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Division of Logic, Methodology and Philosophy of Science and Technology
of the *International Union of History and Philosophy of Science and Technology*

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Reflections by DLMPST Council members on the topics for the forums of debate at the European Humanities Conference 2021

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The International Council for Philosophy and Human Sciences (CIPHS) aims at repositioning the humanities in contemporary society. At the 2017 World Humanities Congress, the outcome document, *A New Humanities Agenda for the 21st Century*, called on higher education institutions to foster interdisciplinary collaboration with other domains of science and humanities research. It also called on CIPHS and its member organizations to promote the re-foundation of the epistemological framework of the humanities through interaction and convergence of different academic traditions, and to engage other fields of expertise in CIPHS, including the humanities dimension in all scientific research.

These are calls that resonate strongly with the International Union of History and Philosophy of Science and Technology (IUHPST). Representing the research fields of history and philosophy of science and technology, as well as research studying the foundations and methodology of science and technology in general, both divisions of the IUHPST are interdisciplinary in nature and work at fostering close links between the humanities, social sciences, and natural science and technology.

The 2021 European Humanities Conference held in Lisbon, Portugal under the auspice of CIPHS is focused on *European Humanities and Beyond*, and like the 2017 World Humanities congress it stresses the importance of interactions between academic traditions. Again, the IUHPST is keenly interested in facilitating close collaboration between history, philosophy and sociology of science and technology and the sciences studied. Collaboration between research *on* science and research *in* science can take many different forms. In one end of the spectrum, philosophers of science, historians of science and sociologists of science may develop their own fields of academic inquiry by engaging very closely with the people and communities that produce science in order to investigate their goals and tools as essential factors in understanding what science is and how it produces knowledge. In the other end of the spectrum, philosophers of science, historians of science and sociologists of science may contribute to advancing research in the sciences by interacting with practicing scientists in solving philosophical problems related to their practice.

Philosophical literacy as an element of scientific proficiency. One of the four themes of the European Humanities Conference addresses how classical and new humanities can be taught at all educational levels, and in a way that considers all disciplines as equally important and closely linked. As stressed in the background document, science education and humanities education depend strongly on each other and require a close dialogue across disciplinary borders.

During the second half of the 20th century, science education around the globe has gradually been broadened in its focus. Initially, it often had primarily an elitist focus on introducing key concepts and principles to those students who would have a future as scientists. But later, it has adopted a more general focus on the application of scientific knowledge in life situations in order to provide future citizens with a sufficient understanding of the nature of science, enable them to critically assess scientific matters of importance to their lives, and empower them to take decisions on issues related to science and technology.

Philosophy of science, history of science and sociology of science have been integral parts of this development and have come to serve as important means for improving scientific literacy. Historical accounts of how science has developed and still develop over time have come to serve as vehicles for engaging students by humanizing science and making it less abstract and more engaging, by displaying connections between topics and disciplines of science, and by counteracting scientism. Similarly, philosophical accounts of the nature of science have come to serve as vehicles for understanding both the strengths and the limits of scientific knowledge, and to recognize and discuss relations between science and values. These are important ingredients in empowering citizens to take informed decisions on socio-scientific issues and to make sense of science in their everyday life.

Most efforts have focused on K-12 education and on the education of science teachers. These remain important foci of attention, and they will continue to require close collaboration between philosophers of science, historians of science, sociologists of science and science educators. At a time in history where misinformation about science is effectively propagated through social media, strong commercial interests contribute to manufacturing doubt about scientific results, and misguided fear against scientific achievements such as vaccines can threaten the health and well-being of entire populations, the importance of continuing these efforts cannot be underestimated.

In addition, with the ever-growing importance of science in the 21st century, it is becoming increasingly important to draw on philosophy of science, history of science and sociology of science not only to strengthen the scientific literacy of the general population, but also to strengthen the reflective skills of scientific researchers, developers, advisors and administrators. In other words, to include literacy in philosophy of science, history of science and sociology of science as important elements of scientific proficiency.

This opens new avenues for broadening the education in philosophy of science, history of science and sociology of science in ways similar to what has happened in science education itself. In addition to continuing educating future specialists in history, philosophy and sociology of science, these disciplines studying science also have an important future role in developing a broader agenda of providing aspiring scientists with sufficient insight in philosophical, historical and sociological approaches to be able to use them for reflecting critically, argue confidently, and take informed positions on questions regarding the production and use of scientific knowledge.

Philosophy of science for the 21st century. Another theme of the European Humanities Conference concerns the humanities in the 21st century. The background document for the conference outline a number of important, future fields of inquiry for the humanities, including Environmental Humanities, Digital Humanities Biomedical Humanities, the Public Humanities. These future fields of inquiry all address developments that are closely linked to developments within science and technology.

When looking ahead into the 21st century, scientific knowledge will be a central element in education, policymaking and value orientation of societies around the globe. At the same time, science is continuously developing. This creates a continuous need for critical reflection on the changing nature, status and role of science in the 21st century.

During the 20th and into the 21st century, science has developed significantly in several ways. First, science has grown more and more collaborative. Many scientific results are now produced by groups in which scientists collaborate and combine their knowledge, workforce, materials or other resources. Second, science has grown increasingly interdisciplinary. Much research today cuts across

disciplinary boundaries and addresses complex problems that reach beyond what can be solved within traditional disciplines individually. Third, through an on-going scientification of practice, more and more areas of human life have become subjects for scientific investigation. Many areas of professional activity are today firmly based on scientific research. Fourth, science is becoming increasingly data-intensive. More and more areas of scientific research adopt methods from computer science, statistics and mathematics.

These developments raise a multitude of new issues for philosophy of science, history of science and sociology of science to explore. Many traditional topics from history, philosophy and sociology of science also need to be continuously revisited as science develops. We will need to revisit questions such as whom to hold responsible for the integrity of a scientific result when it has been produced by several scholars together; how the quality of a scientific proposal can be assessed when it combines methods and theories from disciplines that hold different views about what constitute strong evidence or convincing explanations; or how to minimize bias when working with huge amounts of data established for a multitude of purposes.

In summary, philosophy of science, history of science, and sociology of science are academic fields of investigation that provide important reflections on how science develops over time, on the practices by which scientific knowledge is created, and on the questions that arise in the application of scientific results. Philosophers of science, historians of science and sociologists of science therefore have important roles in engaging in and contributing to current debates on the role and status of science in society, and in contributing to conveying nuanced views on the nature of science to fellow citizens, now and in the future.



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In these times of crisis and conflict, as well as resulting economic limitations within the academy and beyond, people increasingly are questioning the influence and impact of the humanities on society, and tend to focus instead on the importance of medical, scientific, and technological fields which seem to make important and clear contributions to society. The philosophy of science is a central field within the humanities, and seeks to examine the foundations, methods, implications, as well as the diverse practices found within various scientific fields. In historic terms, much of science cannot be distinguished from natural philosophy, but in contemporary times many scientists and the general public tend to view various fields in the humanities including the philosophy of science as separate from and even opposed to science. However there are important roles that the philosophy of science can play and ways in which it can have considerable impacts both on the practice of science and more generally on society. This short contribution outlines some of the types of contributions and influences that philosophy of science can have, in order to assist others in recognising the important and productive role that it can play.

A key role that philosophy of science can play is promoting conceptual clarifications within science through close attention to the theories and practices within science. These can range from fostering reflection on key concepts, such as ‘model organism’ or ‘gene’ in biology, or on how various norms came to be established, such as measurements of temperature. Much of this work has occurred by close examination of episodes in the history of science, and indeed the fields of history and philosophy of science are closely linked, but considerable scholarship now explores current-day practices of science and hence can have direct impacts, which in turn can contribute to improvements in both the practice of science and the products that result from it.

A second contribution frequently made by the philosophy of science is to excavate and critique underlying assumptions within science. These may be blind spots or simply tacit agreements within scientific fields, or may be associated with particular favoured methods or techniques that prove to have

limitations or even be misleading. Such philosophical findings can lead to new directions within scientific fields by pointing out novel approaches to old problems, or even indicating where new problems in fact exist that previously have been unrecognised.

A long-standing set of debates within the philosophy of science explore what makes science distinctive, known formally as demarcation, and in particular why we should take the knowledge produced via science as reliable and useful for society. Much recent scholarship has stressed that there is considerable continuity between science and other human pursuits, and that its practices have been socially constructed, but such practices often share underlying logic in terms of how data are produced, how theories are generated, ways in which findings are made systematic and accepted by peers, and so on. Such contributions from the philosophy of science are more important than ever, given public scepticism about a range of science-related issues, perhaps most notably vaccines and climate change. Philosophical attention to what makes a scientific contribution to debates in controversial domains is extremely valuable and can provide tools to assist in distinguishing valid knowledge produced scientifically from fake news and alternative facts.

Values intersect with science in different ways, and in recent years there has been considerable focus in philosophy of science on the underlying values within various fields, particularly applied scientific fields. These range from the epistemic values that underlie and guide research practices to the cultural values inherent in certain fields and inculcated through training which in turn intersect with broader sociocultural values. Rather than promoting science as ‘value free,’ much work in recent philosophy of science has argued that values are a necessary part of the enterprise, but must be recognised and made transparent, particularly in applications of scientific knowledge, such as in policy decision-making. Perhaps most importantly, we need scientists to be aware of the values that frame their practices, particularly when they decide what problems to prioritize, where to direct resources, and so on.

A final contribution of the philosophy of science lies in its ability to contribute to dialogues between science and society through making debates over the above issues publicly visible. Other fields such as sociology of science, science and technology studies, and science communication no doubt also make important interventions. But philosophy of science is uniquely placed to partner with scientists so that they can reflect on their practices, and encourage them to engage with a range of stakeholders on how science should be done. Such questions are not technical choices about which theory is preferred or what type of equipment is better, but lie in the domain of socially responsible science, which must not only involve practicing in ways that are ethical but also that put public benefit at the centre and are constantly reflective about underlying values and concepts.

To conclude, we reflect on a quote from Albert Einstein: “A knowledge of the historic and philosophical background gives that kind of independence from prejudices of his generation from which most scientists are suffering. This independence created by philosophical insight is—in my opinion—the mark of distinction between a mere artisan or specialist and a real seeker after truth” (letter to Robert Thornton, 1944). Pace Einstein, this ideal of a philosophically (and historically) informed scientist is likely well beyond what most scientists are able to do, but developing more reflective practices in part by asking questions about how to do good science as raised by the philosophy of science is a critical endeavour that will both improve science itself and allow it to continue to produce knowledge and products that can benefit society.