

# The Obvious in a Nutshell: Science, Medicine, Knowledge, and History

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## The Obvious in a Nutshell: Science, Medicine, Knowledge, and History


Fabio De Sio and Heiner Fangerau

**Summary:** The scope and mission of the history of science have been constant objects of reflection and debate within the profession. Recently, Lorraine Daston has called for a shift of focus: from the history of science to the history of knowledge. Such a move is an attempt at broadening the field and ridding it of the contradictions deriving from its modernist myth of origin and principle of demarcation. Taking the move from a pluralistic concept of medicine, the present paper explores the actual and possible contributions that a history of knowledge can offer to the history of medicine in particular. As we will argue, the history of medicine has always been a history of knowledge, but for good reasons has always stuck to the concept of *medicine* as its object and problem throughout the ages, including the modern, *scientific* one. We argue that, in the history of medicine, the demarcation between scientific and non-scientific represents an accident, but is not foundational as in the case of natural science. Furthermore, the history of medicine programmatically played a role in at least two academic domains (history proper and medical education), adjusting historical narratives of medical knowledge to its audience. Accordingly, we underscore that the history of both science and medicine, as traditionally defined, already provides room for almost the whole spectrum of approaches to history. Moreover, their different myths of origin can, and indeed must, be included in the reflexivity of the historical gaze. We argue that the position towards a history of science, medicine, or knowledge is not a question of narrative or theory, rather, it is a question of relevance and awareness of extant contexts.

**Keywords:** History, knowledge, medicine, science, relevance, education, research

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## Introduction

“We can’t just go on as before”: so ends Lorraine Daston’s last diagnosis-cum-prognosis on the state of the history of science as an academic endeavor.<sup>1</sup> According to her, historians of science need a palingenesis, a new identity, and a new point of anchorage for two reasons. First, to free themselves from the “uncomfortable position of teaching our students a narrative that we know is gravely flawed if not outright false”. Second, to counter the effects of that very “[...] ordinary narrative of the history of science” in “the world at large”, leading to appropriations of a science/modernity/race-of-cultures nexus that are both essentially mythological and politically dangerous.

Daston’s story of the history of science is circular, ending in the same odd place where it starts; a hall of mirrors—a place where historians of science find themselves when attempting a reflection on exactly what their job is about. The essential, unbearable tension she describes is the one between the very object of the history of science (“Science” with a capital “S” as the “motor of capital-M Modernity” p. 133) and the long belabored, endlessly refined ways of interpreting it in historical, contextualist terms. On the one hand, also due to its institutional position (usually in historical faculties), the deed of this kind of history was to render science understandable to non-scientists. This aim at once required, and was implied by, a unified concept of science as a special kind of rationality born at a specific time and place (Early Modern Europe), and progressing and spreading ever since without changing its skin. On the other hand, the founding fathers had already constructed “decidedly ambivalent narratives” about the scientific revolution, in which they revealed themselves respectfully, if not nostalgically, disposed towards the reasons of the losing side. The battle between “teleological modernism” and “sympathetic historicism” has its Horatio Nelson in Thomas Kuhn, whose *Structure of Scientific Revolutions* (1962) brought order to the representation of the two tendencies and their stakes. Thus, the grand narrative of one Science, daughter of one mighty revolution and period of progress, has been deflated ever since. The general framework provided by that seminal work was to be enriched by novel ways of conceptualizing *science*, chief among them (from the 1980s) the focus on practices.<sup>2</sup> Practices apparently did the trick, and the continuity between squarely scientific and pre-scientific domains suddenly appeared in all its iconoclastic clarity.

The quick reception of Kuhn’s work catalyzed dramatic rearrangements in both theory and institutions. Yet, it could not free the community from that thorn in the flesh, the nexus between science, modernity and the West that was implicit in the very history of the subject matter. If *our* science is even foreign to us, how can it be the pillar and yardstick of our epoch? This is not simply a question of interpretation—it immediately involves questions of method, approach, and finally *Beruf*.

Another shift, similar to the one from theory to practice, could perhaps achieve the same again: history of knowledge. Knowledge is found in its pure state throughout the world, does not require as many inventive justifications, and

<sup>1</sup> Daston 2017.

<sup>2</sup> See for example Pickering 1992.

would at least provide a comfortable framework for greatly extended chronological, social, and geographical outlooks. The category of *science* could find shelter in it, and become one element in a picture still full of *chiaroscuro* and light-plays, but at least not as Escher-esque as before. Moreover, a move away from the pre-packaged, self-explaining category of *science* could open our eyes, not only to the multiplicity of “ways of knowing”<sup>3</sup> the world has to offer, but also to the multi-layeredness of *our own* knowledge, in the analysis of which other rationalities, just as powerful as the scientific one, could claim their place. Long-term and wide-ranging comparisons would allow a re-appreciation of the inherent contingency of our categories, our professional ethos, and even our institutions. Overall, a history of knowledge would be more culturally sensitive and less imperialistic than a pure history of science. Finally, it would dispense academic historians of science from teaching outright falsehoods as a propaedeutic to critical thinking, and would (hopefully) undermine the misapprehension and mishandling of a theoretically underdetermined, but powerful ideological weapon. Daston’s argument is that through Science, it is the trope of Modernity that must be disposed of, and if the subject-matter *Knowledge* admittedly still lacks a univocal definition, so much the better—it will be the task of new historians to carve it out of the new contexts.

### Where is Medicine?

The task we set ourselves here is obviously not to comprehensively criticize Daston’s proposal, which has been long in the making.<sup>4</sup> However, we feel obliged to at least contextualize her thoughts, at the expense of some boring detail: The essay inspiring the following reflections is part of a series of approximately 20 invited contributions to a new journal of the University of Chicago Press—*KNOW: A Journal on the Formation of Knowledge*, devoted to “uncovering and explicating diverse forms of knowledge from antiquity to the present, and accounting for contemporary forms of knowledge in terms of their history, politics, and culture.”<sup>5</sup> As we learn from the introduction, the whole of the first volume (2 issues) was planned in “an unusual form—even for a journal that aims to cross boundaries.” To set the stage, the reflections “between the personal and the professional” of leading scholars have been solicited, many of whom (not Daston) are affiliated with the Stevanovich Institute on the Formation of Knowledge at the University of Chicago. Consequently, the editors explain, “each piece [...] represents a hybrid of op-ed essay with scholarly article” and in the issue “are gathered the reflections of prominent academics on their own field of enquiry, the stakes in their disciplinary knowledge, and their own ideals for reshaping the field for the better.”<sup>6</sup>

This exercise in contextualizing contextualization provides us with a reason for not indulging in the exercise of “finding the flaws” in Daston’s argument. Howev-

<sup>3</sup> Pickstone 2000.

<sup>4</sup> Daston 2005, 2009, 2015; Daston and Galison 2007; Daston and Most 2015.

<sup>5</sup> Bartsch et al. 2017.

<sup>6</sup> Bartsch et al. 2017, on 2.

er, the context of the piece elicited reflection, initially from the editors of the *Berichte zur Wissenschaftsgeschichte* (perhaps, soon, *zur Wissensgeschichte?*), who invited us to contribute. One rather remarkable feature of the first volume is the conspicuous absence of the history of medicine from the “Disciplinary Formations” on which “reflections” were invited. For a journal with the declared intention of putting boundaries “of neither time nor space” (p. 1) upon the fields of investigation, this comes close to a statement. Is this absence justified by the awareness that the history of medicine has necessarily always been a history of knowledge? Is it irrelevant to a history of knowledge? Is it perhaps because medicine cannot be classified as simple “knowledge”, given its complexity, stratification, and the lack of coherence of actors and content?

In our paper, we will reflect on these questions and on the relations between the histories of knowledge, medicine, and science. We will start from the obvious: the history of medicine is not the history of science, despite the two seeming to converge at points, or at least flirting more than occasionally. This trivial statement conflates at least three different lines of argument: the intrinsic difference between medicine and science (level of the subject matter); the different histories of science and medicine (level of the *res gestae* proper); and the different roles historiography played in identity building.

In an attempt to connect with Daston’s argument, the myth (or prophecy) of a *scientific medicine* will be central to our reflections. The gist of our argument will be that while the two histories (or stories) share many elements (especially as regards the last two centuries), the patterns in which these are organized (and perceived, and taught) vary greatly. This variance is to the point of finally providing contrasting pictures of the relationships between science, knowledge, and practice. Our main claim will be that the medical-historical perspective allows for a special outlook on the role and value of history as a science, and historical thinking as a practice.

In the following, we will provide a necessarily sketchy perspective of medical knowledge, the history of medicine, its objects, content, and approaches, and its epistemological adjacency to various kinds of knowledge.

### Medical Knowledges and Medical History

In an attempt at doing “justice to the complexity of the physician’s vocation, and to the consequent richness and subtlety of medical knowledge”<sup>7</sup> Stephen Toulmin (1993) underscored an intrinsic contrast at its heart. Referring back to the founding texts of the art, he stressed the inevitable co-existence of intrinsic/existential (individual patient-related) and universal/generalized knowledge. Toulmin also highlighted a historical element that is constitutive of medical knowledge and its acquisition. Physicians approach patients by inspecting their medical history, critically evaluating the sources at hand about their past state, and finally by interpreting the historical information and the therapeutic or preventive task in light of

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<sup>7</sup> Toulmin 1993, on 232.

the current (health) status and addressed future.<sup>8</sup> Ultimately, a focus on patients and their history embedded in conceptual general knowledge allows for an explanation of “intuitive” knowledge as empathy “for the inner character of the patient’s complaint”.<sup>9</sup> Ever since the earliest deliberations on the nature of medicine, its specific clinical, patient-centered rationality demanded the inclusion of a knowledge as insecure as intuition, as all the actors in the process of healing need to consider the knowledge they have “at the time as complete and certain” as possible.<sup>10</sup>

Relevant as it is, this in-principle opposition between two neatly defined rationalities (the individual-hermeneutic and universal-scientific) still fails to do justice to the complexity of *medicine*, now as in the past. The classical delimitation of *medicine* as a science and practice is in itself difficult: to the contemporary educated mind, it covers everything related to healing, disease, health (individual or public), epistemology, epidemiology, social systems, practice, performance, drugs, diets, lifestyle, and more. Stemming from the Latin *mederi* (“to heal” or “to help”) the term *medicine* currently defines everything from a substance used for remedial purposes, “an object or procedure intended to have healing power,” “the science or practice of the diagnosis, treatment, and prevention of disease” or the collective of medical practitioners.<sup>11</sup> To return to the Greek roots of the term does not afford any simplification, on the contrary. However, it helps to clarify an important and persistent character of the subject. “*Iathrikē*” is not even a substantive, but an adjective implying the name “*technē*.” According to the Hippocratic tradition, medicine was indeed a “*technē*,” i.e., a rational, secure, and generalizable knowledge, equally distant from the extremes of religious healing and pure empiricism. It was nonetheless to be distinguished from the universal-seeking philosophical enquiries on nature by its characteristic object-plus-product character (diseased body; healing and restoration of balance, respectively), and especially by its being a firm knowledge of the particular. This made it at once a model for art in general, and politics in particular.<sup>12</sup> To Aristotle, medicine as an activity encompassed “the whole life of the person who carries it out”: it was a form of life (*bíos*).<sup>13</sup> He considered medicine “a *technē*, consequently a productive science, but [...] also an ethical, political, and economic praxis and also a theoretical science, episteme, related to mathematics and theology.”<sup>14</sup> His definition “*Epistemē kai technē*” has often been translated as “science and art,”<sup>15</sup> a view that has survived until today.<sup>16</sup> Science and art were not conceived by Aristotle as two extremes of a continuum, or two elements that could be traded off. Rather, both are described

<sup>8</sup> Toulmin 1993. This complex temporality, and the associated historical knowledge in medicine together with its relation to the history of medicine, has been thoroughly described also by Duffin 2004 and Labisch 2004.

<sup>9</sup> Toulmin 1993, on 248.

<sup>10</sup> Hans-Georg Gadamer, quoted after Montgomery 2006, on 39.

<sup>11</sup> Oxford English Dictionary.

<sup>12</sup> Hofmann 2003.

<sup>13</sup> Gracia and White 1978, on 7.

<sup>14</sup> “Medicine as practice necessarily included an interpersonal, ethical element. This is made explicit, for instance, in the original double meaning of “therapy” (*therapeiā*), as both “care” and “cure.”

<sup>15</sup> Gracia and White 1978, on 34 f.

<sup>16</sup> Rothschild 1978, on 2.

as a puzzle picture. Depending on perspective, state of mind, and will, either of them may be dominant, although medicine is both at the same time.<sup>17</sup>

*Art* and *science* remain the key terms when physicians or philosophers try to explain why medicine is different from other academic disciplines or social activities. The actual adjective clinical is the distinctive feature of the physician's art, as opposed to scientific research. It is not by chance that the training of medical doctors is universally divided into pre-clinical and clinical elements, where the latter is ideally rooted into (but not defined by) the former.<sup>18</sup>

For some years now (especially in the context of teaching), the concept of clinical reasoning has become a means to describe the multi-layered process through which physicians arrive at diagnoses, prognoses, and therapies, and how they gain (from different sources and at different levels) the knowledge to perform. Clinical reasoning "seeks to integrate (1) biomedical/epidemiological and historical/hermeneutical understanding and (2) the particulars of common sense knowing and the systematic insights of medical theory."<sup>19</sup> Trial and error, case-based learning, and continuous practice (all with a component of historical knowledge) are included in this reasoning, as well as an attempt at understanding the patients' making sense of their disease (resp. their specific knowledge). Simply put, medical education aims to harness universal and experimental scientific knowledge within an individual and interpretative framework. As phrased by Kathy Montgomery "clinical knowledge remains first of all the interpretation of what is happening with a particular patient and how it fits the available explanations."<sup>20</sup>

Nevertheless, the status of this knowledge is to this day under constant debate: Physicians learn by cases, they acquire individual and general knowledge on ward rounds, they speak of experience learned in practice, they learn by performing. Practical or tacit knowledge in the sense of Michael Polanyi is equally as accepted as medical knowledge, as conditional knowledge linking symptoms, signs, and diseases to general theoretical schemes. Harder to pin down, but equally relevant, is performative knowledge: physicians need to know how to play their role. Often ridiculed, criticized, and perceived (from Molière to Walt Disney) as greedy, market-oriented quacks, ever since the times of Hippocrates healers have had to pay due attention to cultivating their professional persona, preserving their charisma, and consequently, enhancing their effectiveness as healers.

In the last instance, the core of medicine is a relational practice, involving at the very least a physician, a patient, and their social context. It has been this way ever since, we can judge from written sources. This relational framework provides medical practice with its specific meaning, and it is defined by the interplay between different classes of knowledge (know-how; know-why; know-that; performative knowledge). This peculiarity also grounds the time- and context-specific internal balance of the different types of knowledge, especially the essential, in-

<sup>17</sup> Montgomery 2006, on 31. This clarification, however, seems necessary only if a specific, modern, understanding of science is implied. On the changing meaning of *technē* in the Aristotelicum and Hippocraticum Corpora, see Gracia and White 1978.

<sup>18</sup> Saunders 2000.

<sup>19</sup> Daly 2018, on 971.

<sup>20</sup> Montgomery 2006, on 16.

evitable tension between the drives of tradition and innovation, universality, and specificity that have characterized its history, and the history of its history.

Quite unlike Daston's Capital-S-Science, both the *res gestae* and the *historia rerum gestarum* of medicine have always been defined by the ongoing opposition of tradition and innovation. That is to say, demarcation is not as defining and primary a factor to medicine as it is to Capital-S-Science—it is an event within its history, as opposed to a mark of origin. Alternatively, it can be perceived as a recurring trope throughout the whole history of medicine—the demarcation between dogmatic and pragmatic; scientific and practical. These demarcations occur at different times in history, from different points of view, and with contrasting aims. The history of medicine has played a significant (if not always clearly specified) role in defining the identity, meaning, and perspective of the complex system we call *medicine*.

The argument is complicated further by the multifarious meanings of *history of medicine*: as the story of how medicine came to be, or (at a different level) as an academic discipline. The difference between the two options is perhaps most accurately defined by the divergence in stressing medicine (identity) over history (contingence), played out in the often contrasting settings of medical history writing: as a contribution to *history proper*, or to medical education. An example, which directly links our thoughts on medicine to Daston's deliberations about science and knowledge, is the historiography of *scientific* medicine in the late 19<sup>th</sup> and the 20<sup>th</sup> centuries.

### Scientific Medicine and Medical History

Since the 19<sup>th</sup> century, *modern medicine* has been perceived as *scientific medicine* in a narrow understanding of science meaning the *natural sciences*. According to this view, medical knowledge is knowledge acquired through the methods of these sciences. At the same time, the advocates of scientific medicine conceded the insecurity of a *knowledge* gathered from sources that do not always fall under the realm of basic sciences like physics, mathematics, or chemistry. Even Claude Bernard (1813–1878), who as a “physiologist” was searching for deterministic laws directing health and disease, kept the individual patient in mind, in whose interest medicine was performed.<sup>21</sup> Even this great proponent of *scientific* medicine maintained the case as the central end of knowing in mind, although he “emphatically rejected” the idea of the doctor as an artist that many clinicians of his time endorsed.<sup>22</sup>

As Michael Hagner has insightfully argued, the institutionalized history of medicine has played a key role in consolidating the currently common conflation of medical and scientific knowledge. Physiology as a model and ideal, Hagner argues, was the glue that held the concept of *scientific medicine* together. Nevertheless, conflicting interpretations and approaches have never really been completely silenced. Despite the story of the coming of age of medicine as a modern science proving to be an effective rhetorical tool, it cannot be granted the foundational

<sup>21</sup> Bernard 1949 [1865], on 199.

<sup>22</sup> Hagner 2003, on 54.

value it has in the history of modern science. One reason for this is the complexity of medicine beyond knowledge and knowledge production. In an account from 1840, during the wave of excitement about the so-called *rational medicine* seeking logical and causal mechanisms, the physician William Eliot contrasted scientific medicine with “an irregular or unscientific profession of the art”. To him, the general term “Medicine” encompassed the “various phases, relations, and applications” of the approaches to preserving health and healing: 1. Personal preventive medicine, 2. Social prophylaxis or public hygiene, 3. Personal remedial medicine, and 4. Community remedial medicine,<sup>23</sup> which is a scheme that is still summarizing the horizons and expectations of the field quite well.<sup>24</sup>

In addition, Hagner argues that institutional medical history has been informed by internal conflicts—the need to balance the prescriptions of professional historiography with the needs of the medical faculty being only the most evident.<sup>25</sup> Along similar lines, Mirko Grmek characterized the historiography of the 19<sup>th</sup> century as progress-oriented, i.e., seeking to make sense of the new scientific framing of medicine.<sup>26</sup> The picture of medicine as essentially *scientific* on the one hand, and including important personal, social, emotional, and relational components (e.g., social medicine) on the other hand, resulted in a positivistic undertone guiding the historiography. Medical historiography’s role until the middle of the 20<sup>th</sup> century was to present the constant progress of medical science and practice from worse to better.<sup>27</sup> Consequently, the historiography of medicine was in constant danger of being considered positivistic and too narrow in focus on great doctors and their achievements. Further, similarly to the history of science, it was seen as being in constant danger of committing the sins of presentism, essentialism, and traditionalism.<sup>28</sup>

However, with the triumphal procession of scientific medicine, medical faculties and physicians reassessed the history of medicine as an overarching bridge among increasingly specialized research and practice fields. In Germany and the United States, prominent physicians such as William Welch argued for unity of the medical sciences. According to John Harley Warner, contemporaries embraced history to counterbalance the rational-objective scientific gaze of the physician on the patient, to preserve both science and art in medical practice.<sup>29</sup> Similar-

<sup>23</sup> Eliot 1840, on 3.

<sup>24</sup> Following public health promoters like Johann Peter Frank (1745–1821), who had argued for the role of the state in caring for health of their population, the 19<sup>th</sup> century (especially towards the end) experienced a social medicine and hygiene boom, which changed the understanding of what medicine is substantially. Now, it was not anymore only focussing on individuals and their diseases, but also on communities at large.

<sup>25</sup> Hagner 2003.

<sup>26</sup> Grmek 1996 [1993].

<sup>27</sup> Grmek 1996 [1993], on 16 ff.

<sup>28</sup> Stocking 1965, on 461. Presentism is understood by Stocking as the anachronistic transmission of current understandings of the world to different historical contexts, meaning that norms or ideas of today are uncritically applied to past events. Essentialism describes the notion that cultures, nations, or disciplines have fundamental characteristics that are inherent in their being. It denies that social or cultural influences might influence these characteristics. Traditionalism finally marks the idea that there are universal truths.

<sup>29</sup> Warner 2013.

ly, after World War II, and especially since the 1960s, medical history and medical ethics also took the role of *re-humanizing* medicine. In a climate of general criticism towards established authorities in the Western World (including scientific expertise), institutionalized history of medicine with a focus on medical ethics was seen as a possible remedy against the allegedly de-humanizing effects of scientific medicine.<sup>30</sup>

### The shifting objects of the history of medicine

Especially since the 1980s and 1990s, non-scientific (in the narrow sense of capital S) medical knowledge is historiographically treated in its own right.<sup>31</sup> The historiography of medical knowledge decidedly left the grounds of western medicine and the western medical profession. It took alternative, unorthodox, traditional, extra-European, global forms and contexts of medical knowledge seriously into account (unlike earlier histories of medicine, which treated these forms of medical knowledge as a naïve, unorthodox counterpoint to European medicine<sup>32</sup>). Historians, anthropologists, historians of science and of medicine contributed to this development. Everything is a possible object of medical history, regardless of how broadly or vaguely it is connected to health and disease.

This, of course, includes many different knowledge carriers. The struggle to establish a medical profession has historically taken the form of border enforcement and policing: from the controversies between the free healers and the more empirically oriented slave healers of ancient Greece, through those over the status of surgery, to the more recent debates on the gains and losses of scientific medicine and EBM. In these struggles for authority, the *epistemē* as a *dogmatic* element gained a central place only after the 18<sup>th</sup> Century.<sup>33</sup> Throughout history, however, the sources of authority on medical knowledge and practice (in the English language, a medical doctor is a “practitioner”) have always included a varied cohort of subjects. Not only, and not always, did the Great Doctors represent the focus of agency: eventually, midwives, healers, nurses, consultants, insurance companies, organized patient groups, physio- and psychotherapists have also had a say on medical practice, and later found a sympathetic historical ear. Uneven as it is, the history of medical science has successfully extended its gaze upon all of these categories (not least the patient), without necessarily having to face the problem of re-defining, or re-naming medical knowledge. It is striking to notice how contemporaries from many ages and historians of medicine have often acknowledged that medical knowledge is by no means the exclusive province of “experts”. The very idea of the expert is an invention of the 16<sup>th</sup> century.<sup>34</sup> Since early times, historians of *scientific* Western medicine have struggled with knowledge that was unorthodox, yet still belonging to their domain. Since the 1860s, for instance,

<sup>30</sup> Warner 2013, on 326. For this see also Fangerau and Badura-Lotter 2019.

<sup>31</sup> See the overview Jütte 1999

<sup>32</sup> Kurt Sprengel, for example, discussed Indian, Chinese, or Japanese medicine to demonstrate the supremacy of the Western and the otherness of Eastern knowledge; Sprengel 1792.

<sup>33</sup> „Dogmatic“ must here be intended in the Aristotelian sense of “based on a taught corpus of knowledge”. Therefore, the modern version of “dogmatic” would actually be “scientific”.

<sup>34</sup> Ash 2010, on 4

Shakespeare's medical knowledge has been an issue for medical historiography. Bewildered, historians noticed how much he knew of the medicine of his time, although they unsurprisingly rated the knowledge he expressed as inferior to their own. Following the positivistic trend of the 19<sup>th</sup> century, John Charles Bucknill (1860) noted "Metaphysical science is as old as Aristotle and Plato, but physical science, upon which modern medicine is founded, traces its parentage no higher than to Shakespeare's great contemporary, Bacon. Shakespeare, therefore, wrote in the mere infancy of medicine as a physical science; and it would be as unfair to compare his medical knowledge with that of the present day, as it would be to compare Lord Bacon's own chemical absurdities in his *Natural History of the Form of Hot Things*, with the mature enlightenment of Liebig, or of Faraday."<sup>35</sup>

It would be unfair to compare Bucknill's reading of Shakespeare with current approaches on knowledge of wise women, for instance. Today, fairy tales or story cycles like "The Thousand and One Nights" have been reassessed as narratives not simply reflecting "women surrendering to a patriarchal structure in which they are mere objects." Women in these stories know about plants and their remedial and aphrodisiac power. Thus, their stories "may be read instead as a narrative in which women re-join that structure as active subjects, embodying discourses of medical and moral knowledge."<sup>36</sup>

Historiography and its interpretation follow their time, and are to a considerable extent defined by their epistemological structure and institutional framing—by their *hows* and *whys*. As Roger Cooter has noted,<sup>37</sup> the very epistemological and methodological explosion that defined the golden age of social history of medicine, has also rendered it more sensitive to passing cultural trends and fashions, and ultimately undermining it both politically and epistemologically. The result is, on the one side, a multiplication of approaches to, and uses of, the medical in all its multifarious aspects; on the other side, a loss of the original mission and weight of social history of medicine as an intellectual endeavor and political program. A more eclectic and professional production in the discipline has resulted in the erosion of the *very object or category of study* (medicine), as well as its point of anchorage with the outside of academia (society—as both a category of interpretation and a framework of reference).<sup>38</sup>

Similarly, the historical epistemology of medicine has had its glorious time, and since then, has changed its face. When Thomas Kuhn's *Structure of Scientific Revolutions* was published in 1962,<sup>39</sup> historians of medicine followed the idea of shifting paradigms, but only with some unease. The reason was (again) that medicine appeared too different, multifaceted, and complex compared to science, to apply an idea developed following the history of physical axioms.<sup>40</sup> Kuhn's work unintentionally triggered a renaissance of Ludwik Fleck in the histories of both science and medicine.<sup>41</sup> Beyond a crypto-reception of Fleck by various influential

<sup>35</sup> Bucknill 1860, on 9.

<sup>36</sup> Gaul 2016, on 200.

<sup>37</sup> Cooter 2004.

<sup>38</sup> See also Cooter 2007.

<sup>39</sup> Kuhn 1962.

<sup>40</sup> Rothschild 1977, on 74.

<sup>41</sup> Fleck 1979.

authors in the history of science, Fleck was present more openly (at least to some extent) in the history of medicine, perhaps because of the direct appeal provided by his medical horizon.<sup>42</sup> Still, Nelly Tsouyopoulos doubted the very applicability “of his categories to historical investigation.”<sup>43</sup> Meanwhile, Fleck seems to be a ubiquitous reference for various treatments of the history of medicine from studies on gathering and teaching medical knowledge, to knowledge representations in medicine.

Finally, social aspects of medicine, in addition to quantifiable data, structures, and mentalities appeared to be useful tools for investigating the interdependency of medicine and social developments from a *longue durée* perspective. The spectrum was further extended, until today, by approaches like body history, the so-called “history from below”<sup>44</sup> or ethno-medical studies, which fostered a sensibility towards the local circumstances, cultural settings, and belief systems of practicing medicine.<sup>45</sup>

Nowadays, it appears that the spectrum of the history of medicine has integrated almost all of these approaches. The scene has become diverse, even including ethics, but it is still largely coherent as it maintains both (a) the focus on medicine as the reference framework for research questions, and (b) history as the core for methods and theories. In this sense, historical and medical knowledge cross-fertilized each other, which is an ongoing endeavor. Recently, medical historians have directed their crafts and attention towards the problem of stigma associated with certain conditions, or have sought to contribute to the debate on diagnostic criteria.<sup>46</sup> Others have contributed to a finer understanding of the organizing principles of global health programs,<sup>47</sup> while some are contributing to making a strong point on the connection between contact sports and neurological complications in later life, framing the responsibilities and active manipulations of the business leaders.<sup>48</sup> Finally, others have recently found in the archives an important complement to the review of the literature in framing the relations between industry and medical expertise in nutritional research.<sup>49</sup> Moreover, historical data have long proven to be of some relevance to the solution of medical/biological riddles.<sup>50</sup>

Of course, the picture is not as rosy as this simple (and partial) list may suggest; medical practitioners, medical historians, and *proper* historians keep looking at each other with a good deal of skepticism, if not outright distrust, despite the efforts of women and men of good will.<sup>51</sup> This is perhaps most evident in the case of the transfer of medical knowledge into the historical domain. Pathographies (the relic of an episteme past) currently provide (at best) an interesting object for contextualization, and the incidence of the diseases of the greats on the course of

<sup>42</sup> Zittel 2017, on 21 ff.

<sup>43</sup> Tsouyopoulos 1993, on 40.

<sup>44</sup> Porter 1985.

<sup>45</sup> Prinz 1991.

<sup>46</sup> Kushner 2009.

<sup>47</sup> For an overview see Gradmann 2017.

<sup>48</sup> Casper 2018.

<sup>49</sup> Kearns, Schmidt, and Glantz 2016.

<sup>50</sup> Modiano et al. 1986.

<sup>51</sup> See Kushner 2008a, 2008b; Kushner and Leighton 2013.

history has long been considered at the same level of interest as the length of Cleopatra's nose.<sup>52</sup> Nevertheless, solid paleopathological work adds greatly to our knowledge of the conditions of life of ancient populations, supplanting or at least complementing the (eventually lacking) written record.<sup>53</sup> Finally, it remains an open question how to historicize theoretical models such as medicalization, individualization, or the risk society.<sup>54</sup>

Virginia Berridge recently warned that contemporary historians of medicine might become too closely involved with their objects and lose their critical distance. This danger is most evident in oral history projects, where historians may identify with the persons interviewed, or believe their rhetoric. The danger of losing critical distance also exists, however, when historians of medicine try to achieve political impact. Here, the lure of impact might result in teleological or inclined narratives, uncritically adopting the latest sociological or politological fashion.<sup>55</sup>

The consolidation of common ground, or at least of common points, is still a program to be achieved, but perhaps the special status of medicine and its convergence of outlook with the historical sciences is of special support here.

Facing the multiplicity of topics, approaches, and actors involved in the history of medicine, we fear that we would lose some of these many aspects, fertilizations, exciting contingencies, and interdependencies if we subsumed it under the *history of knowledge* label alone. More specifically, a history of knowledge would fail to do justice to history of medicine, as it would fail to capture the specifically interwoven, multi-faceted and multi-layered relational essentials of “*epistemē, kai technē kai bios*.”<sup>56</sup>

### Science, Medicine, and Knowledge

As we have tried to summarize, the *iathrikē technē* is a composite of many diverse knowledges, coming together in different patterns throughout history, with different agents coming in and falling out of the stage, depending on epoch, perspective, or need. What is constant is the tale of the *ars medendi*; the collective autobiography of a category in different times and places; a myth of origin that has a stable—if only ideal—deontological and technical identity based on tradition. All the forms of healing, defining and preserving health, and caring may vary greatly through time. Nevertheless, these changes most often result in additions, multiple paradigms, and complications, rather than substitutions or overcomings. Through the history of medicine and its institutions, through its re- and deconstruction through time, we are indeed in a position to get caught in all sorts of culturally and chronologically defined shifts, hybridizations, and displacements of knowledge—and we can devote a lifetime to unearthing just one tile of the past, without losing touch with the immediate present. In a touching paragraph, John

<sup>52</sup> See on this for instance Grmek 1969.

<sup>53</sup> Labisch 2018; Capasso 1998, 2001.

<sup>54</sup> Pleinen and Raphael 2014; Graf and Priemel 2011.

<sup>55</sup> Berridge 2011.

<sup>56</sup> Grmek addressed this point already in a different form, Grmek 1996 [1993], on 26.

Pickstone (2005) detailed a number of epistemic entanglements with which the medical historian has the privilege to become trapped. Most importantly, however, he also underscored (taking the move from Huisman and Warner, 2004) how “good centers have worked like this for a century or so” from the origins of the history of medicine as an academic discipline.<sup>57</sup>

The object of these centers has always been medicine as *téchnē*; a special category of practical and applied knowledge. In order to become a physician, a medical student has to go through clinical training. Advanced, technology-laden, and naturalistic as it has become through history, clinical training is still strongly rooted in the *technical* tradition of medicine. Thus, the dyad “*epistemē kai technē*” is just as exact a definition of the medical profession now as it was back in the day. A pure medical science does not make sense in the light of what has been said.

We will not go that far and say that science and medicine are incommensurable. However, as opposed to the history of natural science, the history of medical science is not based upon a myth of origin, at the core of which lies a revolutionary rupture.<sup>58</sup> Rather, the demarcation between *scientific* and *non-scientific* represents an accident in the history of medical science, perhaps a rupture (one which “lead us where we now stand”), but not foundational as in the case of natural science (see Daston 2017).

Now, it may be asked, if the gulf between natural and medical science is so wide and clear, why at all are we insisting on adopting the term *medical science* throughout our text? It is for a reason that is perhaps marginal, but not insignificant. In all European languages except for English (or, at least, in Greek, Latin, Italian, French, Spanish, Portuguese, German) the word “science” (*epistemelscientia*) denotes any consistent corpus of teachable knowledge, not necessarily systematic. So, even if it does not cover the whole spectrum of medical and healing activities (formally leaving outside the dimension of *bios* and a part of the *téchnē*), medicine can be rightfully defined as a science throughout its history in the West, without over-stretching the definition. Consequently, the history of medicine can be (to a respectable extent) a history of medical science and its changes through time (that is, both changes in the meaning of *medical* and in that of *science*).

This leads us to a modest reflection upon one point of Daston’s argument for moving to a history of knowledge: the narrowness of the very term *science*. Once the wider, original meaning of the word has been restored, it would appear that a significant proportion of Daston’s proposed program would be already accomplished, as it is in the history of medicine (and science). The modernist narrative that underpins the history of science and provides its very *raison d’être* would be incorporated into a much broader (from theology, queen of sciences, to particle physics), and longer (at least from the Greeks, in Western culture) outlook, within which the very question of *modern science* would be reinstated as a specific problem.

Most of the beneficial effects that Daston ascribes to the move to *knowledge* would arguably be achieved: from the possibility of reassessing the relations of *sci-*

<sup>57</sup> Pickstone 2005, on 307.

<sup>58</sup> Of course we do not mean that the history of medicine is devoid of myths of origin, or of mythologies—but this is a different matter, which we will touch upon below.

*entific revolution* and modernity without oversimplifications and giving it due weight, to other forms of learning that are apparently overshadowed by the star of post-Galilean science. Equally, the present system of the sciences would be re-enlightened from a different angle, and relations among different practices, theoretical and belief systems, technologies and communities would be highlighted.

We could clearly observe that some communities of Western experimental scientists, well into the 20th century, conceived themselves as contributing to physiology, philosophy, *and* natural theology with no shade of a contradiction or signs of schizophrenia. We could feel less guilty by making it clear to our students that Galileo, that father of Modernity, was employed by a medical faculty to make horoscopes. He made these for himself and exploited his own discovery of the moons of Jupiter to cast doubt on the usefulness of the “old”, “unscientific” astrology, because it only considered the largest celestial bodies. Finally, we could teach (as more than a curiosity) that G. B. Vico’s *Scienza Nuova* had been conceived as an alternative science to Cartesian mechanicism, and a superior one in terms of certainty. Moreover, we could perhaps compare this specific debate to the myriad other variants of it that we encounter in the history of Western science.

Equally, the meanings of *Wissenschaft* and *Sciences Humaines* would *ipso facto* be turned from a headache into a research topic, just as the origin and debated suitability of the very recent word *scientist* has already been.<sup>59</sup> In his *Ways of Knowing*, John Pickstone proposed a fine-grained approach to this complex relation; that is non-teleological, open to complexity and contingency, and allows for an expansion of the outlook both in time and through the intertwinement of *ways of knowing* and *ways of making*. Furthermore, it balances a keen attention for the local with an ambitious breadth. Not by chance he used medicine to introduce the readers of his *Ways of Knowing* to the idea of “critical pluralism” (p. 25) regarding historical analyses of practices, scopes of actions, systems, and spheres.<sup>60</sup> This progresses, in our opinion, towards Daston’s proposed program. Yet, Pickstone envisages a different point of anchorage, as can be evinced from his triple introduction, addressed to historians, practitioners, and the public. This attempt at balancing the needs and views of different, present constituencies is linked to the need of being relevant to all of them, but comes at the cost of not completely obliterating the great categories he analyzes—science, technology, and medicine.

<sup>59</sup> Ross 1962. We may incidentally notice that the *Sciences Humaines* (*une autre science française, comme la chimie*) have always been both a headache and a research topic ever since they were defined, and are only one of the last instances of overarching *sciences of Man* appearing in the history of the West, including evolutionary biology, the study of the Classics, Comteian Sociology and even some interpretations of physiology (see on this Piaget 1970, 1–60). Another interesting research topic-cum-headache could be the question about why, in French, the scientist is still currently and happily called a *savant* (as well as a *scientifique*), and in Spanish a *sabio* (or, only later, “*científico*”). No comparative history of the word *scientist* in different languages or cultures is at present available, at least to our knowledge.

<sup>60</sup> Pickstone 2000.

## A Question of Relevance

Instances of consistent ways of connecting medical science to the history of sciences, and using knowledges (ways of knowing/making) as a link are already available. The question here from a medical-historical perspective is, however, what would we gain from a systematic and institutionalized reshuffling of our (contingent, historically constructed) basic categories, and what would we lose? Would the de-potentialization of our contingent categories bear any advantage against, say, a constant, reflexive, and critical consideration of their meaning and its change over time? Would we really gain from a *new grand narrative* to replace the old, when we can fruitfully engage with the ambiguities and changes of the latter, not simply as *object* or *foundation* of our history, but as *bona fide* historiographical problems? Even the history of knowledge to come will have as its foundational narrative the simplification of a very complex historical development to the *disciplinary neurosis* provoked by the incompatibility of two principles: Modernism and Historicism. Is there a way out of this? What should we take from this escapeless entanglement?

If the scope of the history of science is not only to amuse historians or history students but also to benefit scientists and students of science, the history of medicine could provide an example of coping with the entanglement in a productive way. Students enroll in medical faculties possibly to become doctors or health specialists, but not necessarily medical historians. In principle, it is in this connection (within this tradition, within this mythology) that (medical) historical teaching has found its relevance beyond professionalized historiography for many decades. The critical outlook, the debunking of founding myths, can and must be included, but as a practical tool that students can utilize in their self-perception and self-assessment, not as epistemological dogma. Could the same not be true for a history of science?

We can teach the critique as a technique and as a deed, and train our students to exploit adequate approaches skillfully to research and analyze in various faculties. Still, we will need to frame this in a narrative that makes sense to them in relation to their field of study, and may (eventually) benefit them in what they do, either as a puzzle to solve (this is science) or as an idealized professional ideal. In science and medical faculties, this narrative would be *science* or *medicine* rather than *knowledge*. Beyond the content of our histories, or the epistemological resources and constraints that shape them, the institutional and didactical constraints are fundamentals, and not burdens: they are the essentials of our very identity and of the horizon we can set for our actions.

## History

The finale of this surely incomplete and partial outline will focus on a point that we consider essential (although it was at best indicated in the above), and one that is surprisingly absent from Daston's analysis. This proverbial elephant parked outside the room is historicity, or, better, the science of history (*Geschichtswissenschaft*). Isn't this kind of knowledge also historically situated and interacting with others? Hasn't Kuhn's game-changing historicist stance also a history? Hasn't it

come to him through contact with the science of his day (on the one hand) as well as through the influence and appropriation of schemes and approaches (most notably those of Ludwik Fleck) coming from a faraway land, time, and culture<sup>61</sup>? Was it not in relation to the natural sciences that the human sciences were defined? Is history just the past of whatever happens to happen, all over the world or are there other historical gazes, perhaps incommensurable to ours?

Long ago, Benedetto Croce mused that “every history has the character of contemporary history,” a character it derives from the “practical need, laying at the bottom of every historical judgement” and anchoring every history “to the present need and situation, in which the historical facts resonate.”<sup>62</sup> Without necessarily having to adopt the complete paradigm of absolute historicism, we still find much sense in Croce’s definition of the historical inquiry as morally grounded and actually rooted in the here-and-now, in a contemporaneous mind, rather than in the abstract, self-oblivious re-definition of an epistemic space. It is of primary importance to the historian, embarking upon so hard a task as re-considering the extent and import of a scientific field, to strive for depth, as well as for length and breadth. An important element in this exercise, as we have suggested in the beginning, is to contextualize oneself in the first place.

The webpage of the Stevanovich Institute on the Formation of Knowledge reveals a certain consonance of epistemological and geopolitical/business prospects as a context for the history of knowledge. “Thanks to the establishment of the new University of Chicago Centers in Beijing and New Delhi,” they announce, “the founders of the Stevanovich Institute felt that the potential for our faculty to do *in situ* research and interact with local scholars engaged in the investigation of their own pasts was greater than ever before. As such, the time seemed ripe for the foundation of such an institute that spanned not only divisions but continents in its search for how context shapes knowledge.”<sup>63</sup> If we contextualize (again) Daston’s call for epistemological and institutional pluralism within this programmatic frame, then it is easy to gain the impression of yet a new universalism (paralleling a new globalism) spreading from Chicago (Ill., USA). This subtly resonates with the western-centric tone of Daston’s concerns about the impact of “*our* originary disciplinary neurosis” (our emphasis) on the “world at large”: what happened to good old appropriation? Is it part of our job to provide “the world at large” with correct categories they can safely use?

Perhaps the tendency toward universalism and the fascination with revolutionary outcomes is a professional disease of the historian of science, arguably an infective one caught from their object of study. The past is a foreign country, borderless and fascinating; and the temptation to settle there forever and from there to look at ourselves is just as difficult to resist as that of presentism. Yet, it is in “that part of history which is not yet the past”<sup>64</sup> that we live, engage with others, and *act*. With the necessary humbleness, it is the present that makes our intuitions

<sup>61</sup> Babich 2003. Consensus on the weight and relevance of Fleck’s influence on Kuhn is, however, far from established (see e.g. Fuller 2000; Richards and Daston 2016).

<sup>62</sup> Croce 1966 [1938], on 11.

<sup>63</sup> <https://sifk.uchicago.edu/about/history/>

<sup>64</sup> Pickstone 2000, on 26.

and thoughts possible, and gives them a frame. By embracing such an uncompromising historicism as Daston proposes, we run the risk of sacrificing our relevance<sup>65</sup> for the present, that is, the possibility of engaging with, and anchoring to, the many *external* communities, students, and professionals that in a sense provide the object and possible beneficiary of our investigation. Therefore, we think that a history of medicine would lose object, history, and constituencies if it is subsumed under a history of knowledge.

Hans-Jörg Rheinberger has recently posited three pillars for the history of science: the reflexivity of the approach, the historicity of epistemology, and “direct contact with the sciences.” He considers this last point essential for providing both interested practitioners for the discipline and interesting outcomes for the concerned constituencies. In this connection, we wish to underscore that the history of science and of medicine can house the whole spectrum of the ways of writing history, with their different needs and ends that may speak to the specific manner of life into which our students are educated. The issue, from our perspective, is rather that of finding a balance between its specific anchoring points, or uses of history, on the one hand, and the tenets of its mannerisms on the other hand. It is not all a question of narrative, or theory. It is also a question of relevance and uses, and consciousness of present contexts.

## References

- Ash, Eric H. “Expertise and the early modern state,” *Osiris* 25, no. 1 (Expertise and the early modern state) (2010): 1–24.
- Babich, Babette E. “From Fleck’s Denkstil to Kuhn’s paradigm: conceptual schemes and incommensurability,” *International Studies in the Philosophy of Science* 17, no. 1 (2003): 75–92.
- Bartsch, Shadi, Clifford Ando, Robert J. Richards, and Haun Saussy. “Editors’ introduction,” *Know: A Journal on the Formation of Knowledge* 1, no. 1 (2017): 1–9.
- Bernard, Claude. *An introduction to the study of experimental medicine*. Translated by H. C. Greene (New York: Henry Schuman, 1949 [1865]).
- Berridge, Virginia. “Contemporary history of medicine and health,” in *The Oxford Handbook of the History of Medicine*, ed. Mark Jackson (Oxford: Oxford University Press, 2011), 117–132.
- Blake, John Ballard (ed.) *Education in the history of medicine: Report of a Macy Conference* (New York: Hafner Pub. Co., 1968).
- Bucknill, John Charles. *The medical knowledge of Shakespeare* (London: Longman & Co, 1860).
- Capasso, Luigi. “5300 years ago, the Ice Man used natural laxatives and antibiotics,” *The Lancet* 352, no. 9143 (1998): 1864.
- . *I fuggiaschi di Ercolano: paleobiologia delle vittime dell'eruzione vesuviana del 79* (Roma: L’Erma di Bretschneider, 2001).
- Casper, Stephen. “Concussion: A history of science and medicine, 1870–2005,” *Headache: The Journal of Head and Face Pain* 58, no. 6 (2018): 795–810.
- Cooter, Roger. “Framing’ the end of the social history of medicine,” in *Locating medical history: the stories and their meanings*, ed. Frank Huisman and John Harley Warner (Baltimore: Johns Hopkins University Press, 2004), 309–337.
- . “After death/after-‘life’: The social history of medicine in post-postmodernity,” *Social History of Medicine* 20, no. 3 (2007): 441–464.
- Croce, Benedetto. *La Storia come Pensiero e come Azione* (Bari: Laterza, 1966 [1938]).
- Daly, Patrick. “A concise guide to clinical reasoning,” *Journal of Evaluation in Clinical Practice* 24 (2018): 966–972.

<sup>65</sup> Not by chance, the question of relevance has long been central to the very definition and fortunes of Medical History, especially in the American academic system. See Dolan 2010; Blake 1968; Jones et al. 2015; Hudson 1970.

- Daston, Lorraine. "Intelligences: Angelic, animal, human," in *Thinking with animals: new perspectives on anthropomorphism*, ed. Lorraine Daston (New York, NY: Columbia Univ. Press, 2005), 37–58.
- . "Science studies and the history of science," *Critical Inquiry* 35, no. 4 (2009): 798–813.
- . "Science, History of," in *International Encyclopedia of the Social & Behavioral Sciences, 2nd edition*, ed. James D. Wright (Amsterdam: Elsevier, 2015), Vol. 21, 241–247.
- . "The History of Science and the History of Knowledge," *Know: A Journal on the Formation of Knowledge* 1, no. 1 (2017): 131–154.
- Daston, Lorraine, and Peter Galison. *Objectivity* (New York: Zone Books, 2007).
- Daston, Lorraine, and Glenn W. Most. "History of science and history of philologies," *Isis* 106, no. 2 (2015): 378–390.
- Dolan, Brian. "History, medical humanities and medical education," *Social History of Medicine* 23, no. 2 (2010): 393–405.
- Duffin, Jacalyn. "A Hippocratic triangle: history, clinician-historians, and future doctors," in *Locating medical history: the stories and their meanings*, ed. Frank Huisman and John Harley Warner (Baltimore: Johns Hopkins Univ. Press, 2004), 432–449.
- Eliot, William. *On scientific medicine, and its relations to, and claims upon, society at large* (Carlisle: Jefferson, 1840).
- Fangerau, Heiner, and Gisela Badura-Lotter. "Biomedicine and Bioethics," in *Handbook of popular culture and biomedicine. Knowledge in the life sciences as cultural artefact*, ed. Arno Görgen, German Alfonso Nunez and Heiner Fangerau (Cham: Springer, 2019), 41–55.
- Fleck, Ludwik. *Genesis and development of a scientific fact* (Chicago: University of Chicago Press, 1979).
- Fuller, Steve. *Thomas Kuhn: A philosophical history for our times* (Chicago: University of Chicago Press, 2000).
- Gaul, Anny. "Shahrazad's pharmacy: women's bodies of knowledge in 'The Tale of the Porter and the Three Ladies,'" *Middle Eastern Literatures* 19, no. 2 (2016): 185–205.
- Gracia, Diego, and Michael C. White. "The structure of medical knowledge in Aristotle's philosophy," *Sudhoffs Archiv* 62, no. 1 (1978): 1–36.
- Gradmann, Christoph. "Transitions, traditions: From colonial to global health," *Studies in History and Philosophy of Science Part C* 64 (2017): 101–105.
- Graf, Rüdiger, and Kim Christian Priemel. "Zeitgeschichte in der Welt der Sozialwissenschaften. Legitimität und Originalität einer Disziplin," *Vierteljahrshefte für Zeitgeschichte* 59, no. 4 (2011): 479–508.
- Grmek, Mirko D. "Préliminaires d'une étude historique des maladies," *Annales. Histoire, sciences sociales* 24, no. 6 (1969): 1473–1483.
- . "Einführung," in *Die Geschichte des medizinischen Denkens*, ed. Mirko D. Grmek (München: Beck, 1996 [1993]), 9–27.
- Hagner, Michael. "Scientific Medicine," in *From natural philosophy to the sciences. Writing the history of nineteenth century science*, ed. David Cahan (Chicago: University of Chicago Press, 2003), 49–87.
- Hofmann, Björn. "Medicine as techne—A perspective from antiquity," *The Journal of Medicine and Philosophy* 28, no. 4 (2003): 403–425.
- Hudson, Robert P. "Medical history—another irrelevance?," *Annals of Internal Medicine* 72, no. 6 (1970): 956–857.
- Jones, David S., Jeremy A. Greene, Jacalyn Duffin, and John Harley Warner. "Making the case for history in medical education," *Journal of the History of Medicine and Allied Sciences* 70, no. 4 (2015): 623–652.
- Jütte, Robert. "The historiography of nonconventional medicine in Germany: A concise overview," *Medical History* 43 (1999): 342–358.
- Kearns, Cristin E., Laura A. Schmidt, and Stanton Glantz. "Sugar industry and coronary heart disease research: a historical analysis of internal industry documents," *Journal of the American Medical Association Internal Medicine* 176, no. 11 (2016): 1680–1685.
- Kuhn, Thomas S. *The structure of scientific revolutions* (Chicago: University of Chicago Press, 1962).
- Kushner, Howard I. "History as a medical tool," *The Lancet* 371, no. 9612 (2008a): 552–553.
- . "Medical historians and the history of medicine," *The Lancet* 372, no. 9640 (2008b): 710–711.

- . *A cursing brain? The histories of Tourette Syndrome* (Cambridge, Mass.: Harvard University Press, 2009).
- Kushner, Howard I., and Leslie S. Leighton. "The histories of medicine: Toward an applied history of medicine. In Humanities in the Twenty-First Century," in *Humanities in the twenty-first century. Beyond utility and markets*, ed. Eleonora Belfiore and Anna Upchurch (London: Palgrave Macmillan, 2013), 111–136.
- Labisch, Alfons. "Transcending the two cultures in biomedicine: the history of medicine and history in medicine," in *Locating medical history: the stories and their meanings*, ed. Frank Huisman and John Harley Warner (Baltimore: Johns Hopkins Univ. Press, 2004), 410–431.
- . "Molecular Historiography—neue Gegenstände und neue Methoden einer neuen Geschichtsschreibung?," *NTM - Zeitschrift für Geschichte der Wissenschaften, Technik und Medizin* 26, no. 3 (2018): 351–366.
- Modiano, Guido, Luciano Terrenato, Rosaria Scozzari, Augusta Silvana Santachiara-Benerecetti, Laura Ulizzi, Carlo Santolamazza, Romano Petrucci, and Piero Santolamazza. "Population genetics in Sardinia: With a historical account on the birth of the Haldane "malaria hypothesis"," *Atti de la Accademia Nazionale dei Lincei* 8, no. 3/4, no. 18 (1986): 257–328.
- Montgomery, Kathryn. *How doctors think. Clinical judgement and the practice of medicine* (Oxford, New York: Oxford University Press, 2006).
- Oxford English Dictionary. "medicine, n.1": (Oxford University Press: <https://www.oed.com>).
- Piaget, Jean. "The place of the sciences of man in the system of sciences," in *Main trends of research in the social and human sciences (Part I: Social Sciences)*, ed. Jacques Havet (Paris: Unesco, 1970), 1–60.
- Pickering, Andrew (ed.) *Science as practice and culture* (Chicago: University of Chicago Press, 1992).
- Pickstone, John V. *Ways of knowing: A new history of science, technology, and medicine* (Chicago: Chicago of University Press, 2000).
- . "Medical history as a way of life," *Social History of Medicine* 18, no. 2 (2005): 307–323.
- Pleinen, Jenny, and Lutz Raphael. "Zeithistoriker in den Archiven der Sozialwissenschaften. Erkenntnispotenziale und Relevanzgewinne für die Disziplin," *Vierteljahrshefte für Zeitgeschichte* 62, no. 2 (2014): 173–195.
- Porter, Roy. "The patient's view. Doing medical history from below," *Theory and Society* 14 (1985): 175–198.
- Prinz, Armin. "Ethnomedizin - Geschichte der Medizin. Wissenschaften vom heilkundlichen Denken und Handeln des Menschen," *Wiener Klinische Wochenschrift* 103, no. 16 (1991): 481–483.
- Richards, Robert J., and Lorraine Daston (eds.), *Kuhn's 'structure of scientific revolutions' at fifty: Reflections on a science classic* (Chicago: University of Chicago Press, 2016).
- Ross, Sydney. "Scientist: The story of a word," *Annals of Science* 18, no. 2 (1962): 65–85.
- Rothschuh, Karl Eduard. "Ist das Kuhnsche Erklärungsmodell wissenschaftlicher Wandlungen mit Gewinn auf die Konzepte der Klinischen Medizin anwendbar?," in *Die Struktur wissenschaftlicher Revolutionen und die Geschichte der Wissenschaften*, ed. Alwin Diemer (Meisenheim: Verlag Anton Hain, 1977), 73–90.
- . *Konzepte der Medizin in Vergangenheit und Gegenwart* (Stuttgart: Hippokrates, 1978).
- Saunders, John. "The practice of clinical medicine as an art and as a science," *Medical Humanities* 26 (2000): 18–22.
- Sprengel, Kurt. *Versuch einer pragmatischen Geschichte der Arzneikunde* (Halle: Gebauer, 1792).
- Stocking, George W. Jr. "On the limits of 'presentism' and 'historicism' in the historiography of the behavioral sciences," *Journal of the History of the Behavioral Sciences* 1, no. 3 (1965): 211–218.
- Toulmin, Stephen. "Knowledge and art in the practice of medicine. Clinical judgement and historical reconstruction," in *Science, technology, and the art of medicine*, ed. Corinna Delkeskamp-Hayes and Marie Ann Gardell Cutter (Dordrecht, Boston, London: Kluwer, 1993), 231–249.
- Tsouyopoulos, Nelly. "The scientific status of medical research: A reply to Schäfer," in *Science, technology, and the art of medicine*, ed. Corinna Delkeskamp-Hayes and Marie Ann Gardell Cutter (Dordrecht: Kluwer, 1993), 39–46.
- Warner, John Harley. "The humanizing power of medical history: Responses to biomedicine in the 20th-century United States," *Procedia—Social and Behavioral Sciences* 77 (2013): 322–329.
- Zittel, Claus. "Fleck-Fieber," *Zeitschrift für Ideengeschichte* 11, no. 2 (2017): 15–28