

# FOLLOWING POISONS IN SOCIETY AND CULTURE (1800-2000): A REVIEW OF CURRENT LITERATURE

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*Abstract: This paper offers an overview of recent historical studies on toxic products. First, we offer an introduction to the literature and the principal academic groups, describing the major trends in four different areas of scholarship: history of crime and forensic science, history of food quality and adulteration, history of occupational and public health, and environmental history. Second, we suggest avenues for future research by highlighting three meeting points: protagonists, spaces and proof. We also discuss some challenges of the historical narratives: the agency of human and non-human actors; the integration of material, human and environmental effects; and the combination of the socio-cultural analysis of historical cases with the current understanding of poisons. While avoiding the unforgivable sins of anachronism or, even worse, of technological determinism, we want to encourage historical narratives with a bearing on current affairs. This is the last point discussed in the final conclusions. We claim that the history of toxic products can raise long-term debates, decenter the current focus, look for hybrid and complex causations, deconstruct the technocratic discourse of experts, empower victims, question legal standpoints and received cultural constructs, or point out the difficulties of democratic decision-making processes in matters regarding toxic products, particularly in a world marked by an uneven distribution of power and risks. In this sense, we claim that a history of toxic products can*

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*create new links between historians and social movements, academic research and activism, while enlarging the opportunities for fostering the uses of history in policy-making. In order to follow this promising path, we argue the need of crossing disciplinary borders of the history of crime, the history of occupational health, and food and environmental history, while moving outside academia and engaging in public debates.*

*Keywords: History of crime, food history, environmental history, toxic products.*

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## 1. Introduction

Poisons inhabit the twilight zone between nature and culture. Every society and every age has experienced them. While having an indisputable materiality, the range of social uses and cultural meanings associated with poisons are contingent on and changing in time and space. Many poisons have been everyday materials employed for a wide spectrum of purposes: hunting, pesticides, drugs, coloring products, etc. They have also been employed as tools to perform criminal murders or political assassinations as well as for legally-accepted crimes (wars, death penalty, etc.). Their dramatic effects have captivated people and produced a broad range of cultural meanings and social metaphors. They are frightening ingredients in folk tales or fictional literature (from detective stories to more recent “true crime”). While arousing terror in some contexts, particular poisons may be regarded as harmless or even beneficial in other places or historical moments. Moreover, at a particular time and place, poisons can create public controversies concerning their effects, which are largely shaped by the interests, inequalities and capacity of agency of the different actors: experts, lawyers, judges, poisoners, victims, activists, employers or politicians.

Since ancient times poisons have also been objects of medical and scientific inquiry. Their effects have been expressed in terms of toxicity, contamination or pollution, overlapping with other medical concepts such as adulteration, infection or disease. They have been discussed in connection to physiology and pharmacology, food adulteration, hygiene and public health, occupational health and environmental science. These studies have analyzed poisons in different material and social spaces (workplaces, homes, industries, air, rivers, etc.). Historians have also showed the circulation of poisons on the local, regional and global scales. These circulations encouraged exchanges and interactions among legal, scientific, medical and popular cultures.

Putting the focus on poisons offers opportunities to understand these tensions and exchanges. Once released, poisons engage with nature and culture in very different ways, while destabilizing the borders between these categories. In other words, episodes of poisoning, as well as of contamination or pollution, are complex socio-material phenomena. These episodes have to be explained by a broad array of social, cultural, material, medical and environmental issues, whose relative importance depends on the episode at stake.

With this backdrop, this paper offers a brief overview of recent historical studies on toxic products. We have two main purposes in mind. First, we offer an introduction to the literature and the principal academic groups, describing the major trends in four different areas of scholarship: history of crime and forensic science, history of food quality and adulteration, history of occupational and public health, and environmental history. Second, we suggest avenues for future research by highlighting three meeting points: protagonists, spaces and proof. The resulting narratives have to face many challenges: dealing with the agency of human and non-human actors, the integration of material, human and environmental effects, and the combination of the socio-cultural analysis of historical cases with the current understanding of poisons. While avoiding the unforgivable sins of anachronism or, even worse, of technological determinism, we want to encourage historical narratives with a bearing on current affairs. This is the last point discussed in the final conclusions.<sup>1</sup>

## 2. Departures

The study of poisons has been a part of various historical traditions: history of crime, food history, history of occupational and public health, and environmental history. A material history of poisons can establish links between these different historiographical traditions.<sup>2</sup>

### Crime

One of the most influential master narratives in the history of poisons was written by the German toxicologist Louis Lewis (1850-1929) at the beginning of the twentieth century. In spite of his professional career, Lewis devoted many pages to cultural and political issues taken from ancient Greek and Latin literature.<sup>3</sup> Nineteenth-century toxicologists knew that poisons were far from being just objects of inquiry in medical culture. They were also protagonists in mythological and folk tales reflecting their varied social uses. Apart from hunting and human killing, numerous poisons were also used as drugs in many of the ancient

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1. We have discussed some of these topics in the Spring School "Living in a Toxic World (1800-2000)", Maó, Menorca, May 2015. See the special issue edited by Ximo Guillem-Llobat and José R. Bertomeu-Sánchez (eds.), "Living in a Toxic World," *Endeavour* 40, no. 2 (2016): 67-138, and papers in this volume. We are very grateful to all the participants in the meeting and the contributors to the special issues. We are also indebted to the comments and critical remarks of several colleagues who kindly read previous versions of this text: Judit Gil, Pilar Punter, Enrique Perdiguero, Jaume Sastre and Jaume Valentines.

2. Of course, there are many other areas in humanities in which poisons have been analyzed: policy studies, political ecology, gender studies, literary theory, sociology, etc. The review is mostly based on historical studies, particularly those around the four mentioned areas, which are perhaps the most flourishing fields of current historical scholarship on the topic. Our selection of toxic products is also limited. For instance, apart from some exceptions, we have excluded studies on history of nuclear risk, which is a well-defined area of research. See Soraya Boudia, "Global Regulation: Controlling and Accepting Radioactivity Risks", *History and Technology* 23 (2007): 389-406.

3. Louis Lewin, *Die Gifte in der Weltgeschichte* (Berlin: Springer, 1920).

medical traditions in Greece, China and India. These contrasting uses (for healing and for killing) are reflected in the ambiguities of the Greek word “pharmakon” (or “bish” in Indian medicine).<sup>4</sup> Other cultural images which can be tracked back to ancient times were also remarked by Lewis, for instance, the alleged connection between poisoning and women, a creative source of gendered images concerning crime.<sup>5</sup> Since ancient times, women have been accused of having privileged access to poisons and of having used them in both familiar and political crimes. Regardless the available historical record, some of these women (Locusta, Lucrecia Borgia, etc.) have become historical icons for poisoners, recreated in fictional literature for centuries. Writers have also connected poisons with some historical moments and places: the first decades of Roman Empire, the Italian Renaissance, the Papal States, etc.<sup>6</sup> Crimes of poisoning were commonly mentioned in the ancient legal corpus. At the end of the Middle Ages, poisoning trials involved a growing presence of medical experts in courts.<sup>7</sup> Historians of medicine have only paid attention to these trials in recent years. Old studies were focused on the growing academic literature on legal medicine since early modern times and the first experimental studies on poisons, closely related to the new animal experiments and studies on drugs during the late seventeenth and eighteenth centuries.<sup>8</sup>

Modern historical studies have been concentrated in the development of modern toxicology during the nineteenth century. Changes in criminal law, standards of proof and trial procedure carved out more room for experts in courts. Sparked by these favorable circumstances, a new literature on poisons emerged at the encounters of medicine, chemistry and law. Nineteenth-century toxicology was a science made for and in courts. Trials provided a flux of challenging problems and crucial data: autopsies, clinical data, analysis, etc. In courts, medical experts were compelled to present their results to lay people (judges, lawyers, jurors), so they employed many rhetorical resources, sometimes combining a plain (but authoritative) voice with dramatic visual effects and experiments. At the same time, national criminal laws shaped the role of experts and judges in trials (for instance, adversary vs. inquisitorial systems). In some cases, judges acted as gate-keepers limiting the

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4. Franck Collard, *Les Écrits sur les poisons* (Turnhout: Brepols, 2016). David Arnold, *Toxic Histories. Poison and Pollution in Modern India* (Cambridge: Cambridge University Press, 2016). Frédéric Obringer, *L'aconit et l'orpiment. Drogues et poisons en Chine ancienne et médiévale* (Paris: Fayard, 1997).

5. Lydie Bodiou, Frédéric Chauvaud and Myriam Soria (eds.), *Les vénéneuses. Figures d'empoisonneuses de l'Antiquité à nos jours* (Rennes: PUR, 2015).

6. Alessandro Pastore, *Veleno. Credenze, crimini, saperi nell'Italia moderna* (Bologna: Il Mulino, 2010).

7. Frank Collard, *Le crime de poison au Moyen Âge* (Paris: PUF, 2003). Franck Collard, *Pouvoir et poison: Histoire d'un crime politique de l'Antiquité à nos jours* (Paris: Seuil, 2007).

8. Esther Fischer-Homberger, *Medizin vor Gericht: Gerichtsmedizin von der Renaissance bis zur Aufklärung* (Bern: Huber, 1983). Andreas H. Maehle, *Drugs on Trial: Experimental Pharmacology and Therapeutic Innovation in the Eighteenth-Century* (Amsterdam: Rodopi, 1999).

range of knowledge to be admitted in courts. Diverse standards of evidence were required in expert reports, which were combined in different ways with other forms of evidence. Many historians have discussed these issues in terms of co-production of science and law.<sup>9</sup>

Narratives of technological progress have focused on the new methods of high-sensitivity analysis that were introduced during the 1830s, for instance the famous Marsh test for arsenic. Recent research has showed other aspects of these developments. While allowing the detection of minute quantities of poison, the new methods introduced new uncertainties and puzzling situations.<sup>10</sup> Between the 1830s and 1840s, many poisoning cases were detected and some toxicologists became celebrities thanks to their participation in famous poisoning trials.<sup>11</sup> A large and diverse group of experts on crime emerged in many parts of Europe. Their differences were striking in terms of backgrounds, occupation, professional organization, role in courts, salaries, learned literature, etc. A substantial change took place at the turn of the twentieth century, when a new forensic science emerged thanks to new forms of proof based on traces (such as fingerprints, blood stains, etc.), the focus on the crime scene (instead of on bodies) and the advent of scientific policing (in contrast to nineteenth-century forensic doctors). New types of experts and forms of expertise emerged in the twentieth-century courts.<sup>12</sup>

Along with studies on experts and expertise, the role of public opinion has been another dominating topic in historical studies on criminal poisoning.<sup>13</sup> Trials largely captivated the public attention and fueled public controversies in courts, academies and salons. The controversies involved a broad range of issues concerning criminal poisoning: chains of custody, standards of proof, the politics of expertise or even much more general topics related to science and law. The public debates encouraged new regulations on the control of poisons and a literary industry in the form of books and papers in the general press.<sup>14</sup>

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9. Sheila Jasanoff, *Science at the Bar: Law, Science, and Technology in America* (Cambridge: Harvard Univ. Press, 1995). Olivier Leclerc, *Le juge et l'expert. Contribution à l'étude des rapports entre le droit et la science* (Paris: Librairie générale de droit, 2005).

10. José Ramón Bertomeu Sánchez, "Managing Uncertainty in the Academy and the Courtroom: Normal Arsenic and Nineteenth-Century Toxicology", *Isis* 104, no. 2 (2013): 197-225.

11. José Ramón Bertomeu Sánchez and Agustí Nieto-Galan (eds.), *Chemistry, Medicine, and Crime: Mateu J. B. Orfila (1787-1851) and His Times* (Sagamore Beach: Science History Publications, 2006). Katherine Watson, *Poisoned Lives: English Poisoners and Their Victims* (London: Hambledon, 2004). Ian Burney, *Poison, Detection, and the Victorian Imagination* (Manchester: University Press, 2006). Mar Cuenca Lorente and José Ramón Bertomeu Sánchez, "El veneno de María Bonamat: juicios, peritos y crimen en la España del siglo XIX" (Universitat de València, 2015).

12. Ian Burney and Neil Pemberton, *Murder and the Making of English CSI* (Baltimore: Johns Hopkins University Press, 2016).

13. Ian Burney, *Poison, Detection, and the Victorian Imagination*. David Arnold, *Toxic Histories. Poison and Pollution in Modern India*.

14. José Ramón Bertomeu Sánchez, *La verdad sobre el caso Lafarge* (Barcelona: El Serbal, 2015).

Poison panics (as well as “food scares”,<sup>15</sup> “nuclear fears”<sup>16</sup> or “public health crises”<sup>17</sup>) also instigated new regulations on criminal poisons, food adulteration or environmental hazards. These panics conveyed much more than ideas about poisons, adulteration and pollution. They could produce riots against the political or colonial powers, or attacks against marginal groups (transformed into “scapegoats”), encouraging religious discrimination or xenophobia.<sup>18</sup> These social anxieties may also lie behind regulations and government actions. The wave of poisoning crimes during the 1830s and 1840s instigated new regulations on poison control in France and Britain by the middle of the nineteenth century. These laws attempted to address the social anxiety caused by the famous poison trials during these years, while assuring that poisons such as arsenic could be employed for agriculture or industry. Despite their link to important health problems, no regulations were introduced concerning workplace hazards or environmental pollution.<sup>19</sup>

As mentioned before, poisons are far from being a part of crime history alone. They were employed in everyday life, agriculture or industry. Arsenic, the “king of poisons” during the nineteenth-century, was employed as rat-poison, pesticide, drugs or in making wallpaper.<sup>20</sup> Moreover, many of the nineteenth-century experts worked in other activities such as food quality control and other forms of consulting for private and public institutions.<sup>21</sup> Therefore many of them were involved in trials related not only to criminal poisoning but also to food adulteration, public health or industrial hazards. The connections are clear in seminal journals such as the French *Annales d'hygiène publique et médecine légale*, which included both research papers and expert reports regarding criminal poisoning, food adulteration, occupational health and industrial pollution (and in some cases litigations concerning public health and dangers). In this and other publications, nineteenth-century hygienists adopted the old medical tradition connecting diseases, so-

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15. Madeleine Ferrières, *Histoire des peurs alimentaires. Du Moyen Age à l'aube du xx<sup>e</sup> siècle* (Paris: Seuil, 2002).

16. Spencer R. Weart, *The Rise of Nuclear Fear*. Cambridge: Harvard University Press, 2012.

17. Esteban Rodríguez Ocaña and Patrick Zylberman, “Improving Public Health amidst Crises. Introduction”, *Dynamis*: 28, (2008): 19-28.

18. David Arnold, *Toxic Histories. Poison and Pollution in Modern India*, chapters 3 and 4.

19. Peter Bartrip, “A ‘Pennurth of Arsenic for Rat Poison’: The Arsenic Act, 1851, and the Prevention of Secret Poisoning”, *Medical History* 36 (1992): 53-69.

20. James C. Whorton, *The Arsenic Century: How Victorian Britain Was Poisoned at Home, Work, and Play* (Oxford: University Press, 2010). Nathalie Jas, “Public Health and Pesticide Regulation in France before and after Silent Spring”, *History and Technology* 23, no. 4 (2007): 369-88. On the use of chemicals in nineteenth-century food coloring see Carolyn Cobbold (in this issue of *Actes*); see also the paper by Amélie Müller “Devilish Designs: The Wallpaper Industry and Arsenical Pigments in Britain, France and Germany, 1850-1900” (paper presented in the Mahon Conference “Living in a Toxic World”, 2014).

21. Katherine D. Watson, “The Chemist as Expert: The Consulting Career of Sir William Ramsay”, *Ambix* 42 (1995): 143-159.

cial conditions and environment.<sup>22</sup> The analytical tests employed in criminal trials for detecting poisons such as arsenic, mercury and lead were also adopted in the analysis of food or in industrial pollution. Like poisons, experts moved easily from one disciplinary area to another. For instance, public analysts (mostly in charge of food control) played an important role in the emergence of forensic science in England at the beginning of the twentieth century.<sup>23</sup>

By the end of the nineteenth century, in many European countries, public interests and state concerns moved increasingly from criminal poisoning to forms of poisoning associated with adulteration of foodstuffs and the impact of industry, agriculture and mining on air, water and soil. New actors captivated the public imagination. While never vanishing, the ancient trope of the female poisoner lost momentum with the advent of greedy food merchants and industrial polluters. At the same time, toxicology, once one of the most important areas in shaping nineteenth-century legal medicine, grew less significant in the context of the new culture of forensic sciences, which emerged at the beginning of the twentieth century. The problem of poisons and their control took on new cultural meanings and new stakeholders appeared (public health doctors, environmental activists, union trades, industry). However, as David Arnold argues in a recent book on India, many continuities could be pointed out between nineteenth-century poison scares and murder cases and more recent developments related to public health and environmental pollution. These connections and discontinuities have been scarcely studied, forming a *no man's land* at the borders of the different historical traditions discussed in this paper. While a new language of toxicity, adulteration, contamination and pollution emerged, many products, instruments and methods remained, sometimes moving from one disciplinary area to another. As Arnold remarks, "many of the same substances that perturbed nineteenth-century toxicology (arsenic, mercury and lead) resurfaced in a new era of human poisoning and environmental pollution in which individual culpability and criminal intent were less easily established".<sup>24</sup> Many of these products were detected in human food and mineral waters.

## Food

In the 1930s the school of the *Annales*, with Lucien Febvre and Marc Bloch at its forefront, and authors such as Adam Maurizio, Luigi Messedaglia, Jack Drummond and Anne Wilbraham were responsible for the first professional historical studies focused on food. And yet, it was only in the last half of the century when food history started to become institutional-

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22. Ann F. La Berge, *Mission and Method. The Early Nineteenth-Century French Public Health Movement* (Cambridge: University Press, 1992). Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick Britain, 1800-1854* (Cambridge: University Press, 1998).

23. Alison Adam, *A History of Forensic Science: British Beginnings in the Twentieth Century* (London: Routledge, 2015).

24. David Arnold, *Toxic Histories. Poison and Pollution in Modern India*, 174.

ized in some way.<sup>25</sup> The 1960s (with a clearly dominant economic history approach) and the 1980s (with its cultural turn and the growing presence of ethnographic perspectives) were key moments for food historiography. However, during most of this period, the issue on safety and quality was rather marginal, even when dealing with the late-nineteenth century, when adulteration became a major problem.<sup>26</sup>

Poisons and toxic products in general have not represented a central analytical category in food historiography. However, since the 1990s an increasing number of publications have dealt with this issue. Although still a small group inside food history, these new studies are definitely relevant for any historical approach to the study of toxicants. Food safety and quality were central issues in major publications by authors such as Jim Phillips, Michael French and Alessandro Stanziani.<sup>27</sup> However, since these authors were mainly involved in economic and business history, they tended to neglect (or to attribute a minor role to) medical and scientific aspects of toxicity and adulteration. Indeed, most of their work focused on controversies dealing with frauds.

These debates on fraud were usually considered in economic terms, rather than regarding their impact on health; although the rhetoric used by historical actors could be hugely misleading and point to “health” problems. For instance, laws banning the use of saccharin or of margarine could be addressed to the public health interest but once historians had delved into the terms of many of these controversies, it became obvious that the main motivation involved commercial competition.<sup>28</sup> However, despite the relevance of the economic perspective, several authors have addressed issues related to the history of medicine, science and technology.<sup>29</sup>

25. John Super, “Food and History”, *Journal of Social History* 36, 2002: 165-178. Emma Spary, “Ways with Food”, *Journal of Contemporary History* 40 (2005): 763-771. Priscilla Ferguson, “Eating Orders: Markets, Menus, and Meals”, *Journal of Modern History* 77 (2005): 679-700. Peter Scholliers, “Twenty-Five Years of Studying un Phénomène Social Total”, *Food, Culture and Society: An International Journal of Multidisciplinary Research* 10 (2007): 449-471. Maria de los Ángeles Pérez Samper, “La historia de la alimentación”, *Chronica Nova* 35 (2009): 105-162. Jorge Uria, “Una nueva historia de la alimentación”, *Historia Contemporánea* 48 (2014): 33-69.

26. Ximo Guillem-Llobat, “Historia de la alimentación: contribuciones y oportunidades de los estudios sobre seguridad y calidad”, *Ayer* 101 (2016): 269-282.

27. Although they have published a huge amount of articles and book chapters, their two main publications on food quality have been: Alessandro Stanziani, *Histoire de la qualité alimentaire (xix<sup>e</sup>-xx<sup>e</sup> siècle)* (Paris: Éditions du Seuil, 2005) and Michael French and Jim Phillips, *Cheated Not Poisoned? Food Regulation in the United Kingdom, 1875-1938* (Manchester: Manchester University Press).

28. Alessandro Stanziani, *Histoire de la qualité alimentaire (xix<sup>e</sup>-xx<sup>e</sup> siècle)* (Paris: Éditions du Seuil, 2005). Ximo Guillem-Llobat, “The Sugar Industry, Political Authorities, and Scientific Institutions in the Regulation of Saccharin: Valencia (1888-1939)”, *Annals of Science* 68 (2011): 401-424.

29. Christopher Hamlin, *A Science of Impurity: Water Analysis in Nineteenth Century Britain* (Berkeley: University of California Press, 1990). Anne Hardy, *Salmonella Infections, Networks of Knowledge and Public Health in Britain, 1880-1975* (Oxford: OUP, 2015). Peter Atkins, *Liquid Materialities: A History of Milk, Science and the Law (Critical Food Studies)* (Farnham: Ashgate, 2010).



In spite of these limitations, food history has contributed to the study of toxicants in several ways. It has identified transitions in food regulations, which may be deemed a valuable contribution when considering the “context” in the narratives dealing with the regulation of toxicants. The analyses of the change from “perishability” to “toxicity” after the introduction of preservatives and chemical dyes in the nineteenth century,<sup>30</sup> as well as those concerning the transition from chemical to bacteriological risk in food consumption during the 1930s,<sup>31</sup> stand as good examples of this contribution. Additionally, it should be noted that many new regulations were promulgated between the late-nineteenth and early-twentieth centuries and food historians have analyzed the drafting and implementation of these laws. They have dealt in detail with national legislation as well as with the attempts to reach international agreements on food safety and quality controls.<sup>32</sup>

In analyzing food safety controversies and regulations, historians have usually focused on the nineteenth and twentieth centuries. In these periods, food systems experienced unprecedented changes which raised new risks and led to the establishment of a new frame of regulation that still exists.<sup>33</sup> Food fraud, as other frauds, became so ubiquitous in the nineteenth century that some contemporaries, such as Paul Lafargue, even affirmed that this period would be remembered as the “Age of Falsification”.<sup>34</sup> Adulterations of all kinds, including noxious or toxic ones, were then especially common in food consumed by the working class. However, food risks or scares have existed throughout history and several authors have successfully tackled this issue from a *longue durée* perspective.<sup>35</sup>

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30. Alessandro Stanziani, “Defining ‘Natural Product’ between Public Health and Business, 17th to 21st Centuries”, *Appetite* 51 (2008): 15-17.

31. Anne Hardy, *Salmonella Infections, Networks of Knowledge and Public Health in Britain, 1880-1975* (Oxford: OUP, 2015).

32. Authors such as Alessandro Stanziani and Pierre-Antoine Dessaux have analyzed the French food laws of the late-nineteenth and early twentieth centuries and several of these rules even have as their main object the study of collective books such as that edited by DGCCRF in 2007 and entitled *La loi du 1er août 1905 ; cent ans de protection des consommateurs*. The main U.S. law of that period was analyzed by James Harvey Young in *Pure Food: Securing the Federal Food and Drugs Act of 1906* (Princeton: Princeton University Press, 1989). Comparative international approaches can be found in papers such as: Kari Tove Elvbakken, Per Lægreid and Lise Hellebø Rykkja, “Regulation for Safe Food: A Comparison of Five European Countries”, *Scandinavian Political Studies* 31 (2008): 125-148. And for the search for international agreements see: Ximo Guillem-Llobat, “The Search for International Food Safety Regulation. From the Commission internationale pour la répression des falsifications to the Société universelle de la Croix Blanche (1879-1909)”, *Social History of Medicine* 27 (2014): 419-439.

33. Kari Tove Elvbakken, Per Lægreid and Lise Hellebø Rykkja, “Regulation for Safe Food: A Comparison of Five European Countries”, *Scandinavian Political Studies* 31 (2008): 125-148.

34. Paul Lafargue, *Le droit à la paresse : réfutation du droit au travail de 1848* (Paris: Henry Oriol, 1883). See Gérard Béaur, Hubert Bonin, Claire Lemercier (eds.) *Fraude, contrefaçon et contrebande, de l'Antiquité à nos jours* (Geneva: Librairie Droz, 2006).

35. Madeleine Ferrières, *Histoire des peurs alimentaires : du Moyen Âge à l'aube du xx<sup>e</sup> siècle* (Paris: Éditions du Seuil, 2002).

Historical studies on food safety have focused on specific laws, foodstuffs, additives and bacterial contaminations. Historians have also discussed specific agents, laboratories and methods of detection. As stated in the previous section, the changes taking place in the nineteenth century in toxicology and criminal prosecution also affected food regulation. Many connections existed in terms of academic literature (poisons and adulterations were discussed in common journals and textbooks), experts (of both crime and food quality) and sites (academies and courts, for instance). Other sites, such as municipal laboratories, were crucial for food regulation but unrelated to criminal justice.<sup>36</sup> Many other differences can be remarked, including the different historical narratives produced on poisoning crime and ordinary adulterations, and how crime and food historiography have evolved.

As mentioned above, authors such as Alessandro Stanziani have linked the regulation of food in the “Age of Falsification” to the ambitions of industrialists who wanted to control the innovative process.<sup>37</sup> Decision-making was largely dominated by economic interests, particularly the competition among different producers, distributors and retailers. In this context, the regulation of toxic adulterations occupied a minor position among the numerous initiatives undertaken in food control. Trials were only related to some of these minor cases, so they played a minor role in the history (and historiography) of food adulterations, in sharp contrast to the studies reviewed in the previous section.

Another important difference that could explain the lack of further connections between crime and food history narratives is the one that concerns the way in which experts were involved. Food fraud was usually tackled through administrative rather than criminal law. In this case, experts did their analysis in order to evaluate the presence of substances regulated under the law. The noxious nature of these substances could have been contested at the time but the experts were not asked to contribute to this dispute in order to get to the final verdict.<sup>38</sup> This was in clear contrast to poisoning trials, in which toxicological data was usually the most important evidence for convictions. In spite of these differences, many common features offer opportunities for convergent narratives and historiographical exchanges. In food control as in criminal poisoning, new experts emerged during the nine-

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36. Peter Scholliers, “Food Fraud and the Big City: Brussels’ Responses to Food Anxieties in the Nineteenth Century”, in Peter J. Atkins, Peter Lummel and Derek J. Oddy (eds.), *Food and the City in Europe since 1800* (Farnham, Ashgate, 2010), 77-90. Peter Atkins and Alessandro Stanziani, “From Laboratory Expertise to Litigation: The Municipal Laboratory of Paris and The Inland Revenue Laboratory in London, 1870-1914: A Comparative Analysis”, in Christelle Rabier (ed.), *Fields of Expertise: A Comparative History of Expert Procedures in Paris and London 1600 to Present* (Newcastle upon Tyne: Cambridge Scholars Press, 2007), 317-338.

37. Alessandro Stanziani, “Negotiating Innovation in a Market Economy: Foodstuffs and Beverages Adulteration in Nineteenth-Century France”, *Enterprise & Society* 8 (2007): 375-412.

38. The role of experts in legal disputes can be followed in many of the references in this section including, for instance, the monographs by Stanziani and by Phillips and French. A more recent publication that also deals with this issue is Jacob Steere-Williams, “Conflict of Analysis: Analytical Chemistry and Milk Adulteration in Victorian Britain”, *Ambix* 61 (2014): 279-298.

teenth century, new high-sensitivity methods were introduced and, in a similar vein, they led to challenging uncertainties and unforeseen problems, thus creating new tensions between science and law.<sup>39</sup>

Many other issues related to food systems remain unexplored by food historians, but have been tackled by academic studies in fields such as the history of medicine or environmental history. The historical studies on pesticides or zoonosis stand as good examples. The use of arsenic as a pesticide during the nineteenth century has already been mentioned. Additional arsenical as well as lead- and cyanide-based compounds were used for that purpose during the first decades of the twentieth century. Such an increase might be frightening from current perspectives, but analysis shows that historical actors paid little attention to the risks posed by these products in human food. However, some exceptions existed to this general invisibility of toxic pesticides in food, and these examples might be employed in the future for the kind of intersections and historiographical exchanges that we are suggesting in this paper.<sup>40</sup> A similar conclusion applies to zoonosis. Historians of medicine and veterinary science have made significant contributions to and provided interesting hints on these issues, which have generally been excluded from the journals and conferences focused on food history.<sup>41</sup>

## Health

Like food history, the history of occupational health is closely connected to economic history and the social history of labor (particularly, the history of industrial workplaces).<sup>42</sup> Occupational health is located at the tangled intersection of working conditions, industrial relations, medical knowledge, and state intervention. Workers, managers, government of-

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39. The issues on experts, methods of analysis and trust are discussed in the paper by Carolyn Cobbold in this dossier.

40. James C. Whorton, *Before Silent Spring: Pesticides and Public Health in Pre-DDT America* (Princeton: Princeton University Press, 1974). Nathalie Jas, "Public Health and Pesticides Regulation in France before and after Silent Spring", *History and Technology* 23: 369-388.

41. See, for instance: Patrick Zylberman, "Making Food Safety an Issue: Internationalized Food Politics and French Public Health from the 1870s to the Present", *Medical History* 48: 1-28, or Claas Kirchhelle, "Toxic Confusion: The Dilemma of Antibiotic Regulation in West German Food Production (1951-1990)", *Endeavour* 40 (2016): 114-127.

42. Pioneering works are Paul Weindling (ed.), *The Social History of Occupational Health* (London: Croom Helm, 1985), and Christopher C. Sellers, *Hazards of the Job. From Industrial Disease to Environmental Health Science* (Chapel Hill: University of North Carolina Press, 1997). More recent examples are Stéphane Buzzi, Paul-André Rosental and Jean-Claude Devinck, *La santé au travail, 1880-2006* (Paris: La Découverte, 2006); Paul-André Rosental and Catherine Omnès (eds.), "Les maladies professionnelles : Genèse d'une question sociale", *Revue d'histoire moderne et contemporaine* 56 (2009): 5-256; Caroline Moriceau, *Les douleurs de l'industrie. L'hygiénisme industriel en France, 1860-1914* (Paris: EHESS, 2009), Arón Cohen, ed. *El trabajo y sus riesgos en la época contemporánea: conocimiento, codificación, intervención y gestión* (Barcelona: Universitat de Barcelona, 2012), and Judith Rainhorn and Lars Bluma (eds.), *History of the Workplace: Environment and Health at Stake* (Abingdon: Routledge, 2015).

ficials and experts have negotiated many issues related to the risks of workplaces by means of diagnosis, certification, regulation, insurance and compensation. Studies on the “medical politics of occupational health” have highlighted the tensions between medical knowledge, management ideology and occupational health practice.<sup>43</sup> Recent trends in the history of occupational health have overcome old “heroic” approaches centered on physicians/experts and narratives of “progress” of expert knowledge, professionalization and workplace-centered regulations. Joseph Melling and Christopher Sellers employed the case of asbestos as an example of “how expert knowledge, professionalism, and workplace-centered laws, long celebrated by this tradition as solutions, have resulted, at best, in only partial victories over the industrial hazards of today’s world”.<sup>44</sup> The failures of heroic narratives have opened the window to more critical approaches on the history of occupational health. A new social history perspective has introduced new actors, problems and spaces, highlighting the importance of workers and laypeople’s agency while unveiling the politics of expertise. For instance, in his seminal study on silicosis, Gerald Markowitz and David Rosner argued that for the greater part of the early twentieth century, medical professionals played a “peripheral role” in the studies of industrial lung disease.<sup>45</sup> Many other studies have remarked the role of unions, industry managers, insurance companies, government officials, etc.

Many historical narratives are organized around particular products or professional illnesses at the local or rather national level (the scale on which regulations were established).<sup>46</sup> The connections between public health and environmental issues are more than evident. Many of these problems started as occupational hazards and turned into more general public health or environmental issues.<sup>47</sup> The case of mining is a good example: problems related to the workers’ health could be translated to the whole population of the surrounding area when uncontrolled industrial discharges or unforeseen accidents occur.

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43. Richard Gillespie, “Accounting for Lead Poisoning. The Medical Politics of Occupational Health”, *Social History* 15 (3) (1990): 303-331.

44. Christopher Sellers and Joseph Melling, *Histories of Industrial Hazard across a Globalizing World* (Philadelphia: Temple University Press, 2012), 3-4 (quoted on p. 4).

45. David Rosner and Gerald Markowitz, *Deadly Dust. Silicosis and the On-Going Struggle to Protect Workers’ Health* (Ann Arbor: The University of Michigan Press, 2006), 9.

46. Silicosis is one of the most studied topics. Many studies have been written focusing on national borders, for instance, on the USA, David Rosner and Gerald Markowitz, *Deadly Dust. Silicosis and the On-Going Struggle to Protect Workers’ Health* (Ann Arbor: The University of Michigan Press, 2006); or in Spain, Alfredo Menéndez Navarro, “The Politics of Silicosis in Interwar Spain: Republican and Francoist Approaches to Occupational Health,” *Dynamis* 28 (2008): 77-102. Less frequent are global perspectives and comparative analysis, for instance Paul-André Rosental, “Health and Safety at Work. A Transnational History”, *Journal of Modern European History* 7, no. 2 (2009).

47. See Christopher C. Sellers, *Hazards of the Job. From Industrial Disease to Environmental Health Science* (Chapel Hill: University of North Carolina Press, 1997).

When toxic products are transported long distances by air or water, they could turn into more global environmental problems.<sup>48</sup> The cases of asbestos, lead or radioactive products are examples of toxic products moving from occupational to public health and environmental hazards – even in the history of political crimes (if polonium or thallium are considered).<sup>49</sup> As in the other areas discussed in this paper, regulations have been another important research topic for historians of occupational health. Historians have discussed how these regulations emerged as a product of negotiations between different groups (managers, industrialists, trade unions) with different capacity of agency and access to regulators and decision-makers. At the beginning of the nineteenth-century, industrialization developed without taking into account workers' health. In many cases, workers' bodies were "invisibilized" by industrial regulations.<sup>50</sup> At the end of the century, new forms of international regulations emerged. These regulations proved to be particularly important in the case of lead and other dangerous industries, even if not universally applied.<sup>51</sup> Without substantial research in many local cases, a comparative approach to how these international regulations were applied is lacking.<sup>52</sup> Even less historical research is available on the changes after World War II, when the "chemical intensification of all economies" was accompanied by a proliferation of regulations and procedures concerning toxic products, which have proved to be rather ineffective in controlling these hazards at the national and international level.<sup>53</sup>

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48. Many examples in Brett L. Walker, *Toxic Archipelago: A History of Industrial Disease* (London: University of Washington Press, 2010). See Alfredo Menéndez Navarro, *Un mundo sin sol: la salud de los trabajadores de las minas de Almadén, 1750-1900* (Granada: Universidad de Granada, Servicio de Publicaciones, 1996).

49. Gerald E. Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children* (Berkeley: University of California Press; New York: Milbank Memorial Fund, 2013). Angela Creager, *Life Atomic: A History of Radioisotopes in Science and Medicine* (Chicago: Chicago University Press, 2013). Gerald Markowitz, "The Childhood Lead Poisoning Epidemic in Historical Perspective," *Endeavour* 40, no. 2 (June 2016): 93-101. On asbestos see Peter Bartrip, *Beyond the Factory Gates. Asbestos and Health in Twentieth Century America* (London, 2006); Ronald Johnston and Arthur J. McIvor, *Lethal Work: A History of the Asbestos Tragedy in Scotland* (London: Truckwell Press, 2004); Linda Waldman, *The Politics of Asbestos: Understandings of Risk, Disease and Protest*, (London, Washington, DC: Routledge, 2011); Peter Bartrip, *The Way from Dusty Death: Turner and Newall and the Regulation of the British Asbestos Industry 1890s-1970* (London: Bloomsbury, 2001).

50. Thomas Le Roux, "L'effacement du corps de l'ouvrier. La santé au travail lors de la première industrialisation de Paris (1770-1840)", *Le mouvement social* 234 (2011): 103-19.

51. Jean-Claude Devinck, "La lutte contre les poisons industriels et l'élaboration de la loi sur les maladies professionnelles", *Sciences sociales et santé* 28 (2010): 65-93.

52. Among the exceptions confirming the rule see Judith Rainhorn, "The Banning of White Lead: French and American Experiences in a Comparative Perspective (Early Twentieth Century)", *European Review of History*, 2 (2013):197-215.

53. Nathalie Jas, "Gouverner les substances chimiques dangereuses dans les espaces internationaux," in Dominique Pestre (ed.) *Le Gouvernement des technosciences. Gouverner le progrès et ses dégâts depuis 1945*, (Paris: La Découverte, 2014), 32-33.

Other important changes took place in medical knowledge and practice at the turn of the nineteenth century. Many historians have argued that these changes largely affected conceptions on the relationship between health and workplaces, particularly the advent of the germ theory (to be discussed in the next section).<sup>54</sup> Assuming the new conceptions, industrial hygienists would develop during the 1920s a new set of techniques based on quantifying chemical exposures and on correlating these exposures with both physiological variables and clinical symptoms. This idea of the “level of concentration without danger” was at the origin of the threshold limit values (TLVs), which would be dominant during the following decades in occupational health. The new toxicological criteria were organized around goals of productivity and effectiveness in workplaces, rather than around general conceptions of occupational health and an attempt to protect workers from the hazards of the industrial world. Under these circumstances, the new studies of toxic products at the workplace were largely shaped by the interests of experts and employers. Even if far from being passive actors, workers found themselves in a weak position with respect to managers, employers and experts.<sup>55</sup>

These ideas concerning toxic exposures moved outside the factory and were adopted soon in other areas as public health and food quality control, in some cases thanks to social alarms, accidents and high profile trials concerning toxic products such as lead, mercury or arsenic. For most of the twentieth century, professionals in medicine and public health assumed that chemicals were a normal part of the work or home environments. The only relevant question seemed to be the toxic threshold of harmful effects. It was also accepted that there existed a certain level of exposure below which a toxic substance was safe for human bodies. Accordingly, toxicologists and regulators attempted to establish the threshold limit values of all potentially harmful substances found in food, drugs and other everyday products. Further developments on particular products such as endocrine disruptors proved that this approach was ill-conceived for managing chronic poisoning and for the large cocktail of synthesized chemicals that would be released in the twentieth century. Again, the new perception of toxic risks has opened the way to further historical studies aiming to understand how the idea of limit values emerged and was accepted or imposed within the industries and elsewhere.<sup>56</sup>

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54. Linda Nash, “Purity and Danger: Historical Reflections on the Regulation of Environmental Pollutants”, *Environmental History* 13, no. 4 (2008): 651-658. On public health see the new edition of the standard account by George Rosen, *A History of Public Health*, revised expanded edition (Baltimore: Johns Hopkins University Press, 2015). It includes an updated bibliographic essay.

55. Christopher C. Sellers, *Hazards of the Job. From Industrial Disease to Environmental Health Science* (Chapel Hill: University of North Carolina Press, 1997).

56. Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University Press, 2010). Sarah A. Vogel, *Is It Safe?: BPA and the Struggle to Define the Safety of Chemicals* (Berkeley: University of California Press, 2013).

## Environment

The previous discussion shows how the history of occupational health is connected to more general issues of the history of public health and environmental history. As mentioned in the previous section, the relationship between medical and environmental concerns has changed throughout history.<sup>57</sup> These issues have been regarded as closely connected at least since the writing of Hippocrates's *Airs, Waters and Places*, in which endemic diseases are connected to climate, soil, water, mode of life, nutrition, etc. With many changes, these ideas were still accepted during the nineteenth-century, particularly by hygienists and the public health movement. However, at the beginning of the twentieth century, health and environmental concerns drew apart. One reason has already been remarked: the emergence of bacteriology in the 1880s and the ensuing idea of disease, with the focus on germs and individuals rather than on environment. An additional reason is that historians have also pointed out the rise of nineteenth century environmental thought with its focus on wilderness preservation, natural resource-management and rural areas, with scant interest in health. These trends were reinforced by the professionalization of public health on the grounds of studies on chronic disease epidemiology and randomized controlled trials. The new professionals in this area largely abandoned the previous concerns of hygienists with respect to poverty, places, clean water or food quality. In 1916, Hibbert Hill, a leader of the new public health movement, clearly expressed the dominant ideas shared by the new professional group: "The old public health was concerned with the environment; the new is concerned with the individual. The old sought the sources of infectious disease in the surroundings of man; the new finds them in man himself."<sup>58</sup>

New trends in environmentalism and public health during the 1960s encouraged further connections around the concept of "environmental health". These changes took shape under the pressure of multiple actors and circumstances: the emergence of new social movements (anti-nuclear, Green Parties, environmentalism, etc.); the regulation of toxic risks at the local and global level; and tragedies such as Bhopal and Chernobyl in the 1980s. The 1980s were also the context of the consolidation of environmental history in academia,<sup>59</sup> even if its roots can be traced back some decades earlier.<sup>60</sup> And of course, their work

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57. Virginia Berridge and Martin Gorsky, "Introduction: Environment, Health and History", in *Environment, Health and History* (New York: Palgrave, 2012), 1-22.

58. Quoted by Markowitz and Rosner, *Lead Wars*, 3.

59. Fabien Locher, Grégory Quenet, "L'histoire environnementale : origines, enjeux et perspectives d'un nouveau chantier", *Revue d'histoire moderne et contemporaine* 56 (2009): 7-38.

60. Among the founding generation we could include authors such as Roderick Nash, John Opie, Donald Worster, Susan Flader, and Donald Hughes, but also Alfred Crosby, William Cronon, Richard White, Carolyn Merchant, Thomas Dunlap and Joel Tarr, among others. These authors are quoted as pioneers in recent reviews such as: John R. McNeill, "The State of the Field of Environmental History", *Annual Review of Environment and Resources* 35 (2010): 345-74, and Andrew C. Isenberg,

was not completely new, as indeed it never is, so just as many authors have emphasized, we could search for deep intellectual roots which could lead us to the nineteenth century in authors such as George Perkins Marsh, or at least to previous decades in the works of Fernand Braudel and the Annales school.<sup>61</sup>

Nevertheless, the 1970s were crucial for environmental history as it developed in the context of the also emerging modern environmental movement. Interestingly, this modern environmental movement and historiography were heavily influenced by the work of Rachel Carson and her criticism of the use of toxic pesticides such as DDT. The connection between the toxic bodies and toxic environments was therefore already present in the minds of the first generation of environmental historians, even if for some reason this connection only inspired a limited number of books.<sup>62</sup> At that time, the main focus of these historians was on the environment with hardly any reference to human health.

Despite the influence of Carson's book, it can be argued that historical work tended to mirror the early twentieth-century cleavage between health and the environment. And as stated by Virginia Berridge and Martin Gorsky, the main conferences in environmental history (and central publications such as the journal *Environmental History*) showed scant interest in human health.<sup>63</sup> Little concern for the urban spaces in mainstream environmental history is, according to Berridge and Gorsky, another reason for neglecting health problems.<sup>64</sup> The received dichotomies of artificial vs. natural, urban vs. rural or local vs. global have probably played a substantial role in separating concerns about natural resources from those of human health.<sup>65</sup>

In recent years a new generation of historians has replaced the foundational one, thus

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"Introduction: A New Environmental History", in Andrew C. Isenberg (ed.), *The Oxford Handbook of Environmental History* (Oxford: Oxford University Press, 2014).

61. John R. McNeill, "The State of the Field of Environmental History", *Annual Review of Environment and Resources* 35 (2010): 345-74.

62. For instance, Thomas Dunlap, *DDT: Scientists, Citizens, and Public Policy* (Princeton: Princeton University, 1981).

63. Virginia Berridge and Martin Gorsky, "Introduction: Environment, Health and History", in *Environment, Health and History* (New York: Palgrave, 2012), 1-22.

64. Of course there would be some significant exceptions to this approach focusing on the rural world and the environment and in this sense Berridge and Gorsky refer to several works such as Cronon's *Nature's Metropolis*, Melosi's *The Sanitary City* and Mosley's *The Chimney of the World*. We must note, however, that Cronon's book mainly dealt with the impact of the city on its hinterland and the other two books were written at the turn of the century when things started to change. See William Cronon, *Nature's Metropolis: Chicago and the Great West* (New York: W.W. Norton, 1991); Martin Melosi, *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present* (Baltimore: John Hopkins University Press, 2000); Peter Brimblecombe, *The Big Smoke: A History of Air Pollution in London since Medieval Times* (London: Routledge, 1987), and Stephen Mosley, *The Chimney of the World: A History of Smoke Pollution in Victorian and Edwardian Manchester* (Cambridge: White Horse Press, 2001).

65. Gregg Mitman, "In Search of Health: Landscape and Disease in American Environmental History," *Environmental History* 10, no. 2 (2005): 184.



moving the focus to new historical areas. According to Andrew C. Isenberg, who has recently reviewed the new trends, young historians are more concerned than their forerunners about integrating “the insights of environmental history into a host of other subfields” such as studies on “class, race, ethnicity, gender, consumption, borderlands, labor, law, and the history of science”.<sup>66</sup> Studies on toxic products are well situated in the new context. Several collective books have been published with studies placed at the crossroads of the traditions reviewed in this paper. For instance, in the *Osiris* volume *Landscapes of Exposure*, the editors employ the recent discovery of the Asian brown cloud (an atmospheric phenomenon caused by pollution with damaging effects on both human health and the environment) as an example of how “the once-separate histories of health and of environment have become intertwined in our own time”. The Asian brown cloud confirms that toxic effects are not only confined to human bodies. They also affect nature and its resources and these environmental problems could be damaging for public health in terms of food or water supply, for instance, or air and soil contamination. The disasters of Bhopal and Chernobyl provide further examples which have already been the object of important studies in this direction.<sup>67</sup>

The volume *Landscapes of Exposure* inspired further projects during the following years. In 2007 the American Society for Environmental History brought together environmental scientists, historians of science, science studies scholars, and environmental historians to discuss the new chemical bodies of the twenty-first century. Many of the participants in this workshop had contributed to the *Landscapes of Exposure* volume and they would continue this discussion in a special issue of the journal *Environmental History* published in 2008.<sup>68</sup> Many of the topics and authors of this issue would then reappear in further projects of similar characteristics, such as the collective volume edited in 2014 by Soraya Boudia and Nathalie Jas under the title *Powerless Science*.<sup>69</sup>

### 3. Convergences

The reviewed examples confirm that historians have recently realized that “poison, pollution, adulteration and contamination all existed within the same broad spectrum of social concern and collective unease”.<sup>70</sup> Accepting the consequences, many historians have

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66. Andrew C. Isenberg, “Introduction: A New Environmental History”, in Andrew C. Isenberg (ed.), *The Oxford Handbook of Environmental History* (Oxford: Oxford University Press, 2014), 1-14.

67. Gregg Mitman, Michelle Murphy and Christopher Sellers, “Introduction: A Cloud over History”, *Osiris* 19 (2004): 1-17, quoted on p. 2.

68. Jody A. Roberts and Nancy Langston, “Toxic Bodies/Toxic Environments: An Interdisciplinary Forum”, *Environmental History* 13 (2008): 629-635.

69. Soraya Boudia and Nathalie Jas (eds.), *Powerless Science? Science and Politics in a Toxic World* (New York and Oxford: Berghahn, 2014). For a review of this book, with other works discussed here, see Ximo Guillem-Llobat, “Science and the Regulation of Toxicants in Historical Perspective”, *Ambix* 62, no. 3 (2015): 287-91.

70. David Arnold, *Toxic Histories. Poison and Pollution in Modern India*, p. 82.

crossed the disciplinary borders and collaborate with other scholars interested in the history of toxic products. We have already mentioned in passing some of the meeting points: studies on industries with both exposed workforces and potential environmental hazards (for instance, mining activities),<sup>71</sup> urban history (fumes and water),<sup>72</sup> risk society in historical perspective,<sup>73</sup> the history of waste and recycling,<sup>74</sup> studies focused on conflicts on industrial pollution<sup>75</sup> and the history of environmental activism in connection with other social movements after the WWII.<sup>76</sup>

Thanks to these topics, the once separated historical studies on poisons and toxic products (related to the history of crime, health and environment) have become more and more intertwined in recent years. Melling and Sellers affirmed that such convergences have made the history of industrial hazards (and, we can say in more general terms, the history of toxic products) a topical “contact zone” “where historians of health, medicine, and environment have met up with other social scientists and contemporary practitioners”.<sup>77</sup> And yet, much room is left for further convergences and exchanges between the various historiographical traditions which have marked the last few years. Let us explore these avenues for future research by reviewing further studies on poisons, actors and spaces, which can be

71. Judith Rainhorn (ed.), *Santé et travail à la mine (xix<sup>e</sup>-xx<sup>e</sup> siècle)* (Villeneuve d'Ascq: Presses universitaires du Septentrion, 2014). See note 42 for more examples.

72. Some examples confirming the diversity of approaches: Christopher Hamlin, *A Science of Impurity: Water Analysis in Nineteenth Century Britain* (Bristol and Berkeley: University of California, 1990); Stephen Mosley, *The Chimney of the World: A History of Smoke Pollution in Victorian and Edwardian Manchester* (Cambridge: White Horse Press, 2008); Martin V. Melosi, *Precious Commodity. Providing Water for America's Cities* (Pittsburgh: University of Pittsburgh Press, 2011); James Rodger Fleming and Ann Johnson (eds.), *Toxic Airs: Body, Place, Planet in Historical Perspective* (Pittsburgh, Pa: University of Pittsburgh Press, 2014). More examples in note 64.

73. Many studies have been written on the genealogy of Ulrich Beck's risk society. See Jean-Baptiste Fressoz, *L'apocalypse joyeuse : Une histoire du risque technologique* (Paris: Seuil, 2012). Two very different edited books on France and England are Thomas Le Roux (ed.) *Risques industriels: savoirs, régulations, politiques d'assistance, fin XVII<sup>e</sup>-début XX<sup>e</sup> siècle* (Rennes: Presses universitaires de Rennes, 2016), and Tom Crook, and Mike Esbester, eds. *Governing Risks in Modern Britain: Danger, Safety and Accidents, c. 1800-2000* (London: Palgrave Macmillan, 2016).

74. Simon Werrett, “Recycling in Early Modern Science”, *British Journal for the History of Science* 46, no. 4 (2013): 627-646.

75. Thomas Le Roux and Michel Letté (eds.), *Débordements industriels : Environnement, territoire et conflit (xviii<sup>e</sup>-xx<sup>e</sup> siècle)* (Rennes: Presses universitaires de Rennes, 2013).

76. Virginia Berridge and Martin Gorsky, “Introduction: Environment, Health and History,” 9-10. See Stephen Mosley, “Common Ground: Integrating Social and Environmental History”, *Journal of Social History* 39, no. 3 (2006): 915-33, Geneviève Massard-Guilbaud and Stephen Mosley, *Common Ground: Integrating the Social and Environmental in History* (Newcastle: Cambridge Scholars Publishing, 2011). Alice Ingold, “Écrire la nature. De l'histoire sociale à la question environnementale?”, *Annales. Histoire, sciences sociales*, year 66, no. 1 (May 5, 2011): 11-29.

77. Christopher Sellers and Joseph Melling, *Histories of Industrial Hazard across a Globalizing World* (Philadelphia: Temple University Press, 2012), p. 4.

found across the narratives of the history of crime, public and occupational health, and environmental history.

### Experts and activists

The reviewed literature shows that poisoning, pollution and contamination are the result of complex mixture of agencies. These episodes are usually marked by striking inequalities concerning human, economic and cultural capital. In old narratives, historians centered their analysis in the work of scientists and physicians. The previous discussion has shown that recent scholarship has enlarged the range of historical actors. Studies on experts and expertise have also introduced fresh air for the study of doctors in decision-making processes. In the case of toxics, one can find a great variety of experts in tort litigation, risk assessment or international standards offices, to begin with. This variety defies any attempt of classification such as the “periodic table of expertise” suggested by Collins and Evans.<sup>78</sup> Once the old ideals of objectivity and disinterested knowledge were abandoned, the politics of expertise became one of the main common topics for those working on the history of toxic products. Many studies have shown how experts can be enrolled by the industry or by trade unions and activists. They can become partisan experts or be captured by economic and political interests. Their practices and reports can sometimes support environmental injustices, but sometimes correct them as well. Historical studies offer a broad scope of cases, from experts in the hands of industry and governments to productive engagements with victims, so their expert advice helped in the pursuit of criminal, occupational or environmental justice. Expert reports can sometimes bolster lay resistance to toxic risks while in other cases they can help to naturalize (by numbers, chemical tests or rational explanations) the interests of the industry while downplaying the hazards.<sup>79</sup> Experts can also encourage standards of proof out of the reach of one of the parts. On the contrary, “expert-activists” (such as Florence Robinson on the Louisiana chemical corridor) can help to gather relevant epidemiological data or health registers, to deconstruct “disinterested science” or to translate science into socially-meaningful knowledge.<sup>80</sup> In that way, experts can help to deconstruct cultural imaginaries exploited by industry lobbyists such as those concerning gender bias, modernist views on technological progress or the primacy of profits over health.<sup>81</sup> Finally,

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

79. See for instance the infamous studies by Otto Wong on carcinogenicity of trichloroethylene in Paul Jobin, “Les cobayes portent plainte”, *Politix* 91 (October 29, 2010): 11.

80. Barbara L. Allen, *Uneasy Alchemy: Citizens and Experts in Louisiana’s Chemical Corridor Disputes* (Boston: MIT, 2003).

81. Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES*. Quoted from Nancy Langston, “Precaution and the History of Endocrine Disruptors”, in *Powerless Science?: Science and Politics in a Toxic World*, eds. Soraya Boudia and Nathalie Jas (New York: Berghahn Books, 2014), 36. See also Nancy Langston, “Law and the Environment”, in *The Oxford Handbook of Environmental History*, ed. Andrew C. Isenberg (Oxford: Oxford University Press, 2014), 259-80.

experts enrolled in social movements can also empower victims by using available academic knowledge (sometimes concealed by industry) or encouraging new forms of risk evaluation and toxic control, which could change the decision-making process.<sup>82</sup>

Common topics in the reviewed literature are the tensions between experts and lay voices. A good summary is offered by Markowitz and Rosner: “Why were community perceptions of the problem of industrial disease so completely different from those of the expert? How did these differing perceptions get resolved at different historical moments? How did changing public perceptions about disease affect the sciences and the scientists who were given the authority by public bodies to define these conditions? Where did “real” science fit into contentious issues of blame and responsibility? Who had the right to define the real nature of the health problem? Where was the public in public health?”<sup>83</sup> Many additional questions might be added: Can technical experts’ participation in public hearings and committees silence the voices of citizens and victims? How is information about epidemiology managed and discussed in public forums? – for instance during a waste crisis.<sup>84</sup>

Using the framework provided by studies on controversies, many historians of toxicants have focused on the analysis of conflicts, protests and public debates. Examples are social conflicts between industry and workers, public controversies on famous poisoning trials or tort litigations between polluters and victims. The focus on conflicts allows the unveiling of common assumptions about poison and pollution as well as the different strategies, contrasting perceptions and opposed interests of the stakeholders. Relying on Mary Douglas’ ideas on purity and danger, Thomas Le Roux and Michel Letté suggest scrutinizing the “débordements industriels”, that is, when industrial activities “surpass” or “transgress” the accepted limits and are contested by the surrounding communities. They have suggested three modes of closure for these conflicts: legitimation, domination and naturalization, each mode involving a particular relationship of power and knowledge regarding industry, government, workers, activists and experts.<sup>85</sup>

Science studies during the 1980s and 1990s moved away from received views of experts and lay people. Many studies have shown how lay people can construct contra-expertise or contra-narratives challenging the dominant view, for instance, by means of “popular epidemiologies”.<sup>86</sup> One of the most famous studies was on how Cumbrian sheep farmers

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82. Gwen Ottinger et al. (eds.), *Technoscience and Environmental Justice: Expert Cultures in a Grassroots Movement*, Urban and Industrial Environments (Cambridge, Mass: MIT Press, 2011).

83. Gerald Markowitz and David Rosner, *Deceit and Denial. The Deadly Politics of Industrial Pollution* (New York: Milbank Books, 2003), 12.

84. Roberto Cantoni, “The Waste Crisis in Campania, South Italy: A Historical Perspective on an Epidemiological Controversy,” *Endeavour*, Living in a Toxic World (1800-2000), 40, no. 2 (June 2016): 102-13.

85. Thomas Le Roux and Michel Letté, *Débordements industriels : Environnement, territoire et conflit (xviii<sup>e</sup>-xix<sup>e</sup> siècle)*.

86. Phil Brown, “Popular Epidemiology and Toxic Waste Concentration: Lay and Professional Ways of Knowing”, *Journal of Health and Social Behavior* 33, no. 3 (1992): 267-81.

challenged the narrative constructed by British experts on the radiation hazards produced in the Lake District by the radioactivity from cesium from the Chernobyl fallout in 1986.<sup>87</sup> These studies highlighted the need of extending the group of experts in decision-making processes. “Hybrid forums”, “democratizing expertise” and “promoting public debates on technosciences” were common expressions during those years. The most recent studies have shown the limits of the “participative turn” in the governance of technosciences, particularly in the case of risk control. Public controversies on toxic products are marked by an asymmetric distribution of power and an unequal access to technological, financial and media resources. Polluters can conceal information on toxic risks and deny conspicuous hazards by sustaining counterfeit controversies, supporting scientific research favorable to their views or domesticating regulators by means of revolving doors. Protest, activism and counter-expertise is limited by subtle but sometimes violent forms of control.<sup>88</sup> The recent killing of Berta Cáceres (1971-2016) is another example of the increasing violence against activism in Latin America and elsewhere.<sup>89</sup> In this context, historians might face problems in accessing sources and making balanced analysis: victims and activists are less likely to keep their voices in the historical record than governments, experts and industry. In this context, oral history could provide alternative sources to the voices of subaltern groups with fresh perspectives on toxic disasters.<sup>90</sup>

### Spaces, cultures and circulations

Biographical accounts play a minor role in the reviewed literature. Some exceptions are celebrity forensic doctors (Mateu Orfila, Bernard Spilsbury), heroic members of sanitary movement (Edwin Chadwick) or influential environmental writers (Rachel Carson).<sup>91</sup> Less common are biographies or collective portrayals of victims and poisoners.<sup>92</sup> On the contrary, many studies can be regarded as “biographies of toxic products” (on asbestos, lead, arsenic, DDT, etc.), somehow echoing current historical literature on material culture, com-

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

88. Sezin Topçu, *La France nucléaire* (Paris: Seuil, 2013). Naomi Oreskes and Eric Conway, *Merchants of Doubt. How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (New York: Bloomsbury, 2010).

89. See GlobalWitness, “En terreno peligroso”, 2016. <http://ep00.epimg.net/descargables/2016/06/20/8b5a1f34e859db-962be9f3cab9f454b1.pdf?rel=mas>.

90. See Timothy Cooper and Anna Green, “The Torrey Canyon Disaster, Everyday Life, and the ‘Greening’ of Britain”, *Environmental History* 22, no.1 (2017): 101-126.

91. Christopher Hamlin, *Public Health and Social Justice in the Age of Chadwick Britain, 1800-1854*. José Ramón Bertomeu Sánchez and Agustí Nieto-Galan, *Chemistry, Medicine, and Crime: Mateu J. B. Orfila (1787-1851) and His Times*. Arlene Rodda Quaratiello, *Rachel Carson: A Biography* (Amherst, New York: Prometheus Books, 2010).

92. Katherine Watson, *Poisoned Lives: English Poisoners and Their Victims*.

modities or biographies of scientific objects.<sup>93</sup> Another common narrative in environmental history is organized around both spaces of pollution (industries, mines, waste deposits) and polluted spaces (rivers, valleys, fields).<sup>94</sup>

Recent trends around the so-called “spatial turn” in historical research provide further ways to intertwine the above-mentioned lines of research. Historians of science and technology have largely reviewed the broad number of places in which knowledge emerges, from laboratories to open fields, hospitals, asylums, museums or industries, and even ships or cathedrals. They have also reviewed how these social spaces have constrained the productions emerging from them. Likewise, they have discussed how these spaces were designed according to particular views on science. Apart from the sites of scientific production, historians have reviewed how local cultures have conditioned the practices and products of science. Local politics, national regulations or transnational organizations have been discussed in this sense. Finally, historians have paid more attention in recent years to the movements of science: how specimens, instruments or data travel across space by means of standards, “immutable mobiles”, disciplined witnesses, etc.<sup>95</sup>

In the reviewed literature, studies have been more focused on the polluted and polluting scales, rather than on the sites from which knowledge on toxic products emerges. Local scales of analysis have been frequently adopted in these cases. Regional or national scales are usually adopted when dealing with different modes of regulation. Expressions such as “forensic cultures”, “industrial hazard regimes” or “modes of governance of risks” have been employed when describing shared concerns on toxic products at these geographical levels. For instance, Joseph Melling and Christopher Sellers coined the expression “industrial hazard regime” in order to describe both formal and informal arrangements, “by which public, bodies, private interests, and civic mobilizations handle the danger and damage” of industrial poisons.<sup>96</sup>

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93. On scientific objects and materials see Lorraine Daston (ed.), *Biographies of Scientific Objects* (Chicago: University Press, 2000); Lorraine Daston (ed.), *Things That Talk. Object Lessons from Art and Science* (New York: Zone Books, 2008), Ursula Klein and Emma Spary (eds.), *Materials and Expertise in Early Modern Europe: Between Market and Laboratory* (Chicago: University Press, 2010). For a recent review of the literature see Simon Werret, “Matter and Facts: Material Culture and the History of Science”, in Alison Wylie and Robert Chapman (eds.), *Material Evidence: Learning from Archaeological Evidence* (London, Routledge, 2014). For different typologies of scientific objects see John Law and Vicky Singleton, “Object Lessons”, *Organization* 12, no. 3 (2005): 331-355.

94. A recent example is Leslie Rosenthal, *The River Pollution Dilemma in Victorian England. Nuisance Law versus Economic Efficiency* (Farnham: Ashgate, 2014). Many papers presented in the meeting “Living in a Toxic World (1800-2000)” organized in Mahon (2015) adopted this approach, for instance, by Olivier Chatterji on Maurienne Valley, Pavithra Vasudevan on aluminium towns, and Roberto Cantoni on Naples.

95. David N. Livingstone, *Putting Science in Its Place: Geographies of Scientific Knowledge* (Chicago: University Press, 2003). Charles W. Withers, “Place and the ‘Spatial Turn’ in Geography and in History”, *Journal of the History of Ideas* 70, no. 4 (2009): 637-58.

96. Christopher Sellers and Joseph Melling, *Histories of Industrial Hazard across a Globalizing World* (Philadelphia: Temple University Press, 2012), 4.

More recently, in a general overview of the nineteenth and twentieth centuries, Soraya Boudia and Nathalie Jas have described different “modes of governance of risks”, that is, ways in which “scientists, experts, public authorities, industry and activists think, conceive and manage the hazards of poisons”. They claim that three of these modes (by norms, by risks and by adaptation) have emerged during the nineteenth and twentieth-centuries. Rather than being replaced by each other, these modes have coexisted and produced hybrid situations.<sup>97</sup> “Forensic cultures” can also overlap and hybridize. According to Christopher Hamlin, forensic cultures are constellations of technologies of “witness” (how poisons are detected), “testimony” (who is allowed to speak for poisons), and “judgment” (criminal and environmental laws). They are connected to the “overarching anxieties” concerning poisons and poisoning in every society and culture (from women to greedy industry managers).<sup>98</sup>

Historians of toxic products have remarked that the scope of analyzed areas is constrained by some received ideas, for instance, on dichotomies between cities (regarded as primary sites for pollution, regulation and detection) vs. rural areas (portrayed in terms of wilderness, nature and purity). Toxic products, however, move in and out of both urban and rural landscapes as well as human and non-human beings (or vehicles) affected by them. Moreover, many choices can be made concerning the political geography of the analyzed site. Many scholars have remarked on the differences between the “environmentalism of the poor” (subsistence, food and water supply, inequality of distribution of environmental hazards) vs. the middle-class European environmentalism (based on ecological, moral and aesthetic arguments).<sup>99</sup> More recent scholarship has tried to follow industrial hazards across this unequal world. Moving on the global scale, historians can provide insights on the cultural diversity of perceptions and regulations of toxic products. By using different scales of analysis, historians might provide insights on the tensions and interconnections between the local, regional, national and global hazards as well as on the changing hybridizations of culture and nature at stake.<sup>100</sup>

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97. Soraya Boudia and Nathalie Jas, “Gouverner un monde contaminé. Les risques techniques, sanitaires et environnementaux”, in Dominique Pestre *et al.* (eds.), *Histoires des sciences et des savoirs*, (Paris, Seuil, 2015), vol. III, 381-397. See Soraya Boudia and Nathalie Jas (eds.), *Toxicants, Health and Regulation since 1945* (London: Pickering & Chatto, 2013), and Soraya Boudia and Nathalie Jas (eds.), *Powerless science? Science and Politics in a Toxic World* (New York: Berghahn Books, 2014).

98. Christopher Hamlin, “Forensic Cultures in Historical Perspective: Technologies of Witness, Testimony, Judgement (and Justice)”, *Studies in History and Philosophy of Biological and Biomedical Sciences* 44, no. 1 (2013): 4-15.

99. Joan Martínez Alier, *El ecologismo de los pobres: conflictos ambientales y lenguajes de valoración*, 5th ed., (Barcelona: Icaria, 2011).

100. Christopher Sellers, “Cross-Nationalising the History of Industrial Hazard”, in *Environment, Health and History*, Virginia Berridge and Martin Gorksky (ed.) (New York: Palgrave, 2012), 178-205. Christopher Sellers and Joseph Melling, *Dangerous Trade: Histories of Industrial Hazard across a Globalizing World* (Philadelphia: Temple University Press, 2012). Soraya Boudia and Emmanuel Henry, *La mondialisation des risques : une histoire politique et transnationale des risques sanitaires et environnementaux* (Rennes: PUR, 2015). David. E. Winickoff and Douglas. M. Bushey, “Science and Power in Global Food Regulation:

Apart from these geographical transits, a focus on disciplinary circulations might be also fruitful. With appropriate changes and adaptations, practices of diagnosis, treatment, risk assessment and even regulations could move from one disciplinary field to another. For instance, in the case of lead, most of the studies before the nineteenth century were focused on occupational hazards. At the beginning of the century, new issues appeared, carving out room for public health, pediatrics and environmentalism. As Christian Warren affirms, “the standards established by lead industry doctors for the diagnosis and treatment of adult workers formed the basis for understanding, diagnosing, and treating children, as well as for setting standards for lead pollution in the general environment”.<sup>101</sup> The same might be applied to many other toxic products, which encouraged the movement of practices and instruments from legal medicine to public health, environmental science or food quality control.

### Managing uncertainties

Other crucial spaces for following toxic products in society are courts. These are privileged sites for making and disputing claims on toxic hazards. These legal disputes unveil shared (or disputed) ideas on what credible claims on toxic hazards “should look like” and where and how “they ought to be articulated, represented, and defended”. “Civic epistemologies” are reflected in the broad range of criminal laws, tort litigations and national regulations concerning toxics.<sup>102</sup> Many examples have confirmed the co-production of science and law in courts.<sup>103</sup> Nineteenth-century toxicology emerged in the everyday practice of experts in courts.<sup>104</sup> The role of courts in other areas related to toxic products (food quality, occupational health, environmental problems, etc.) was substantially different, in part due to the agency of governmental offices, regulators, experts and industries.<sup>105</sup>

In recent years, debates have evolved around the burden of proof and the precautionary principle in Europe and the USA. Industry lobbyists argue that the precautionary principle might deter scientific development and economic investment.<sup>106</sup> Many chemicals are re-

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The Rise of the Codex Alimentarius”, *Science, Technology & Human Values* 35, no. 3 (May 1, 2010): 356-81. See also Nathalie Jas, “Gouverner les substances chimiques dangereuses dans les espaces internationaux”.

101. Christian Warren, *Brush with Death: A Social History of Lead Poisoning* (Johns Hopkins University Press, 2000), 4.

102. Sheila Jasanoff, *Designs on Nature. Science and Democracy in Europe and the United States* (Princeton: University Press, 2005), 249. A similar idea, “regulatory epistemologies”, is employed by Winickoff and Bushey, “Science and Power in Global Food Regulation”.

103. Jasanoff, *Science at the Bar: Law, Science, and Technology in America*.

104. José Ramón Bertomeu Sánchez, “Managing Uncertainty in the Academy and the Courtroom: Normal Arsenic and Nineteenth-Century Toxicology”, *Isis* 104, no. 2 (2013): 197-225.

105. On food quality in courts see Peter William Atkins, *Liquid Materialities. A History of Milk, Science and the Law* (Farnham, Surrey: Ashgate, 2010). On occupational health and environmental hazards see the literature quoted in the following notes.

106. Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES*, 152-63.



leased without knowing their toxicological effects on humans, and legal action is only possible after proving the causal connections between chemicals and diseases. In the USA, many tort litigations on toxicants involved a discussion on what constitutes admissible proof and reliable expert knowledge. In many cases, judges had to act as gatekeepers concerning the admissibility of medical and scientific evidence in courts. It is worth noting here that one of most important US court decisions concerning this issue (Daubert standard) emerged from litigation on the health hazards caused by toxic products (in this case, a drug distributed by Merrell Dow Pharmaceuticals). Requiring high standards of evidence in an area surrounded by uncertainties could put citizens at risk of being “legally poisoned”.<sup>107</sup>

Studies reviewed here show that similar problems have arisen in courts in recent centuries. It was extremely difficult to prove with high standards of certainty that a particular product caused criminal poisoning, food adulteration, health or environmental problems. In many cases, as famous nineteenth-century toxicologists remarked, “medical evidence alone can never amount to more than a strong probability”. It has to be pondered with “other circumstances of general evidence” in order to gain rational certainty on the poisoning crime.<sup>108</sup> Lawyers of industry, in a vein similar to the defense in nineteenth-century poisoning trials, have thought up many alternative causes as well as fallacies, inconsistencies or uncertainties surrounding epidemiological studies or animal experiments on toxic effects.

These well-known examples show that the problems of expert evidence in poisoning trials is far from being a recent issue. Many nineteenth-century experts faced similar probatory problems due, for instance, to the confusion between the clinical symptoms of common diseases and the effects of criminal poisoning (cholera vs. arsenic), food adulteration, occupational hazards (tuberculosis vs. silicosis) or environmental pollution. They were requested to show in court how poisoning and pollution could be proved and distinguished from other forms of illness. In doing so, they mobilized different kinds of expert evidence: from epidemiology and clinical cases to chemical tests and animal experiments. No general agreement existed concerning the value and pertinence of each form of proof.<sup>109</sup>

These probatory problems point out the social invisibility of many toxic products and poisoning crimes in general. This situation stems from the material elusiveness of poisons

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107. Kenneth R. Foster and Peter W. Huber, *Judging Science: Scientific Knowledge and the Federal Courts* (Cambridge: MIT Press, 1999). Carl F. Cranor, *Toxic Torts: Science, Law and the Possibility of Justice* (Cambridge: University Press, 2006), which reviews the consequences of Daubert's standards in the admissibility of tort litigation in USA. See also Carl F. Cranor, *Legally Poisoned: How the Law Puts Us at Risk from Toxicants* (Cambridge, Mass: Harvard University Press, 2011). For a review of history of USA environmental laws, see Kathleen A. Brosnan, “Law and the Environment”, in *The Oxford Handbook of Environmental History*, ed. Andrew C. Isenberg (Oxford: Oxford University Press, 2014), 513–52.

108. Robert A. Christison, *Treatise on Poisons ...* (Edinburgh: Adam & Charles Black, 1836), p. 14.

109. Paul Jobin, “Les cobayes portent plainte”.

and the secrecy of the crime, which limits the scope of regular eyewitness testimony and makes expert evidence so important in trials. Experts have to make poisoning and pollution visible to the unscientific minds of magistrates, jurors, lawyers and, in more general terms, decision-makers. In criminal trials, the proof is sometimes based on a complex web of data derived from autopsies, clinical symptoms and chemical analyses. More difficulties could be faced when connecting pollution or occupational hazards and victims' illness experiences. Evidence based on epidemiological studies or animal experiments are easily challenged by the company lawyers. They can cast doubts on available data or demand higher standards of proof. Companies can also use less honorable tactics: hiring experts, supporting research designed to blunt regulation, or funding prestigious publications. Historical research has showed how companies can obtain the support of “merchants of doubt” (as in the cases of tobacco industry and climate change).<sup>110</sup> Other similar but more invisible practices are related to “agnotology”: since R&D departments in leading industries produce a substantial part of the research on toxicants, company managers can easily avoid “sensitive topics” for their interests or conceal confirmed evidence that could reduce their profits.<sup>111</sup>

The probatory problems concerning toxic hazards are thus another meeting point for the studies reviewed in this paper. They are related to another important issue in historical studies on toxic products: the responsibility / liability for pollution. A crucial point in many litigations was whether polluters knew (as in the case of tobacco or the lead industry) the damaging effects of their activities on workers, citizens and the environment. Economic issues played an important role, for instance, in the case of insurance companies. They largely shaped their reaction against the lawsuits of workers concerning disabilities produced by silicosis. Compensation laws and expert committees were introduced, thus redefining the nature and social perception of silicosis, which became “the king of occupational diseases” during the 1930s.<sup>112</sup>

#### 4. Does history matter?

The role of high profile trials in shaping regulations and public debates has been discussed in many historical studies on toxicants: famous nineteenth-century poisoning crimes in the UK (Madeleine Smith, William Palmer) and France (Marie Lafarge), the Agra murders in early twentieth-century India, the cases of collective food poisoning (arsenic-laced beer in

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110. Naomi Oreskes and Eric Conway, *Merchants of Doubt. How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming*.

111. Carl F. Cranor, *Legally Poisoned*, 161-77. On the practices of current pharmaceutical industry regarding the conceal of information from clinical trials see Ben Goldacre, *Bad Pharma: How Drug Companies Mislead Doctors and Harm Patients*, reprint edition (New York: Farrar, Straus and Giroux, 2013).

112. David Rosner and Gerald Markowitz, *Deadly Dust. Silicosis and the On-Going Struggle to Protect Workers' Health*, 78-86.

early twentieth-century Manchester), drugs (the thalidomide scandal), and catastrophes such as the Bhopal or Minamata trials in Japan. These affairs stirred up public debates on the regulation of toxic products and encouraged the publication of an abundance of medical, legal and fiction literature, which shaped further approaches to the issue.

In recent times, litigations on health problems caused by toxic products have involved not only industry, victims and regulators but also historians. Historians as expert witnesses in trials: from Simon Cole on fingerprints, Allan Brandt and Robert Proctor on tobacco and Gerald Markowitz and David Rosner on silicosis and lead pollution. All of them have benefited from access to new sources and many books on toxics have since been written with the large amount of sources produced by these trials.<sup>113</sup> Historical research on toxic products has widely circulated outside the academic world and informed the debates in courtrooms and somehow the actions of social activists in environmental justice. This confirms that the history of toxicants can offer fresh perspectives on current issues, for instance, by raising long-term debates, decentering the current focus, looking for hybrid and complex causations, deconstructing the technocratic discourse of experts, empowering victims, questioning legal standpoints and received cultural constructs, or pointing out the difficulties of democratic decision-making processes in matters regarding toxic products, particularly in a world marked by an uneven distribution of power and risks. In this sense, poisons and toxic products have created new links between historians and social movements, academic research and activism, which adds further opportunities for fostering the uses of history in public affairs and policy-making. In order to fulfill these opportunities, the main point is far from being a choice between particular scales of analysis, either micro- or macro-historical, as historians Jo Guldi and David Armitage have claimed in their “History Manifesto”.<sup>114</sup> Our view is that the main problems are current trends in the neoliberal management of universities and research centers with its associated rhetoric of pseudo-indicators, academic ranks and entrepreneurial efficiency. In the field of humanities, these ideas have also involved a neglect of critical thinking and political engagement under the banner of hyperspecialization, publish-or-perish careers, and a return to narrow (but productive in terms of papers) disciplinary paths. Whether local or global, micro-historical or trans-national, we think that we need more critical studies on the history of toxicants, particularly

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113. Allan M. Brandt, *The Cigarette Century: The Rise, Fall, and Deadly Persistence of the Product That Defined America* (New York: Basic Books, 2007). Robert Proctor, *Golden Holocaust: Origins of the Cigarette Catastrophe and the Case for Abolition* (Berkeley: University of California Press, 2011). Gerald Markowitz and David Rosner, *Deceit and Denial. The Deadly Politics of Industrial Pollution*. Gerald Markowitz and David Rosner, *Lead Wars: The Politics of Science and the Fate of America's Children*.

114. Jo Guldi and David Armitage, *The History Manifesto* (Cambridge: Cambridge University Press, 2014), <http://history-manifesto.cambridge.org/>. See the special issue on this publication in H. Floris Cohen, “Editor’s Introduction”, *Isis: International Review Devoted to the History of Science and Its Cultural Influences* 107, no. 2 (June 1, 2016): 309-10. See also Zuoyue Wang and Naomi Oreskes, “History of Science and American Science Policy”, *Isis* 99 (2008): 365-73.

those made with the aim of enhancing the role of historians in current affairs. In order to follow this path, we have argued the need of crossing disciplinary borders of the history of crime, history of occupational health, food and environmental history, while moving outside academia and engaging in public debates on toxic products. In this respect, we agree with Guldi and Armitage in the last sentence of their manifesto: “Historians of the [toxic] world, unite! There is a world to win – before it’s too late”.<sup>115</sup>

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115. Jo Guldi and David Armitage, *The History Manifesto*, 125.