Prefiguring 'Pasteurization'?: Science, Society, and the Introduction of Vaccination to Siam[1]

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Abstract

This article is an attempt to apply the critical insights and theoretical tools of science studies to the case of the introduction of vaccination in nineteenth century Siam. By briefly reviewing the introduction of vaccination in other Asian states, this article offers a comparative approach to the question of the role of political culture in the spread of Western medicine. While the article focuses rather narrowly on the practice of vaccination against smallpox in Siam, the intention is to offer a critical perspective on the prevailing narrative of medicine and the modern state. The article concludes with a proposed alternative model for investigating the relations between science and society in a way that preserves the work-like nature of spreading knowledge and the inherently social channels through which knowledge moves.

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Introduction

Smallpox (*Variola major*) has recently become a central actor in the historiography of early European imperialism. When introduced to populations without any prior exposure to the disease, the results were catastrophic. Even in regions of the globe where smallpox had long existed, it was a virulent disease that killed and maimed without regard to social class.[3] Then, quite suddenly at the end of the eighteenth century, a British physician discovered a prophylactic treatment that protected against smallpox. The treatment, vaccination, which involved the injection of the lymph from a distinctive form of pox marks on cows into humans, spread rapidly around the globe. In many parts of the world, smallpox was all but eradicated through vaccination a short time after its discovery.

In light of recent critical insights into the history of science and medicine, however, the history of the spread of vaccination can no longer be viewed as a simple tale of the inevitable triumph of modern medicine. Historical and sociological studies of science, for instance, approach individual instances of the introduction of vaccination as case studies in the localization of a supposedly universal form of knowledge. Scholars focused on comparative colonial history have also seized on cases of the introduction of vaccination around the globe for what they might reveal – individually and collectively – about the relations between medicine and imperial power. Social historians have connected these historical power dynamics with the development of nationalist politics and post-colonial society. Insights gained at the edges of empire have also been used to suggest new perspectives on the development of biopower in the European metropole.

B.J. Terwiel offers a revisionist perspective on the introduction of vaccination in nineteenth century Siam.[4] Terwiel's revisionist impulse was to write back against nineteenth and early twentieth century imperialist historiography, which "regard[ed] most Asians as steeped in ignorance, and to describe the blessings of measures such as smallpox vaccination and inoculation as directly attributable to

[3] Hopkins, *Princes and peasants*.
[4] Terwiel, "Acceptance and rejection".

a European or an American agent".[5] Terwiel argues that it was Thai, not Western, initiative that lay behind the introduction of vaccination in Siam. While Terwiel's account is important for redressing political imbalances present in colonial era historiography, it cannot escape the peculiarities of the Thai historical case and does not invite broader comparative perspectives on the relations of science and society.

The discovery and implementation of vaccination in many parts of the world occurred long before the modern germ theory of disease could explain exactly how vaccination worked. This disjuncture, between theory and practice in modern medicine, highlights particular tensions that underlie the spread and practice of medicine and likewise certain forms of scientific knowledge. This article is an attempt to apply the critical insights and theoretical tools of science studies to the case of the introduction of vaccination in nineteenth century Siam. By briefly reviewing the introduction of vaccination in other Asian states, this article offers a comparative approach to the question of the role of political culture in general – and imperial power in particular – in the spread of Western medicine. This comparative perspective also allows for the consideration of alternative explanations of the spread of vaccination, including cases where consumer demand seems to have been the driving force. While the article focuses rather narrowly on the practice of vaccination against smallpox in Siam, the intention is to offer a critical perspective on the prevailing narrative of medicine and the modern state. The article concludes with a proposed alternative model for investigating the relations between science and society in a way that preserves the work-like nature of spreading knowledge and the inherently social channels through which knowledge moves.

The Discovery of Smallpox Vaccination and its Introduction in Nineteenth Century Asia

The English physician Edward Jenner (1749-1823) is credited with realizing the relationship between cowpox and smallpox. Jenner's work began with the observation that English farmers who

[5] Terwiel, "Acceptance and rejection", 184.

came into contact with a dairy cow's udder marked with pox would often themselves develop pox on their hands. He then connected this observation with reports – folklore – that those very farm workers coming into contact with pox-laden cow udders seemed to succumb to smallpox at a much lower rate than the general population. He hypothesized that cowpox, which is a mild disease in humans usually marked by localized inflammations that are similar in appearance to the much more virulent inflammations produced by smallpox, must convey some protection against smallpox infection. He embarked on a research agenda aimed at confirming this hypothesis by investigating natural occurrences of cowpox infections in humans and by intentionally injecting people with cowpox matter.[6]

In 1798, Jenner published a treatise in order to publicize this research and the method of using cowpox to protect against smallpox. Jenner's *Inquiry into the Causes and Effects of the Variolae Vaccinae* reviews twenty-three cases of vaccination by cowpox – intentional and otherwise – to present his theory on the preventative properties of cowpox.[7] Jenner's treatise asserts that:

> Morbid matter of various kinds, when absorbed into the system, may produce effects in some degree similar; what makes the Cow-pox [sic] virus so extremely singular, is, that the person who has been thus affected is for ever [sic] after secure from the infection of the Small pox [sic]; neither exposure to the variolous effluvia, nor the insertion of the matter into the skin, producing this distemper.[8]

In other words, cowpox protects the human constitution from the effects of smallpox. Jenner therefore thought it justifiable to spread a new, relatively benign disease, cowpox, in order to combat a more virulent scourge, smallpox.[9]

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6 Rusnock, "Catching cowpox", 19.

7 Jannetta, *The vaccinators*, 26-29.

8 Jenner, *An inquiry*, 6. Jenner's use of the word "effluvia," meaning "an unpleasant or harmful odor, secretion, or discharge," is consistent with the dominant (miasmatic) theories of disease prior to the discovery and articulation of the germ theory of disease in the late nineteenth century. I will delve into the role of etiology in the spread of vaccination below.

9 Bennett, "Passage through India", 202.

Although others had experimented with the relationship between cowpox and smallpox in the past – and more commonly with trying to isolate less virulent forms of smallpox in order to use in inoculation (variolation) – what made Jenner's work different was, first, his attempts to transfer cowpox from human to human, and second, his efforts to publicize his work and to transform a local peculiarity into a systematized form of universal medical practice. As Rusnock notes, "The practice of inoculation…depended solely on the communication of knowledge about the technique. The practice of vaccination, however, depended on transmitting not only knowledge about the technique but, more importantly, on the availability of cowpox itself."[10] Jenner's treatise was the first salvo in efforts to spread the practice of smallpox vaccination to the far reaches of the globe. His success in spreading cowpox from human to human by timing the initial injection and removing lymph from the individual at the height of the infection in order to inject it into others provided a feasible model for spreading cowpox to areas of the globe where it was not prevalent, or did not occur naturally.

The implementation of Jenner's method on a global scale, however, required a peculiar form of socio-political culture. The story of the spread of Jennerian vaccination to Asia in the early years of the nineteenth century therefore constitutes something of a litmus test for both European imperial states and early modern indigenous states in two important respects. On the one hand, the spread of cowpox by the arm-to-arm method required a political system where certain human bodies could be readily appropriated to serve the ends of powerful state agents.[11] On the other hand, the receptivity of the state to novel interventions in public health is indicative of a certain kind of openness. In this case, the decision of a sovereign state to adopt the practice of vaccination and to try to obtain cowpox lymph suggests a parameter for judging the extent to which it was joined up with global networks of commercial and intellectual exchange.

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[10] Rusnock, "Catching cowpox", 21-22.

[11] As Bennett notes, "Without official sanction and support, it cannot have been easy to find volunteers for vaccination chains." Bennett, "Passage through India", 204.

Spanish colonial efforts to spread cowpox in what has been called "The World's First Immunization Campaign" represent one extreme of the political spectrum.[12] Jenner's treatise appeared in Spain within a year after its publication in London, and was subsequently translated and abridged on numerous occasions over the next four years as the practice of vaccination – and the cowpox lymph that it depended upon – spread quickly both in Spain and in Spanish America.[13] In order to transfer viable cowpox lymph across the Atlantic to a region where cowpox did not occur naturally without an effective means of preservation, the Spanish Crown resorted to a malleable human vector: "twenty-two nonimmune orphaned boys, ages three to nine years old, would be vaccinated during the crossing by serial arm-to-arm inoculation".[14] The expedition would travel back and forth across the Pacific, from Spanish America to the Philippines and eventually to Macau, recruiting a new cohort of nonimmune boys at each stage of the journey.[15] Imperial Spain therefore used its bureaucratic might to spread vaccination to its colonial territories, appropriating human bodies as vectors and utilizing a global network of officials and infrastructure to accomplish the task.

At the opposite end of the political spectrum is the case of Edo Japan. Knowledge of Jenner's discovery reached the Dutch trading compound, which was sequestered from Japanese society on a small island off the coast of Nagasaki, in 1803. But this knowledge, similar to all other forms of contact with the outside world, remained cloistered among a select contingent of Japanese scholars and officials who were appointed to act as intermediaries between the Tokugawa Shogunate and the Dutch traders who had been granted a monopoly over Japan's limited external trade. It would be almost another half-century, in 1849, before viable cowpox lymph would arrive in Japan

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[12] Mark and Rigau-Pérez, "The world's first immunization campaign".
[13] Mark and Rigau-Pérez, "The world's first immunization campaign", 66.
[14] Mark and Rigau-Pérez, "The world's first immunization campaign", 69.
[15] The fate of these child-vectors in what was known as "The Royal Philanthropic Vaccine Expedition" is not sufficiently dealt with in current scholarship (Hopkins, *Princes and peasants*, 225); it is likely lost to history as the value of the boys in transit was far greater than on the return voyage (Thompson, "Mission to Macau", 197).

from the Dutch Indies and vaccination would begin in earnest.[16] On account of its restricted access to foreign trade, vaccination arrived late in Japan, after physicians had long heard of its successful use around the globe. Several years would pass before the state showed an interest in vaccination in 1857, and still longer before state-sanctioned clinics were established in 1860.[17] This meant that the Japanese engagement with vaccination was quite distinct from other parts of Asia, where imperial power seems to have been the driving force behind its spread. In terms of the metaphorical litmus test suggested above, it seems likely that the spread of vaccination in Japan was driven by consumer demand that had been fostered over the half century between the first news of vaccination and the arrival of viable cowpox.[18] In Edo Japan, then, vaccination seems to have spread in spite of the state, according to the whims of consumer demand and in the absence of a colonial regime.

The spread of vaccination in Edo Japan and the Spanish colonial world represents two diametric ends of a spectrum. Each case therefore suggests an analytical model for describing the spread of medical – and likewise scientific – knowledge and practice that is something of an outlier, overly reliant on either (colonial) state power or much more diffuse forms of social interest, i.e., consumer culture. Nguyen Dynasty Vietnam, another autonomous Asian state, is perhaps an intermediate case located somewhere between the coercive Spanish colonial model and the case of Edo Japan, where medical knowledge spread in spite of a repressive state that constrained its connections with Europeans through the Dutch intermediaries at Nagasaki.

According to Thompson, Emperor Gia Long (1762-1820) and his heir apparent who would reign as Ming Mang (r. 1820-1841), learned of vaccination in 1819 from visiting French naval officers who had attempted to vaccinate some fifty Vietnamese children.[19]

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[16] Jannetta, "Jennerian vaccination", 125-126. Bloomgaard offers an exhaustive account of the history of Smallpox and vaccination in the Dutch East Indies. Bloomgaard "Smallpox, vaccination, and the pax neerlandica, Indonesia, 1550-1930".

[17] Jannetta, *The vaccinators*, 131.

[18] As Jannetta has argued. Jannetta, *The vaccinators*, 4.

[19] Thompson, "Mission to Macau", 200.

Their attempts were unsuccessful as the injections failed to produce a proper reaction, which was often the case when using spoiled cowpox lymph. At the time, Gia Long was suffering in secret from an ailment that would soon lead to his death, and Thompson surmises that this affliction provided the basis for the emperor to interact with visiting French physicians and learn about the practice of vaccination.[20] Not long after Gia Long's death, Minh Mang sent the royal physician, Despiau, a Frenchman who had resided in Vietnam since the end of the eighteenth century and who was therefore himself unfamiliar with vaccination procedures, to Macau to learn the technique and bring it, along with cowpox lymph, back to Vietnam.[21]

When the Vietnamese mission reached coastal southern China, it intersected with European colonial powers and their agents. Upon his arrival in Macau, Despiau was introduced to Alexander Pearson, a surgeon in the British East India Company who had long worked to encourage the spread of vaccination in Canton and Macau.[22] Thompson gathers that Despiau likely studied the method of vaccination under Pearson, who expressed high esteem for Despiau and his abilities in his formal reports on vaccination.[23] After a year spent studying vaccination with Pearson, Despiau returned to Vietnam bringing with him his knowledge of vaccination and also cowpox lymph by the method of arm-to-arm transmission. It is here that the spread of vaccination to autonomous Nguyen Vietnam intersects with colonial history in an interesting, although hardly straightforward way.

Thompson surmises that Despiau would likely have had to *purchase* unvaccinated children in order to transport the cowpox lymph back to Vietnam.[24] Despiau brought two children with him from Macau; he could inject the first and wait for the appearance of symptoms related to cowpox, then inject another child and be ready to extract the lymph at the height of its potency when he arrived in Da Nang some six days later. Because of language barriers and other

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[20] Thompson, "Mission to Macau", 202.
[21] Thompson, "Mission to Macau", 204.
[22] Thompson, "Mission to Macau", 197, 205.
[23] Thompson, "Mission to Macau", 205.
[24] Thompson, "Mission to Macau", 206.

issues, Thompson thinks that the most likely candidates for child-vectors would have been Portuguese-mestizo children living in charity orphanages in Macau. The case of Nguyen Vietnam indicates that a sovereign Asian state could make use of the established networks of colonial science – and the social conditions fostered by a colonial port city – without subjecting itself to colonial rule.[25] The Vietnamese court was able to import cowpox matter independently, and to establish and conserve its own supply through arm-to-arm injection, in order to benefit "the royal medical service of the Nguyen."[26]

The spread of vaccination to early nineteenth century Asia illuminates distinctive features of political culture in the region and highlights the differences between colonial states and autonomous indigenous states. Vaccination was generally slower to arrive in locales that were not under foreign colonial power in the early nineteenth century, as the cases of Japan and Vietnam suggest.[27] But this difference in chronology is not in itself sufficient evidence to suggest that differences in the spread of medical, and scientific, knowledge and practice in nineteenth century Asia can be reduced to the presence or absence of a colonial power. The differences between Edo Japan and Nguyen Vietnam, for example, suggest that there are other variables that require consideration. Moreover, these variables cannot be explained by the simple dichotomy of (colonial) state power on the one hand, versus social networks (and consumer demand) on the other.

In most cases, the spread of medical and scientific knowledge depended on a variety of forms of power and agency, frustrating the colonial versus non-colonial duality. Recent scholarship on the arrival of vaccination in colonial South Asia, for instance, suggests that the power and agency of the British colonial state have been systematically overvalued in the historiography. The work of Jenner and his supporters appears to have been more decisive than that of the

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[25] Thompson argues that, in fact, the Nguyen decision to try and obtain vaccination at Macau was a strategic one based on their friendly relations with and greater trust of the Portuguese over the French. Thompson, "Mission to Macau" *passim*.

[26] Thompson, "Mission to Macau", 209.

[27] The case of China outside of the southern colonial port cities likewise confirms this; see Ki Che Leung, "The business of vaccination in nineteenth-century Canton".

East India Company in bringing vaccination to colonial South Asia – at least in the earliest period. Bennett makes the case that the arrival of vaccination in India cannot be easily linked with British colonial policy,[28] and that early successes – one million vaccinations were performed within ten years of the publication of Jenner's treatise – are more evidence of the fervor of Jenner and his allies than of the power of the colonial state.

The problems with this dichotomy extend to the spread of science and medicine to non-colonial states. As noted above, Jannetta concentrates on how the demand for smallpox vaccination created global networks that allowed for its spread.[29] She posits that:

> A widespread understanding of the promise of vaccination rapidly created a global demand for the precious vaccine. And this demand, in turn, forged personal relationships between physicians and patients, churches and parishioners; diplomatic relationships between allies and foes; commercial relationships between trading partners; and power relationships between colonizers and colonized.[30]

But this account presumes that the promise of the vaccine was a given, which could spread by word of mouth in the absence of any demonstrations – as in Edo Japan. This approach fails to consider the significant labor involved in making the requisite arguments and demonstrations before the demand could be realized. The many translations and adaptations of Jenner's treatise on vaccination that were composed around the globe in the first half of the nineteenth century provide documentary evidence of this work.[31]

In the next section, I will present an empirical account of the labor involved in spreading smallpox vaccination in early nineteenth century Asia. Similar to Nguyen Vietnam, autonomous Siam (Thailand) represents another intermediate case on the political

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[28] Bennett, "Passage through India", 202.

[29] Jannetta, *The vaccinators*.

[30] Jannetta, *The vaccinators*, 4.

[31] Jannetta provides a partial account of the spread of Jenner's treatise through translations and adaptations in vernacular languages. Jannetta, *The vaccinators*, 32-54.

spectrum between imperial Spain and Edo Japan. This historical account of the introduction of vaccination in early nineteenth century Siam relies on a treatise composed by an American missionary-physician in the Siamese (Thai) language in 1844.

The Introduction of Vaccination in Siam (Thailand)

In his *Treatise on Vaccination Comprising a Narrative of the Introduction and Successful Propagation of Vaccina in Siam*,[32] the American missionary-physician Dan Beach Bradley offers an account of the original discovery and subsequent spread of vaccination as a technique to protect against smallpox infection.[33] In spite of its name, the *Treatise*, which was published in the Siamese language, constitutes an *argument* for the use of vaccination in Siam, and not simply a description of a *fait accompli*. As such, I will attempt to present Bradley's chronology of the introduction of vaccination to Siam in full view of the many missteps and contingencies, making use of Latour's principles of method for exploring science and society.[34]

In their reviews of Latour's *The Pasteurization of France*, Sturdy and Schaffer both highlight the commonality between Latour's historical methods and those of the Strong Programme in the sociology of scientific knowledge (SSK).[35] Schaffer outlines two fundamental methodological principles common to Latour and SSK:

> …first, study systems in the course of controversy, when all is unstable and up for grabs, since closure effaces the memory of the work through which the taken-for-granted is established; second, do not accept the rigid boundary between the scientific-textual and the social-contextual[,] which is often a result of these passages of action, and so cannot be used to explain them.[36]

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[32] Bradley, *Treatise* (in Thai).

[33] The following is an account of Bradley's chronology culled from his *Treatise*; all translations are my own. See the appendix (below) for the tabular form of this chronology.

[34] Latour, *The Pasteurization of France*.

[35] Latour, *The Pasteurization of France*; Sturdy, "The germs of a new Enlightenment"; Schaffer, "The eighteenth Brumaire of Bruno Latour". For a concise introduction to the latter, see Bloor, *Knowledge and social imagery*, chapter one.

[36] Schaffer, "The eighteenth Brumaire of Bruno Latour", 180.

In my reading of Bradley's *Treatise*, I will engage with the forms of contingency inherent in his work championing vaccination in Siam. Bracketing for the moment the eventual validation of the practice of vaccination by scientific theory – namely, the germ theory of disease – I will explore the impediments to the spread of this practice in the early-to-mid nineteenth century. Because vaccination is today a widespread practice that coheres with modern theories of disease, it is easy to lose sight of the contingencies involved in the dissemination of this technique in the first half of the nineteenth century before modern virology specified the relationship between microbes, disease, and contagion.

Bradley's *Treatise* suggests several important transitional moments in the understanding and practice of vaccination, especially in relation to the deployment of vaccination as a form of universal medical practice. Beyond Jenner's discovery of the inherent connection between cowpox and human smallpox, several difficulties had to be confronted in order for this practice to spread to Siam. First, physicians had to find a way to convey viable cowpox lymph to people residing in places without naturally occurring cowpox. As noted above, colonial states and sovereign rulers of Southeast Asian states solved this problem by making humans the living vectors of cowpox lymph through the arm-to-arm method of preservation. But Bradley, a medical missionary, lacked the power and resources of either a colonial or a sovereign Southeast Asian state. In order to convince the Siamese of the efficacy of vaccination, Bradley needed greater access to cowpox lymph, but he was at pains to obtain that lymph at a time when there was no reliable means of conveying it apart from the arm-to-arm method using human vectors.

In the end, Bradley had to rely on social connections and an appeal to actors who shared his desire to spread vaccination around the globe. He wrote letters to doctors stationed in colonial port cities in South, East, and Southeast Asia – as well as the city of Boston – requesting that they send him cowpox lymph.[37] These doctors willingly obliged Bradley, presumably in the interests of spreading a practice

[37] Bradley, *Treatise*, 11 (in Thai).

whose benefit they believed was unimpeachable. Unfortunately, as Bradley notes on several occasions, the lymph continually spoiled by the time it reached him. When he tried injecting the lymph – usually into children residing near his mission compound or communities of resident Asian foreigners in Siam – it either produced 'spurious' pox, which would not protect against smallpox, or no pox at all. Such were the frustrations of attempting to spread vaccination in the time before a reliable medium had been developed to preserve cowpox lymph, not to mention steam shipping to speed up transit times.

In time, Bradley realized that the cowpox lymph being sent from abroad was likely spoiling as a result of exposure to "air and humidity".[38] He then proposed a manner of packing the lymph that would protect it from exposure to the elements in transit. Bradley wrote to the physicians in his network and requested that they:

> take cowpox scabs [Thai: *saket*] and place them inside of a small glass jar, then close the mouth of the jar securely with sealing wax [or lac]. Do not allow air and humidity to enter. Then drill holes in a piece of wood wide enough to fit those glass jars. Take those glass jars containing the [cow]pox matter and place them into the holes. Secure the mouth of the jars tightly again with sealing wax.[39]

An American doctor in Boston followed Bradley's instructions and seven months later a shipment arrived in Bradley's hands.[40] Even with the new packaging, however, the cowpox proved fickle and Bradley was able to obtain only one successful injection, in a Chinese child.[41] He nevertheless persevered and was able to cultivate a strain of viable

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[38] Bradley, *Treatise*, 15 (in Thai).

[39] Bradley, *Treatise*, 15 (in Thai).

[40] It is interesting to note that the cargo arrived on a ship owned (or leased?) by the British merchant Robert Hunter, who was a long-time resident in Bangkok and who owed his vibrant import business to his affiliations with the crown. On Hunter, see Hong, *Thailand in the nineteenth century*, 62-64 and Vella, *Siam under Rama III, 1824-1851*, 126-129. Bradley's journals recount other forms of patronage he received from Hunter during the lean early years of his mission work in Siam. *Bradley Papers*, vol. VII, entry for January 11, 1840.

[41] Bradley , *Treatise*, 15 (in Thai).

cowpox in human vectors by following the course of the disease in the Chinese child and injecting it into others when pus had developed in the pox near the site of injection.

The issue of spoilage in transit was more than a mere inconvenience for Bradley; it signals the root of his problems in spreading the practice of vaccination in Siam. His ability to tout the virtues of vaccination was constantly tempered by the fickle reality of smallpox vaccination in early nineteenth century Asia. On the one hand, Bradley had to work earnestly to convince the Siamese (and resident foreigners in Siam) of the efficacy of cowpox injections in preventing against smallpox. On the other hand, the specter of spoilage, which produced 'spurious' cowpox-like symptoms but did not provide any immunity to smallpox, meant that Bradley had to be diligent in his observation and assessment of different strains of cowpox lymph in humans. At the same time, on account of the possibility of injecting 'spurious' cowpox, Bradley had to encourage proper skepticism among those he injected. If those who were injected were too trusting in vaccination, then they might place their faith in an unsuccessful vaccination attempt and subsequently succumb to smallpox.

The most pressing issue in Bradley's *Treatise* was the fear of public censure for unsuccessful vaccination. The concern was not only that Bradley himself would shoulder the blame for such censure – although this was, explicitly, among his concerns[42] – but that rumors of unsuccessful vaccinations would taint the public trust in Western medicine and its practitioners. In the final sections of this article, I will consider this problem as a means of entering into the question of the relation between science and society – the second of Latour's principles of method.[43]

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[42] Bradley, *Treatise*, 19 (in Thai).

[43] Latour's principles of method. Latour, *The Pasteurization of France*, as described by Schaffer, "The eighteenth Brumaire of Bruno Latour", above.

Science and Society in Latourian Perspective: The Case of Vaccination

At first glance, the history of the arrival and spread of vaccination against smallpox in nineteenth century Asia seems ripe for the kind of analysis of science and society that Bruno Latour derives from the work of Louis Pasteur (1822-1895) and his acolytes in late nineteenth century France.[44] Latour's work suggests a vision of scientific knowledge that is inherently implicated in the power dynamics of a given society in two ways. I will consider Latour's model of science and society and its relevance for the case of the spread of vaccination to early nineteenth century Asia.

In the first instance, Latour suggests that science itself is political in the sense that scientific ideas do not take hold of their own accord; they depend upon the interactions and relations of social actors. "An idea," he writes, "even an idea of genius, even an idea that is to save millions of people, never moves of its own accord. It requires a force to fetch it, seize upon it for its own motives, move it, and often transform it."[45] Latour explores this first sense of the political nature of science through the notion of 'translation.' Surveying the career of Pasteur, Latour sees the social process of translation at work when Pasteur sidestepped the issues that were most important to him in order to take up the concerns of a large social group with relatively coherent interests (this group was most often French 'hygienists,' whose work paved the way for Pasteur's ascendance). Latour's sense of 'translation' can also be seen in cases where Pasteur intentionally expressed the results of his work in terms that were vague enough to suggest congruity with those whose alliance he sought.[46]

Latour's *The Pasteurization of France* is fundamentally an argument against the analytical division between science and society. Such is the force of his claim that "We cannot understand anything about Pasteurism if we do not realize that it has reorganized society in a different way" by changing its ontology through the introduction

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[44] Latour, "Give me a laboratory and I will raise the world".
[45] Latour, *The Pasteurization of France*, 16.
[46] Latour, *The Pasteurization of France*, 70.

of millions of previously unknown *social* agents.[47] This is the second, more profound sense in which science is political in Latour's work; science alters the field of social forces that is constitutive of society, and is therefore deeply involved in the mapping of social power. Situated in the historical context of "the great upheaval of late nineteenth-century Europe," Pasteur and his allies were able to "redefine what society is made up of, who acts and how, and they become the spokesmen for [microbes,] these new innumerable, invisible, and dangerous agents."[48] From this perspective, Pasteur not only discovered the microbes that caused diseases, such as rabies and anthrax, he "*actively modifies the society of his time and he does so directly – not indirectly – by displacing some of its most important actors*."[49] Pasteur's work ushered in a new social paradigm in French society by adding a new form of social – although non-human – agency, over which he exerted some degree of control.[50]

'Translations,' which describe the operations of scientific knowledge on the interpersonal social level, intersect with Latour's theory of the macro-political effects of science – the way science can alter the ontology of a society – through the notion of "obligatory passage points." Coined by Michel Callon and developed by Latour,[51] "obligatory passage points" mark the transition from the cultivation of common interests through 'translation' to the reification of those collected interests as social power. From a Latourian perspective then, the spread of vaccination to nineteenth century Asia implies that this new technique was the precursor to a modification of the power relations within society. One might expect to find Jenner's acolytes proselytizing in his name, establishing a formal network of 'Jennerian' institutes to distribute cowpox lymph from Western England to the rest of the globe, and forming alliances with physicians and public health advocates in order to spread the technique in Jenner's name. Applying

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47 Latour, *The Pasteurization of France*, 35.
48 Latour, *The Pasteurization of France*, 39.
49 Latour, "Give me a laboratory and I will raise the world", 156; original emphasis.
50 Latour, "Give me a laboratory and I will raise the world", 157.
51 Callon, "Some elements of a sociology of translation", and developed by Latour, *Science in action*, 245.

the Latourian model of science and society, one would anticipate a rich social history of the spread of vaccination, and an exploration of the choke points where practitioners of Jennerian vaccination would assert their power over cowpox, a new social agent with the power to prevent smallpox.

When applied to the case of vaccination, however, the nuanced model of science and society suggested by 'translation' and 'obligatory passage points' instead seems to result in a view of medicine as a coercive apparatus of power mobilized by the modern state. David Arnold's work on the introduction of vaccination in colonial South Asia is paradigmatic.[52] Arnold argues that the British colonial state attempted to implement vaccination schemes by relying on the intermediary power of local elites. This policy "made authority (the authority, in this instance, of the raja [local lords] over the body of his subject) the key issue rather than understanding or desire (as in the voluntary use of variolation [, which was common among South Asians prior to the introduction of vaccination])."[53] For Arnold, this initial interaction and negotiation with local power brokers set a precedent for the implementation of colonial state medical schemes that would continue into the twentieth century.

Rather than exploring the engagement of social interests and the establishment of positions of authority, the study of the spread of vaccination in the colonial era yields a state-centric narrative. The Foucault-inspired historiography of medicine and public health as a form of state power obscures the roles of other actors and their disparate interests. This homogenization of interests is also characteristic of Davisakd's recent contributions to the history of modern medicine in Siam/Thailand.[54] Similar to Arnold, Davisakd adopts the Foucaultian instrumental view of medicine as a channel of state power, but he goes further to try and link that power through a simple equation with the economic interests of the Siamese elite.[55]

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[52] Arnold, *Colonizing the body*.

[53] Arnold, *Colonizing the body*, 149.

[54] Davisakd, *Disease, the body, and the medicalizing state* (in Thai); Davisakd, "Of germs, public hygiene and the healthy body" (in Thai).

[55] Davisakd, "Of germs, public hygiene and the healthy body" (in Thai).

In his narrative there is no room for other forms of agency apart, perhaps, from physicians, who attempt to assert their own interests through organization and professionalization. But for Davisakd, the professionalization of medicine occurs belatedly, after the state has appropriated medicine according to its own ends, i.e., the economic agenda of its elite patrons.[56]

Latour's late-nineteenth century France is at least a marginally more complicated social arena that Davisakd's depiction of Siam. Physicians, for example, do eventually constitute a challenge to the authority of Pasteur-as-spokesman of the microbes[57] – they do so, however, only after having aligned their own interests with those of the state.[58] In the remainder of this article, I will attempt to situate vaccination within the broader social and intellectual realm of medicine, rather than politics per se, in the context of early nineteenth century Siam. This perspective will allow for an alternative theory of the relationship between science/medicine and social power/'politics.' It makes it possible to retain Latour's vision of the inherently *political* nature of science (and medicine) without succumbing to the overly facile association of this political vision of science/medicine with the interests of the state.[59] I intend to suggest that there are important intermediary social forces between medical or scientific practice, on the one hand, and state-level politics, on the other. These intermediary forces – 'translations' in Latour's terminology[60] – resist easy assimilation into narratives of the state and its interests and can provide a richer account of the effects of new forms of scientific knowledge in society.

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[56] Davisakd, "Of germs, public hygiene and the healthy body", 312 (in Thai).

[57] Latour, *The Pasteurization of France*, 133-135.

[58] Latour, *The Pasteurization of France*, 138.

[59] Another dichotomy in the historical literature places vaccination on the side of the repressive powers of the (colonial) state and variolation on the side of popular resistance to that power. Bastos challenges this perspective, arguing that in colonial Goa at least, there were intermediate positions held by both representatives of the Portuguese colonial state and the indigenous population. Bastos, "Borrowing, adapting, and learning the practices of smallpox".

[60] I refer here to the notion of 'translation' developed in Latour but also Sturdy's exploration of the idea as "the fundamental activity of the Latourian universe." Latour, *The Pasteurization of France*, 65, 81; Sturdy, "The germs of a new Enlightenment", 165.

Vaccination, 'Quackery,' and the Professionalization of Medicine

In this final section of the article, I would like to suggest a more prosaic model for understanding medicine/science and society in nineteenth century Asia. Eschewing the Latourian chimera of shifting ontology, I approach the relationship between science and society through a more empirical lens, by tracing changes in the social location of scientific forms of knowledge. The idea is not to chart the appearance of new social actors introduced through changing scientific knowledge – as in Latour's work[61] – but instead to try to map out the topography of the contested social distribution of important forms of knowledge within society.

Smallpox vaccination substantiates the observation that advances in the *practice* of Western medicine progressed at a greater rate than *theories* of medicine until at least the late nineteenth century.[62] In the era before the germ theory of disease introduced an etiology based on germs and contagion, it is difficult to maintain that vaccination introduced new social agents that disrupted the equilibrium of power in society. Moreover, Jenner himself and the medical community at large appear to have been relatively unconcerned with proprietary rights to the knowledge and practice of vaccination, as evidenced by the profusion of treatises and texts espousing its benefits. For these reasons, it seems misguided to attempt to link up the practice of vaccination with the spread of European imperial power in nineteenth century Asia. A more important consideration would seem to be the relation of medical practice to knowledge in the era before medicine became scientific and 'modern'.[63]

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[61] Latour, "Give me a laboratory and I will raise the world", 1988.

[62] Headrick was perhaps the first to note this systematic disparity between theory and practice in relation to Western science: "technological advances preceded a scientific explanation of the underlying natural phenomena; technological advances arising out of scientific discoveries were the exception. We should not think of technology as 'applied science' before the end of the nineteenth century, but rather of science as 'theoretical technology'." Headrick, *Tools of empire*, 65. Others, such as Bala, have extended this observation to Western medicine, arguing, for instance, that Western medical theory did not outstrip indigenous South Asian medicine until the late nineteenth century. Bala, *Imperialism and medicine in Bengal*, 17.

[63] Latour, *The Pasteurization of France*, 8.

Vaccination in the pre-Pasteur and Koch era was a form of medical practice whose efficacy far surpassed the etiological knowledge of Western medicine. Its advocates and practitioners simply did not possess a viable explanation of *how* or *why* it worked. Rusnock summarizes the ambiguity involved in Jenner's own understanding of vaccination: "Jenner and his contemporaries… referred to cowpox lymph as a virus – literally, a poison. They knew that lymph applied to a scratch in the skin had the power to infect," but they lacked a coherent theory of how infection occurred.[64] Bradley's understanding of disease seems to rely on the 'miasmatic' theory derived from the influential work of James Lind.[65] This theory of disease resembled that of the 'Hygienists' in France who set the stage for "Pasteurization" at large with their vague notion of "morbid spontaneity," a theory predicated on a bewildering number of perceived circumstances that could give rise to disease.[66]

In considering the spread of vaccination it is important to seek out the inherent contingencies involved in spreading a medical technique whose efficacy was based solely on experience and testimony. Medical treatises, which depicted the history, theory, and practice of vaccination, were one means of cultivating credibility for the technique. In the wake of Jenner's treatise,[67] vaccination treatises flourished around the globe, as noted above, forming an integral link in the causal chain that rendered a local peculiarity – English milkmaids and farm hands rendered invulnerable to smallpox – into a universal medical practice. Jenner's treatise became a model, which was translated and adapted by local practitioners into the local vernaculars. In each case, the point was not to explain *how* vaccination worked – such an explanation would remain conjecture until the work of Pasteur

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64 Rusnock, "Catching cowpox", 20.

65 Lind, *An essay on the incidence of diseases in hot climates*. Davisakd explores the miasmatic theory of disease as Bradley presents it in his published work in the Siamese press. He also explores the ways in which some of Bradley's later works seem to presage the germ theory of disease. Davisakd, "Of germs, public hygiene and the healthy body", 315-316 (in Thai).

66 Latour, *The Pasteurization of France*, 20, 33.

67 Jenner, *An inquiry*.

and Koch in the late nineteenth century – but simply to make the case for its efficacy.

Yet even scientific treatises – printed, bound, and authored by respected physicians – were not enough to ensure the success of the practice they championed. It was not only the *reasons* for the potency of vaccination that remained in doubt, but the *vaccinae* (cowpox) matter itself. Physicians lacked an appropriate medium that would guarantee the successful transmission of cowpox lymph from place to place and over time in a single location. Strains of 'genuine' cowpox lymph could be interrupted by the exuberance of the physician who failed to follow the development of the pox and then to extract the matter at the height of its potency, some six to eight days after injection. Common forms of skin disease were liable to interfere with the cowpox after injection and render it ineffective.[68] Even more troublesome were the strains of spoiled or 'spurious' pox, which produced symptoms that were often difficult to discern from 'genuine' cowpox, yet which conveyed no immunity to smallpox. In these cases, treatises were of limited value, and the real burden of ensuring successful vaccination fell on the expertise of the practitioner.

A missionary-physician like Bradley could not help but realize the delicate nature of the trust he was building among the Siamese with respect to Western medical practices. Bradley recalls being blamed when those he injected did not heed his call to be wary of false symptoms produced by 'spurious' strains of cowpox. He lashed out in his *Treatise* against the injustice of being held to a different standard than other medical practitioners, asking his readers to:

> Consider the case of doctors who care for other diseases, such as in a child who is not yet afflicted with Smallpox. If that child should later develop Smallpox, why do people not blame that doctor who had previously treated that child with medicine? Why do they not blame the toxins in that doctor's medicine, which remain in the child's system? Why then do people blame only me in this manner?[69]

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[68] Bradley, *Treatise*, 12 (in Thai).
[69] Bradley, *Treatise*, 20 (in Thai).

Such were the unhappy results of Bradley's own efforts to vaccinate the Siamese people. But given that his aim was to introduce the practice to as many people as possible – by publishing the *Treatise* and instructing other physicians in Siam – the potential dangers far exceeded the number of his own patients.

The only way to ensure a successful vaccination that would protect against smallpox and help to solidify the reputation of Western medicine in Siam was to thoroughly instruct vaccinators in the difference between 'genuine' and 'spurious' cowpox. This required careful observation of the course of physical symptoms after injection. In his *Treatise*, Bradley describes the physical symptoms of a successful vaccination at great length, charting in detailed and graphic language the first appearance of pox to their scabbing and ultimate resolution.[70]

The greatest concern of a missionary-physician such as Bradley was that careless practitioners of vaccination would undermine the credibility that he was working so hard to establish for himself and his medical practices. The crux of the issue, as Bradley himself states, was that physicians had to be diligent in inspecting the site of the injection over the course of the cowpox infection. It was necessary for the vaccinator to follow up after the injection to make sure that the reaction followed the standard course as described in his *Treatise*. Bradley writes:

> Let all doctors who would take a strain of cowpox and pass it from person to person carefully inspect and be absolutely certain before using it. If someone is not diligent and mindful,

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[70] Bradley, *Treatise*, 16-18, 21-22 (in Thai). Recent studies on science and visual culture (for example, the "Focus" issue of *Isis*, vol. 97 [2006]) suggests that we should pay greater attention to the role of visual media in science. It is notable that Jenner included four colored plates in his 1798 treatise in order to demonstrate to practitioners the course of symptoms indicative of genuine cowpox infection. Rusnock, "Catching cowpox", 28. I have explored elsewhere the central role of visual knowledge in Bradley's efforts to spread Western midwifery among the Siamese — as evidenced by the fifty-plus illustrated plates in Bradley's *Treatise on Midwifery*. Pearson, "Womb with a View". But Bradley evidently failed to see how vital illustrations were to spreading knowledge of vaccination, as they are absent in his *Treatise*.

> the strain will spoil and it will no longer be effective in preventing against Smallpox. But most doctors do not pay close attention to the details; they deal with it in a cursory manner.[71]

Bradley's *Treatise* hints at the very same issues of professionalism in medical practice that were beginning to emerge elsewhere in the colonial world at the same time between surgeons in the employ of colonial states and under-equipped missionary-physicians who acknowledged their own medical practice as 'quacking' or 'quackery'.[72] The modest intervention I am suggesting is that rather than look to the grandiose narrative of shifting ontology, historians should be more attentive to the quotidian conflicts between medical practitioners that seem to lie at the heart of social and institutional processes such as the professionalization of medicine.

This perspective has the virtue of uncovering a pre-history of modern medicine that resists easy assimilation into the narrative of biopower and the Foucaultian medicalizing state. Rather than searching back to locate the convergence of the interests of the medical profession and the state,[73] historians should be attentive to the natural unfolding of social conflicts that instigated the processes of medical professionalization. This inductive approach will provide a critical perspective from which to reassess dominant historiographical approaches aimed at revealing the genealogy of the biomedical power of the modern state.

Even at the supposed moment of historical convergence between the Siamese elite and modern medicine in a new mode of governmentality in the early twentieth century, social conflicts continued to help shape the course and trajectory of the professionalization of medicine in more oblique ways. In March 1905, as the state considered legal measures to regulate the practice of medicine in Siam, editorials reveal competing social forces that

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[71] Bradley, *Treatise*, 21 (in Thai).

[72] Fitzgerald, " 'Clinical Christianity' ", 108-109.

[73] Latour, *The Pasteurization of France*; Davisakd, *Disease, the body, and the medicalizing state* (in Thai); Davisakd, "Of germs, public hygiene and the healthy body" (in Thai).

helped to determine the course of professionalization. According to the *Bangkok Times*, a special committee drafted regulations to be administered by the Hospital Department, which included the issuance of "permanent certificates to all Siamese physicians who have been practicing medicine for ten years"; physicians who had been practicing less than ten years would receive certificates as well, but had to appear before an examining board once a year. The author of the article accurately identified "inevitable concessions to vested interests" in this legislation, which favored the established corps of physicians – whatever their training – and cemented the place of modern medical education in the future by passing "a strict rule prohibiting anyone except graduates of the Royal Medical College from practicing medicine in future."[74]

For the (Western) editor of the *Bangkok Times*, such legislation was welcome news as it conformed to the trends of professionalization in the West. The editor thus praises the perceived effects of the legislation: "The new law will be of great advantage to the Royal Medical College, as its graduates will be protected, and the ambitious young Siamese will find some encouragement to study medicine. He will no longer be confronted with a coolie as a competitor who has never studied a day in his life."[75] But even in an era when Western medicine was becoming the standard – and Bangkok's foreign residents and press advocated one particular course of action – social forces were able to intervene in the process of standardization and help dictate the terms of professionalization to suit their own interests. This small degree of intervention at a relatively late stage in the modernization of Siamese medicine is perhaps sufficient proof that Foucaultian tales focused on elite interests in medicalizing the population are partial at best.

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[74] Anonymous, "The practice of medicine in Siam".
[75] Anonymous, "The practice of medicine in Siam".

Conclusion

If, as Latour claims, "The social context of a science is rarely made of a context; it is most of the time made up of a *previous* science,"[76] then much of the social history of colonial era science and medicine in Asia remains to be written. Latour's assertion inherently suggests a reversal in the models of diffusion that have long dominated the history of modern science and medicine. In the case of the spread of vaccination to early nineteenth century Asia, for instance, one cannot look to Edward Jenner, his acolytes, and the history of Western medicine for a grounding context. Instead, scholars must investigate indigenous society, including political culture and intellectual infrastructure in order to locate a truly meaningful context for discussing the interactions between science and society.

In the case of modernizing medical science in nineteenth century Siam, in particular, much more attention must be paid to the condition of 'traditional' Thai medicine and the status of its practitioners in the early nineteenth century. An historical-ethnographic view of Siamese medicine will reveal its intrinsic relations with aspects of religious life and its status as a socially important form of expertise. Specialized forms of knowledge, such as medicine and science, but also aspects of religious knowledge and practice, are at all times unevenly dispersed throughout society. The distribution of these forms of knowledge interacts with (or helps to dictate) the nature of the political culture in important ways. The arrival of new forms of knowledge inevitably affects this distribution in a way that is akin to Latour's depiction of the changed ontology of French society. But the idea of ontology needlessly mystifies the more tangible ways in which scientific and medical knowledge affect the equilibrium of power among social actors.

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[76] Latour, *The Pasteurization of France*, 19.

Appendix: Chronology of the Discovery and Spread of Jennerian Vaccination According to Dan Beach Bradley's *Treatise* (1844)

- จุฬาศักราช (*julasakarat*, จ.ศ.) 1156 [c. 1794 CE]: Jenner discovers that cowpox prevents smallpox.
- จ.ศ. 1198 [1836]: English and American doctors realize that cows can be infected by human smallpox, which will produce cowpox in the cows.
- จ.ศ. 1200 [1838]: Unable to locate genuine and viable cowpox, Bradley uses variolation (injecting them with live smallpox lymph from an infected individual) to treat his own children.
- จ.ศ. 1201 [1839]: Bradley receives cowpox lymph from abroad and uses it to inject children in the missionary community. Foreign doctors tell Bradley that he does not need to import cowpox lymph from abroad; instead, he can inject smallpox into local cows to produce cowpox.
- จ.ศ. 1202 [1840]: Bradley gains access to cows through state officials and begins trying to produce cowpox lymph in Siam. But after injecting smallpox into the cows, he finds that he is unable to produce cowpox.
- จ.ศ. 1204 [1842]: After two years of unsuccessful attempts to produce cowpox in local bovine populations, there is an outbreak of smallpox in Siam. Bradley's daughter succumbs to the disease before he can find a course of Cowpox to vaccinate her and she dies.[77]
- จ.ศ. 1206 [1844]: Bradley publishes his treatise on vaccination in the Thai language (500 copies).

[77] Bradley's diary also notes the passing of his daughter in December 1842. Bradley "Papers, 1800-1991."

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