

# Growing Science in Thai Soil: Culture and Development of Scientific and Technological Capabilities in Thailand<sup>1</sup>

Soraj Hongladarom  
Department of Philosophy  
Faculty of Arts  
Chulalongkorn University  
Bangkok 10330, Thailand  
hsoraj@chula.ac.th

## **Abstract**

*This paper proposes a way of integrating modern science and technology into the fabric of Thai culture. Such an attempt is necessary for the development of science and technology in such a country like Thailand because science and technology do not exist in a vacuum, but are deeply interrelated with various external factors in a culture. But if this is the case, then any attempt to promote and develop science and technology in a Third World country needs to take the culture and historical tradition of that particular country into consideration. Finding a way to integrate the culture of modern science and technology with the local one is also necessary as an antidote for the feeling of alienation, apparently felt by many in Thailand nowadays, that results from imposing modern science and technology from outside without careful consideration of the cultural and historical factors. It is argued that the integration can only be accomplished effectively by, metaphorically speaking, 'growing' them out of indigenous soil. This means that elements within the culture need to be found as a starting point for development into modern science and technology that are capable of serving the goals and values of the members of the culture.*

## **Introduction**

Science and technology are means by which humans achieve their aims and purposes. Thus both are deeply intertwined with human culture. As Asian countries are becoming more assertive and self confident, they naturally embrace science and technology as a means by which their self confidence could be expressed and by which they achieve some of their aims and objectives. However, some may doubt whether this self confidence and assertiveness is merely a simulacrum, since the famous Asian economic crisis of 1997, which seriously affected Thailand, Indonesia, and South Korea, appeared at first to deal a crippling blow to such claims.<sup>2</sup> But the recovery and growth of these countries soon after the crisis seems to show that the crisis is a symptom of ‘growing pains’ instead of a crippling blow. This is substantiated by the fact that these countries are institutionalising sweeping reforms which would eventually strengthen their infrastructure. One means of strengthening these countries is greater commitment in science and technology.

This paper represents an attempt to draw a rough chart for negotiating the difficult course of eventually achieving an integration of indigenous Asian culture with science, technology, and globalisation, without the former losing its own unique identity. What I intend to do is to use a specific example, i.e., how Thai culture views science, as a case study and propose what Thai culture itself should do in order that science and technology become integrated within it.<sup>3</sup> I will take Thailand as a case and argue that, instead of viewing science merely as being founded on the Enlightenment notion of objectivity, universality and rigorous separation between facts and values, one needs to view modern science more as a part of the world intellectual and cultural system that also comprises the Asian cultural traditions. Instead of viewing science merely as a universal search for truth with no regard to differences in cultural and historical contexts, science should also be viewed as part of a cultural entity’s attempt to solve their problems at hand. The view presented here has a strong affinity with the

idea underlying current science and technology studies; that is, the relation between science and technology on the one hand, and social and cultural contexts on the other is not one way. The former shape, and are also shaped by, the latter.<sup>4</sup>

Three levels of analysis need here to be clearly analytically distinguished from one another. The relation between science and technology and their socio-cultural contexts can be viewed at either at (1) the level of popular perception, (2) the analyst's perspective, and (3) the policy perspective. At the first level, the analysis is focused on how the public view science. At the second level, the focus is accomplished through the eyes of the analyst, who observes the situation and often pronounces judgements on the situation. At the third level, it is the viewpoint of the policy experts that matter the most. The level presented in this paper is a careful blend of all the three levels. For science to grow successfully out of the indigenous soil of Thai culture, the public should grasp some basic concepts of science; that is, they should attain at least a basic level of science literacy. Moreover, the argument presented in the paper obviously cannot escape the viewpoint of the author. To say that a way *should* be found so that science can grow from the indigenous soil is not merely a description of the situation. So the author's perspective is clearly involved. In addition, the third level, that of the perspective of the policy expert, is also involved in the argument too, as a set of recommendations will be provided as a conclusion of the argument presented in the paper. The set of recommendations will be aimed at those who have the means to formulate formal policies and to implement them.

The pervasiveness of globalisation has made the problem of how science and culture are to be related all the more pressing, as cultures are more closely interacting with one another more than ever before and exchanges at all levels are being conducted between localities. From the perspective of the members of a culture where modern science did not first develop, that is, all the world's cultures except for the West, there is the problem of how to integrate modern science to the fabric of one's own culture

and tradition. What I would like to propose here is that developing countries should look at science as not being alien to their traditions. One can indeed critically examine one's own cultural heritage and search for those aspects that could encourage and support the growth of modern science in one's own context.

In what follows, I will discuss the brief history of science in Thailand and the reception of science and technology during the reigns of Kings Rama III and Rama IV from 1828 to 1864 AD, as well as the general trend of the ruling class' policy toward scientific and technological matters. The history will lay a background for comprehending the recent story of a controversy created by a strong reaction against globalisation, one that is based on a perceived equation between science and economic globalisation. This controversy is a concrete example of the alienated feeling that figures prominently in Thai discourse and led to impasse and dilemma that clearly show the gravity of the problem. Then I will propose a set of solutions on how to make science an integral part of the culture.<sup>5</sup>

### **Indigenous Science and Technology in Thailand**

Before the advent of the western powers in the mid nineteenth century, Siam (as Thailand was called at that time) enjoyed a rich tradition of indigenous science and technology. There were many advances in such fields as horticulture, agriculture, astronomy, metallurgy, ceramic production, pharmacology, medicine and many others. It is from these material and epistemic aspects of the Thai culture that elements could be drawn in order for modern science and technology could be integrated into the culture. In this section I would like to present a brief overview of Thai indigenous science, focusing first on the *Traiphum*, a fourteenth century text based on Buddhist cosmology that largely informed the Thai understanding of themselves and their environment; then I will focus on some of the local epistemic and technical cultures as found, for example, in herbal medicine and in casting Buddha images, in both of which Thais are known to excel.

### *The Traiphum and Its Clash with Western Knowledge System*

*Traiphum* is a work dealing with geography, astronomy and cosmology of the Thai civilisation.<sup>6</sup> Based on the Theravada Buddhist cosmological system, it was written more than seven hundred years ago by King Lithai of Sukhothai. The knowledge in the text assumed a privileged position among the systems of knowledge available in Thailand. The text presents a cosmology that is deeply imbued with moral and spiritual attainment of human beings. The world of the *Traiphum* is a stable one, where everything revolves around the axis which lies at its absolute centre and which provides the entire universe with its core and meaning. The central axis of the universe symbolises the central authority, both in politics, culture, and epistemology. It is quite difficult to imagine how this kind of universe could contribute in any meaningful way to modern cosmology with its idea of centreless universe where everything is scattered around. However, if one realises that the science of a time is a reflection of the values and social order of that time, then one might perhaps see that the *Traiphum* universe could contribute to our modern world as a reminder of the time past, as an always viable alternative. Its role, in any case, is still very much visible even today in Thai culture, a point also noted by Reynolds (1976). The account of successive stages of heavens and hells presented in *Traiphum* still provides the foundation for the Thai moral discourse as well as their almost unconscious understanding of the world around them.

This picture of the universe provided a frame of reference to the Siamese world for many centuries until the coming of the western powers in the mid nineteenth century changed all that. In fact the Europeans had come to Siam many times before, and especially during the reign of King Narai of Ayutthaya in the middle of the seventeenth century, there was an intense interaction between Siam and European powers such as France, Holland and England. There were exchanges of

ambassadors between King Narai and the French King Louis XIV. King Narai showed many interests in scientific and technological advances that were taking place in Europe at that time (Hodges 1998). According to Ian Hodges, Louis XIV even sent Narai some timepieces and globes (Hodges 1998: 89), and Narai himself sent for many scientific instruments to satisfy his curiosity (Hodges 1988: 88). He also entertained the Jesuits who demonstrated astronomical instruments for him and were present with the King during a lunar eclipse in the area.<sup>7</sup> However, the close proximity between the burgeoning western science and the Siamese cultural universe did not materialise into anything other than proximity and curiosity. Narai himself did not become a scientist or a patron of western science, and there was no evidence that his courtiers or subjects knew anything or took any interest in it. Narai remained firmly within the lifeworld informed by the *Traiphum*. In fact Narai's closeness to westerners prompted some of his nobles to plot a coup against his appointed successor as he laid in his deathbed. The head of the coup section himself became king after Narai died in 1688, and he immediately drove away the French, the Dutch and other westerners out of Ayutthaya, effectively closing Siam to westerners for almost three centuries.

Then in the middle of the nineteenth century, Siam had to open herself up to western powers again. This time there was no turning back, as the westerners had become much more powerful.<sup>8</sup> Siam could not regard western science and technology as a curiosity any more. During the reign of King Rama III of Bangkok, his half brother Prince Mongkut, who was to become Rama III's successor Rama IV, was a Buddhist monk and he became avidly interested in western science. He conversed with leading western intellectuals who resided in Bangkok at that time, such as the French catholic priest Pallegoix and the American missionary Dr. Bradley (Phueksom 1998). Together with Prince Mongkut were some of the best minds of Siam at that time, most of whom were close acquaintances of Mongkut himself, and they intensively discussed scientific and religious topics with the westerners. This lively intellectual exchange focused on such topics as the role of western science and technology in

Siamese culture, how much of science and technology should be introduced into Siam and what limits should be put on science and technology in order that they do not swamp the indigenous forms of knowledge and practices that were held dear by the Siamese culture. It is rather amazing that this debate and discussion still persists in Thailand today, and these questions are still pertinent, both in Thailand and I believe elsewhere.

Taweesak Phueksom (1998) writes that the main attitude of the Siamese intellectuals at the time, including Prince Mongkut, who later became Rama IV, was that Buddhism was to be kept separate from western science. The missionaries had been publishing their views that one of the chief reasons Siamese remained relatively backward compared with the European nations was the former's espousal of Buddhism, which was perceived by the missionaries as a religion that taught people to accept their fate and not to work hard. The Siamese intellectuals responded by trying to show that a progressive Siam could indeed be Buddhist also, since religion and material progress did not contradict each other. Western science and technology were useful tools in advancing a nation economically and otherwise, but spiritually nothing could be compared with Buddhism as the supreme truth. Thus, Taweesak held that the Siamese intellectuals were careful in distinguishing the materially useful and the spiritual (or spiritually useful, which amounts to the same thing). Western science and technology, according to these mid nineteenth century Siamese intellectuals, belonged to the former domain; whereas Buddhism belonged to the latter.<sup>9</sup>

This distinction was useful in keeping the sanctity of Buddhism against the attacks of the Protestant missionaries and against the onslaught of modern advances made possible by science and technology. However, what escaped the attention of Mongkut and his intellectual followers was the indigenous form of Siamese knowledge embodied in the *Traiphum* as well as in the folk traditions practised by common villagers outside of the royal court. In their zeal to modernise Siam in order to counter the European threat, Mongkut and his followers sought to find a place for Buddhism,

but at the expense of the cosmology and with it all the associated forms of knowledge that had informed Siamese culture. The Buddhism for which they found a place was somehow reduced to moral teachings only, and the rich heritage of Buddhist and Hindu cosmology, astronomy and geography were then lost. For Mongkut and his followers Buddhism was to be shorn of its superstitious practices. The function of providing a frame of reference for daily lives of the people, according to Mongkut's vision, belonged instead to the modern sciences.

This vision was enforced when Mongkut himself became king in 1851. It was then pursued very avidly by his son and heir King Chulalongkorn (Rama V), who gave birth to modern Thailand as we know it today. However, it is curious that even though the vision was that Siam was to become modernised, so that the European colonisers would find no excuse in colonising Thailand (which was never colonised by the Western powers), today the gap between modern science and Thai cultural life still appears as wide as it was during Mongkut's reign.

### *The Practical Systems of Knowledge and Technologies*

The picture presented by the *Traiphum* is not the only one in the Thai epistemic and technological culture. Right now there is an active movement in Thailand of reviving its own epistemic heritage, especially in medicine, pharmacology and metallurgy. Other areas, such as astronomy, are also present, as seen in a book on Thai indigenous astronomy by Niphatporn Pengkaew (2000). In medicine, many books are being published on traditional herbs and how they can be useful in combating a large variety of ailments. The Institute of Traditional Thai Medicine was set up in the Ministry of Public Health to research and co-ordinate efforts to bring Thai medicine to the public. Thais have also been casting bronze or golden Buddha images for centuries, and even today the skill is passed on from generation to generation using the traditional method.

Only a few of these practical, indigenous knowledge systems were recorded in texts, and those that were are the medical ones. One notable attempt was made by King Rama III in early nineteenth century. The King ordered that treatises in medicine as well as many positions of exercising for therapeutic purposes (much like today's yoga) be recorded in stone inscriptions on the columns around Wat Pho or the Temple of Reclining Buddha in Bangkok. The attempt made Wat Pho a centre of traditional Thai medicine and massage until today. King Chulalongkorn also had the major compendium of all the knowledge inherent in medical practice published. The treatise, called *Phaet Saat Songkroh*, was acknowledged to be the authoritative source on the discipline. However, the influx of modern medicine almost annihilated all the traditional knowledge and practice systems of indigenous Thai medicine. Fortunately, recently the knowledge is making a comeback, and one can now find many old treatises on the subject being republished for wider audience. After being neglected for more than half a century, *Phaet Saat Songkroh* has now been republished to commemorate the present King's sixth cycle birthday in 1999 (Prapaspong et al. 1999).<sup>10</sup>

Apart from medicine and metallurgy, Thai people are also very proficient in producing wine and beer, using their available crops such as rice and various kinds of fruit juice. For many decades, however, production of indigenous wine or beer was declared illegal and the practice almost died out. The license for production of alcoholic beverage was given only to large corporations which produced western-style whiskey and beer, and villagers were not allowed to continue their century-old tradition of making their own wine. However, the Thai government repealed the law in 2001, prompting a nationwide boom on wine and beer production at the village level. Many brands are now competing in the market, resulting in a very healthy picture for the economy and the obvious benefits of traditional skill and knowledge (Hongladarom 2002). What this example and the one on the resurgence of traditional medicine show is that indigenous knowledge systems have, fortunately, not died out in Thailand, and

Thai people can still find in these knowledge systems resources for their attempt to develop modern science and technology without losing their own cultural identity.

The main difference between the *Traiphum* and the various systems of knowledge and arts in medicine, wine production and the like is that the former is a Buddhist text, while the latter are more practical and worldly. These practical systems were not accorded the high status given to the *Traiphum* because they are not based on the canonical Buddhist text. The cosmology of *Traiphum* deal with the general picture of the cosmos and man's place in it, while the practical systems deal more with mundane lives. Since almost all Thais are Buddhists, it is natural that the Buddhist text has had a hold on their imagination and their perception. Hence the two knowledge systems—*Traiphum* and the practical arts and knowledge—are not in conflict with each other. On the contrary, the medical texts almost invariably refer to the Buddhist teaching as a frame of reference, a context within which the medical knowledge derives its meaning. Bronze casting is almost invariably intended for making Buddha images, smelting iron was for producing weapons, which were necessary for defending Buddhism, and the local wine and beer is made for festivities that are based on Buddhist ceremonies.

However, with the advent of the western powers and their epistemic and technological cultures, both the indigenous technical systems and that of the *Traiphum* were seriously threatened and almost completely forgotten until just a few years ago. In their quest to rapidly modernise Thailand in order to defend it from the colonial powers, Kings Mongkut (Rama IV), Chulalongkorn (Rama V) and Vajiravudh (Rama VI) sought to bring in modern scientific practices, which eventually resulted in the indigenous system being neglected, ignored and even persecuted. For example, a law passed in 1923 during the reign of King Rama VI requiring that only western-trained medical doctors were allowed to register and practice. This law effectively outlawed traditional medicine and almost wiped it out (Chompon 1998: 120). Ancient belief and knowledge systems and were viewed as superstitions and almost never received any

kind of support from the government. It is only a few years ago that the government started to recognise indigenous knowledge traditions to some extent. The Institute of Traditional Thai Medicine, for example, was established a few years ago, and a new law on traditional Thai medicine has recently been promulgated.<sup>11</sup> However, western medical institutions here still receives a very large share of resources compared to traditional medicine, which received far less and exists in the minds of policy makers more like an addition or an afterthought rather than a serious issue.

The process from indigenous to western epistemic and technological practice outlined above was not an abrupt change, but a gradual one. We have already noted that Chulalongkorn did try to preserve traditional Thai medicine through the publication of the compendium. However, the attempt was a futile one at that time as it could not resist the force of the colonial epistemic systems. This onslaught of the foreign and powerful epistemic cultures into the Thai fabric has created a gap between indigenous knowledge systems and modern science has engendered serious repercussions for Thai culture which can well be seen even today, as we shall see in the next section.

### ***Aporiai* Arising from the Alienated Attitude toward Science**

We have seen that, in the matters of the possible clash between modern science and Buddhism, the Thai ruling élites sought to protect the latter through allowing the former to work only at the superficial, mundane and material level. There was no attempt actually to integrate the system of thinking underlying western science into the fabric of Thai culture, or more accurately to modify science in such a way that it fits more with the local culture, since such attempts entail that Buddhism and science need to be considered together on the same level. In essence, Thai culture is in effect a very traditional culture in the garb of a modern one (Reynolds 1976: 203-220). According to Reynolds, the old system of *Traiphum* did not go anywhere. It still persists in the collective consciousness of the people. The attempts by the kings

and policymakers to stamp out indigenous knowledge and practice in fact worked only among the emerging urban middle class, while the majority in the countryside still had to rely on it. This can be seen in the unsuccessful attempts for more than half a century by the authorities to eradicate local production of wine and beer. This is the main reason why the knowledge is still available when the law against local production was repealed.

The persistence of the *Traiphum* beliefs provides for a strong resistance to any attempt to bring in the modern, scientific way of thinking to the people beyond the superficial level of using science and technology to bring in material comfort, at least when the latter is brought wholesale from outside with no regard to the indigenous knowledge and cultural system. Science is viewed more as a ready made knowledge to be exploited materially rather than a process whereby knowledge is gained. Since the process of scientific knowledge creation involves thinking and believing in one way other than the usual way to which Thais are accustomed (e.g., believing that knowledge is dynamic and not forever inscribed in stones), Thais prefer the product and benefits of science without science affecting their core belief systems.<sup>12</sup>

In short, the indigenous practical systems almost died out because they could not compete with the material culture coming from the West; however, the cosmological system of the *Traiphum* was preserved as part of the Buddhist belief. Any aspect of modern science that could threaten the *Traiphum* was prevented from coming into the culture. This includes basic, theoretical science and the philosophical system underlying the conduct of scientific inquiry, for these try to bring the whole of reality under investigation. The specific technologies, on the other hand, do not, *prima facie* at least, challenge the worldview of a culture and since they yield material benefits they were allowed into the culture. Thus Buddhism and modern science could exist together in the same culture.

The reason behind such a move was that the ruling élites looked at modern science as working only at the superficial and mundane level, while Buddhism deals with spiritual matter, the really valuable source of truth. Niels Mulder tells us that for the Thais knowledge is a kind of precious treasure that can be hoarded or jealously guarded (Mulder 1996: 139-142). It confers a high status on those who possess it, and there is not the emphasis on the process of inquiry and gaining provisional knowledge. As real knowledge is perceived to be immutable and centred around the axis of absolute authority, knowledge then cannot be in form of an unending quest or process. Hence the philosophical underlying modern science and its theoretical, basic parts cannot be allowed in because they would threaten the epistemic status quo in the Thai culture.<sup>13</sup>

One deleterious effect of such a separation can be seen scientific research and technological innovation, in which Thailand lags far behind some of its neighbours in Asia. A recent survey by the Swiss based International Institute for management Development (IMD) showed that Thailand ranked last in science and technology among the forty-seven countries included in the survey.<sup>14</sup> This happens amidst the policy of promoting and supporting science and technology by successive governments. Moreover, Thailand's educational attainment also lags behind.<sup>15</sup> Many critics point out that the Thai educational system is in a dire need of reform, as teaching and learning are still centred around rote learning and the atmosphere of learning that strongly inhibits creative and critical thinking.<sup>16</sup> This may stem from the ingrained belief that knowledge is not a process, but a treasure to be possessed only by the privileged few. When this ingrained belief clashed with the ideal of universal education, what happened may be that teaching was not done in a serious way. The objective was not to provide students with workable knowledge, but to enhance the social status of the students themselves and to grant a ticket to middle class, well paying jobs.

I would like to call this situation an *aporia* in Thai culture. The *aporia* happens when there is a feeling of alienation in the culture. For *Traiphum*, it is the matter of preserving the Buddhist morals and teaching vis-à-vis modern knowledge and for the indigenous techniques it is the matter of abandoning them altogether for the imported Western technologies. A very interesting illustration is the recent controversy that raged in the Thai media for a few weeks in the middle of this year. A popular magazine reported that they had found the real '*peta*', a kind of ghost in the Buddhist cosmology, in a forest in the Northeast of the country. A picture of the *peta* was shown on the front cover.<sup>17</sup> This issue of the magazine, *Arthit*, immediately created an intense stir and started widespread debates and discussions whether *petas* really existed. Television programs, newspapers and other magazines jumped in and dissected the question in various aspects. Many respected academics in the country were involved and they deliberated whether this type of ghost actually existed.

The reason why this ghost story created a tremendous level of interest in Thailand was because *petas* were mentioned in the *Traiphum* as one type of sentient beings who are below the level of human beings but not quite creatures of hell yet. To believe that *petas* exist then resonates in the deep collective psyche of the Thai people. However, many Thais do not want to admit publicly that they believe in such a creature. So the typical Thai is landed in an *aporia*, not being able to find their way out. On the one hand, they would like to believe in the basic tenets of western science, namely the idea that things are to be explained through physical causation and not through references to supernatural or hellish creatures. On the other hand, they want to be good Buddhists, and since *petas* are those creatures who suffer as a result of their bad karmas in their previous lives, to believe that they exist would seem to be what a good Buddhist should do. It appears that the intense attention paid to this *petas* issue shows how the Thai culture is engrossed with the problem of its own identity vis-à-vis the economic and scientific advances. Where should the Thai society be heading in the twenty-first century? Thais ask: 'Do we have to choose between

Buddhism and its associated teachings of deities and hellish creatures, and the exorcised world view afforded by modern science?’ Here is the locus of the *aporia*.

The *peta* controversy shows that Thais are generally ambivalent toward science and technology. They realise that they cannot get away from them, but they do not want to be swamped by them at the expense of the loss of their cherished belief in Buddhism. However, this *aporia* is a result of the attitude toward science and technology that has been in place since the time of King Mongkut more than 150 years ago. The classification of modern science and technology as ‘materially useful’ and of Buddhism as ‘spiritually useful’ led to the attitude toward science as something foreign imposed on Thai culture from outside. This attitude is clearly visible in the policies of neglecting and even actively dismantling traditional Thai medicine and other forms of knowledge, for these knowledges were viewed as not ‘materially useful’ any more. Thais were then disconnected with their own roots, their accumulated wisdoms being wrenched away from them with brute force.

Furthermore, western science and technology cannot replace these lost belief system because the attitude toward them is that they are only ‘materially useful’ and thus can never substitute for spiritual guidance. This in turn left the Thais with the kind of bleached Buddhism with all its teachings that directly contradict western science washed away, leaving only the moral teachings. But since Buddhism was shorn of its metaphysical system consisting of petas, devas, hellish creatures and the like, it cannot provide an effective ground for ethical judgements. So Thai people are put in a contradictory situation. They are made to believe that Buddhism provides ethical moorings, but since Buddhism is disconnected with the traditional metaphysics it is very problematic how Buddhism is to achieve this task. This strange situation is precisely the problem for Thai people. They lack their metaphysical moorings, facing the *aporia*.

### **Growing Science from Indigenous Source**

The way out of this *aporia*, I believe, cannot be achieved without science and technology as being integrated to Thai culture. Actual practices have to be in place to ensure that science and technology be indigenous and be an outgrowth, so to speak, of Thai culture itself. Firstly the persistent attitude of viewing science as ‘materially useful’ but ‘spiritually void’ and of viewing Buddhism (and by extension the other traditional forms of Thai knowledge) as ‘materially void’ but ‘spiritually useful’ must be abandoned. For this separation merely reflects the modernist attitude of facts and values as radically separated from each other.

In the past few years scholars such as Susantha Goonatilake (1998), David Hess (1995) and Sandra Harding (1998) have argued that science is not the sole prerogative of the West; on the contrary science is a confluence of many streams of ‘civilisational knowledge’, to use Goonatilake’s term. The metaphor, following Joseph Needham, is of science as an ocean into which many rivers flow from various places and continents.<sup>18</sup> Thus science is not solely European. One upshot of this finding is that when science (and the associated technologies) is brought into the culture where science itself appears to be alien (i.e., the culture where science in its generally recognisable form today did not first take shape and where its members do not trace their ancestors to that culture), the feeling of alienation toward science should be decreased, as it can be pointed out that science also contains elements from cultures quite similar to that particular culture where science is being introduced.

However, I think this does not go far enough toward getting rid of the *aporia* facing the Thai culture nowadays. Not only should it be pointed out that science contains elements from, say, Chinese or Indian civilisation, but it is possible that science contains elements from relatively minor Asian cultures such as the Thai one too. In the dynamics of the culture, in its progress through time, a way has to be found in such a way that science develops out of the local contexts of that culture. The seed, so to speak, *can* be brought from outside, that much is necessary, but once there the seed must be allowed to grow within the nurturing environment of the local

culture itself. Only through this way can perhaps the *aporia* felt by Thai culture, for example, be diminished and eventually be eliminated.

The belief that science should be universal and free from the cultures and histories of where it is found and practised stems from the belief that the context and the content of science is radically separated. However, as Steven Shapin has shown, this belief was a result of the attempt of the early founders of modern, western science to distance this newly found discipline from the powers of the religious authorities (Shapin 1996: 9-10). The idea that the context and the content of science should be separated is reflected in the ‘internalist’ and ‘externalist’ debate on how science itself is studied. In *The Scientific Revolution*, Shapin writes:

...the identification of what is sociological about science with what is external to science appears to me a curious and a limited way of going on. There is as much “society” inside the scientist’s laboratory, and internal to the development of scientific knowledge, as there is “outside.” And in fact the very distinction between the social and the political, on the one hand, and “scientific truth” on the other, is partly a cultural product of the period this book discusses (Shapin 1996: 9-10).

The period discussed in Shapin’s book is seventeenth-century Europe. The point is that if such a radical separation is itself a historical and political construct, designed to insulate science from the vagaries of its socio-cultural contexts, then to say that science should belong more to the culture where it is practised would not be too far-fetched as it might seem at first. If there is no real distinction between ‘scientific truth’ and its contexts, then in a culture where science did not first develop elements that make such cultures receptive to scientific ideas and practices can indeed be found because each culture is naturally dynamic and adaptive and more significantly each culture contains its way of understanding the world which could form a foundation on

which scientific practices can be laid. To say that science is an integral part of a culture, such as the Thai culture, is to say that its specific beliefs, those that are constitutive of what it is to be scientific (whatever that may be), comprise the same set of core belief systems that are definitive of the culture involved. If the context and content of science are separated only through pragmatic concerns—for example the separation is to be maintained when it does insulate science against attacks on its epistemic credentials, but when science is seen as serving humans' purposes and aspirations, then such a distinction would not have to be that rigorous, then to found modern science on Thai culture would be tantamount to bringing one set of practices onto another context. And what makes this possible is precisely because the receiving context already contains elements that make it receptive to the imported set. To require that science be totally free from values and cultures works only to the extent the epistemic objective of science is called for. That is, if the goal is to show, or try to show, that science aims at producing 'objective knowledge of nature', then the distinction would seem to be needed. But if one is to find out how modern science could be integrated to Thai culture, for example, one does not have to believe in the essential distinction between context and content, for one can bring in both the context and the content of science wholesale, and the attempt is possible through the realisation of the already existing elements of the Thai culture, such as in traditional medicine referred to above.

What one needs, in short, is a conception of science which is not based on the belief in its simple universality and its so-called freedom from contexts. For the theoretical and moral conception in *Traiphum* one needs a way for modern science to accommodate its moral system, and for the indigenous practical knowledge, one needs to bring it back to the lifeworld of the community, which could supplement what is missing in Western science and technology. When the radical separation and distinction is blurred, science can then belong more to the local and the actual cultures and communities. In short, science can and should be better integrated to the actual

lifeworld and cultural practices of real, existing communities in the world. This is the case both for the theoretical system like the *Traiphum* and the practical, indigenous one. What is needed is that the culture re-evaluates its own epistemic heritage such that the heritage is co-opted and integrated in its quest for scientific and technological development.

Science as part of culture is in fact a hybrid, deriving its defining characteristics from many divergent sources (Niranjana et al 1993 and P. Petitjean et al 1993). Thus ‘modern Chinese science,’ for example, refers not only to what is happening strictly within the Chinese cultural milieu, but a mixture of various original sources from which the science in question derives its being. And since ‘modern Chinese science’ is part of the Chinese culture, it assumes a Chinese characteristic which differentiates it from, say, Russian science. In the same vein, Thai science is also a hybrid. Thai science growing from the indigenous resources of Thai culture would comprise attempts by the Thais to understand their own natural environments, relying of course on theories and methods that are internationally accepted among the scientific circles, but attending to the problems that are unique to the Thai context. The attempt must also include that of re-integrating the mostly lost indigenous practical systems back into the Thais’ lifeworld. This is an example of how hybridised science is produced within the framework of globalisation. Thai scientists may not have to focus on producing expensive military hardware; instead they focus their attention and effort on finding a way to raise salt water prawns without harming the environment. This is an important problem for Thailand because it exports a large quantity of prawns to the world market. Thai science growing from the indigenous soil would mean that these attempts are part and parcel of the Thais’ responsiveness toward their own environments, both natural and socio-economic.<sup>19</sup>

### **Conclusion: Science and Thai Culture**

If my argument is on the right track, then a way has to be found for science to grow from Thai culture as well as from other Asian cultures for that matter. The characteristic trait of Thai culture has to be found and science should be built upon that. It is true that 'culture' is a notoriously illusive concept and it is very difficult to tell exactly where one culture ends and where the next one begins. Nonetheless, one can stay on the superficial level and regard culture as ordinary people do when they distinguish one culture from another. One does not need any more profound understanding of culture in order to found science on the culture and to find ways to grow it. Hence, as Thailand is a predominantly agricultural country, its science should revolve around problems in agriculture, as we have seen. There is a large store of traditional or indigenous knowledge handed down through generations of farmers. And we have discussed how these vast stores of knowledge are being endangered due to the influx of foreign and alien knowledge system coming with globalisation. Lying underdeveloped, these traditional pieces of knowledge apparently cannot compete with the knowledge coming with globalisation which is itself a result of a long history of nurture and development. And as Thailand is becoming more industrialised, indigenous science and technology are essential in creating new knowledge and tools which should be directed toward autonomous, small scaled, and localised industries rather than merely those serving as appendages to the transnational corporations only.<sup>20</sup>

In short, science and technology must not become allies to the forces of globalisation and transnational businesses. To do so would mean that science and technology cease to become attached to localities and thus forfeit their role as tools that solve problems in the local contexts and for the local people. In saying this, one should be clear that science and technology on the one hand, and public policy on the other are distinct from each other. And direction of science and technology in a society should be brought under democratic control. What I am suggesting here is that in order for science and technology to be directly beneficial to the people in the poorer

countries, they should be allies of the people and the communities in those countries rather than of the transnational businesses, which typically aim at maximising profit, sometimes without providing lasting benefits to the local population.<sup>21</sup> To say that science and technology grow from indigenous source means simply that both should be responsive to local needs.

Cultivating science from indigenous source would also diminish the *aporia* felt by members of Thai culture amidst the rushing tide of globalisation. The *aporia* mentioned in the early parts of this paper resulted from an equation of science with globalisation. To the typical Thai consciousness, globalisation is what happens from the outside and affects Thailand, and the same has been the case for science, which, as we have seen, was grafted onto Thai culture at the expense of its traditional belief system. This situation has to change. When viewed as a hybrid, science would cease to be a prerogative of a particular culture. Moreover, as science becomes more attuned to the needs and priorities of the culture and the local people, and as it does not cater solely to the interests of the state or the transnational corporations, the feelings of alienation of the people would diminish. I believe that this seems to be the only way for an Asian country such as Thailand could prosper sustainably in the future.

Therefore, I propose the following concrete measures to cultivate science from the indigenous soil of Thai culture:

- (1) There should be an increase in spending on research and development of science and technology that is based on indigenous knowledge and practical systems. Even though no knowledge system is pure breed, so to speak, there is a persistent danger that the indigenous knowledge system of the Thais will disappear amidst the onslaught of the stronger systems coming from outside. The traditional knowledge handed down through generations of Thai farmers should be studied and measures found to advance these knowledges scientifically. Knowledge of medicinal herbs could be advanced into modern scientific knowledge and patentable products. The fund could come from both public and private sources, as well as international donors.

(2) A way should be found to integrate Buddhism more tightly with science. This could be a valuable contribution that the Buddhist tradition can make for the world. As Goonatilake and others have proposed already, Buddhism should be regarded as a civilisational storehouse of knowledge where modern, localised science can develop and flourish. The Buddhist study of the psychological process could be a fruitful area of research, as well as other areas of the relation between Buddhism and science (Kirthisinghe ed. 1984).

(3) The direction of scientific research and development in Thailand should reflect traits distinctive of Thai culture. As with the space exploration example, an area of scientific research should be found which is informed by Thai culture. As Thai culture traditionally revolves around rice, rice research naturally assumes a high ranking priority. Another promising area is the development and advancement of Thai medicine, based on the stone inscriptions at Wat Pho or the Temple of the Reclining Buddha mentioned above, which is essentially a very large open library of traditional Thai medicine and other knowledge systems. The almost exclusive emphasis on western medicine at the expense of traditional medicine must be avoided. Much more spending is needed to develop traditional medicine, which could post a real alternative to western-based medicine if properly developed.

(4) The way Thai students are educated should reflect the awareness that Thai culture possess valuable store of knowledge which can be developed further. Education should stress as its aim the feeling of pride in one's own culture. This is not cultural chauvinism or nationalism, but an awareness that one's culture can contribute to the world.

As Thai culture is here an instance of how a non-western culture reacted to the influx of science and technology from the West, and of how, I propose, the local culture should go about in adopting science to its own use, this story is obviously not about Thailand alone, but is pertinent to other non-western cultures as well.

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## NOTES

<sup>1</sup>An earlier version of this paper was presented at the International Conference on Knowledge and East-West Transitions, National Institute of Advanced Studies, Bangalore, India, December 11-14, 2000. I would like to thank Prof. Roddam Narasingha and Prof. Susantha Goonatilake for their generous hospitality, and to Prof. C. K. Raju and Prof. John Pickering for their insightful comments. Research for this paper was supported by a grant from the Thailand Research Fund, under Grant nos. RDG3/01/2542 and BRG/14/2544. The present version of the paper benefited greatly from the guidance of Prof. V. V. Krishna, who kindly saved me from many errors through our engaging conversation. I am also indebted to an anonymous reviewer for *Science, Technology and Society*. I owe so much to both of them. However, any remaining mistakes in the paper are all mine.

<sup>2</sup>A good source of information related to the Asian economic crisis of 1997 together with its aftermath can be found on the Internet at <http://www.stern.nyu.edu/globalmacro/>, maintained by Nouriel Roubini. See also Nouriel Roubini, "An Introduction to Open Economy Macroeconomics, Currency Crises and an Analysis of the Causes the Asian Crisis," available at <http://www.stern.nyu.edu/~nroubini/NOTES/intromacro.html>. A scathing criticism of the policy of the Thai government that led to the crisis is found in Walden Bello (1998).

<sup>3</sup>For an overview of the scientific community in Thailand, see Davis, Gaillard and Eisemon (1997).

<sup>4</sup>Obviously this paper cannot argue for this important point in any detail, though the idea that science should be grown from indigenous source clearly depends on it.

<sup>5</sup>Many scholars have already noted the close connection between science and culture. Among philosophers, these include Sandra Harding (1998), Helen Longino (1990; 2002), Steve Fuller (1997) and others. Longino (2002) is especially relevant in arguing for a social conception of science which takes socio-cultural contexts as indispensable for objective knowledge. For historical work detailing the relation between science and culture in the Indian context, see Habib, Habib and Raina (1999), Dhruv Raina (1999a; 1999b), Shiv Visvanathan (1999), Kapil Raj (1986). Visvanathan (1998) is an essay on the relation between science and democracy in the Indian context.

<sup>6</sup>Lithai of Sukhothai (1961). The original manuscript dated back to the fourteenth century. *Traiphum* presents a cosmology based on the Buddhist canonical text, where there are multiple universes whose centres are the Sumeru Mountain. Surrounding the Sumeru Mountain are many others smaller mountains of progressively decreasing height and size as the distance from the centre increases, each separated by a ring of sea. These mountain complex is then surrounded by a vast ocean, Sitandorn, which leads to the edge of the universe itself. In this cosmology, a universe is not unique, but one universe always succeeds another just like it without end. After one universe is born (after the cosmic fire has destroyed the previous one)

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it stays for an immensely long period of time, but after that period ends, this particular universe will be destroyed, to be replaced by another one just like the one before, down to the smallest detail

<sup>7</sup>See also Dhruv Raina (1999a) for an account of the Jesuits in India during the same period.

<sup>8</sup>What happened in Siam during the latter part of the nineteenth century was not unique by any means. A persistent pattern can be detected in all the non-western regions around the same time. However, responses of these non-western societies toward the coming of the European powers seem to vary. For example, Burma tried to resist the British with force, but Siam tried to use diplomacy and played off one European power against another. And this is a standard explanation as to why Siam successfully maintained its sovereignty whereas Burma did not (although, having to grant extraterrestrial rights to the European powers, it can be said that Siam did not have full independence either). One would benefit if one looked at the vast historical research on responses of non-western societies toward the West, especially the case of Meiji Japan. A pertinent source is Sakai (1996) and Yamada (1996).

<sup>9</sup>Saying this, I do not imply that Buddhism and science should in fact be so separated. In fact it is not the case that the knowledge system represented by Buddhism is static, whereas that of modern science is dynamic. There is much dynamism in the Buddhist conception of knowledge, as evidenced in Thai medicine, which is much informed by Buddhism and has a long history of development. The point made in this section is only that, *according* to the key Siamese intellectuals in the middle part of the nineteenth century, Buddhism represented the true knowledge which needed to be protected against the introduction of the western knowledge system. And this belief of the intellectuals led to many persisting opinions in Thai culture regarding the relation between Buddhism and science which are visible today.

<sup>10</sup>A book detailing the various positions of self exercise can be found in Sapcharoen 1994. This book is an edited collection of the inscriptions found on the columns at Wat Pho.

<sup>11</sup>Due to the growing awareness of the importance of traditional and indigenous medicine to the health and well being of the Thai population as an alternative to, and compliment of modern medicine, the Thai Ministry of Public Health first established the Institute of Thai Traditional Medicine (NITTM) on March 26, 1993, as a division attached to Department of Medical Services. Later the Act on Protection and Promotion of Traditional Thai Medicinal Intelligence, B.E. 2542 was announced on November 29, 1999, formally charged the Institute with the authority to carry out duties concerned with protection and promotion of education, training, research, studies and development of intelligence on traditional Thai medicine and herbs. Currently, the National Institute of Thai Traditional Medicine was legally in the Office of Permanent Secretary, Ministry of Public Health announced by Government Gazette on January 10, 2001, bringing to develop and promote Thai traditional medicine and herbs more quality, standard, integrating into the national health care service system and alternative health for people taking care their health. The Institute's web site can be found at <http://www.ittm.or.th/>.

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<sup>12</sup>In *Science* (1997), author Steve Fuller argues that the idea that in order for a culture to master technical skills such as medicine or metallurgy it is necessary for that culture to have already mastered the scientific knowledge underlying it is a kind of ‘*retrospective colonization of the past*’ (88). For Fuller, attempts to bring modern, western science into a non-western culture is a kind of colonisation in that it makes the governing of natives possible since they now think and behave according to the standards westerners can understand. This can also be seen in the attempts of Thai authorities to stamp out indigenous knowledge and replace it with the European system of science and technology. Only in this case the ‘westerners’ in question are the Thai élites themselves, who copied the governing methods of western colonial rulers for use in their own country.

<sup>13</sup>The view proposed here does not assume that there is such a thing as the modern science or the western science, for, as many scholars have noted, what is understood as modern science in fact an amalgam of many traditions. Thus the picture to be presented here is not that of some ‘thing’ that seeped toward the Thai culture; instead the picture is that Thai culture itself has its own store of knowledge systems, which is adapted and modified as a result of contact with the West. What happened is that there is a ‘hybrid’ kind of knowledge system resulting from marriage of the indigenous knowledge system and the system that came with the Europeans (not that both systems here are pure breed either). See, for example, Niranjana et al (1993); P. Petitjean et al (1993).

<sup>14</sup>Source available at <http://www.imd.ch/wcy/>.

<sup>15</sup>“Thailand is Put Bottom of the Class” (2000).

<sup>16</sup>See, for example, Hongladarom (1998).

<sup>17</sup>A more detailed analysis of this fascinating controversy can be found in Hongladarom (2000).

<sup>18</sup>Needham (1973; 1979).

<sup>19</sup>I would like to thank the anonymous reviewer who pointed this out to me, which has improved the clarity of my point a great deal.

<sup>20</sup>The works of Vandana Shiva are particularly relevant to this issue. See Shiva (1991) and Shiva (2000). One could certainly argue with Shiva on a number of issues, though to do so would not be the subject of the present paper. Globalisation and its aftermath is I believe the most pressing issue facing the world today. It would not be too far fetched to say that many problems in the world are due to the conflict between the force of globalisation and those that oppose it. At any rate, the study of globalisation and anti-globalisation can be done in an enormous variety of ways, and this paper is but one attempt to have a look at this issue from the perspective of science in the Thai culture. There is a large lacuna on how one could comprehend the impacts of globalisation on local cultures, especially concerning science and technology, which lacuna needs to be filled by successive scholarly efforts. These studies, moreover, should also aim at a critical stance toward globalisation too.

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<sup>21</sup>I have written another paper which argues precisely this point in Hongladarom 2002.

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