff: one took the

long run into account, and I found myself using that phrase, because I had been asking how did Western philosophy and science get from Plato to Darwin – that's a long run question. It's a question that philosophers might come up with, but this business of the long run is associated for historians with the *Annales* school of history rather than with any philosophical school.

There was of course a turn away from the long run of history during the 1970s and '80s. I remember once having lunch with a postgrad here and he was doing a study of nineteenth century Northern English natural history, and I reflected that he didn't seem to be interested in what social classes these people belonged to, and which social classes were losing, and which were winning power at this time. And he told me that his supervisor told him that he shouldn't be interested in those questions because those questions were looking unprofessional in the 1980s. They looked like the kind of things that were written about by retired journalists who wrote popular history, big picture stuff that had class interests included. I'd like to think that this professional stance is no longer influential, and that to look professional you don't need to be very narrowly focused and leaving out grand narratives and big pictures.

#### **0.4 Are there polarisations and divisions within iHPS?**

You could say that there is a contrast to be drawn within the history of science: some historians, when they've done their work, and it may not be deliberate, depict the authority of science as diminished, because science is shown to be subject to political or religious influences. To use the inevitable word, when these people have done the history of science, relativism is the bottom line. Of course, by contrast, we have people who are openly philosophically motivated, and wanting to say: 'No, you can immerse yourself in the history of science as a philosopher and still come out a realist and a confident progressive realist', insisting that we can really show that we really do know more about the world out there than they did in King Charles's or Queen Victoria's time.

There's no question that that's a polarisation, but I don't see that being acted out in the politicised way that went before. I remember a conversation in the early 1970s with a visitor to Pittsburgh, and we asked him why he was such an externalist – of course that was the buzzword then – and he said that we in the West are in a terrible perverse war in Vietnam, and he can't go there and demonstrate on the streets, but at least he is trying to discredit this deference to science which is a component of the ideological and military warfare that is being waged in Asia. It was a salutary moment: he was trying to make us internalists (and I was one at that time) look reactionary and in denial about big issues of liberty and humanity and so on across the world. I have never quite bought the argument, but I feel it is one worth bearing in mind, even if HPS people don't often get into these kinds of discussions these days.