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INTRODUCTION:

SCIENCE AND EXPERTISE IN MODERN SOCIETIES

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This new HoST volume—which this year celebrates its tenth anniversary since the publication of the first special issue in 2007—explores how scientists constructed their expertise and scientific authority in countries such as Greece, México, Portugal, and Spain. The five papers included in this HoST thematic issue combine the study of the scientific works done by engineers, biologists, physicists, naturalists, toxicologists or chemists jointly with their social, political and economic agenda.

Studies on experts have proved to be a very flourishing area in science studies during the last decades. These studies provide a rich framework to deal with a broad range of historical questions, such as the co-production of science and social world, the boundaries

between expert and lay communities, the circulation of practices, skills and objects, the sources of social trust and credibility, the role of experts in decision-making, and the regulation of issues related to science, medicine and technology. Most of this scholarship has been focused on Anglo-American contexts, but more recent research has introduced a new array of protagonists, sources, and questions in connection with other geographical contexts.¹ Recent works by the sociologists of science Harry Collins, and Robert Evans have contributed to revitalise the studies of expertise. In a very influential paper, they proposed a chronology (or “waves”) in the social studies of science and expertise. A first wave, between the 1940s and the 1960s, offered a heroic vision of scientists (identified by their academic degrees) with expert knowledge, and a positivist image of scientific activity. At those times, expert and scientist were employed as interchangeable words, assuming that science was linked to the epistemic values of truth, disinterest and objectivity. In a second stage (1960s–2000s), a new sociology of knowledge associated with the work of Thomas S. Kuhn offered a more critical view of science. Symmetric analyses of scientific controversies were introduced, and the barriers between experts and lay people became blurred. These works made possible a large number of empirical studies on the construction of expert knowledge in diverse social and cultural contexts. Writing in 2003, Collins and Evans cheered the emergence of a new (third) wave of science studies, which could circumvent the phantom of relativism, and confront the problems of extension and legitimation opened by the so-called socio-constructivists analyses during the 1980s and the 1990s. The main purpose of both authors was to offer a “normative theory of expertise” that could offer clues for the analysis of the legitimate sources of authority, trust and credibility of experts.²

In a subsequent publication, Collins and Evans offered a classification of experts (the so-called “periodic table of expertise”),

¹ See, for instance: Christelle Rabier ed., *Fields of Expertise : A Comparative History of Expert Procedures in Paris and London: 1600 to Present* (Newcastle: Cambridge Scholars Publishing, 2007); José Ramón Bertomeu-Sánchez and Stathis Arapostathis, “Experts and Peripheries: Ongoing Research and Future Challenges,” *Technology and Culture*, 2016, 57 (4): 951–65.

² Harry Collins; Robert Evans, “The Third Wave of Science Studies. Studies of Expertise and Experience,” *Social Studies of Science*, 2002, 32 (2): 235–296, on p. 235. For a critical view see: Christopher Hamlin, “Third wave science studies: Toward a History and Philosophy of Expertise?,” in *The Challenge of the Social and the Pressure of Practice, Science and Values Revisited*, eds. Martin Carrier, Don Howard, Janet Kourany, (Pittsburgh: University of Pittsburgh Press, 2008), 160–185.

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in which the role of tacit knowledge was crucial.³ For instance, “contributory expertise” was described as involving “internalization” of tacit knowledge and skills. They remarked that this form of expertise could be acquired either in academic education or by means of practical experience (or, in most cases, by both ways). While avoiding the expression “lay expertise”, due to its oxymoronic nature, they accepted the idea of experts without academic credentials (like the Cumbria sheep farmers in Brian Wynne’s famous study).⁴ Another type of expertise included in their periodic table was “referred expertise,” which implied the ability to move at ease throughout different domains of science, that is, for instance, the scientific and social skills acquired by leaders of scientific projects, whose contributions can just been related to a very particular part of topics at stake, or even in a related area Collins and Evans claimed that their most original contribution was the identification of “interactional expertise,” which involved just the “mastery of the language of a domain”, so acquiring the capacity for communicating with these groups and eventually mobilizing their theoretical resources for practical purposes.⁵

The “periodic table of expertise” is a good compass for exploring the world of experts. However, the ubiquitous presence and diverse role of experts in modern societies makes it very difficult to grasp their activities by means of a fixed typology. Many studies have portrayed the broad spectrum of roles played by experts in issues such as public health issues, criminal investigation, nuclear disarmament, food quality and food adulteration, pollution control, climate change, patent litigation, transport infrastructure, chemical industry regulation, risk management or international standards. Just limited to the legal context, the scope of activities of experts in courts is wide when considering different local settings and historical periods.⁶ Historical studies have offered vivid portrayals

³ Harry Collins and Robert Evans, *Rethinking Expertise* (Chicago: University Press, 2007).

⁴ Brian Wynne, “Misunderstood Misunderstandings: Social Identities and Public Uptake of Science,” in *Misunderstanding Science? The Public Reconstruction of Science and Technology*, eds. Brian Wynne and Alan Irwin (Cambridge: University Press, 1996), 19–47.

⁵ For a very brief summary on the periodic table of expertise see: Harry Collins, *Are We All Scientific Experts Now?* (Cambridge: Polity Press, 2014).

⁶ Some recent works on the role of experts in STM history are: Ian Burney and N. Pemberton, eds. “Forensic Cultures,” *Studies in History and Philosophy of Biological and Biomedical Sciences*, 2013, 44 (1): 1-109; Wolfram Kaiser and Johan Schot, *Writing the Rules for Europe: Experts, Cartels and International Organizations* (London and New York: Palgrave, 2014); Soraya Boudia and Nathalie Jas, *Science and Politics in a Toxic World* (London: Berghahn Books, 2014). Stathis Arapostathis and Graeme

of experts captured by industry or governments, but also examples of productive engagements of academic experts with activists and victims, so offering priceless advice in the pursuit of criminal, occupational or environmental justice. Expert reports could bolster lay resistance to industrial hazards, while in other cases contributing to naturalise the interests of governments and corporations by neglecting hazards and damages. In other situations, “expert-activists” could help to gather relevant epidemiological data or health registers, to deconstruct forms of “disinterested science.” Or they can translate esoteric and highly specialised literature into socially-robust knowledge, which could support the victims or produce new forms of regulation. In these examples, the role of experts is often constrained by striking inequalities in political and economic power of the different stakeholders. These polychromic situations challenge any attempt at classification and encourage comparative analysis by means of collaborative work.⁷

Following this trend, the five papers included in this special issue contribute to enlarge the range of studies on experts with new contexts, actors and historical sources. They cover the interval between the mid-nineteenth century and the late-twentieth century, a period so crucial for the shaping of new ways of expertise, and the redefinition of the relationship between politics, science and society. The authors deal with a diverse group of experts, each of them working in different areas, and with peculiar strategies of legitimisation. Their activities were developed in many different spaces, from private companies, international committees or natural history museums to legal courts, universities and chemical laboratories. By adopting different strategies, experts managed to connect different spaces attending diverse purposes. Social trust and credibility emerged not mainly from academic publications or research activities, but mostly from interactions between experts and stakeholders, politicians, public health officials, etc. The political and social contexts under review are also diverse: the shaping of liberal ideology in mid-nineteenth-century Spain; the

Gooday, *Patently Contestable. Electrical Technologies and Inventor Identities on Trial in Britain*, (Cambridge: MIT Press, 2013). Other works focused on the relationship between experts and law are: Al Golan, *Laws of Man and Laws of Nature: A History of Scientific Expert Testimony* (Cambridge: Harvard University Press, 2004). Katherine Watson, *Forensic Medicine in Western Society: A History* (London: Routledge, 2011); José R. Bertomeu-Sánchez, *La verdad sobre el caso Lafarge: Ciencia, justicia y ley en el siglo XIX* (Barcelona: El Serbal, 2015).

⁷ For a recent review of current historical literature on these issues, see José R. Bertomeu-Sánchez and Ximo Guillem-Llobat, “Following Poisons in Society and Culture (1800–2000): a review of current literature,” *Actes de la Societat Catalana d’Història de la Ciència i de la Tècnica*, 2016, 9: 09–36.

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colonial debates related to the Berlin conference (1884–1885) in Portugal; the establishment of new international relations after the World War II in México; and the long persistence of fascist governments in Greece. The five papers have been organized in inverse chronological order, starting with a study on the second-half of the twentieth century and finishing with a scientific family of experts from the 1830s.

The first paper by Stathis Arapostathis is an example of the impact of recent history in the European landscape. He reviews the socio-technical context of the massive introduction of fertilisers in post-World War II Greece. Experts and scientists were not only advisors or mediators of such process, but also active promoters of the use of fertilisers, which eventually caused negative environmental consequences in the ensuing decades. His work is related to other studies on the exploitation of natural commons to maximize the profits. It is also linked to recent studies on environmental history during fascist regimes, in which technology, and science notably reshaped rural landscapes, usually with deep harmful long-term consequences.⁸ In the Greek case, the government encouraged the use of chemicals, and stimulated the creation of a monopoly in the fertiliser industry. The industrial sector created their own research institutes, in which agronomists, and chemists carried out scientific works as well as propaganda activities, some of them associated with the Marshall project. Government intention of controlling Nature eventually resulted in environmental destruction, with both economic and social consequences. Arapostathis discusses these issues by analysing the role played by the Greek experts in the promotion of chemicals in agriculture, and their later efforts for rationalising the use of such products fitting new standards and regulations.

The construction of international standards is also analysed in the second paper by Adriana Minor and Joel Vargas. Their study shows how some Mexican experts were not just agents appropriating foreign knowledge, but also co-producers of substantial and innovative research. They consider the biography of Francisco de Paula Miranda (a nutrition expert), and Manuel Sandoval Vallarta (an expert in nuclear energy) to study how their scientific careers were constructed simultaneously in both Mexico and other countries (mainly the USA). Their paper considers Miranda and Sandoval as “scientist-diplomats,” namely scientists participating in

⁸ Tiago Saraiva, “Fascist Modernist Landscapes: Wheat, Dams, Forests, and the Making of the Portuguese New State,” *Environmental History*, 2016, 21: 1–22, on p. 16.

international conferences and regulatory committees as diplomatic representatives of their countries. Both experts were involved in the creation of new regulations and standards, the creation of advisory panels and the establishment of transnational scientific panels. Miranda, as well as Sandoval, conducted surveys, discussed standards, and evaluated risks in different committees of the United Nations after WWII. Their familiarity with such organisational structures (in most cases based on US models), as well as with the relevant international literature and the mastery of foreign languages, allowed them to mediate between the interests of the Mexican government, and the main goals pursued by international organisations. As a result, they had an intense international agenda, while being also authoritative voices within their own country, where they succeeded in obtaining prominent institutional positions.

The connexions between expertise and the international agenda are also explored in the paper by Catarina Madruga. She studies the pathway of a Portuguese zoologist, José Vicente Barbosa du Bocage, who graduated in medicine, but devoted his scientific career to natural history. She employs the typology suggested by Collins and Evans to analyse the different forms of expertise at the different stages of the career. In the first stages of his career, Bocage had certainly “contributory” and “interactional” expertise as a competent member of his discipline. He described new species, published in both Portuguese and French scientific journals, and maintained a sustained correspondence with many outstanding European colleagues, mainly professors, museum directors, and curators of natural history. Later, Bocage developed his idiosyncratic form of “referred expertise” by transferring his credibility as an expert in natural history to matters related to colonial issues in tune with the political agenda of Portugal.⁹ He transformed the museum from an academic space into a colonial institution where a wide variety of information was collected: natural history specimens, geographic information, and social and political data on African colonies. As Madruga highlights, Bocage was not alone in doing such work. He established and disciplined a network of collaborators, both in Portugal and in Africa with naturalists, and collectors of zoological, botanical and geological materials.¹⁰ The management of such an amount of varied information, jointly with his new positions as president of the

⁹ Collins, *Are We All Scientific Experts Now?*, p. 62.

¹⁰ David N. Livingstone, *Putting Science in its Place. Geographies of Scientific Knowledge* (Chicago: University of Chicago Press, 2003), p.16.

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Society of Geography of Lisbon, and Minister for Navy and Overseas, transformed Bocage into a key-figure in the co-construction of the colonial discourse on Africa by merging natural history, geographical and political knowledge. In this sense, Bocage can be also considered as a go-between, that is, an expert with the social virtue of connecting different contexts (universities, museums, nature, and politics) and spaces (Europe and Africa) in a critical period for the colonial history of Portugal.¹¹

Mar Cuenca-Lorente also deals with experts able to work in very different contexts. Her paper considers how the toxicologist Pere Mata contributed to consolidate such a discipline in Spain thanks to his participation in trials, the reform of medical studies and his publications. The diversity of works published by Mata, from specific handbooks to textbooks and novels, also became essential to promote toxicology by pointing out the advantages and uses of the new discipline. He also employed his publications to discipline new incomers to the field, and expand the audience of his writings. Moreover, he was very active in both academic and political contexts, with enough ability to apply his “referred expertise” in administrative issues such as the development of a medical curricula, the creation of a body of forensic doctors, and the establishment of new chairs of toxicology in Spanish universities. Cuenca-Lorente also reviews the problems and opportunities that experts in the periphery had to deal with during the nineteenth century. In that sense, her paper points out another relevant characteristic of experts: their claims concerning the exclusive control of practical skills and tacit knowledge. By using his outstanding academic position and his political connections, Pere Mata could convince the Spanish authorities that physicians specialised in toxicology were much more able to apply their scientific expertise (both theoretical and practical) in front of a judge than pharmacists and chemists, and eventually succeed in his objective of consolidating the disciplinary status of toxicology in mid-nineteenth century Spain.

The previous papers highlight that experts frequently employed their prestige and authority to create or expand scientific disciplines in local contexts. Ignacio Suay-Matallana studies a scientific family to show how family connexions are relevant ingredients in the making of scientific authority and social trust for experts. It also requires convincing to both, political and academic authorities, as

¹¹ Kapil Raj, “Go-Betweens, Travelers, and Cultural Translators,” in *Companion to the History of Science*, ed. Bernard Lightman (Chichester: Wiley-Blackwell, 2016), pp. 39–56.

well as the general public, about the virtues of the new discipline in order to obtain public recognition, support, funding, and institutional positions. Suay-Matallana compares the biographies of Antonio and José Casares, father and son, to show how kinship facilitated the achievement of many of their university positions, travels of learning, textbooks, and chemical analyses. Both chemists established deep family ties with the local power elites of Santiago de Compostela, and strong connections with the academic elites of Madrid. Thanks to this, their scientific works were facilitated, and they merged the scientific authority gained in the academic world with their recognition and trust obtained as experts in the public sphere.¹² They also succeed in the promotion of analytical chemistry as an academic discipline in Spain by creating new scientific spaces, textbooks, and curricula, while, in turn, they placed themselves, his pupils and collaborations in new positions and vacancies created in the discipline during several decades.

By dealing with different economic, political or industrial contexts, the five papers included in this volume offer clues for comparative analysis on relevant issues concerning experts and expertise: the intermingled problems of extension and legitimation of the group of experts, the blurry boundaries between technoscientific reasons and professional, political and economic interests, or the differences and similarities in the role of experts in totalitarian or democratic regimes. As the five articles of this monograph show, there was a positive feedback between political and academic networks in the making of the credibility of the experts. In the Portuguese and Spanish cases, the connections between academic and political settings were crucial for experts. Living in a world of weak academic institutions, experts strongly required the political support for their legitimation. The papers on the Mexican and Greek cases deal with the more recent period after WWII, when transnational economic and diplomatic interests created a more complex network of experts operating in different geographical scales. Scientific knowledge became increasingly interdisciplinary, and the traditional scientific credentials and academic hierarchies gave rise to other ways of experts' selection and new forms for constructing experts' credibility and therefore trust emerged. In some cases, local networks—and even family connections—were essential to promote academic careers or to obtain support for publications and travels of learning. In other cases, political positions also contributed to the consolidation of their scientific

¹² Graeme Gooday, "Liars, Experts, and Authorities," *History of Science*, 2008, 46(4): 431-456, on p. 450.

authority. The previous questions were commonly combined with the effort of the experts to attract the interest and support of the general public, which was essential to justify experts' activities, and to obtain more resources for themselves, their pupils or their discipline.

The five studies in this special issue show the value of connecting studies on experts with more general issues related to social and cultural history of science, technology and medicine. For instance, it offers a fresh perspective on scientific biographies, in which a wider spectrum of historical actors is critically examined. Such integration also provides new grounds for studying the circulation of knowledge in terms of cultural appropriation, social resistance and accommodation to local political and economic agendas. It also highlights the unequal exchanges of objects, practices and values amongst transnational areas while placing the historical focus on the "trading zones" amongst people from different geographical contexts and backgrounds, sometimes making claims on overlapping fields of expertise. Finally, a geographically decentred and fine-grained history of expertise encourages the analysis of social, political and economic factors inside science, providing an excellent opportunity to reflect historically on the increasing role of experts in decision-making processes in modern societies.