

Connecting with the Past? A Commentary

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Over its relatively brief history, science and technology studies (STS) has developed into an interdisciplinary project spanning issues as diverse as Welsh sheep-farmers' contributions to nuclear science or the dress codes of Chicago stockbrokers. Generally speaking, STS deals with the modern world or its immediate colonial forebears, worlds in which the terms 'science' and 'technology' are and were common currency. Indeed the greater part of STS research and reflection bears on the relations between technocracy and democracy in contemporary societies that have institutionalised science and technology as indispensable tools for solving society's problems. Within this journal, discussions concerning what might distinguish a specifically East Asian STS have variously proposed as a common substratum either a characteristically high level of scholarly commitment to critical, policy oriented analysis, or a shared post-colonial legacy of late admission into the magic circle of modern, international science.

As Yung Sik Kim remarks in his Introduction to this special issue, the concepts and methods of STS are largely shaped by the conditions of modern life, and notably by a common belief that science and technology exist as entities, as distinctive human activities that shape our lives. This is a worldview that can legitimately be extended back into the colonial era, but certainly neither science nor technology constituted an actor-category, however embryonic, in East Asia in earlier times. Kim argues that East Asian historians should not artificially impose anachronistic concepts or questions drawn from Western STS to frame their research, although an awareness of STS concerns can be productive. What Kim hopes an accumulation of studies of the history of science in East Asia in this vein might promote is a better understanding of 'the common and distinct

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history of traditional East Asia, which, I believe, is more significant [than the colonial experience] as a distinct background of science and technology of the region...New problems, subject, methods, etc. will come up when we take this East Asian perspective.'

Historical case studies of European societies certainly played a seminal role in shaping STS theories and methods, not least because they dramatically highlighted the contemporary strangeness of ideas that we now take for granted. One of the most striking and influential founding manifestos for STS was John Law's analysis of the Portuguese carrack and its place in a 'revolution in the means of long distance control' that transformed the balance of power across the globe; another was Steven Shapin and Simon Schaffer's study of the debates around Boyle's air-pump, and the building of a 'scientific polity' within which the experimental method proved its worth as an intellectual, and political, product (Law 1986; Shapin and Schaffer 1985). Shapin and Schaffer concluded that scientific knowledge, like politics, is the product of human actions. Law's paper represented the more radical Actor Network Theory approach within STS, dislodging humans from the apex of the great chain of being by attributing equivalent agency to 'non-human actors', including in this case charts, wind patterns, forms of rigging and eventually a transformed understanding of how political power was best exerted. There are, nevertheless, many common points between the contrasting approaches in these two seminal studies. Both treated scientific ideas and technological artefacts as the product of complex material, symbolic and social negotiations. Both blurred the boundaries, at that point still quite jealously preserved within historical sub-fields, between science and technology, ideas and matter, Nature and Society, the micro-politics of everyday experience and the macro-Politics of states and polities. That said, one could argue that *Leviathan and the Air-Pump* was still a quite conventional historical exercise in that it unteased the shaping and consolidation of new ideas largely within the terms of its historical actors. Law's paper, on the other hand, was defiantly a-historical: he imposed a newly developed theoretical apparatus and concepts completely anachronistically—not an actor's category in sight!—and thus drew a radically new, intriguing and convincing picture of one of human history's great tectonic shifts. Law has never pretended to be a historian, yet his work has been highly influential among historians as well as sociologists.¹

By and large, however, historians mistrust the strategy of starting from Theory, and in any case historical sources often frustratingly fail to document the phenomena we moderns would like to investigate. Furthermore, however useful the concepts of STS might seem heuristically, the problems and distortions entailed by an apparently unquenchable preoccupation on the part of comparative historians with the so-called 'Needham question' have largely discredited recourse to terms like science and technology within mainstream history of China. (This may be less true for Korea and Japan.) Kim's methodological and conceptual caution is therefore understandable, as is the fact that the six substantive articles in this collection by and large follow the path of theoretical moderation advocated by Kim rather than adopting Law's radicalism. Most

¹ Law is credited with having 'built bridges between theory and history' within the history of technology; (Schatzberg 2004). On the influence of work by Law and other STS theorists on the history of science, see for example (Golinski 1990).

of the papers engage only implicitly, if at all, with STS concepts or with the implications their findings might have for an STS perspective. Indeed, in his Introduction Kim presents the papers simply as an unplanned assemblage, leaving it to the reader to tease out for herself any common themes or contrasts that might emerge, or ways in which the arguments might link to or challenge STS concepts. There are, however, a number of intersecting themes and issues that arise which should definitely be of interest to STS scholars who are not historians. I shall briefly discuss two of them here.

The common focus in these essays on 'specialised knowledge' raises obvious parallels with STS concerns about the nature, location and status of expertise, its modalities of transmission and distribution, and its place in governance. The papers by Yung Sik Kim, Ya Zuo and Cho-ying Li offer stimulating cross-cutting perspectives on this issue. Yung Sik Kim's discussion focuses on the ambivalence of Confucian scholarship towards specialised knowledge. There were a number of domains of specialist knowledge that Confucian scholars might be expected to master at different periods, to various degrees and in different capacities. Several of these fields (astronomy or harmonics, for instance) can usefully be thought of in terms of science, yet within an over-arching philosophical framework that located cosmological-moral principles as the fulcrum for effective action, literati whether in their private or official capacity were discouraged from pursuing what was viewed as over-specialisation in technical knowledge. Even for those who acquired a high degree of competence or expertise in scientific domains, argues Kim, such achievements remained secondary, hence science as a project (my words, not Kim's) remained absent from the imperial agenda. Kim's well-illustrated account is painstakingly embedded in its philosophical and cultural matrix. Nevertheless, in its broader implications this is an argument that I would find more convincing had not the cult of generalisation, classical education and amateurism also flourished among the British ruling elite precisely throughout the period when the onset of scientific specialisation and technological transformation in Britain were at their most striking.²

Ya Zuo spells out in rich detail an original interpretation of the relations between making and thinking, skills and inscription, artisans and literati, as expressed by the Song official and thinker Shen Gua in his famous and influential collection of 'jottings'. The *Mengxi bitan* (Brush Talks from Dream Brook) is conventionally considered a key text for the history of science in China. Zuo's perceptive discussion of how Shen Gua conceived of not only distinctions but also parallels and complementarities between manual and cerebral skills, and of the methods by which he as a scholar could transform such skills into knowledge, is illustrated with specific cases that usefully test Kim's model of the general principles and conceptual frameworks within which Chinese literati thought about heaven, earth and man, or about the capacities which educated men should cultivate versus the skills from whose observation they might enrich their philosophical understanding.³ I feel,

² Patrick O'Brien further argues that British businessmen were rather unentrepreneurial in their attitudes during this formative period; 'Provincializing the first Industrial Revolution', *Working Papers of the Global Economic History Network (GEHN)* No. 17/06, 2006; available online at <http://www2.lse.ac.uk/economicHistory/whosWho/profiles/pobrien@lse.ac.uk>.

³ Another illuminating and equally iconoclastic interpretation of a text conventionally claimed for the history of science and technology is Dagmar Schaefer's study of the *Tiangong kaiwu*, *Knowledge and Technology in 17th Century China*, forthcoming with the University of Chicago Press, 2011.

however, that Zuo overstates the extent to which Northern Song intellectuals and statesmen like Shen Gua felt that their role as *shi*, literati, lay beyond and distinct from the complementary competences of *li* and *gong* (administrators and craftsmen): it seems to me more plausible that they expected truly capable intellectuals and managers (if not perhaps manual workers) to combine within themselves sufficient of these different types of expertise to be able to collaborate effectively across the boundaries of different kinds of knowledge and skill.

Cho-ying Li's study of hydraulic policy in Ming Jiangnan documents exactly such a case of collaborative construction of knowledge between local experts and high-ranking officials. Since Song times two contending models were proposed for dealing with the threat of floods in the region: one model prioritised dredging water-courses, the other prioritised careful maintenance of the dykes. The first model was basically a response to emergency conditions; the second aimed to maintain long-term stability. When Yao Wenhao was appointed to take charge of hydraulic policy in Jiangnan, at the end of the fifteenth century, the first model was currently favoured by the emperor and many of his ministers; the second model, which posed the challenge of organising regular inputs of money and labour, was less attractive to the central government yet from a local perspective appeared greatly superior.⁴ Consulting closely with local experts, Yao Wenhao succeeded in converting the central government to supporting the stabilisation model. Li gives us a brilliant close reading, reminiscent of STS analyses of how modern scientists craft persuasive and authoritative arguments, of how Yao Wenhao, in his successful policy memorials to the throne, selectively quoted and subtly sequenced the writings of earlier authorities on hydraulics, weaving in technical recommendations (both for the management and for the actual material practices of hydraulic works) from local experts who did not belong to the scholar class but were nevertheless respected and supported both by local officials and gentry. Li gives us a richly documented case of the overlaps between the competences of *shi*, *li* and *gong* in practical action; the interplay between local and central priorities of governance and their translation into material practices; and the politics and practice of what in ANT terms is referred to as enrolment. In other words, this trio of articles offers food for thought on an issue of shared concern to most readers of *EASTS*, namely, a set of historical takes on ideologies of technocracy.

The second theme I shall raise here is also pertinent to STS studies in general, although STS scholars working on contemporary questions are less likely to think critically about it than historians. It bears on the kinds of evidence we use, and the place we give them in our analyses. STS researchers on contemporary issues are usually spoiled for choice. We draw selectively, yet often without any explicit reflection upon our choices, upon an immense spectrum of primary and secondary sources: we can talk to real live people; practice participant observation as personal users of sun-screens based on nano-materials or as activists in anti-nuclear groups; decode advertisements or design processes, text-books or scientific publications; sit in on laboratory life or parliamentary debates...But historians operating before the last couple of centuries are largely obliged to work with worlds known to us only as

⁴ The contrast between the emergency and stability approaches to conceptualizing and solving hydraulic problems is discussed in a modern context by (Bijker 2007).

they are translated through surviving inscriptions: principally written texts, perhaps graphics or images, occasionally supplemented by a few surviving artefacts. Historians have to think very carefully about what materials are available to them and why, as well as about how they evaluate and use them. Researchers on contemporary STS issues are more likely to take their raw materials for granted, yet the field would certainly not suffer if more of us thought more critically about the kinds of evidence we dispose of, and about the rationales underlying our selection and ranking of sources.

In terms of available sources, the articles by Karine Chemla, Dongwon Shin and Jacob Eyferth offer an intriguing contrast. Each of them documents historical transformations in a community of specialist practice. In Karine Chemla's study of how mathematicians worked, the sole sources currently available are strictly technical, expert texts, namely mathematical treatises and commentaries. These texts do not explicitly address either the underlying rationales for formulating mathematical problems, or the material aids used by mathematicians to produce and transmit mathematical understanding. The first use of illustration in mathematical practice was long held to be the incorporation into printed mathematical texts of diagrams or other graphic layouts, *tu*, starting in the Song dynasty. Through close re-reading of the uses of the term *tu* within the mathematical corpus, Chemla argues that in their earliest form, the *tu* used by mathematicians were in fact coloured paper cut-outs. With the later transition to including *tu* as two-dimensional graphics that formed a physical part of the mathematical text, new possibilities opened up for what could be done with *tu* and several different traditions emerged for setting *tu* to work and for giving them meaning. In using *tu* and text to reconstitute shifts in epistemological culture, Chemla's paper calls us to reflect upon the materialities underpinning verbal representation in texts, and how these two dimensions of experience interact in the conceptualization and formulation of scientific questions.

In Dongwon Shin's study of the expanding role of professional medical treatment and drug therapies in Chosŏn Korea, rather than taking as his primary source the surviving expert texts (theoretical medical treatises, guides to diagnosis and therapy, compendia of *materia medica*), Shin draws upon an unexpectedly rich range of records kept by consumers of medicine, including four judiciously selected individual diaries, and the record-books (kept over two-and-a-half centuries) of a provincial medical mutual-aid society. Shin is thus able to trace a fascinating and suggestive history of shifts in the practices, expectations and identities of consumers of medicine as *materia medica* became more freely available, and as the number of physicians expanded. We are enabled to see the ways in which people used medicine, not as filtered and selectively represented in technical texts like the collections of case studies written up by physicians, but as directly experienced by representative individuals, their families and kin-groups. Such users' views are generally less easy to retrieve the further we go back in history, and it is instructive in this regard to compare Shin's study with Asaf Goldschmidt's on the first public pharmacy in China, established in the eleventh century.⁵

⁵ Goldschmidt 2008. The contrasting impact of Song and Chosŏn state interventions to control the flow and quality of *materia medica* is another intriguing point arising from comparison of Shin and Goldschmidt's studies.

Jacob Eyferth's Jiajiang paper-makers, in contrast, were typical of many craft specialists in China and elsewhere in that they did not produce expert texts documenting their practices. Written texts were, and still are, very important in the paper-makers' affirmation of identity: the communities of paper-makers trace their history as craft lineages through stone stelae and through ritual texts as well as through naming practices. As for expert texts documenting skills, materials or management, although quite a few of them were at least functionally literate, the paper-makers saw no reason to produce any such thing; all the practical skills of the industry were transmitted between people and through material experience. In tracing the historical antecedents of the industry and its technical practices Eyferth was able to draw upon one or two pertinent written sources produced not by practitioners but by literati or state officials (or later, by academics or administrators). But historical reconstruction would have been impossible had Eyferth not spent time in the villages. He shows us that the flexible skills necessary to succeed in every stage of paper-making are embodied not just within individuals but within communities and across lifespans, landscapes and trade routes: as a prime example of 'distributed intelligence', it is not surprising that recent government attempts to transfer Jiajiang paper-making technology to other regions failed miserably. Although it is hardly unexpected that the Jiajiang paper-makers themselves produced no written accounts of their craft, what might appear surprising is the paucity of technical documentation in official sources, given that between 1684 and 1905 Jiajiang was obliged to supply paper for the civil service examinations.⁶ This raises the important question, currently being explored by historians from many angles, of why, when and how official documentation of what we consider scientific or technological activities took place in a polity like imperial China, and of how, or even whether, such 'technical' documents were designed to facilitate the transmission of knowledge.

Finally, in his Introduction Yung Sik Kim suggests that one value for contemporary EASTS scholarship of engaging with historical studies is that the latter can generate new problems, subjects or methods specific to East Asia, more deeply rooted in time and perhaps more culturally or intellectually significant than similarities attributed to a supposedly shared East Asian 'colonial experience'. Certainly, individually and collectively, these six papers demonstrate that much is to be learned from a close attention to historical actors' categories and the way in which they shift over time—but Eyferth's is the only paper that addresses the question of the modern legacy of older, pre-industrial sociotechnical systems and values. I must confess to some disappointment that Yung Sik Kim chose to give us no clues as to how he believes all or any of these six papers might contribute to explicating the present through the past.

⁶ Other technical domains of importance to the imperial state, such as agriculture, hydraulics, astronomy, the construction of public works or state buildings, etc., were well documented in various official genres, although not always from the perspective that historians of science and technology might find most useful.

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