BIOARTS IN SCIENCE-CITYSCAPES

ETHNOGRAPHIC FRAGMENTS OF THE NEUROWORLD

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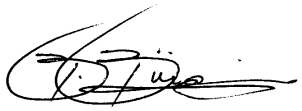
DECLARATION

I hereby declare that this thesis is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.



Birgit Ruth Buergi

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In memoriam

Zaha Hadid
1950-2016

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Table of Contents

Notes on Transliteration and Transcription

Names of institutions and their specific locations, and cartographic names (rivers, canals, streets, cities) are not italicized, but foreign language expressions are set in italics. Quotations in direct speech from field records, transcripts of primary and secondary audio recordings, and email communications shorter than five lines are indicated with double quotation marks ("…"). All transcripts are lightly edited to enhance readability of the text. Interruption in audio recordings is indicated with a double hyphen (--) and pauses with a long hyphen (–). No quotation marks are used for indented quotations from primary and secondary research material. Secondary sources are single indented if longer than five lines, and otherwise set in single quotation marks ('…') as are specific notions when used the first time (e.g. 'Fight for Science'; 'season of discontent'). Books and exhibition titles are set in italics (*Operation Bangkok*) whereas the titles of individual works of art and artistic creations are set in double quotation marks ("The Growth"), except in the transcribed dialogues. Thai transliteration is a fraught issue, and often arbitrary. There is no coherence in Romanized names of locations in the Thai language (e.g. 'Pathumthani' and 'Pathum Thani'; 'Khlong Luang' and 'Klong Luang'; 'Paholyothin' and 'Pahonyothin'). The same applies to titles (*ajarn*, *acharn*, tr. doctor, master, teacher, and artist). The working language of the research is English. Since I am not proficient in the Thai language, I refrain from using Thai script and will avoid Thai verbalizations. Occasionally, the narratives of field encounters are interspersed with non-English language expressions in italics (*chai*, tr. yes) to give the reader a feel of the intermingling of different cultural traditions. The ownership of the copyrighted illustrations is acknowledged, and without the permission of their author/s shall be neither used nor reproduced.

Abstract

This thesis is an ethnographic anthropological exploration of art and science in Thailand. My interrogation of the 'art-in-science-city phenomenon' follows in the tradition of experimental ethnography and life histories. Two collections of non-Western 'Brain Art' provide the research platform from which the inner social lifeworld of the first Thai biopolis *– Pathumthani Science City – and the bioart scene of Bangkok are explored.* Science-Cityscapes *(*Part One*) closes in on key events that cast light on the importance and relevance of cultural and generational renewal in the formation of science-city communities. Adding descriptive analysis to the cultural niches that develop in the social worlds surrounding the healthy and diseased brain – the Neuroworld – is the task set forth in* Brainscapes *(*Part Two*). How contemporary artists research the conflicted question, 'Are we our Brains?' is central to the inquiry into how exponents of the bioarts speak of themselves as finding alternative and complementary methods to neuroscientific explanations of personhood, language, and culture. The two primary collections of artistic work informing the two parts as well as the fieldwork records resulted from the development of a bilingual and annotated science-fiction anthology and a group art exhibition (both projects are ongoing). Both ethnographic interventions will illuminate the precariousness and vulnerability of research communities in one of the strongest economies of Southeast Asia. Scientists and engineers, architects and lab designers, science and technology policymakers, and science-trained art practitioners, and science-interested and intrigued artists have been situated at the centre of this ethnographic anthropological analysis. The purpose is to demonstrate that 'bioarts in science-cityscapes' is a viable research subject through which to study contemporary neurocultures in an interconnected world that increasingly communicates visually.*

Preliminaries

The Art-in-Science-City Phenomenon

This thesis is about a nascent science-cityscape. It brings the reader into an emergent culture developing from the cognitive bases of bioscience and bioarts. This ethnographic incursion into the inner social life of Pathumthani Science City (henceforth PS-City) and the emerging bioart scene of Bangkok is divided into two parts. *Part One* as well as *Part Two* shed light on the interface of art and science (Reichle 2015, 2009; Wilson 2010; Kemp 2006; Jones 2004; Kemp and Wallace 2000; Jones and Galison (eds) 1998) in the contemporary knowledge ecology of Thailand. *Part One* investigates the interests, values, and worldviews of techno-park communities in PS-City that they would defend against actual and perceived intrusions by state and capital. *Part Two* deals with the emergence of neurocultures (Choudhury and Slaby (eds) 2011; Ortega and Vidal (eds) 2011; Frazzetto and Anker 2009) in a Thai science-cityscape and the bioarts practices involved in enriching the sociocultural context of the brain and cognitive sciences.

Initially, we may think of the emerging bioart scene of Bangkok and the first *biopolis* of Thailand as spaces of circulation. Two manifestations of the art-science interface in the investigated context of a Thai science-cityscape help to show existing links between these two sites that provide the main research platform for this study. "Model Homunculus" is an artistic rendering of the cortical brain maps[1] developed in the early twentieth century (Pogliano 2012). The undated sculpture by an unknown artist is exhibited outside the National Science Museum (NSM) inside the

[1] Roger Bartra described the brain maps of the neurosurgeon Wilder G. Penfield as 'in the form of a homunculus ("little man") lying down, with its head hanging over a brain hemisphere and with its extremities represented in proportion to the size of the region of the motor cortex they are linked with: In the centre there is an enormous hand with a huge thumb above which, going upward, is a tiny body stuck to a bigger foot with the genitals over the toes; in the other direction, going downward, is a tiny neck and a face with a very bulky mouth, large eyes, and a long tongue that is not on the face' (2014: 28-29, insertion added).

government-administered Technothani/Technopolis[2] (TT-Complex henceforth) in Pathumthani's Khlong Luang district.

Figure 1 – "Model Homunculus" (n. d.) at the main entrance of the National Science Museum (NSM), inside Technopolis, Khlong Luang, Pathumthani province, Thailand. The caption (in English) reads: 'This sculpture represents your brain's view of your body. Each part is in proportion to the volume of the brain which controls the sensory and motor functions. Why are the tongue, fingers and face so huge? Because a relatively large part of your brain is devoted to their function. These parts have huge numbers of sense receptors, nerves and muscles. They are very sensitive and can make delicate and controlled movements. The legs, torso and ears are small in comparison. They have fewer sensory receptors and muscles. These parts are controlled by a smaller volume of the brain (even if you can wiggle your ears!)' © 2015 Photo by B. R. Buergi.

Before the NSM acquired the scientific artwork that is a caricature 'representing the cortical regions for the various body parts overlying the motor and sensory cortices' (Pryse-Phillips 1995: 421), the above sculpture was exhibited at the Bank of Thailand Museum in central Bangkok. When that exhibition closed this

[2] *Thani* means city in the Thai language.

exhibit was sent to PS-City. The second example of art and artists circulating between Bangkok and PS-City is a Thai artist whom I met in PS-City, by the name of Noraset Vaisayakul. We met on one occasion at the government-administrated Thailand Science Park (TS-Park henceforth), also located in the Khlong Luang district of Pathumthani province. But that was not where we first met. This research contact was located by searching for bio-artistic works like his "Study of My Own Brain I", which was on show at the H Project Space of the H Gallery in the financial district of Bangkok. Our first meeting, in fact, took place several weeks before I travelled to the TS-Park[3] to look for the public artwork that he was commissioned to produce for a science-based establishment at the Innovation Cluster Two (INC 2).

Figure 2 – The artist looking at his "Study of My Own Brain I" (2014) inside H Project Space, H Gallery, Bangkok, Thailand. © 2014 Noraset Vaisayakul, by courtesy of the artist.

[3] The main tenant of the TS Park that opened in 2002 is the National Science and Technology Development Agency (NSTDA), one of the five public funding bodies of science and technology research and innovation in Thailand. The park is home to the first children's university (Khaopa 2012), and is known for spearheading youth campaigns in collaboration with art-based institutions, like the Bangkok Opera, the CartoonThai Institute, and other cultural organizations.

These first two illustrations foreshadow the circulation of artists and artworks within these two delineated spaces engaged in the experimental and scientific discovery of the nature of the human brain. There is cultural exchange occurring at a particular conjunction in science-city life. These two introductory examples explain the rationale for dividing the thesis into two parts.

Science-cityscapes (*Part One*) prepares the ground for studying the emergence of a local neuroculture in the so-called 'age of the brain' (Littlefield and Johnson (eds) 2012). Its main focus is the cultural and generational renewal of a science-city population that is growing and expanding.The empirical chapters of *Brainscapes*[4] (*Part Two*) analyse the bioarts practices to show the specific features of that local neuroculture developing at the intersection of art and science. Drawing from and building on the verbalizations of a group of Bangkok-based artists coping with 'the enigma of the brain', it is argued that neuroculture cannot be reduced to science or arts: hence the science-city as such. Accordingly, both fieldsites are conceptualized as *spaces and places of circulation*.

Written in a programmatic manner, this field-based inquiry into the 'art-in-science-city phenomenon' seeks to bring neurobiologically informed art ('brain art') into the anthropological study of the brain (Bloch 2015, 2012; Turner 2015; Bartra 2014; Dumit 2014, 2012; Cohn 2011, 2010, 2009a; Rose and Abi-Rached 2013; Lende and Downey (eds) 2012). To that end, the investigation draws attention to how a group of Bangkok-based artists originally engage and creatively deal with the worn-out 'nature versus nurture' debate (Fischer 2009; Dowling 2007 [2004]; Ingold 2007, 2000). The visible and notable trend of integrating the arts into science-city development plans presents an opportunity to examine how the intellectual encounter of art and science plays out in a Southeast Asian sociocultural context. Concerted

[4] The title of *Part Two* does not refer to the exhibition by the Chilean-born neurobiologist Vivian Budnik (University of Massachusetts Medical School 2012).

initiatives, like those introduced in the beginning that seek to give science-cities a strong cultural dimension, are central to the first part of the thesis. It deals with how art making is tied to the quest for cultivating "a new breed of scientists and engineers with an ability to go at the interpretative level of life systems" (Aebischer 2013, oral communication), and 'a new breed of science-based artists' (Saidon 2013:282) in an emerging Thai science-city.

The empirical question of how the 'Art & Science' paradigm is lived out in the delineated context inevitably draws into the discussion the so-called 'Two-Cultures' debate (Kagan 2009; Snow 1961). Has the paradigm lost its momentum with the recent spread of art and art-related events and programmes in science towns? Alternatively, do the diffused ideas of a fragmented and polarized academic world continue to influence the thinking of this Thai science-city population? The recent proliferation of museums, galleries, labs and experimental art spaces promoting bio-artistic works in many parts of the world has prompted the question of whether the art-science divide has become something of a straw man. The observation that there are many labs hosting artists and working with them on art-science projects and/or exhibitions is readily applicable to the research-leading countries of the 'First World'.

Indeed, in places where research funding agencies encourage and support collaboration between artists and scientists, and academic and industrial campus contractors allocate floor space to art, the presumed art/science divide is less evident. This situation, however, does not apply to Thailand, where the 'two cultures divide' continues to inhibit the arts and the sciences from flourishing together. Prioritization of science over art in financing policies and plans and scholarship and fellowship schemes, is one aspect of the problem that the Thai interlocutors believed hindered the development of culturally strong science-cities. A related problem is the difficulty for artists of accessing technoscience-driven research facilities in this lesser studied Southeast Asian science-cityscape. In spite of ambitious Thai government

programmes that tout culture and science as high priority goals (Science, Technology and Innovation (STI) Policy Office 2012), the funding gap between art and science remains wide.

Face-to-face discussions with strategically situated professionals in these fast-moving arenas bring to the foreground the difficulties encountered in building integrated research communities. That this is different from building integrated research facilities and platforms is forecast in the endorsement of the former Thai science and technology minister Yongyuth Yuthavong, of the art-in-science/science-in-art youth programme at the TS-Park, and its initiator Somtow Papinian Sucharitkul (*The Nation* 2010). 'It's been my lifelong vision to see the arts and sciences come together to provide new perspectives for young people,' Yuthavong was quoted as saying. 'The idea of the camp was "to encourage young people to connect the dots and to understand the myriad ways in which the arts and sciences feed off each other",' explained the internationally renowned composer and musician, who writes science fiction under the penname of S.P. Somtow (ibid.).

The artistic director of the Bangkok Opera said in addition, 'What they learned over the weekend was the why and how of music, the historical and scientific context, and the philosophy of what they were playing. This gave the kids an edge and enabled them to perform in a genuine, stylistically authentic way.' The reporter of *The Nation* (the newspaper with the second largest circulation in English) quoted the US-Thai maestro, saying 'The Science students were amazed to see, instead of a blackboard and dry mathematical formulae, a full symphony orchestra as part of Somtow's arsenal of teaching aids' (ibid.).

The dialogues with academically trained professionals holding posts in the higher echelons of the Thai science and technology administration on science-city community formation brought into the analysis two pillars that uphold the *Krabi Initiative*. They are 'STI (Science, Technology, and Innovation) Enculturation,' and

'Youth-driven Innovation'. The education ministers of the Association of Southeast Asian Nations (ASEAN)[5], in order to spearhead education and labour reforms to develop the emerging knowledge economies in the ASEAN Economic Community (AEC), adopted these two policy paradigms. Considering that Thailand has the second largest economy of Southeast Asia, and is a centre of UN (United Nations) and international NGOs' development work, it seemed fitting to view their implementation from within the sociocultural milieus that generated the white paper (ASEAN 2010). These two paradigms[6] reverberate strongly in the Thai government-supported youth enhancement programmes for 'gifted and talented children', which create the kind of social pockets that captured my research interest.

Establishing a dialogue with people working in science-cities revealed itself to be as challenging as placing the found bio-artistic objects in relation to how to cultivate dynamic and stress resilient science-city communities in emerging knowledge economies. The research participants, who inform the ethnographic fragments of *Science-cityscapes*, have been working for public and private institutions that are key players in the scientific and policy worlds surrounding technoscience in Thailand. They include scientists, engineers, policy advisers, high-ranking government officials, employees of managerial rank, and administrative staff at academic and industrial R&D campuses, including receptionists, museum staff, and security guards. The dialogue partners speaking in *Brainscapes* are artists and their project partners, and in particular, their curators and audiences (me included).

Channelling one's energies into the kind of art that science-city populations produce and consume is understood to offer a fresh perspective on these newer social formations in Southeast Asia's knowledge ecologies. Critical to the investigation that

[5] The member countries include Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam. Together with Australia, China, India, Japan, New Zealand, and South Korea they form the ASEAN Plus Six trade bloc.
[6] A main objective of youth-focused interventions that are premised on these two pillars is to stimulate interest in science, technology, engineering, and mathematics (STEM) subjects among the younger Thai population and to sensitize them to the value of art in innovation.

follows in the steps of existential anthropology (Jackson 2013) and anthropology as experience (Turner 1985) has been showing how they contribute to a culturally richer and more diverse 'neuroworld'; borrowing Harvey Whitehouse's notion for the brain-culture interface here. I expected that the rhizome-like ramifications of the bioarts in the knowledge-based economies would lead us deeper into these cultural niches and reveal something about the cultural and generational renewal of these technoscientific communities. I believed that a cognitively-based approach to how artists articulate their experience, think and feel about the art-in-science-city phenomenon could bring into view their participation in the national dialogue on matters that concern 'the bios and the polis of us all' (Fischer 2013:402).

Brainscapes describes and examines the interface of art and the brain and cognitive sciences through the voices of artists engaging with theories about the physical brain and human consciousness in relation to selfhood, feelings, perceptual image and concept formation, memory, imagination, and other *sui generis* human activities. Neuroscience is a largely reductionist science, pursued through functional magnetic resonance imaging (fMRI) and biochemical analyses of synaptic processes in the cerebrum and central nervous system (Marcus and Freeman (eds) 2015; Nadal 2013; Hanson and Bunzl (eds) 2010). Many in the arts, the medical humanities, and anthropology (Ingold 2015, 2007; Dumit 2014; Whitehouse (a) 2012; Cohn 2011, 2010, 2009a, b; Roepstorff 2009; Dumit 2014, 2004; Turner 1993 [1983]) find such reductionism problematic. Besides questioning the large speculative leaps required from the kind of data that can be produced experimentally, the artists offer alternative and complementary methods for widening and deepening current understandings of the 'bio-cultural orchestration of the brain' (Lövdén, Bäckman, Lindenberger, Schaefer, and Schmiedek 2010; Li 2003).

How contemporary artists are dealing with the conflicted question 'Are we our brains?' (Eagleman 2015; Swaab 2015; Glannon 2009; Noë 2009; LeDoux 2003

[2002]) in Thailand has been central to the attempt to make locally produced bioart works relevant to the study of neurocultures. The global neuro community, thus far, has paid little attention to artists working in the newer field of the contemporary visual arts known as 'Bio-Art' (Mitchell 2010; Kac (ed.) 2007), and plying their trade in the peripheries of the Neuroworld**.** Thus, we know very little about the creativeness and originality of Bangkok-based artists who work with older and newer theories of the physical brain and human consciousness.

The names of the Bangkok-based artists who engaged with this research are mostly absent from the vast body of the *ars* and *techné* literature (Reichle 2015, 2009; Ginsberg, Calvert, Schyfter, *et al*. 2014; Gessert 2010), and interactive art (Rinehart and Ippolito 2014; Cubitt and Thomas (eds) 2013; Hauser 2013). Likewise, art-interested scientists of the neuro disciplines (Boccia, Barbetti, Piccardi, Guariglia, Ferlazzo, *et al.* 2016; Huston, Nadal, Mora, Agnati, Cela-Conde (eds) 2015; Kranjec 2015; Aviv 2014; Chatterjee 2014, 2011; Zeki 2014, 2009, 2001, 1999, 1998, 1993; Davies 2013; Finger, Zaidel, Boller, and Bogousslavsky (eds) 2013; Coote and Shelton (eds) 1992) have not paid much attention to brain art produced and consumed *outside* the Western hemisphere. The two field-based interventions with the National Science and Technology Development Agency that is headquartered at the TS-Park, and the Office of Contemporary Art & Culture, Thai Ministry of Culture in Bangkok respectively, represent one attempt to make known and accessible to these specialized knowledge communities works of brain art that come from the Thai neuroworld (writ small).

The unpredicted and unexpected discovery of exhibited works of art shot through with neuromedical and neuroscientific iconography marked an initial breakthrough. To develop an art-based approach to researching the social lifeworld of science-cities ethnographically, I had to find bio-artistic works. This was all the more so since I embraced the view of Tim Ingold that 'the path of discovery' lies in

'attending to what lies before us, in the world, not by looking it up at the back of the book' (2013:2). Therefore, the two field-based interventions could not but espouse the notion of 'feeling forward' (Ingold, ibid). Feeling a way forward was necessary in view of my decision not to set out from a normative and instrumental understanding of science-cities as a constituent element of the global bio-economy.

Rather than working with the influential approaches designed to 'process geographies of neoliberalization' (Peck and Theodore 2012) that revitalized the anthropological critique of neoliberalism (Bockman 2012; Collier 2012; Hilgers 2011; Greenhouse 2010), I tried to offer a complementary approach starting with the co-production of a commented, bi-lingual science-fiction (sci-fi) comic anthology and a brain-art themed travelling exhibition. Both research-driven initiatives supported the argument of Nicholas Thomas[7], for whom an art collection 'is more than a historical resource; it is also something that we work with prospectively, a technology that enables the creation of new things' (2016:99-100). Similar to the artists 'feeling a way forward' (Bloch 2012) by paying attention to the cognitive when mapping the unconscious urban structures of political and psychic repression in a Southeast Asian megalopolis, this study proceeded by feeling a way forward. I feel a way forward through ethnographic dialogic engagement with study participants, and the 'ethnographic self' (Collins and Gallinat (eds) 2010), as the primary research tools.

The investigation therefore recognizably breaks away from the ways in which science-cities in Southeast Asia have been analysed and theorized in the past. It neither builds nor draws on theories and conceptual notions that rose to prominence in the social sciences scholarship of international collaboration in biomedicine and the life sciences (Franklin 2012; Sunder Rajan (ed.) 2012, 2006; Schüll and Zaloom 2011; Lock and Nguyen 2010; Ong and Chen (eds) 2010; Abi-Rached (2008); Rose

[7] The Australian-born anthropologist and historian is the director and a curator of the Museum of Archaeology and Anthropology (MAA), University of Cambridge, Cambridge, UK.

2007; Lakoff 2005; Agamben 1998; Rabinow 1996). Therefore, I do not take up the influential notions of 'biocapital', 'biosociality', 'biological citizenship', 'global assemblages', 'bare life', and other analytical and theoretical concepts that belong to those theorems.

The need for a research method that would be extracting the 'ethnographic in artwork' (Marcus 2010) and tailored to the needs of the two ethnographic interventions was strongly felt in the early stage of this undertaking, and absorbed a considerable amount of investment. The search for an innovative approach leading into the inner lifeworlds of PS-City and its surrounding art scene moulded by the global flows of financial capital and researcher mobility grew even more urgent after the two pre-fieldwork visits in 2012 and 2013. Artistic works, found in a place set up 'to promote science and technology industries and support the international competitiveness of Thailand' (Boonnoon 2007), played a decisive role in developing a visual aesthetics-based approach to science-city life. However, they did not by themselves lead the examination deeper into the social fabric of this emerging Southeast Asian science-cityscape.

An even greater role was played by ethnographic dialogic engagement with science and art professionals in their immediate working environment. That largely explains the slow discovery process. Extending over a little more than four years, the journey began with early reconnaissance trips to the bio-corridors of Singapore, although the city-state was marginal to this dissertation work, which began and ended there.

The 'Bioarts Hypothesis'

Inquiry entails experimentation, argued Paul Rabinow (2008). That makes the nature of this exploration of an understudied geographical region of the Neuroworld (writ large) intrinsically experimental. It departed from Michel M. J. Fischer's proposition that we consider the usefulness of the literary and artistic aesthetics of the bioarts in studying 'communities of concern' (Fischer 2015[8], 2013, and 2009). Referred to as the 'bioarts hypothesis', the anthropologist's proposition primarily served to establish the research potential of the bioarts that are produced, commissioned, consumed, and disseminated by science-city people to generate a relational knowledge and understanding of science-city life, and in particular, their formation and consolidation.

A primary task then was to establish their usefulness as a primary research tool for writing not only about the cultures of the sciences and technologies, but also about 'the imaginaries that inform new experimental discoveries, validating tests, as well as psychic and financial investments in new socio-technical infrastructures', as put forward by Fischer. In his study of Singapore Biopolis sociality, Fischer observed how articulate and thoughtful people were in their technological lives and in relation to the scientific arts that were part of those lives, but how reduced discourse became in the so-called public sphere (2013:402). Linking the bioarts hypothesis with Fischer's quoted observation grounded the inquiry into bioarts in science-cityscapes theoretically in the newer fields of social and cultural anthropology. This took place technically, in experimental ethnography with an autoethnographic leaning, and practically, in dialogues with the research participants.

[8] Professor Dr Michael M. J. Fischer generously shared an electronic version of the blueprint of the encyclopaedic entry in October 2013 (see Wright (Ed) 2015).

The empirical question of if, and how, locally produced bioart works act out a role in science-city life asks for an engagement with normative and instrumental understandings of bringing together people of different disciplines and walks of life for the advancement of knowledge. Are artists contributing to scientific knowledge? Are their exhibited works tearing down disciplinary, institutional, social, and cultural barriers? What do bio-artistic works disclose about the imaginaries of professionals whose work and decisions impact on the growth or decline of science-cities? These are the sort of questions that were crucial in adding analytic description to the imaginaries[9] of community life in science-cities.

The potential social benefits of combining the lab and the studio (Edwards 2010, and 2008) in research practice was an important matter for the science-city developers whom I contacted in Singapore and Thailand during pre-fieldwork. For the American architects and lab designers who told me that community-building was a less discussed subject in their industry, the cognitive value of art in science-dominated environments revealed an even more pertinent question about the inclusion of artists in the social fabric of science-cities. It was of greater relevance than the economic benefit of such collaborative enterprises, maintained the China-based executive of a UK-registered pharmaceutical client of a British-born architect-engineer in Singapore.

Fischer's reference to the 'psychic and financial investment in new socio-technical infrastructure' that he associates with using the bioarts as an investigational tool is pertinent to these preliminary observations of my dialogue partners. They foretold that developing socially and culturally diverse science-cities, known also as 'science towns' and 'technopolis' (Krishna and Sha 2015; Oh and Phillips (eds) 2014; Castells and Hall 1994; Gibson, Kozmetsky, and Smilor (eds) 1992) was not as

[9] 'Imaginaries' is used in the sociological sense of a set of ideas, symbols, values, institutions, principles, rules, customs, and cultural practices shared by a group of people or community.

straightforward as it was presented in Dominque Fache's 'bet on culture' (1992), discussed later on. The visual narrative of the popular art and design works contained in the first set or collection of artistic creations will reveal details of the eventful history of PS-City and the rich cultural ferment that is mostly absent from the dominant discourse on promoting technoscientific research and innovation in Thailand.

Exposing the inherent political nature of some of the artworks is not to tell war stories about accessing information on a lingering conflict between the Thai authorities and supporters of the 'Fight for Science' protest movement. On the contrary, the elucidations of their link with the core message of the protest that peaked in the 'season of discontent' (a euphemism for a national political crisis) showed an interesting side of artistic expression about science-city life. They revealed how the loosely structured and organized research communities were caught up in the dialectics of party politics[10]. Secondly, and probably more importantly for this study, they revealed themselves as vehicles creating a sense of oneness among this splintered science-city population at a time of political instability. Ironically, perhaps, the conflict partly caused by redistributive policies and the perceived loss of privileges sealed that rift between two techno-park communities, inferable from an early map of Pathumthani Science City (Kanatharana 2013).

[10] The pro- and anti-government groupings in Thailand are colloquially called 'red shirts' and 'yellow shirts.'

Figure 3 – The title of the satellite map is 'Pathumthani Science City' (Kanatharana 2013). The total area is indicated with 25 km^2. © 2013 Janekrishna Kanatharana.

The content of the works examined in Chapter One proved useful for deconstructing that divide, which will be explained in greater detail through the travelogue in the Interlude. The discussion of a protest movement that was unprecedented in the history of this Thai technoscientific community will show how they removed a long-standing hurdle. That hurdle delayed ministerial approval of the PS-City project by several years. The conflict was related to investment, but not solely. Public investment by Thailand in science and innovation development is low in spite of government strategies and plans to raise the annual budget to one percent of the annual gross domestic product (Science, Technology and Innovation (STI) Policy Office 2012).

The visual narratives of the works introduced in *Bioarts as Appraisal* echo the immediate, and longer-term, repercussions of underfunded scientific research and innovation in developing the PS-City community. As the first chapter will show, the creators of the satirical cartoons, the sci-fi comic stories, and the video recorded song of a Thai microbiologist (performed live in Singapore) tell quite a different story of

what we generally hear, see, or read about the research communities populating Thailand's first science-city. With their eyes to the future, they speak of frustration and disappointment. They also speak of the kind of hope captured in "The Growth" (1963), a sculpture by the internationally renowned Thai artist Chamruang Vichienket exhibited in front of the Thailand Institute of Scientific and Technological Research (TISTR) inside the TT-Complex.

Figure 4 – "The Growth" (1963) by Chamruang Vichienket, restored and re-established at Technothani/Technopolis in the Khlong Luang district of Pathumthani province, Thailand, in 2013. © 2014 Photo by B. R. Buergi.

The sci-fi comic stories made by two groups of underage students during youth camps held at the TS-Park show that they are not merely educational in the sense of

teaching children science (as insinuated by the *Nation* journalist), but enrich the imagination of adults as well. Moreover, their quirky imaginaries of science-city life suggest a shift in the ways these young Thais, groomed for a career in technoscience, think about traditional social and cultural norms and values. It seems that we are able to witness a profound transformation as it happens in this rapidly changing landscape to the north of Bangkok, which was a vast expanse of sparsely populated marshland well into the nineteenth century (Baker and Phongpaichit 2005).

The three chapters of *Brainscapes* follow a line of inquiry as to how neurobiologically informed works of art help us write the imaginaries that lead to experimental discoveries in the brain and cognitive sciences. To achieve the purpose of this thesis, the method used is based above all on how Bangkok-based artists interact with the social world surrounding neuroscience. What their art projects tell us about the art-brain interface has developed into the main research topic of studying science-cityscapes through the bioarts that they commission, produce, and disseminate. How do these internationally exhibited artists talk about their contribution to a complementary and alternative understanding of the workings of the brain?

This questions gains momentum when we place the bioarts hypothesis in the midst of research communities that are embedded in the global bioeconomy. Before establishing the analytical and theoretical potential of the bioarts in relation to studies of the art-brain interface, I set out with the assumption that one needs to gain first-hand insight into how this cross-pollination of art and science unfolds in the multiple social realities of research practice in science-cityscapes. Only with a fine-grained picture of 'what is going on in front of us' would it make sense to expand the scope and scale of the research, I thought. Without such a preliminary exposition, the study would have been a mere theoretical exercise (which it is not). This practice-oriented

vantage point begged for a conceptual framing of these urban and semi-urban agglomerations as 'cities of life' (*biopoleis*).

Mapping the Bioarts onto Science-Cityscapes

The 'mapping exercise' that will bring art forms and practices reaching the interpretative level of life systems (i.e. bioarts) onto the cultural and historical map of PS-City, and by extension, onto the global map of the Neuroworld, is presented in the two parts of the Interlude. The first part traces the historical past of this newer science-city to the early second half of the twentieth century, and thereafter to the seventeenth century Burmese Mon migration. The second part will revisit the insights gleaned thus far, and foreshadow what is to come in the ensuing chapters.

A satellite map, entitled 'Pathumthani Science City' (Kanatharana 2013:25), aided the territorial survey before and during the first months of fieldwork. Though I travelled beyond the yellow-marked borders, this early cartographic document of PS-City proved useful in my exploration of this scarcely charted terrain in the anthropology of science and technology. The satellite map, as well as the monthly exhibition calendar *BAM! (Bangkok Art Map)* that is superimposed onto a street map of the capital city show these two main fieldsites as a bounded area. However, for this study, they are not considered bounded fieldsites, since artists are moving in both campuses. A further reason for treating the boundaries between the world of art and the world of science as fluid and shifting relates not just to the circulation of art and artists as illustrated by the two introductory art works, but also to the material they use for realizing exhibition projects.

Figure 5 – A screenshot of the video recorded preview of the *Operation Bangkok* exhibition (2014) by Roslisham Ismail, aka Ise. His crew was an integral part of the 'fake lab' that the artist set up at the Bangkok University Gallery (BUG), Bangkok, Thailand. © 2014 Bangkok University Gallery (BUG), by courtesy of the gallery.

For instance, the three microscopes in the 'fake lab' seen in a video of the preview of the *Operation Bangkok* installation exhibition (Bangkok University Gallery (BUG) 2014b) were lent by a science laboratory willing to participate in the experimental art project of the Malaysian-born multi-medium artist Roslisham Ismail, aka Ise[11] . The provider of a novel type of cement that the foreign-trained Thai artist and art scholar Be Takerng Pattanopas used for a live body cast that 'tricks the eye' has research laboratories inside the TS-Park. The Industrial Design Gallery in Bangkok exhibited the installation that the artist entitled "Mould Boy" (2006). These instantiations of art-in-science indicate that these two distinct and different knowledge circuitries have intersected in this sprawling Southeast Asian science-cityscape earlier than yesterday.

At the time when I set out to find bio-artistic works in and around Bangkok, the plan to build a science-city in the Khlong Luang district of Pathumthani province had not yet been approved by the Thai science and technology minister. This eventually

[11] To preserve the nature of the peer working relationship, the artists are called by their first name, with the exception of Roslisham Ismail, who is referred to by his artist name Ise.

occurred when my fieldwork drew to a close (Wipatayotin 2015). Regardless of the disputed boundaries seen in the satellite map of 2013 that delayed the implementation of the science-city plan, there were signs of the intention to build an integrated research community. Among the contested budget positions, in fact, was the allocation of public funds for a technoscience themed amusement park in the far western part of the Khlong Luang district, and a new science museum in the eastern part of the district.

The beginnings of the study were modest and humble. I took to heart the comments of artists, scientists, and science-city developers on the barriers they perceived as hindering the formation of culturally diverse and integrated research communities. Their views provided an incentive to research how 'Art & Science' plays out in the social lifeworlds of science-cities in a Southeast Asian cultural setting. Finding myself in-between these two research-driven knowledge communities threw me into an intellectual milieu that, in the words of Paul Rabinow, positions the anthropologist 'in the midst of things of the world' (2008:9), and hence, 'midst the relationship of the contending *logoi* (embedded as they are within problematizations, apparatuses, and assemblages)' (2005:51).

The first of the two main research platforms materialized as a result of following the symbolic tree in the corporate logo of the TS-Park during two fieldtrips in the summers of 2012 and 2013. The cultural and social significance of the pixelated tree icon was not immediately apparent. It became clearer in discussions of theoretical and policy-driven approaches to science-city building and development. The sighting of an artwork by a Thai-born life scientist at Singapore Biopolis (who wished to remain anonymous) then pushed the inquiry in the intended direction. Her artfully crafted allegory – resulting from combining a scientific illustration of parasite-infected blood with a sovereign title that is no longer in use – was a thinly

veiled social critique of neoliberal science politics that she believed corrupted the work ethos of biomedical and bioscientific research.

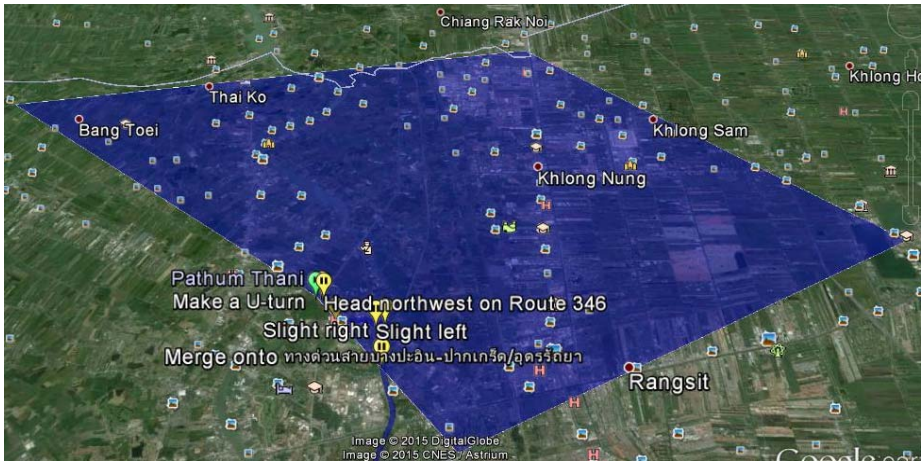
While the influential tropes of biopolitics and governmentality reverberate strongly in the commissioned artwork of the microbiologist, I decided to study national development projects to incentivize the domestic bioeconomy with a visual research method. To devise an aesthetics-based approach I had to find artistic objects that mirror their sociocultural and historical context in an interesting way. Take the mirrored image seen in the light-reflecting panels of the high-tech installation below. Even though it is not an artwork in the strict sense of the term, it encapsulates a specific moment in the historical trajectory of PS-City. Namely, it captures the transition from the first to the second expansion phase of the TS-Park, which changed strikingly the skyline of the *biopolis* rising from the alluvial plains of the Chao Phraya.

Figure 6 – The blocks of the Innovation Cluster One (INC 1) and the interconnected towers of the INC 2 (Innovation Cluster Two) of the Thailand Science Park, Khlong Luang, Pathumthani province, Thailand, collapse in the mirror image of this engineered installation. © 2014 Photo by B.R. Buergi.

In the above image, we see the older- and newer-style buildings of the INC 1 and the INC 2 collapsed in the geometrically arranged light reflecting panels. They visually contain that ‘jump’ of which a senior science and society policy adviser spoke as we walked across a passageway connecting the two sites of the expanding park. While the mirror image discloses little about this ‘parkscape’ that entered the third development phase in 2014, the dialogue partners willing to elaborate on the meaning of that graphic tree in the logo gave away enough to elucidate an important chapter in the development of the first science-city of Thailand. These discussions of the generic symbol that the park adopted called attention to a purportedly less addressed topic among science-city developers; that is, science-city community building. The importance of generation renewal, of cultivating the next generations of scientists and engineers, is found in th9999e visual narrative of Vichienket’s sculpture (Figure 4) that visualizes the generational renewal of an industry-oriented scientific community.

Figure 7 – A screenshot of the TS-Park logo with the tagline in a promotional online streamed video on You Tube (Thailand Board of Investment (BOI) North America 2011). © 2011 Thailand Board of Investment (BOI) North America.

When I set out to remap the borders of PS-City, equipped with the satellite map that shows the pixelated tree icon in the bottom right corner of the page, the rift between the gated technoscience parks on either side of Paholyothin Road ran deep. Reassessing the territory and the pool of researchers and university students at the beginning of fieldwork was useful for illuminating the sociocultural and historical layers of this science-cityscape. The travelogue of a two-day journey across this vast terrain will elucidate further the relevance of redrawing the boundary lines. The disappearance of that horizontal line in the reassessed map of 2014 denotes an important passage. Similar to the rites of passage in a person's life course, the transition from the parkscape to the science-cityscape lingers on. It continues, but in a different gear.



	Latitude	Longitude	
Valaya Alongkorn Rajabhat University (north)	14.13339	100.61797	
Rangsit University (south)	13.96518	100.58797	
Rajamangala Univiversity / Technopolis (east)	14.03585	100.72656	
Pathumthani University (west)	14.01436	100.54837	
Shinawatra University (north-west)	14.10106	100.43338	
Total Area (in km^2)			293.81

Figure 8 – A satellite map indicating the reappraised catchment area of Pathumthani Science City, produced with Draft Logic, Google Earth, and Universimmedia software. © 2014 Map by B.R. Buergi.

The remapped area that resulted from connecting the farthest points of the institutions listed next to the satellite map of 2013 (Tab. 2A) covers about one fifth of Pathumthani province, which is roughly half the size of Singapore[12]. Reassessing the topographic boundary of PS-City was relatively easy, whereas elucidating the obstacles of this long-planned science-city was anything but straightforward. 'Convert every certainty into a question,' Ingold advised his students (2009:2). This principle of questioning what one finds on the ethnographic surface was essential in the mapping processes. The groundwork for elucidating that important passage in the history of PS-City underlay an effort to understand why two important dates were missing from a graph chronicling Thai technoscience development (Yuthavong 2011).

Revisiting these turning points, which occurred in 1963 and 2002 in the biography of PS-City, was decisive for demonstrating that this passage, in a Southeast Asian context, is not necessarily achieved by 'filling up' a *biopolis* with people (Smaglik 2003). In Thailand, the growth of the locally available pool of technoscience-based professionals happens primarily through science education and the training of the next generation of scientists, engineers, and technologists 'at home' and abroad. That was revealed in discussions with Thai policy advisers who offered statistical data on science and engineering students benefitting from government-funded youth enhancement programmes, and/or international exchange programmes for growing the local science-city population.

Teasing out the cross-border movements of Thai 'foreign talent' on the macro-scale has not been a research priority. Nonetheless, the preliminary findings (see Appendices), besides securing access to science-city advisers, helped to establish a dialogue between the sci-fi comic story "Brain Eyes" (Firered Maximum 2012) and

[12] The comparison refers to the land mass of Singapore in 1969, when the size of the city-state was approximately 586 km^2.

the Thai national discourse of high-skilled labour mobility within the AEC (Chia 2011). Insights gleaned from this first attempt to forge a path into the local research culture, believed to be 'Thai by default' unless questioned, were pivotal for penetrating more deeply into this lesser known science-cityscape.

Mapping Artistic Brainscapes onto the Neuroworld

The three empirical chapters of the second part of the thesis show the forays of artists into the Neuroworld, and specifically, how they carve niches in the social world of neuro communities. *Brainscapes* turns to the artists' views and interpretations of the cerebrum and nervous system that the anthropologists Greg Downey and Daniel Lende maintained were 'our most cultural organs' (2012:23). The endeavour of a group of emerging and established artists plying their trade in Bangkok to map artistic interpretations of the complex nature of the brain (i.e. brainscapes) onto the cultural map of the Neuroworld pushed into the background matters raised and discussed in *Part One*.

The main research focus in *Brainscapes* is the kind of neuroculture that is developing in this world region. Artists who 'pick brains and minds', and their curators and audiences, are at the centre of the dialogues that add descriptive analysis to neurobiologically informed art produced and consumed in this under-researched part of the Neuroworld. I borrow the phrase of Kaona Pongpipat (2014b) who reviewed Noraset's installation exhibition *Fault Lines*, since it gives an idea of the investigative process. His thought picture conveys what paying attention to the cognitive (Bloch 2015; Whitehouse (a) 2012) in order to reach *below the ethnographic surface*, as argued by Maurice Bloch (2012:146), means for this field-based research. Picking the brains and minds of artists was the task set before me

after I had found works of contemporary art that seemed to say something about the intellectual encounter of experimental art and brain-related empirical research.

BAM! – the bilingual monthly art exhibition calendar started by the British-born art writer, curator, and consultant Steven Pettifor – was a useful guide for identifying art spaces of cultural institutions that promote the work of artists who engage originally and creatively with epistemic objects and processes of the life sciences. The question 'What's on?' guided the early approaches to the contemporary art scene of Bangkok. That is where I would find artworks that, besides breaking conventions of artistic tendencies in order to innovate within their trade, explore 'controversial subjects' to 'propel questioning' (Brownell 2013). While they confirm the optimism of the UK-trained curator Bow Wasinondh, who reportedly said, 'I think there has been great work done to nudge and push those boundaries' (ibid.), there is also opposition.

From the Thai curator Ark Fongsmut we learn that 'our understanding of contemporary art still exists in a limited space' (Pongpipat 2014a). It is important to note that he made that statement in relation to the art installation by Ise, discussed in the first chapter on artists. During his art-in-residence at the Bangkok University Gallery (BUG), Ise turned the art space into a social laboratory to register the aesthetic responses of the exhibition visitors. *Bioarts as Introspection* examines and discusses this interactive and process-based art exhibit to show how this artist engages with newer exhibition formats that seek to engage the public in a dialogue on current matters: for instance, taking up the street protests in central Bangkok that ended with a military coup. Like Ise, Noraset deals with the same criminal case that continues to haunt Bangkokians and that illuminates a darker corner of Thai forensic neuropathology, albeit from a twenty-first century perspective.

Common to the artists featured therein is that they set up the exhibition space as one that playfully ensnared the viewers, enabling the artists to see the viewers'

reactions to the various symbols and signals that may or may not provide guidelines to how to approach their art. Finding artists who explored the brain and nervous system in relation to the aesthetic response of their audiences to the aesthetic effects that they hoped to achieve was indispensable for developing this line of inquiry. Of even greater importance for proceeding in the intended direction was the establishment of a working relationship with the artists.

The artists' interest in my research, and my research interest in their work, formed the premise for the ethnographic dialogic engagement within which the research methodology roots itself. That reciprocal resourcefulness mattered especially for our joint attempt to elucidate the tacit theme of their exhibited works which may, or may not, be outlined in the catalogues and reviews of their exhibitions, for reasons of medical confidentiality, self-censorship, and other factors. These layers of dialogic engagement are, as anthropologists like to point out, always double-sided. Although it was not immediately apparent that the artists became part of this study *after* I had become part of their projects, this recognition was important in relation to the ethnographic encounter that was founded on dealing with the research participants as peers.

From their reflexive accounts it emerged that their experimental inquiries into the translational processes involved in the formation of concepts in the brain from vision were entangled with their life histories. Re-tooling the ethnographic interview with in-depth dialogues (Marcus (ed.) 1995; Maranhao (ed.) 1990), combined with a life history approach (Marcus and Fischer 1999; Casagrande (ed.) 1960), brought out layers of intensive engagement with their work that were not found in the catalogues and exhibition reviews. This investigative approach recognizably experiments with newer forms and practices of ethnographic writing that uses the fieldwork experience as an analytical tool (Taussig 2013; Collins and Gallinat (eds) 2010), and that is not to be confused with a stream-of-consciousness writing style.

On the contrary, this research approach takes its model from Marilyn Strathern's remark that 'anthropologists really have nothing to offer if they cannot demonstrate the difference it makes to understand relations through the relationships they are involved with' (2011). That demands self-cognition at all stages of the research process. How this contemporary anthropological convention in current ethnographic theory played out 'in the field' can be traced by presenting the ethnographic fragments in a dialogic fashion. The study draws extensively on these primary resources because they are the empirical research material that supports the proposal to integrate the bioarts into the growing corpus of neuroanthropological literature. The inclusion of directly and indirectly quoted passages from audio recordings, electronic communications, field journals, and diary entries, in the main body of the thesis makes it transparent that the way I write is part of the method of exposition (Starn (ed.) 2015; Zenker and Kumoll (eds) 2010; Clifford and Marcus 2010 [1986]; Geertz 1988).

Three aspects of the form and style of presentation will be clarified at the outset. One, it demonstrates how dialogue-driven research has been rewiring the canonical interview (Smith, Staples, and Rapport (eds) 2015; Skinner (Ed.) 2013 [2012]) in the newer fields of anthropology that comprise neuroanthropology (Pinney 2012). Two, it exposes the collaborative nature of ethnographic research (Lassiter 2005) that works prospectively with the study participants. Three, the research was also a process of discovery for me, not just of *what* to study but of *how* to study it. In this respect, it is hoped that the thesis will be a useful, productive and provocative addition to a set of debates about ethnographic methods in theory and practice. A further clarification regarding the inclusion of life-changing events in the artists' biographies is in order.

Since these turning points at particular moments in time took the artists' earlier work in a fresh direction, by excluding them we would miss important and significant

aspects of experimental exploration. We would miss how art can make explicit the unconscious urban structures of political and psychic repression during the 'season of discontent', to Paritta Wangkiat and Apinya Wipatayotin's euphemism. How the artists speak of themselves as finding alternative and complementary methods to reductionist understandings of the organization and functions of the brain and/or mind is found in the dialogue transcripts, but not in the secondary literature.

The Irish-born curator of the *Fault Lines* exhibition at the American-owned H Gallery pointed that out in his assessment of contemporary art taking root in Bangkok. In an interview with the *New York Times* he said, 'When I first came here, you could not really criticize an art exhibition as it was seen as culturally offensive with this whole culture of shame.' That was in the late twentieth century. 'Shows were examined more through a moral code than art criticism'; moreover, 'people have been imprisoned for pushing artistic boundaries,' Curtin told Ginanne Brownell (2013). Self-censorship is an issue not only in writing art critiques, but also in working with artworks that raise politically and ethically sensitive topics, as do some of the works that have been included in the first and second art collections.

The thoughts and feelings that they evoke, however, constitute a fundamental factor in how their creators communicate with the public. As the French conceptual artist Duchamp so powerfully said, 'Art may be bad, good, or indifferent, but whatever adjective is used, we must call it art' since 'bad art, is still art in the same way as a bad emotion is still an emotion' (Duchamp 1957, quoted in Arman 1984:50). The ways in which the artists are feeling a way forward through their pain developed into a principal research focus because the emotions of the artists and the viewers are constitutive elements of art making and art appreciation. Setting aside feelings in the process of art production and consumption would run against the grain of working with an aesthetics centred research method focused on the bioarts.

What is bioart? From an art historical point of view, Stephanie Walden (2013) wrote that this sub-genre of contemporary art intended 'to provoke social discussion'. Artists throughout history had often 'traversed new, controversial territories to awaken social consciousness, encourage thought-provoking conversation and address pressing existential questions'. The twentieth-century pioneer of the French conceptual art movement Marcel Duchamp and the Renaissance artist Leonardo da Vinci served Walden in illustrating her point. If this art form and style was art, science, or the future, Walden responded: 'The label "bioart" serves as an umbrella term for the use of living tissues, bacteria and organisms in creating intriguing – and often shocking – works of art.' Even as Walden's description captures the aesthetic characteristics and the intellectual driving force of this twenty-first century subgenre of contemporary art (Mitchell 2011; Kac, ibid.), using the notion as an umbrella term suppresses the multifacetedness of creations that are reducible to neither art nor science.

They combine the quest for aesthetic beauty in the life sciences (Benner 2012; Wilson 2010; Flannery 2007; Chandrasekhar 1987)[13] with the view that bioart should be aesthetically beautiful (i.e. appealing to the eye), a view which I do not share. Since I use aesthetics in the in the Aristotelian sense of experiencing the world through the sense organs (Rosenblum 2010), the research methodology does not confine aesthetics to beauty and taste, as in a definitional understanding of eighteenth-century romanticism (Eco (ed.) 2004). The embalmed corpse of an alleged cannibal on show at the Siriraj Medical Museum in Bangkok lacks beauty and taste.

The sight of the encased body of the presumptively mentally disturbed Chinese immigrant, owned by the Songkran Niyomsen[14] Forensic Medicine Museum,

[13] Examples of art-in-science/science-in-art are the cortical brain maps of Wilder G. Penfield, illustrated by Hortense Pauline Cantlie (Pogliano 2012), and Santiago Ramón y Cajal's illustrations of the microscopic brain structure (Swanson, Newman, Araque, and Dubinsky (eds) 2017).
[14] Songkran Niyomansen is also spelled Songkranniyomansen.

probably upsets the viewer's state of mind. Certainly, it is neither charming nor pleasing to the eye. The mummified body was frightening, said Ise. He was shocked. How might he have felt when he sketched his impression of this museum exhibit alongside Fongsmut's curatorial note in the *Operation Bangkok* exhibition catalogue (Bangkok University Gallery 2014a:4)? Contrary to the "Chaotic Connectome" (2013) and other brain-themed artworks by the American neuroscientist Greg A. Dunn, who claimed to be inspired by classic Asian art forms (Hutton 2011), the awe-inspiring scar on the skull of the unclothed man, known as Si Quey, is disconcerting and disturbing to watch. The neurosurgeon who established, based on a sub-cranial inspection, that the accused serial killer was not legally insane claimed the body after his execution. Hence, it is not an urban legend as some people continue to maintain.

This item in the museum collection raises questions that this artist has taken up and that are central to the discussions of brain health in *Brainscapes*. The Kelantan-born artist, by including this forensic case, rekindled interest in the legal and ethical issues surrounding the admissibility of high-resolution brain images as forensic evidence in court (Davis 2017; Dumit 2004). A topic that concerned Noraset deeply in his artistic explorations of 'what it means to pursue the truth of things' (H Project Space 2014) was 'the distortions and conflicts of universal experiences – love, lust, life and death – and how these distortions and conflicts occur through relationships between internal and external forces'. As Curtin wrote in his curator note, 'Fault Lines also suggests great significance for contemplating how the manipulation of personal agency and comprehension can be understood for urgent social and political contexts in the contemporary world' (ibid.).

Figure 9 – This unpublished work in Ise's *Operation Bangkok* post-exhibition drawing collection, seen at his studio in Kota Bharu, Kelantan state, Malaysia, recalls the installation segment that documented his 'mission' to the Siriraj Medical Museum in Bangkok, Thailand. © 2014 Roslisham Ismail, aka Ise, by courtesy of the artist (in the picture).

Was the neuropsychiatric evaluation by Nited Songkranniyomsen scientifically sound? How did the Thai neurosurgeon reach the conclusion that the anatomical shape and structure of the brain of the imprisoned Hainanese immigrant was in the 'normal range'? What prompted the physician to conclude that the brain showed insufficient abnormality to support a plea of diminished capacity? How do neuroanatomical features correlate with a person's capacity for intention ('free will')? Are these neurobiologically derived results by any means conclusive? We shall turn to these controversy-ridden questions in *Bioarts as Dialogue*. Here it suffices to

specify that Ise and Noraset forcefully bring to the fore questions about the use of invasive and non-invasive brain inspections in clinical and forensic medicine on which newer categories of the person are based. These questions are by no means just philosophical (Domínguez 2012).

These two installation exhibitions, in conjunction with a discussion of a short documentary film by a group of Thammasat University students (Jennunthakajorn 2012) about the Siriraj Medical Museums of Mahidol University, lead us deeper into the Thai neuroculture. The authors of these works seem to be saying that classifying personhood through pictures of the brain, obtained by either surgical or non-surgical procedures, is problematic. In the words of Joseph Dumit, these works of art teach us 'a cultural lesson in seeing, and in seeing what is "normal" and what is "not normal"' (2004:118). 'To see something new,' Dumit continues, 'some people must figure out how to see it and then teach others.' The artists seem to be doing exactly that by interrogating the standards of reference for distinguishing between a healthy, diseased, injured, and/or otherwise traumatized brain and/or mind.

Figure 10 – A screenshot from the theatrical play *A Short Story of Si-Quey* in the online streamed documentary *Siraraj Medical Museum* (Jennunthakajorn 2012) by new media and communication students of Thammasat University, which has a campus in Bangkok and one in Rangsit, Pathumthani province, Thailand.

Even though the students did not interrogate the inspection of the brain that justified the execution of Si Ouey Sae Urng[15], described by the American military surgeon Mitch Meyers as 'Bangkok's bogeyman' (2003:17), their re-enactment of his arrest and death, shows that we, the viewers, are also implicated in the proliferation of symptomatological tables of brain disease and mental health. The factual account of a museum employee trained in the life sciences confirms that this forensic case is not a myth, told and retold to scare people, and especially children. Central to *Part Two* are the ways in which the examined works rework older and newer theories of the criminal, diseased, and healthy brain.

With these preliminary elucidations I have tried to prefigure the presumed usefulness of working with works of art that might facilitate 'a gradual increase in the ability of the public to talk about matters that concern the bios as well as the polis of us all' (Fischer 2013:402). Looking at the showcased body in the museum hall, or artistic interpretations of the forensic case that made headlines in mid-twentieth century Thailand, is equally discomfiting. Watching the lecherous and obviously disturbed face of the young actor in the theatrical play, who thirsts for human flesh to boost his virility, creates discomfort. Listening to the personal story of the Thai artist, who conversed with his neurobiological self in the art studio, and later in the gallery, was comparably stressful.

Yet, through these emotions we gain a fuller and more nuanced understanding of how artists in Thailand take stock of the interplay between art and brain science following the 'neuro revolution'[16] (Lynch and Laursen 2009). If we want to gain a deeper understanding of what is going on in front of us, in those cultural niches emerging in the fringes of the social worlds surrounding the healthy and diseased brain, following Bloch, we need to reach the implicit level. 'This ultimately means

[15] Spelled alternatively as 'Si Quey' and 'See Uui'.
[16] What is meant is the development of neuroscience into a 'big science' (see also Martin 2002, and Price, Adams, and Coyle 2000).

that the anthropologist has to pay attention to the cognitive' (2012:146), to which I adjoin emotions and the visual unconscious that influence and shape our social imaginaries.

"Digging Deeper"

The process of deconstructing the brain motif in the works of the artists who inform *Brainscapes* departed from Duchamp's (1957) concept of the 'personal art coefficient'. The French pioneer of conceptual art defined it as the 'arithmetic relationship between the unexpressed but intended and the unintentionally expressed' (quoted in Arman, ibid., 51). This concept proved useful for starting a dialogue with the artists about their work. Deployed as a proxy in the first instance, it served to extract both the explicit and implicit narratives of the selected works that I had seen. The exposition of the unique methods and techniques that the artists used in their physics-based explorations of perspective, and biomedical scanning to explore people's neurobiological identity, required proximity to them as well as reciprocity.

Research with people 'engaged with cultural diversity and the neurological consequences of developmental environments,' proposed Strathern, 'brings to (the anthropological) mind another peer group'. She named that group *Knowledge in Hand*, meaning 'all those subjects of studies of manual expertise, of craftwork and handwork: namely, the owners of the hands' (2012:433). The twofold premise of the research methodology that sought to generate relational knowledge about the special training of the artists 'not just by subject matter but by practice and application' (ibid.) was rooted in the peer relationship with the artists. Looking at the artworks alone, in solitude and isolation, and from a distance, proved unviable from the moment I found the first bio-artistic work of a Thai microbiologist working at

Singapore Biopolis. Strathern's proposition that, in the future, what now seemed superfluous to the creative process, that is, adding analysis or description to material experience and practice, might find a new niche (2012:433) resonated with that unexpected find (see *Introduction*).

In view of the renewed interest of social anthropologists in the neurological consequences of developmental environments for the psyche, I have turned my analytical gaze to those emerging niches where artistic and scientific knowledge feed off one another in the Thai neuroworld. Getting brain and cognitive scientists, neuroimaging researchers, and researchers in other specialized areas of the neuro disciplines involved in this study has never been articulated. The focus has always been the producers of bio-artistic works, and less on how artist communities and networks are structured and organized at the macro-level (da Costa and Philip (eds) 2008; Moore and Held (eds) 2008) in the Thai contemporary art world.

Noraset described the local art scene with the words: 'Conflict, Unity, Possibility, Limited, Combination, Links, Eastern Attitude, Western Attitude, Digital, Analogue, Conceptualise, Technical theme, Language, Religion, Crowd, Noise, Quiet, Temple, University, Bureaucracy, Tropical, Lost, Found, Idea, Electronic, Computer, Timing, Interactive, Activity, Party and Friendship' (Asia-Europe Foundation (ASEF) 2008:46). The Thai artist's descriptive notions contain clues to why the experimental art scene remained largely unrecognized in the Thai capital city. The curator of the Bangkok University Gallery told the *Bangkok Post* who reviewed the *Operation Bangkok* exhibition that 'A conceptual work like this is not often found in Bangkok because we often question whether this kind of work is art or not. There's always a question like this in this region because our understanding of contemporary art still exists in a limited space, but Ise is opening that up' (Pongpipat 2014a).

The art professional who participated in my study spoke about the frailty of these informal networks of artists, such as the one described in the thesis, which was partly pre-existing and partly brought into being or intensified by my investigation and the initiated brain art group exhibition. Their verbalizations of their economic situation essentially helped me to grasp the current state of affairs. From their accounts it emerged that, in spite of ambitious government plans (science-cities, art/science museums, etc.), art, like science, is precarious in terms of project funding and other infrastructural support. In addition to what has already been said about the ethnographic dialogic engagement with the artists, three further aspects of the research methodology require clarification.

The decision to highlight the 'aesthetic agency of art' relates to a comment by James F. Weiner about Alfred Gell's seminal works in the anthropology of art (1999, 1998, and 1992). Weiner (2001) maintained that Gell's move to marginalize the aesthetic agency of art to the benefit of the social agency of art might have been hasty. A bioarts centred method is understood to reclaim the aesthetic agency of art, as implied in the bioarts hypothesis. Had I not paid attention to the individual reactions of Ise and Noraset to the life history of Si Quey, it would have been very difficult to establish a historical link between the twenty-first century anthropological critique of 'picturing personhood' (Dumit 2004) and this forensic case from the nineteen-fifties in the Thai cultural context. Their aesthetic response made that link to the concreteness of everyday science-city life possible. Such was the advantage of working with an aesthetics-based approach, which seemed to shore up Fischer's proposition.

These dialogues would not have been far-reaching had I departed from Bruno Latour's presumptuous statement that artists lie 'like a rug' (2013:247) about their identity. Accepting this view would have imperilled the establishment of a symmetrical relationship with the artists. It would have been comparably damaging to

cling to Gell's assumption about anthropologists that we were all 'self-confessed devotees of the Art Cult' (1992:42). I do not think I fit within that description. Nor do I hide the fact that I was a newcomer to bioart, synthetic art, new media art, process-based installations, art mapping, and interactive art. Knowing comparably little about the contemporary art scenes in Thailand and the wider Southeast Asia region (Ward 2014; Poshyananda 2012, 2010, 2003; Pettifor 2003; Subhadradis 1991), Asia (Chiu and Genocchio (eds) 2011), and the 'new art worlds' (Belting, Buddensieg, and Weibel (eds) 2013) was not an impediment, however. Rather, it opened up a space for 'learning to learn' (Ingold 2013).

The reason why it would have been unwise to claim that artistic insights were similar to those produced by ethnographic descriptions (Franklin 2013:295) relates to the scope of this field-based inquiry. *Because* we came to the examined works from different thought traditions, we were able to see them in a new light. Just as problematic as the view of Alexander Kranjec that it might be more productive to investigate 'the processes not the products of conceptual art' (2015:4) is Reichle's view that 'scientific simulations and visualizations may well shape our view of the world (*Weltbild*) much more than any work of art' (2015:74). Privileging scientific over artistic brain imageries undermines the rationale of promoting the arts in a science-dominated setting to pave the way for peer relationships between artists and scientists. Moreover, it forecloses a line of inquiry rooted in the bioarts hypothesis.

Focusing primarily on the processes and applications that produced the exhibit is problematic because it eliminates the aesthetic response to the art object that resulted from those processes. Both views are problematic for engaging with the ambitious proposition that neuroanthropology could bring 'a more intriguing set of research questions to neuroimaging' (Downey and Lende 2012:36). These additional considerations clarify further why I placed the art-in-science-city phenomenon 'midst the relationship of the contending *logoi*' (Rabinow, ibid.), rather than between

anthropology and the arts (Schneider and Wright (eds) 2010, see also Svašek 2007; Morphy and Morgan (eds) 2006; Westermann (ed.) 2005; Pinney and Thomas (eds) 2001; Firth 1992). What 'digging deeper' has come to stand for in this study was signalled by the artist who made visible through his artistic work the difference between saying 'I feel, therefore I am' and 'I am, therefore I feel' (Damasio 2010). During the third audio recorded dialogue, Ise said of our collaboration,

> It would not be going this far. Now we keep digging, digging, and then we are finding new things. Without meeting an anthropology researcher, I, we, I cannot, I cannot dig until that far the *Operation Bangkok* [exhibition, see above]. What makes me trust more in this kind of coming together is when I showed the *Operation Bangkok* to a curator, to a Singapore-based curator two days ago. She said, "Ise, nobody can make this work." I am not saying that I am the one who can make it, but, actually, to come to that point it needs a very long experience (Tab. 1A, 4.3).

For a deeper engagement with artistic explorations of concept formation through vision, I approached the UK-educated and trained Thai artist Piyatat Hemmatat. Selected art photographic works of the unfinished *Titans* project and exhibits of the *Landscape: 2007-2014* exhibition that challenge our visual literacy are at the core of the fourth and last chapter *Bioarts as Memory*. The symmetrical images with Rorschach-like potential, produced with daguerreotypes and chromogenic colour printing, help him explore alternative perceptual image formations shaped by chemical processes. The prints discussed challenge our visual organs to such an extent that they compromise the viewer's ability to read and interpret visual information 'adequately.'

Figure 11– A segment of a photograph taken during the *vernissage* of Piyatat Hemmatat's *Landscape: 2007-2014* exhibition at Sirindia Gallery, Bangkok. © 2015 Serindia Gallery, by courtesy of the gallery.

These pictures, like "Landscape: 2007-2014, no. 28" above, confuse our visual pathways. We struggle to give a single interpretation of the forms and figures we think we discern in such pictures. Since we live in an increasingly visual world, these images are likely to bring a set of more exciting questions to visual literacy research than the bi-stable images commonly used in diagnostic tests[17]. How his works and those of the other artists participating in the *Light and Shadows: Art in the 'Age of the Brain'* travelling exhibition take the worn-out nature versus nurture debate into a fresh direction is the core argument of the thesis.

[17] A classic example is the 'duck-rabbit' bi-stable image used in neurological tests. When we see the duck, we do not see the rabbit, and vice-versa. Both interpretations are equally valid.

Part One

Beginnings

Art in "Cities of Life"

Two truths approach each other. One comes from inside, the other from outside,
and where they meet we have a chance to catch sight of ourselves.

The man who sees what's about to take place cries out wildly: "Stop!
Anything, if only I don't have to know myself."

– Tomas G. Tranströmer, *Preludes*

Beginnings

A few days into my doctoral programme, I was looking for a public artwork featured on the website of *Asian Biopoleis: Biotechnology and Biomedicine as Emergent Forms of Life and Practice*.[18] The caption provided the photographic credits, but not the names of either the sculptor or the sculpture. Who made it? Who decided to put it in a public space? What did this bioart work do in a bio-science dominated environment? Why was the work not exhibited at a gallery or a museum: Singapore's ArtScience Museum, for example? What did this artwork tell us about the intellectual encounter of artists and scientists in the rapidly expanding bio-corridor of the city-state? These were the sort of questions that had sprung to mind when I was reading the website of the grant programme that I joined at the beginning of 2012.

Calling on the senior colleague who took the picture of "SARS Inhibited" by the American bioartist Mara G. Haseltine was a possibility. However, I preferred to find the answers to these questions by myself. Connecting the dots between the sculpture, the artist, and the health motif was relatively simple. Inhibiting the spread of the virulent virus turned into a top priority for the local biomedical and life sciences community. People in hospitals were dying of severe acute respiratory syndrome (SARS). Health professionals, trying to save the lives of their patients, were dying. There was the risk of this epidemic outbreak, unprecedented in the contemporary history of Singapore, turning into a global health crisis.

Drawing the lines between those three dots, however, proved more challenging. What I mean by this is the relationships between the three dots. How did the US-born artist connect with the local biopolis community? How did research scientists engage with her art project about a disease for which they were developing

[18] http://www.ari.nus.edu.sg/asianbiopoleis/index.html.

a cure? Did any such intersubjective relationship develop from the commissioned artwork? This question calls attention to concerted efforts to build and develop more inclusive and culturally diverse knowledge and innovation-driven communities in the bioscience-belts of Southeast Asian world cities, such as Bangkok, Kuala Lumpur, and Singapore.

Specifically, did the Brooklyn-based artist and daughter of the renowned American biologist William A. Haseltine have access to the high-security research facility involved in international biomedical collaborations to develop safe therapeutics for this life-threatening and contagious infectious disease? Had she been working hand-in-hand with members of the lab-based research teams trying to find a remedy to quickly stop the epidemic? These specific questions brought to mind the poem *Preludes* of the late Thomas G. Tranströmer (2001) from which selected verses are quoted throughout this thesis to set the mood of what is to come.

Thinking of the two truths coming together, one from the outside and the other from the inside, we may wonder what happens when they meet. That is how I approached the art-science interface in the delineated context of a science-cityscape. What would the SARS researchers have had to say about her knowledge and expertise? How would they bring to fruition her 'truth' about SARS, which comes from the outside? Moreover, what would we, the witnesses of that personal encounter, have to say about it in relation to building, not just integrated research platforms and clusters, but also integrated research communities that include artists? Can we study the inner lifeworlds of these newer social formations through the art that they commission, produce, and consume? Fischer's bioarts hypothesis suggests that we can, in anthropological theory, but what about in ethnographic practice?

Before saying anything else, I will explain that this was the main methodological challenge faced in the development of a consistent and coherent line of inquiry into s science-city with a bioart-centred approach. Put differently, how

does one research, ethnographically, site-specific bio-artistic works such as "SARS Inhibited", and works that came out of *the Biopolis Arts Programme*[19] that was established in 2002? How does one use works of art like "The Dandelion" of the Temasek Design School, featured on the book cover of Aihwa Ong's *Fungible Life: Experiment in the Asian City of Life* (2016) as primary research tools? Answers to these questions are difficult to extract from the growing body of anthropological literature on the culture and social life of Southeast Asian science cities.

Neurocultural studies have paid just as little attention to bioarts emanating from the non-Western hemisphere. Again, the same epistemological and methodological question arises? How does one generate a relational knowledge of artworks with a brain-related theme like Chng Nai Wee's "Innards of Consciousness" (2003), "The Universe is My Mind" (2000) of Irene Chou, or "Plastic Kinetics" (2001) by Saraswati Gramich that the site-specific art programme of Singapore Biopolis produced? A brief response is: with ethnographic dialogic engagement. The unavoidable implication of a research methodology that is premised on a dialogue is that it makes the fieldworker both the subject and author of the study.

At the outset I want to make clear that I was present in the described and analysed situations at most times. That implies working with an aesthetic-centred research method focused on artworks that denote life/bios. Trying to understand relations through the relationships in which I am involved required both proximity to the research contacts and reciprocity. The establishment of a research platform relied on the development of face-to-face dialogues with art and science professionals in PS-City and the Bangkok art scene, which are framed as spaces of circulation of knowledge, technology, and innovation. That methodological premise can be visualized with a photograph that shows the encounter of artists and scientists.

[19] See http://www.biotechnics.org/Nexus/2002/10/biopolis-arts-program-initiative-of.html

Figure 12 – During an editorial meeting at the Foundation for Children, Bangkok, Thailand. © 2014 Photo by B. R. Buergi.

We see the coming together of these two ethnographic platforms during the editorial meeting at the Foundation for Children. On the left side are the two artists of the Bangkok-based Cartoonthai Institute. Opposite from them are the two executives of the Science Media Division, National Science and Technology Development Agency (NSTDA) located in PS-City, who were willing to engage with this research. Next to the comic artists sits the editor, a businessman who is also an artist. He sat opposite me during the discussion of the first blueprint of the sci-fi comics I had translated, and offered comments, along with the life scientist sitting next to me in the meeting. Besides elucidating my positionality and situatedness in the study and in the text of the dissertation, the above picture captures the art-science interface as it happens in the everyday life of a science-city community.

The described situation, which materialized from an ethnographic intervention during pre-fieldwork, prefigures why I thought investigating the bioarts in science-cityscapes was a viable research subject in the anthropological study of neuocultures. These hybrid milieus cannot be reduced to either a science-city or an art scene because they ‘go together’. The situational circumstances of that encounter at the

beginning of fieldwork call attention to what I mean by experimental ethnography in the newer fields of social and cultural anthropology, such as neuroanthropology. It would be misleading to suggest that I built the ethnographic dialogic method on a philosophy of art that uses psychoanalysis of artists and scientists as a methodology. My approach to the study of a Thai *biopolis* has been practice-oriented. Theoretically, it was grounded in the bioarts hypothesis, and ethnographically, in the social context of a *biopolis*, understood in strict terms as a 'city of life'.

A first step in that undertaking was to conceptualize locations like One North[20] in Singapore, and Pathumthani Science City (PS-City) in Thailand, in terms of places and spaces of circulation where new sensibilities and aesthetics arise from education, training, research, and innovation. Singapore has never developed into a major research site, though my engagement with the local life science community prepared the ground for entering the bio-corridor of the greater metropolitan area of Bangkok. There, I found two government-administrated techno-parks that are located within a special economic zone (SEZ). The TT-Complex (Technothani/Technopolis complex), and the TS-Park (Thailand Science Park), invest in site-specific art activities. They commission artworks and conduct art-in-science/science-in-art programmes for young people.

The TT-Complex is situated in the western part of the Khlong Luang district. Among the main tenants are the Thailand Institute of Scientific and Technological Research (TISTR) founded in 1963, and the National Science Museum (NSM). The TS-Park is located on the other side of Paholyothin Road, and thus lies in the western part of the Khlong Luang district. The park opened in 2002.and is administrated by the semi-autonomous NSTDA. The Sirindhorn Science Home hosts the Children's University of Thailand (Khaopa 2012), and youth camps (The Nation 2010) that bring

[20] This name refers to the geographical location, which is approximately one degree north of the Equator.

scientists and artists together with young people interested in the sciences and the arts. The composition of these technoscience communities is very diverse, especially if we include, besides the residents and investors, the visitors who can be practically anyone. The NSM is open to everyone. Spots like the one where I spotted the sci-fi comics, which were the first item of the primary art collection that gradually increased in volume, provided the entry point for adding a bioart-informed chapter to the largely undocumented biography of the first Thai science-city.

Anthropologists of science and technology have paid little attention to such spots, where we find artworks that try to make 'science-in-the-making' (Kleinman (Ed.) 2000; Shapin 1992) accessible to a wider public so as to get more people involved in the national dialogue on science and technology development (Fischer 2015, see also Holden and Demeritt 2008; Shapin 1992). When reviewing the scholarly literature on Singapore Biopolis I noticed that few mentioned the art-devoted spaces dotting the meticulously landscaped environment. It seemed that the integration of art spaces in science-city development plans and programmes both in Singapore and Thailand has not been regarded, thus far, as an interesting object of study among scholars of the anthropology of science and technology, or of science, technology and society studies (STS).

The seminal study of Catherine Waldby (2009) about life in Singapore Biopolis makes only a passing mention of art spaces. 'The complex is set in a garden of bougainvillea and hibiscus, the facilities scattered among art galleries and cafes linked by meandering pedestrian walkways' (ibid., 368), she writes. Someone unfamiliar with Zaha Hadid's One North Masterplan may mistake these galleries as yet another outgrowth of the global bioeconomy. Instead, they are a constitutive element of her masterplan for which she had adopted for the first time the concept of

'artificial landscape formation'[21]. An understanding of these art spaces as enhancing the 'bohemian spatial qualities' of a *biopolis* distract does not direct the focus to what is going on in these social pockets that form at the intersection of artistic and scientific knowledge-making practice.

An earlier account of One North that Waldby referenced portrayed the place as a 'space devoted to creativity, flexibility, and intellectual play' that benefitted from the neighbouring 'little bohemias[22] in which an "entrepreneurial culture" may be fostered', and from which 'new-economy cultures and lifestyles' developed (Wong and Bunnell 2006:71, 77-78). Again, that view is problematic because it endorses clichés about the places and spaces where artists work and how they organize their professional life. A possible line of inquiry that I evaluated was Fischer's proposition which I referred to as the bioarts hypothesis.

The scientific arts may gradually increase 'the ability of the public to talk about matters that concern the bios as well as the polis of us all' (2013:402), he proposed. His subsequent suggestion to consider the literary and artistic aesthetics of the bioarts 'not only for writing the cultures of the sciences and technologies, but also for the imaginaries that inform new experimental discoveries, validating tests, as well as psychic and financial investments in new socio-technical infrastructures, conventions, and trade shows' (Fischer 2015) resonated with preliminary observations gleaned from my early field visits. Fischer's comment on how impressed he was by the articulateness and thoughtfulness of people 'in their technological lives and about the scientific arts that are part of those lives' (2013:402) particularly intrigued me. I had similar feelings when I spoke to a Thai molecular biologist working in a lab inside one of the iconic tower blocks of Singapore Biopolis.

[21] For artistic renderings of the One North masterplan, see http://www.zahahadid.com/masterplans/one-north-masterplan/.
[22] For an explanation of the term 'little bohemia' that was popularized by the first prime minister of Singapore, see Wong and Bunnell (2006:77).

Singapore, 29 April 2013 – Short of breath, and a little agitated, the mid-career life scientist excused herself for running behind schedule with a time-sensitive experiment. Certainly, I did not mind waiting ten minutes, I assured her. She then guided me through the access secured door next to the lab toward a waiting area at the end of a brightly-lit corridor. When the microbiologist returned, I was still holding my pen. Was it truly her artwork on the wall above the sofa? I asked her in disbelief. "Oh yes," she replied. "It's my artwork." We went to a nearby coffee shop to begin a conversation on how she experiences work and life in Singapore. Did she think that foreign scientists had social and political agency in science-city life? A disquieting silence fell between us. Then she began to talk, and I listened. When she stopped, she looked up from her cup. Our eyes met. Looking at the pen that had been lying on the little black notebook all the while, she asked me not to write a word of what she said. I promised her that, and changed the topic. Would it be all right to write about her artwork instead? There was nothing to say or write about her artwork, she said. Why would I care to write about it? It was ingenious, I replied, but she viewed the matter differently. It was not important at all for her, she insisted, but had no objections to my mentioning her work in future conversations with existing and prospective research contacts, as long as I did not disclose her identity. She agreed to send me a photograph of the work before we parted.

Before the day's end she sent me an email with an attachment in which she wrote: "I think I did delete it" (electronic communication, 29 April 2013). In its place, she sent me the digital painting, but that was not the actual artwork. It was an image that was published in a peer-reviewed journal article that she co-authored, and used for creating a work that took issue with the neoliberalization and internationalization of the biosciences. In view of our agreement, before we spoke about her artwork, not to write about what she had told me, I was unable to continue our conversation. This may suggest that nothing came out of this meeting. That is incorrect. She signalled to

me the limitations of mobilizing artworks that are autobiographical as a primary research instrument in the fore field of fieldwork. Without her agreement to expound on both the explicit and the tacit theme of her visual narrative that indexed conflict, I was unable to write about the newer biological sensibilities and aesthetics of 'communities of concern', as Fischer referred to these social formations in bio-corridors.

Biopolis *Architecture*

The next episode concerns a chance encounter with a mid-career American architect and lab-designer, which was an eye-opener. We met at Singapore Biopolis. Right after the meeting with the Thai-born infectious disease researcher, I walked toward a construction site on the edge of Biomedical Grove.

> *Singapore*, 29 April 2013 – At the far end of Biopolis Road, closer to the southern edge, there were cranes and other heavy equipment. Curious about these latest developments, I walked toward the construction site to take photographs. A middle-aged man came across the street and stopped next to me. He was doing just the same. Why was he taking photographs of the building under construction? I asked him, to get him involved in a conversation about the fast-changing skyline. "Why are you taking pictures?" he returned my question. They served to show me the rapid development of this Southeast Asian science-city for a forthcoming seminar in Oxford[23], I replied.

[23] I thank Professor Dr Xiang Biao of the Centre on Migration, Policy & Society (COMPAS), University of Oxford, for inviting me to the COMPAS Work-in-Progress Seminar series, and the audience for their constructive and useful comments on 'Foreign academic migrants and their political subjecthood in Singapore Biopolis, and beyond', presented on 9 May 2013.

"What's the topic?" enquired the man, who introduced himself as an architect and lab designer working for a US-based global engineering company. The talk was on science-city community formation and development, I said, and gave him a summary account of my research interests in biosocialities and the rationale for studying science-city life close up. We knew little about the social amalgam holding science-city communities together and helping them to grow in size and importance. Obviously, they benefitted from capital and labour market deregulation that was designed to grow science-cities and their population. Government-supported investment policies, promoting integrated research platforms, coupled with a freer circulation of high-skill professionals in the emerging knowledge economies of Asia, however, revealed little about the social, cultural, and political integration of so-called foreign talent in these growing knowledge ecologies and their socio-technical infrastructure.

The architect and lab designer listened with interest, and asked me to expand on what I had just said. Presumably, there were additional factors in making science-city communities grow and prosper, beside the oft-mentioned state-of-the-art research facilities, attractive salaries and compensations, competitive tax breaks, and other incentives to attract researchers *in flux* to raise the researcher/population rate in countries like Singapore and Thailand. Assuming that these highly skilled foreign workers may want to participate in dialogues and negotiations on matters that affect their workplace and research community, such an exercise would call attention to *how* they intervene, if they intervened in decision-making processes.

In case they had the means to do so, did their intervention leave a mark on science-cities? These were the kind of questions that I would want to elucidate with bio-artistic works, since social science scholars had neglected the art spaces found in places like One North in field-based studies of science-city sociality. I concluded my account by drawing on a literature review[24]. "This study is timely," commented the architect and lab designer who surveyed the progress of the building that was going to house the regional R&D headquarters of a New York Stock Exchange listed

[24] The paragraphs reference the works of the following authors (following the order of the text): Gibbon and Novas (eds) 2008; Smaglik 2003; Roco, Bainbridge, Fuller, Tonn, and Whitesides (eds) 2013; Giorgi 2009; Thrift 2010; Yeoh and Huang 2004; and Koh 2003.

corporation. We agreed to continue our conversation on science-city community development after my return from England two-weeks from then. He said that this was a less-spoken about topic in his industry.

Since the stay of the American architect and lab designer did not overlap with my return from England, we decided to continue our dialogue in cyberspace. The continuation of the conversation with him contributed significantly to making inroads into science-city life. We looked at research community building through the lens of the aesthetics of science-city architecture. At the start of the first audio recorded session[25], I mentioned how I intended to proceed with my investigation.

> **[BRB]**: In Singapore, I have an interest in an art collection, artworks that scientists have produced. These artworks, they are hanging in the company itself. They were commissioned, but they also are consumed by the organization those people are working for. In the TS-Park, I am looking into popular culture, into science fiction comics. […] The scripts were produced by scientists. Some of them are internationally renowned scientists. That is why I got interested in this comic series, and thought to take these comics seriously. […]
>
> **[Architect]**: I see.
>
> **[BRB]**: It is a way to bring the arts and the sciences together. To my own understanding that would open up a fresh perspective on how we think, how we think about these communities. Whether they are imagined or, or real. These artefacts may also reveal something about the scientists' need for community, for value, and meaning so that their being there, being in Biopolis, being at the Science Park, has meaning for them […].

[25] Permission for audio recording the sessions was granted during the first teleconference call.

[Architect]: Right, you know, that is fascinating to me. I have a personal kind of relation to that because architecture is a very technical industry, and it can be a very artistic industry, as well. So many of us have, we create art, especially if we have a hard time putting art in our work. Ideally, our work is both technology and art, but what you are talking about is, is very close to my heart. But I wonder, these two examples you gave of the art that was by scientists, and then the comics and cartoons by scientists, are there websites to those that I could visit to have a look?

[BRB]: There are not, and I am now working --

[Architect]: Oh!

[BRB]: -- on a translation, and, and that would then be in English. At the moment, they are in, in, in Thai. Hopefully --

[Architect]: I see.

[BRB]: -- by the end of this year […].

[Architect]: Oh yes, it would be fascinating and, I am sure, beautiful. I am interested in it because, as I said, clients often come to us and ask us, how the environment can encourage collaboration. I think that is an intriguing idea that I could share with future clients. There could be places made within the architecture to allow for display of artwork, of one kind or another, by the actual scientist. I can, I can really imagine how that creates a sense of community, just by allowing people to express themselves in a way that they don't usually do on a day-to-day basis. That may break down some barriers between people that would normally be there (Tab. 1F, 1).

Science-city community building was a less discussed topic, the American architect conceded. "My involvement in the project has mostly been in construction and administration here. So the topics are very limited, and talk of community is, is – I don't remember community of scientists really coming up in conversations I had about the project." His admission surprised us. It surprised us in view of the

following statement that he made in relation to his client. “One of the reasons that this client decided on Singapore was because of the idea of Biopolis. It was appealing to the client to have a place there, within that community.” The idea of being part of that specific biosciences community appealed to the multinational company.

A few weeks later, I raised that same question during a dinner conversation with a British-born regional director of a global consulting firm with a branch in Singapore and his client who flew in from China. What did he know about the Singaporean technoscience community? I asked the engineer, who is also an architect. “We know little about them,” he replied. “What about their growth?” I asked. What did he know about the ways in which these communities form and grow? My question earned the same reply. “We know very little about that,” he conceded. Why then did his client, a UK-based pharmaceutical company with regional R&D headquarters across Asia, choose Singapore and not Thailand? The executive manager replied that his firm had chosen One North because of the cosmopolitan research community there, “unlike other places in the Southeast Asia region” (Diary entry, 7 October 2013).

That community development was a less discussed subject intrigued me, especially after I had learnt from strategically situated professionals, holding positions in the higher echelons of the policy world surrounding science and technology in Thailand, that they understood community building ‘from the ground up’ as a major concern. There seemed to be a notable difference between how these two bioscience-belts are expanding. Another aspect that emerged from our conversation was their interest in the integration of art spaces in science-dominated environments. All four dialogue partners were aware of the trend that I conceptualized as the ‘art-in-science-city phenomenon’. The integration of artists in the socio-technical infrastructure of science-cities is likewise a less discussed topic, they observed. Artists have received marginal attention from scholars of science-city

life. They are either absent (Oh and Phillips (eds) 2014; Zhang 2002; Castells and Hall 1994), or mentioned in passing (Ong 2016; Waldby 2009; Gibson, Kozmetsky, and Smilor, ibid.).

That neglect is surprising insofar as art spaces have been integrated into the landscape of contemporary technoscience and university campuses. I have already mentioned the site-specific arts programme at Singapore Biopolis. The architectural model of the new Edmond and Lily Safra Centre for Brain Sciences (ELSC), scheduled to opening in 2016, boasts an art gallery. It is not a new idea to incorporate artists into scientific research communities. The very notion of biopolis as used by the twentieth century urban planner Patrick Geddes is about the integration of the arts in cultural environments that promote the advancement of knowledge and innovation. The Hebrew University, modelled on Patrick Geddes's 'biopolis' concept (Dolev 2016, 2004, and 1998; Welter 2002), wants all the disciplines to come together on the mountain top.

Describing places like Singapore Biopolis as 'a garden of innovative Eden' (Waldby, 368) or a 'ghostly topography' (Comaroff 2007) is problematic because they are neither ethereal nor paradisiacal. That is conveyed by the Chiang Mai-born artist Jitti Jumnianwai with his art installation *Robots Factory* that was on show at the ArtGorillas ArtGallery in central Bangkok (6 November-4 December 2014). Even though the title refers to the information and communication technology industry, it has affinities with science-city architecture. After graduating from art school, Jitti worked in the motion graphics industry for several years before returning to the life of a full-time independent artist. When we met, he told me that he wove his working experience into the visual narrative of this process-based and interactive artwork that he realized in collaboration with his artist colleague O Witaya Junma.

Figure 13 – From the *Robots Factory* installation sketchbook (2014) of the Thai artist Jitti Jumnianwai. In private collection. © 2014 Photo by B. R. Buergi.

When I asked him to elaborate on the inscription in one of the exhibited installation sketches that I had acquired, he imaginatively compared the operation centre of this technoscience landscape to the brain. It was built on the 'PAST', on 'MEMORY', on 'IDEA' and on 'LIFE', he explained. In his words,

> The control room is like a brain. It controls everything and checks everything. Before everything is put in the control room, it has something, like data or information. That part is like the past. Your experience in the past and the memory is like every feeling that you have. There you keep it. The idea you create. It is like an experience for the art too, like the form, the shape and everything else when you make new things (Tab.1A, 6.1).

The artist projected life in his representation and interpretation of the science-city life with which he is familiar. He wanted to share that experience with his audiences. His intention was to invite the visitor into the lifeworld as he has experienced it. “You visit a part of me; everyone who goes to the exhibition already is a part of me” (Tab. 1A, 6.1). The moment the exhibition visitors pushed the buttons and manipulated the knobs of the ‘game-art’ piece, as a reviewer called the ‘funny interaction of the show’ (Tuang 2014), they were trapped in the moving artificial landscape made up of crowded building blocks and connecting corridors. The feeling of being in control of the situation vanished with the realization that the hands pushing the buttons and manipulating the knobs of the ‘control station’ failed to coordinate the constantly changing events in the flickering ‘robotscape’ projected onto the white wall.

Figure 14 – A group of university students interact with the process-based centrepiece of *Robots Factory*, co-produced by Jitti Jumnianwai and O Witaya Junma, and exhibited at ArtGorillas ArtGallery, Bangkok, Thailand. © 2014 Photo by B. R. Buergi.

His message was that science cities have life, and that they develop a life of their own. The playfully set up installation, in that respect, offers a dialectical cultural critique of the digital age and the digital ecology as he experienced it in the course of nearly ten years. Once inside that imaginary microcosm of technoscience that the artist created with his colleague, one began to realize that the course of events in the unravelling scenes was unpredictable and capricious. It did not follow a strict order or structure. There was room for surprises. The artist was not the control master and the visitors were not subjugated subjects in this imaginary science-cityscape. They were actors with agency. “Stop pressing the buttons and you are out of it,” said the artist, who wanted the exhibition visitors to become a part of his story that recounts the history of science-city development in Thailand on the scale of individual people. To reiterate, he said that everyone who went to the exhibition was already a part of him.

The artist set up the exhibition space as a laboratory. He watched his visitors playing science-city life. He studied them. Days later, and without any hesitation, he confirmed my assumption that he had set up the gallery space as an extension of his art studio. The two realms converged and seamlessly blended into the imaginary science-cityscape projected onto the wall that seamlessly flows into the mural: the painting that expands the projection. This world in flux parallels the situation on the ground, where artists crisscross the two worlds of the arts and technoscience, as did the emerging Thai artist.

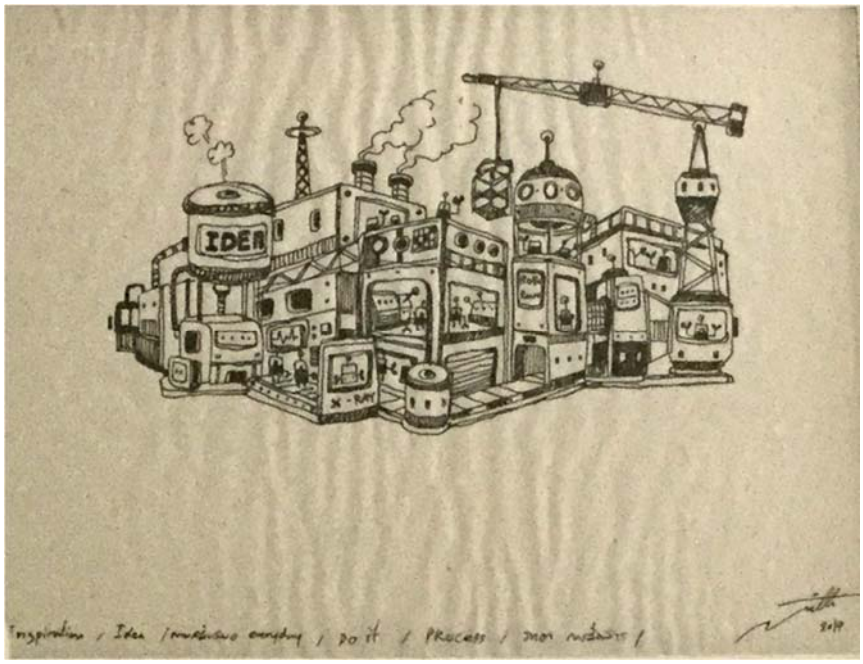


Figure 15 – A section of the framed sketch by Jitti Jumnianwai shown during the *Robots Factory* exhibition. In private collection. © 2014 Photo by B. R. Buergi.

What does the artist say about the work ethos of these technoscience-driven milieus, which he had experienced at a time when robotics developed into priority research areas in national technoscience policies and plans (Science, Technology and Innovation (STI) Policy Office 2012)? We find a response to this question in one of the exhibited sketches of the installation project. The caption reads: 'Inspiration / Idea / regularity (in Thai) / everyday / Do it / PROCESS / language (in Thai) creativity (in Thai)/'. This string of notions conveys the viewers through the social reality of science-city life. These terms make it hard to differentiate the artistically recreated science-city in the gallery from the world of the motion graphics industry that the two collaborating Thai artists know intimately.

Science-city Models

How does it feel to be inside these technoscience-driven places, which hundreds if not thousands of scientists, engineers, technologists, technicians, academically-trained support staff, and students pass through day after day? The Thai bio-corridor keeps growing and expanding, and so do Singapore's Construction sites abound, and green spaces turn into concrete, glass, and steel. We think of growth, but what if people leave the science-city? The topic of the possibility of science-city populations shrinking surfaced in a discussion with the US-based architect and lab designer. We were discussing the aesthetics of the open-floor spaces he said were trendy in contemporary lab design. Brick and concrete walls gave way to glass walls, he said, referring to the trend to bring transparency and lots of light into science buildings. What did the end-users make of these radical changes? He and his colleagues had thought about this question, but barely knew how they experienced the environment that they created for them. It occurred to him that people might well walk away if they did not like the built environment, because of how they felt about it.

> **[Architect]**: The quality of the space, for example, is something that you cannot quantify but architects are experts at. This art piece you are talking about is subjective as well. When you talk about what motivates these people to go to a different science community, or stay at one, I wonder how important the subjective in the sense that I am talking about is. The design of the place that the – if it feels modern, if it feels pleasant, or if it feels comfortable; those kind of things that are harder to quantify. I wonder how much those weigh into these people's decisions.
>
> **[BRB]**: Sure […] I thought these artworks are interesting because they offer an opportunity. What I really appreciate is that they were asked, in the first place,

to produce these works in order to express themselves in a way that was not narrowly defined.

[Architect]: Yes, and it is interesting, especially thinking about Zaha Hadid's masterplan. She is a very aesthetic individual, and her master plan very much shows her aesthetic is a very cutting-edge style, if you will. Her own personal style, which really comes through because of the rule she set up for Biopolis. Though I know you are talking about the art of the scientists themselves, but they are surrounded by the environment that we, as architects, create for them.

[BRB]: Right.

[Architect]: As Zaha Hadid has planned for them, as a community, and I wonder, I always wonder, how the end users see those subjective things that we create for them, and if they see them positively, especially with Zaha Hadid's work, which is, I don't know if you had looked at any of her other works.

[BRB]: Yes, I did.

[Architect]: It is extraordinary, unusual architecture (Tab. 1F, 1).

Aesthetics and feeling are related. A foretaste of the darker scenario of people walking away provided Jitti with the sketch containing the one-liner which encapsulates the core values and principles of the working environment that the artist shared with scientists, engineers, and technologists. The artistic rendering of the science-cityscape in this particular frame makes it look as though it were suspended in mid-air, resting on a cloud, as it were, and held up by invisible strings. "Why worry?" I was told by Singaporean science administrators and researchers at networking events held at Fusionopolis and Biopolis. "Look, this place is growing." I knew that, since I witnessed the growth of this and other science-cityscapes in Southeast Asia over the period of ten years. The food outlets were getting more and more crowded. Had I not noticed that? I was asked repeatedly by local residents. Sure, I had noticed these positive developments, I would reply to him and to people

met before and after seminars and lunchtime talks to which I had been invited since joining two social networks for academics in Singapore.

Their outlook was predominantly positive, and they would dismiss the likelihood of an eventual reverse trend when I tried to get them involved in a conversation about science-city development. Invited speakers lauded the place as exemplary and avant-garde, and often presented it as a model science-city that other countries might want to consider adopting. John W. P. Phillips, in his account of Singapore Biopolis, recalls that the island nation has likened itself to a *biopolis* of and for the world (2012:85)[26]. After one such event, I asked people their views on the neuroscience professor's remark about the cultural rejuvenation of scientific research communities. What did they think of Aeberischer's (2013) observation that a major challenge for twenty-first century science was the cultivation of 'a new breed of scientists and engineers with an ability to go at the interpretative level of life systems'?

They would not enter into my question, which I posed over nibbles and light bites. These gatherings were not venues for critical voices. Accounts of less pleasant and unhappier moments were given behind white paper napkins or washed down with soft-drinks. Had I ever been at Biopolis during lunchtime? asked the US-based architect and lab designer. There was a short pause. His question caught me unprepared. Did he take the plazas also as an indicator of the vibrancy of this technoscience community? "During happy hours, and of course, during lunchtime the plazas are getting very busy," I replied. I hesitated to tell him about the few scientists who were willing to share their experiences but who asked me not to disclose their names. In a conversation with a mid-career biomedical scientist, who is also a medical doctor, he shared his reasons for leaving Singapore by the year's-end.

[26] He writes, 'Biopolis functions as a model for Singapore just as Singapore functions as a model for the world (in the analogical formula, Biopolis: Singapore: Singapore: world; or in the neater slogan, "Singapore is the Biopolis of the world").'

My question was about placing artists in laboratories like the one where he worked. He had not thought about it, he replied. He was new to the notion of bioarts, but interested in the subject. Had he ever gone for an art walk inside the Biopolis? He gave me a puzzled look. Was he not aware of the public artworks, such as Haseltine's "SARS Inhibited"? He was not. It had not occurred to him that artists participated in the life of Singapore Biopolis. At his lab, people did not speak about art, he replied. Why did I think it was necessary to research art in Southeast Asian science-cities? I replied that I was interested in endeavours to build not just integrated research clusters, but integrated research communities, so as to make science-cities culturally diverse. He sighed. That is when he told me that he had resigned from his job. "Cultural differences," he said with a distinctively French accent.

It is difficult to draw out the cultural dimension of science-cities when they are conceptualized as models. People produce culture. Models don't. John W.P. Phillips's account of Singapore Biopolis (2012) engages with ideas that frame science-cities as 'models of a self-contained biotechnical entity with "plug-and-play" accessibility'. What did he think of framing science-cities as 'plug-and-play models' operating in a 'plug-and-play mode' (Phillips, 85), I asked the biomedical scientist and clinician. "It makes sense," he replied without wavering. "Plug out the cable and they go bust." Models and simulations of science-city scenarios have allure, in spite of their tendency to be divorced from the reality on the ground, or perhaps for that very reason. The moment we place people in them, we begin to see frictions and divisions. On closer inspection, one notices that science-city life has little affinity with biosynthetic designer organisms and autopoietic systems that are self-contained. The digital ecology model has affinities with the above model. That emerges from the conversation about community formation and development with the director of the TS-Park administration and his two advisers.

Khlong Luang, 22nd August 2013 – "The research community of the park grows naturally," I was told. "It grows like trees in nature." A little perplexed, I looked up from my notes. The year before, I had heard a similar statement. "We use the sign of the tree since it matches the tagline," said the senior officer of the Technology Management Centre, who patiently explained to me the meaning of the corporate logo of the TS-Park and the tagline (Pre-fieldwork records, 5 June 2012). Her director added that the pixelated tree icon stood for the digital age and the digital ecology. Did he just say digital economy? I enquired. "No," replied the US-trained engineer promptly. Gently but firmly he corrected me. "Digital ecology," he said twice. To ensure that I spelled the technical term correctly, he repeated it once more. "Digital E-co-lo-gy," he said, stressing the two final syllables[27] emphatically.

Thinking about science-cities conceived as a morphological system organized and functioning like a digital relay system encountered in Phillips's account, I enquired the meaning of the notion in the local context. What did digital ecology mean? I asked the director. My ignorance seemed to amuse the senior of the two female policy analysts. I had not heard of digital ecology before, I clarified. He offered an explanation. As in the evolutionary model of the living cell, there were specialized functions that needed coordination to achieve the goals of the main organism. I took note. Noticing my bewilderment, he offered to explain the concept in simpler terms. "To keep it simple, tree and park go together." In what sense did they go together? I asked. Matter-of-factly, he repeated, "Tree and park go together." That was the meaning of the tagline that he would then repeat for me, and I quote him: "Where knowledge and innovation grow". Was it not, "Where innovation and technology grow?" Keeping the question to myself, I put down the pen.

Conceptualizations of avant-garde research and innovation-driven campuses as self-contained biotechnical entities that betray 'elements not only of the body as

[27] In Thai "l" is pronounced as 'n.'

understood by molecular biology, but also those of a plug and play digital relay system', as in Phillips's essay (ibid., 86), have theoretical currency. A problem with presenting science-city life as modelled on nature is that it does not take into account the human propensity to act and react to inside and outside stimuli. Another conceptualization of industry-oriented science and technology hubs that is too abstract for studying the co-presence of art in technoscience milieus is the so-called 'bet on culture' (Fache 1992:196). While the intent to develop culturally strong science-cities draws artists into the discussion, arguing that without culture the 'revolution of intelligence' was not going to take place makes a parody of the art-science interface.

Saying that it boiled down to bringing together people of all disciplinary backgrounds is comparably problematic because it glosses over existing and perceived barriers between artist and scientist communities that can be of varying natures: institutional, social, and cultural. The Thai conceptual artist whom I met at the TS-Park told the *Bangkok Post* that there was still 'a long way to go for art to become more multidisciplinary' (Pongpipat 2014b). He said so with reference to his difficulty in collaborating with science laboratories locally. The artist's statement (that was based on his experience of producing a commissioned artwork for a science-based organization from outside their laboratories) shows that bringing together artists and scientists in the social reality of research practice is more complicated than the board member of Sophia Antipolis Science Park in Nice put it. 'Bring together thinkers, creators, plasticians, musicians, artists, and scientists from everywhere,' he advised; 'Get local people interested and attract other partners' (1992:196).

Whilst it is useful to think of 'cities as actors' (Engelstoft 1992:113), to regard Leonardo da Vinci as 'The true father of the technopolis' (Fache, ibid.) is counterproductive, and even illogical, when suggested in relation to building

culturally diverse research communities. The works of the Renaissance polymath do not express the intersubjective encounter of artists and scientists for which the 'Art & Science' paradigm stands. Nonetheless, the view of Fache, who maintained that imagination, creativity, and intelligence were going to be 'the most precious and rare materials of the twenty-first century' (1992:196), is widely shared. Even though Leonardo is not representative of the encounter of artists and scientists, his persona is often evoked in discussions about the cross-pollination of artistic and scientific knowledge in science-city circles.

For instance, we find works of the Renaissance master in the central panel that expresses in pictorial form the core values and ideals of NSTDA's corporate culture. The caption under the replicas of da Vinci's alleged self-portrait and his "Mona Lisa" reads 'Art & Science'. The reprints of these world-famous works, however, say nothing about the dynamics between art-in-science and science-in-art, or about how these compounded forces act out in the social lifeworld of the TS-Park. A more appropriate illustration of the art-science encounter in this institutional environment would have been the winning entries of the serialized national sci-fi comic competitions that were exhibited on the adjacent wall. These artistic works tell us stories about the newer biological sensibilities and aesthetics that Leonardo does not tell. They are a *living* testimony of the art-in-science-city phenomenon, and thus, will be discussed in Chapter One.

Figure 16 – A section of the exhibited winning entries of sci-fi comic competitions seen at the Science Shop of the National Science and Technology Development Agency (NSTDA), Khlong Luang, Pathumthani province, Thailand.

Initially, I would say that they bear witness to the *intersubjective* encounter of art and science professionals joining hands in practice, and not in theory or policy, where these educational activities are subsumed under the project of developing a 'competitive, sustainable, and inclusive ASEAN' (Yokakul, Prongwong, and Zawdie 2014:146). A final problem with Fache's 'bet on culture' relates to a statement that risks exacerbating the enduring tensions between artist and scientist circles. He writes, 'There are no noble tasks and lowly tasks; the engineer and the artist should be reconciliated to the advantage of both' (Fache, 196, quoted as in the original text). How to reconcile the two distinct and different epistemic communities is a difficult task, especially in countries where the division continues to be felt even given art-based activities in science-dominated settings that seek to mitigate that rift. The arresting picture of the artist-scientist relationship in Thailand, painted by a senior political anthropologist from a prestigious Thai university, gives an idea of that division.

Bangkok, 25 December 2014 – "NUS? Singapore?" the elderly professor asked me with doubt in his voice. What was my dissertation topic, he enquired. In two sentences I told him what I had proposed to research "What? Never heard of it," commented the scholar. "Neuroanthropology? Bio-, what art did you say? Pathum?" I repeated, "Pathumthani Science City." Why then was I in Bangkok, and not out there? he asked in bewilderment. Before I could reply, he asked why I was not spending the evening with my family. What had that to do with my research? I wondered. Was it a reproach? Pointing in the direction of a small group that gathered near the exhibition hall, I said that the Malaysian artist had invited me to the preview. Why did I want to write about artists and science in Thailand? he insisted. Unmoved by my defensive stance he lowered his voice, and pulled his chair closer to mine.

Had I failed to notice that there was nothing to write about in the social relationship between artists and scientists in Thailand? "They do not talk to one another," maintained the professor. "Scientists are snooty," he said with a sniff. Because of their high social standing, artists were even snootier. With a cynical smile, he added, "Even snootier than us," and laughed about his comment on the local intelligentsia. Baffled, I kept quiet. "Look around!" he then invited me. I looked around for signs of what the academic called "elitist". This was not a "place for commoners," I quote the professor. When the artist came over to our table, he rose to his feet, and offered the chair to him. "It is good you foreigners do this," he said, and with a "Ring me," he left to greet his acquaintance at the next table. While the anthropology professor's unprompted approval of our work was unlikely to have been meant as a blessing, it felt like it on that Christmas night.

The early twentieth century Scottish urban planner and social reformer Patrick Geddes provided a more helpful model approach to 'urban artefacts' (Rossi 1984; Scruton 1979) for researching the co-existence of art in science-cityscapes. His adoption of the 'biopolis' concept in the literal sense of a 'city of life' is not modelled on nature, but on life itself. His 'diagram of the Notation of Life' pleaded for the

reconciliation of the arts and the sciences in places of knowledge and learning. To flourish, they must be kept neither apart nor far from one another. The spatial arrangement in Avraham Melnikoff's model of the Hebrew University (Welter, 238-239), based on the 1919 Geddes-Mears masterplan (see Dolev 2016, 2004, and 1998), overcomes the visual separation on the map. Hadid's artificial landscape formation that she applied to an entire urban quarter, thereby opening up room for the arts, has a precursor in that early twentieth-century architectural model featured in Volker M. Welter's seminal work *Biopolis: City of Life* (2002).

The 'Charting of Life' matrix of Geddes appeals to an aesthetic-centred study of science-city formation and the evolution of community life within its perimeters. His town-city scheme owes its attractiveness primarily to the attention that he paid to emerging forms of social interaction within new urban environments, and its epistemological premise rooted in Greek metaphysics. 'The soul not only gives life to matter but is also the carrier of knowledge about ideas and forms', recalls Welters (2002:52) in his elucidation of the Notation of Life matrix (ibid., 32). A discussion of the four conceptual elements informing the four quadrants of the Cartesian chart (i.e. 'ACTS'; 'DEEDS'; 'THOUGHTS ("DREAMS")'; and 'FACTS,' original emphasis) lies beyond the scope of this brief excursus into ideated constructs of science-city architecture and socio-technical infrastructure planning.

Its primary purpose has been to illuminate the need to broach a complementary and alternative path for analysing and eventually, theorizing conviviality in science-cityscapes ethnographically. The model approaches introduced have cast light on my reservations about following in the footsteps of Ong, Waldby, Phillips, as well as Dolev, who described the Geddes-Mears masterplan as 'a *disegno* of an *idea* for a university that exists in the realm of theory and symbolisms' (Dolev 2004:235, original emphasis). The projection of Mount Scopus as 'a hill-top meeting-place where Sciences, Arts and Humanities may increasingly work together, in mutual

respect and stimulus, towards a unity of Culture in its fullest sense; and with this monumentally expressed, in the comprehensiveness and harmony of architectural design' (Dolev, 232) is more than an ideated construct in view of the cultural niches that emerge in the margins of the Neuroworld (see introduction to *Part Two*).

Since the TS-Park shares a number of architectural and other commonalities with Singapore Biopolis, including exhibition space and spaces for displaying public artworks, the first two field visits investigated the appropriateness of saying that these building complexes were 'essentially empty dwellings designed to be filled with always yet to be specified activities within a general designated theme' (Phillips, 84). Even before the question arose among the group of nanoscientists who discussed with me the concept of 'valuable innovation' in a Thai context, they said that they hoped to move soon into the new tower block of the INC 2 (the second innovation cluster opened in late 2013). That was in summer 2012. They required additional floor space for expanding their project activities, including a recently marketed mosquito net to prevent the spread of tropical infectious diseases (e.g. dengue, lymphatic filariasis, malaria, and other vector-borne diseases).

The park management knew about their need for more floor space. A senior manager of the INC 1 Business Centre explained that, although the INC 2 was intended for private corporate tenants, they would have allocated space for NSTDA subsidiaries. Both statements contradict the assumption that these 'intelligent infrastructures' are 'designed to be filled with always yet to be specified activities within a general designated theme' (Phillips, 84). The themes of these integrated research clusters have been defined during a major science and technology policy reform that pushed nanotechnology toward the top of the list of research priorities of the ten-year national science and technology investment policy and plan (Pre-fieldwork records, 12, and 15, June 2012). Witnessing personally the gradual filling of the neighbouring tower block of the Campus for Research Excellence and

Technological Enterprise (CREATE) over four years (2012-2016), I learnt from observations and talks with lab-based scientists there that the activities that Wong and Bunnell (2006) called 'intellectual play' had begun before the facilities were occupied to their full capacity.

That the floor space exceeded the demand was not necessarily the case, since the process of filling a *biopolis*, to use Paul Smaglik's phrase, does not necessarily follow the phased trajectory of science-city development plans. Science-city community formation, although a less discussed topic in Singapore and the United States, came up as a topic of conversation for the people whom I re-met in Thailand after two years of absence and the new research contacts made there by literally walking through the door of strategically positioned institutions of the Thai *biopolis*. There is one aspect of the national identity of science-cities that needs elucidation. While discussing the various models, illuminated in the foregoing sections, with a pharmaceutical scientist at the Thai Food and Drug Authority (FDA), I asked her what was meant by saying that the TS-Park was modelled on a Japanese science park and *not* on an American one.

The high-ranking official, who was soon to retire from the Ministry of Public Health, paused for a moment before listing a few examples of Japanese science-cities. "Tsukuba, Okazaki, Nagaoka, look them up," she advised me (Pre-fieldwork records, 5 June 2012). On a slightly different note, I asked her what she thought about naming buildings after the research centres that they hosted, rather than after Greek gods as in Singapore (e.g. Helios at One North). "It's humanizing buildings," she replied. "In Thailand, we stress on people and the research community more than on the architecture of buildings," responded the public health administrator, who enigmatically maintained that "knowing what other parks did helped form a community" (Pre-fieldwork records, 11 June 2012). Though cryptic, her comment helped me to close in on this Thai science-cityscape that one might describe in

Waldby's words as being 'designed to both capture the mercurial effects of intensified interaction and inspire scientific musing on fundamental processes of life and matter, saturating the space with experimental energy' (ibid., 367).

The senior science and policy adviser who pointed out the Thai-ness of their park community, asked why I thought we needed to know more about how the art-science encounters manifested themselves in science-city life. I showed her a copy of the digital painting of the Singapore-based Thai microbiologist, without her name, but with the title and caption. "How brave, truly original," she exclaimed. Did I say the molecular biologist was Thai and worked in Singapore? "Hmm," I mumbled. Could she think of anything like it inside the park that would say something about science-city life in a Thai cultural context? "You must speak to the director of the Science Media Division who is a scientist and a musician," she replied, and offered to accompany me to the NSTDA Science Shop. Before introductions were made, she pointed to the central panel on the partition between the two floors. "Art and science [read Art & Science] is important to us," she said. If anywhere in the park, it was there that I would find what I was looking for, she said (Pre-fieldwork records, 15 July 2013). I hoped so too, though knowing well that the fruits of ethnographic research do not hang this low.

Chapter One

Bioarts as Appraisal

Pigs Pigs … Pigs don't cry [Repeated twice]
My name is Phanramphoei and I go by Jibby.
I' ma tell you about my work, Are U ready?
I'm a scientist.
I'm working on a virus.
We work so hard and we need our bonus.
This virus's so bad. It's killing piglets.
Pork price is so high, losing money in da pocket.
Disease is Porcine Epidemic Diarrhoea Virus
Need to fix it fast, it's definitely a rush.
Making vaccines for sows as a preventive.
Colustrum lgA to the babies' protective.
We made the virus using Reverse Genetics.
This technique's so fly, so academic […].

– Jibby, *Pigs Don't Cry*

Prologue

That the art-science interface is a viable topic for researching the cultural and generational renewal of science-dominated knowledge ecologies, such as science-cities, became apparent early in the study. It happened some time before the first meeting with the NSTDA Science Media Team at the TS-Park in 2013, and before visiting the National Science Museum (NSM) at the TT-Complex, located 'on the other side' of Paholyothin Road. When the former director of the Science, Technology and Innovation (STI Policy Office) and I re-met during the first pre-fieldwork visit (4-16 June 2012), he enquired about the reason for visiting him again. "Science-city community formation brings me back to Thailand's technoscientific research community," I explained to the incumbent minister of science and technology.

The director then pointed to the whiteboard opposite the window that stretched from one wall to the other of the spacious conference room. All I wanted to know was there, in plain view. Most of the technical terms were familiar to me. They can be found in the *National Science, Technology and Innovation Policy and Plan (2012-2021)* published by the STI Policy Office (2012), and white papers of the Thai Ministry of Science and Technology. The day before, they had discussed the draft of the ten-year national science and innovation policy framework, continued the senior science administrator, who would be appointed a cabinet minister in 2014. Without elaborating on who participated in that meeting, the director introduced me to the *ASEAN Krabi Initiative* that the ASEAN ministers of education conference adopted in relation to the proposition for Thailand in 2010.

Would I excuse him for a moment? When he returned to the room, the director gave me a copy of the chart that explains the policy framework. He singled out two of

the five pillars, namely 'STI (Science, Technology and Innovation) Enculturation' and 'Youth-focused Innovation' (Association of Southeast Asian Nations (ASEAN) 2010). These two paradigms were critical for developing the knowledge economy of middle-income economies, he said. Thailand needed a bigger pool of researchers to build up the knowledge base with which to produce innovation from the ground, he said. He walked over to the window and asked me to join him. "Look!" he said. We were overlooking the crowded high-rise buildings that make up the downtown of the capital city. "We need to build up the knowledge base," he repeated. They needed to do that from the ground up, he said while I was looking down onto the clogged junction at Chamchuri Square many floors below.

Who were "they"? I wondered again. Had I heard of the youth camps at the Sirindhorn Science Home? "Yes," I replied to the director. "I have read about them in the newspaper," and referenced the article reporting on the first such camp at the TS-Park (see *Preliminaries*), where he and I had last met (Konrad and Buergi 2009). "What about Horizon?" Had I seen the youth science magazine they published in Thai? Before I could reply, he advised me to download copies from their website. "You can read," he said with an encouraging smile (Pre-fieldwork records, 12 June 2012). Who the people were that participated in the meeting that laid out the policy strategies for the next ten years proved to be important.

The friction between the two major constituencies of the planned science-city slowly but surely became public knowledge. The tensions between the two sites grew stronger after the *The Nation* reported on government plans to build a 'technology theme park', a 'robotics institute', and an 'anti-ageing institute' at the TT-Complex, and to launch a television channel for science (Tipnampa 2013). That was in February 2013. The conflict between the two techno-parks grew and was rife in the summer, when I got caught up in the so-called 'Fight for Science' during the second field visit (15 July-29 August 2013). The *Bangkok Post* (Wangkiat and Wipatayotin 2013)

reported on the parallel protest movements of scientists and medical and public health professionals during the 'season of discontent' (a euphemism for the spiralling political violence). *Pantip*, a Thai social media outlet, began to post blogs by the supporters of the Fight for Science, which, perhaps surprisingly and unexpectedly, would heal the division between the splintered park communities of this Thai science-cityscape.

In 2015, the science and technology minister Pichet Durongkaveroj announced that the Chan-o-cha administration endorsed the Pathumthani science-city proposal (Wipatayotin 2015). The government was going to spend around 2,7 billion Thai Baht (ca. 109,752,330 Singapore Dollars) on a new science and technology museum, and provide funds for the construction of a monorail linking the several state-run science agencies in the Khlong Luang district (e.g. NSTDA at the TS-Park, and TISTR at the TT-Complex). The sub-chapters will tell how the erstwhile conflicted 'parkscape' developed into the first science-city of Thailand. That important chapter in the biography of the PS-City has been written with the aid of the *arbor vitae*. This thought concept has been derived from the artistic creation that opens a window onto the cultural development and generational renewal of this science-city.

The* arbor vitae *in Guise (and Disguise)

Trees are ubiquitous in this leafy science-cityscape. We find trees on the covers of magazines, brochures, annual reports, videos promoting the park as a destination for foreign direct investment (FDI), and signposts. Trees are also found in art and design creations, including proscenium-like installations at technoscience fairs, satirical cartoons, and, the tree in the corporate logo of the TS-Park. This ethnographically informed anthropological analysis of the arboreal icon seen in the corporate logo of

the TS-Park was inspired by Eduardo Kohn's *How Forests Think: Toward an Anthropology Beyond the Human* (2013), and Maurice Bloch's essay 'Trees, from Symbols of Life and Regeneration to Political Artefacts' (1998), and by 'thinking through things' (Henare, Holbraad , and Wastell (eds) 2007). Trees, in general, have positive connotations. Trees denote life. They are widely associated with growth and longevity, rootedness and stability, and in anthropological scholarship trees have been discussed in connection with rites of passage (Turner 1967).

The frequent allegorical use of trees in conversations with senior exponents of the TS-Park prompted me to take up the subject by investigating and analysing the tree icon in the corporate logo and the tagline 'Where Innovation and Technology Grow'. Similarly to the acquisition of a foreign language, learning to speak the vernacular language of the PS-City community took a while. In circumstances that indicate political conflict, my dialogue partners would invoke trees.

Growing the knowledge base from the ground up was seen as the way of developing the country's emerging knowledge economy, I was told by the director of the STI Policy Office. When we discussed science-city community building in 2012 in relation to the ten-year science, technology, and innovation development plan, he called attention to the need to grow Thailand's knowledge pool. A few months before the meeting with the incumbent Thai minister of science and technology (2014 onward), his predecessor Yongyuth Yuthavong (2006-2008) told reporters at the international meeting *Design and Evaluation of Innovation Policy*,

> It is clear that innovation is really a big word. What is also clear is, it is not just about science and technology, but science and technology has a very integral part in that. It is also a result of many, many aspects of policy, you know, from education, to financing policy, to various types, and export and import, of promotion, of promotion of industries and agriculture. We really need to have good manpower. That means good

> education, and education not only in the sense that you have good contents or are well connected in the world, but also in the sense that you are free or liberated to be able to think of something that is quite new and innovative.
>
> So, that's not very easy because in the East, we tend to take education as something that the teacher tells us, you know, what it's all about, and not in terms of generating certain things by ourselves. […] although we are proud [in Thailand] that we are part of the growing, you know, dynamism of Asia, I also know that this could be a passing phenomenon. It could, you know, get better, or it could get worse. We know from our own experience that, although we have been doing reasonably well, we have been struck many times you know, sometimes, by the world's economic crises, and sometimes by crises of our own doing, political or otherwise (quoted in United Nations University (UNU) - MERIT 2012, my video transcription).

How these internal and external crises affect the growth of the domestic high-skill labour market developed into a first line of inquiry that departed from asking which was first, the tree or the park. Though not exactly analogous to the 'chicken or egg' dilemma, discussions of the 'tree/park conundrum' have gradually brought to the ethnographic surface the various meanings of the tree that I theorized as the 'tree of life' of this local science-city community. The underlying logic of the tagline in relation to the pixelated tree icon can be summarized as follows.

To grow a park (community) one needs to invest in the trees (people), to enable their branches (projects) to produce fruits (output, e.g. degrees, publications, patents, products, bonuses, awards, etc.). To achieve that, Thailand needed a stronger knowledge base, as pointed out by Durongkaveroj and by Yuthavong when they spoke about raising the level of science and innovation. The country needed good education, and not just in the sense of having good curricula or being well connected in the world, "but also in the sense that you are free or liberated to be able to think of something that is quite new and innovative," he said (UNU - MERIT 2012).

Figure 17 – A graphic visualization of the allegorical ‘tree/park’ conundrum. The photograph shows the newly opened gate leading to the INC 2 of the Thailand Science Park in Pathumthani Science City. © 2013 Photo by B. R. Buergi.

“I could not believe my eyes,” conceded the division director of science and society affairs when we walked across the connecting pathway between the convention centre and the newly opened INC 2. “We did not think it possible,” she remarked and stopped to take in the sight that I captured on my camera. With benign irony, I asked her if she would agree to the view that science-cities grew from nature. After all, the TS-Park logo and the motto ‘Where Knowledge and Technology Grow’ suggested just that.

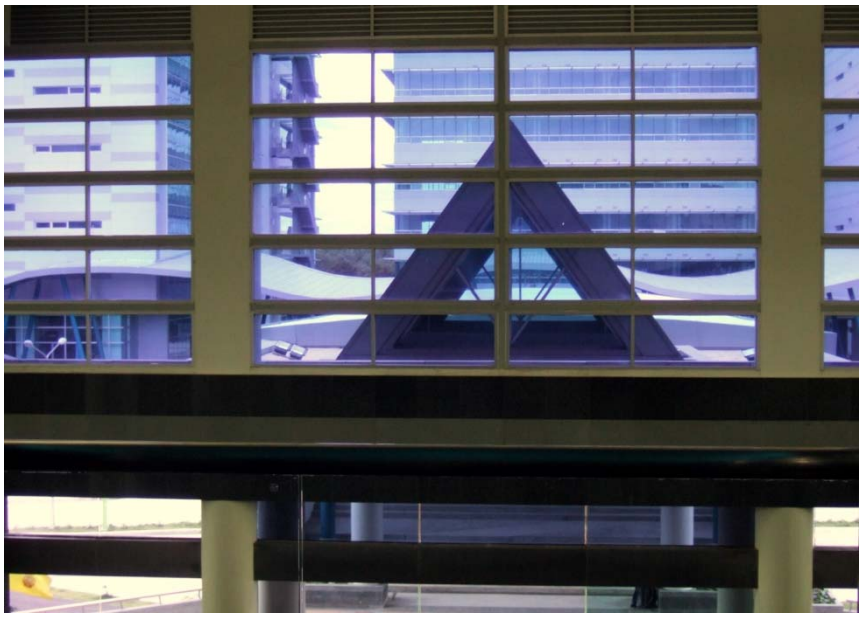


Figure 18 – The covered pathway connecting the INC 1 with the INC 2 of the Thailand Science Park via the Convention Centre. © 2013 Photo by B. R. Buergi.

She did not agree with the view that science-cities were self-contained facilities, 'structured according to the current paradigms of cellular or molecular science' (Phillips, 85). "We are not self-contained," she replied when I discussed with her the theories of science-city development. The park community relied on external funding. The park was still young. When I told her colleague at the INC 1 Business Centre the year before that the signboards along the tree-lined road leading to the TS-Park were getting bigger, brighter, and more numerous, she replied: "The park is growing fast." I was right. The list of park tenants was getting longer. "That's the trend," she said. "The park is growing" (Pre-fieldwork records, 5 June 2012).

An important figure among the growth indicators in the annual reports of the four national research centres under the umbrella of NSTDA is the number of researchers holding doctoral degrees. Where they graduated from was of interest to an early inquiry into how this science-city population is growing. The statistical analysis of data sets provided by major government-funding agencies (see Tab. 3A-3I) primarily yielded signs of a trend that might indicate an intensification of cross-

border movement of Thai science and engineering students in the ASEAN Economic Community (AEC) and the organization's strategic partners in the Asia-Pacific Region (ASEAN Plus 6). When the director of an international liaison office met with me to discuss the study results, I asked her about the meaning of the pixelated tree icon. With this question I sought to establish whether she would link the pictogram, printed on corporate documents of NSTDA and its subsidiaries, with the growth of the scientific R&D community of PS-City.

> *Khlong Luang*, 26 August 2013 – While the US-trained environmental engineer was leafing through the printouts, she suddenly looked up when I enquired about the necessity to print the tree icon on the front cover of the annual reports of NSTDA subsidiaries. The two women looked at one another. Slightly irritated, the division director asked why I was raising the matter of the digital tree again. The symbolism of trees was a classic trope in social and cultural anthropology, I replied defensively. Did the pictogram refer to the *Bodhi* tree? Implying that I should have known better, she replied instantly: certainly it was *not* the *Bodhi* tree. That tree species belonged to a religious, and definitely not to a scientific, community, she said. I was going to tell them about the collection of the Queen Sirikit Arboretum Garden in the neighbouring campus of the Asian Institute of Technology that included the 'Nine Royal Holy Trees of Thailand'[28], but did not want to interrupt her. She rushed to tell me that the pixels of the low-resolution pictogram represented the country's growing digital economy. Was it not obvious?

The connection she drew between the tree icon and the industrial transformation of Thailand in the early twenty-first century was obvious, on the

[28] The botanical collection comprises over 1770 plants, trees, and seeds from Thailand, Asia, and the rest of the world, see http://www.arboretum.ait.ac.th/about.cfm.

premise that science-cities were self-contained ‘plug-and-play’ facilities. It surprised me nevertheless, because the year before she had told me, “The tree means absolutely nothing to me.” Her varying statements raised the question of what had happened with the ‘park tree’ between 2012 and 2013. By analysing how the meaning of the tree was ‘variably distilled and elaborated’ (Comaroff and Comaroff 1999) in the social imaginary of this science-city community, we gain a deeper understanding of why ‘tree and park go together’ (see *Beginnings*). The proscenium-like tree installation described next opens the ‘fan of pliable associations’ that the Comaroffs attributed to the ‘polyvalence of imagination’ (1996:6) and that sheds light on the park/tree conundrum from a Thai perspective.

> *Thailand Science Park*, 31 July 2013 – “Still not ready?” asked the director of the NSTDA Science Media Division his deputy, who then turned to me. “Go and see it,” he said, amused. “What should I go and see?” I asked, bemused. “Our tree in Bangkok,” he replied.

Figure 19 – The several meter high tree effigy as seen in the proscenium-like installation of the NSTDA at the 2013 National Science and Technology Fair, held at the Bangkok International Trade & Exhibition Centre (BITEC), Bangkok, Thailand. © 2013 Photo by B. R. Buergi.

19 days later – Toward the end of our next meeting, they asked me if I had seen the tree at the science and technology fair. “I sat under it,” I said. What did I think about their tree? “It was clever,” I said about the several-meter high plastic tree that they had ‘planted’ in the centre of the NSTDA booth. It corresponded with the tree in the park logo. Did it not? “No” they replied in chorus. There was a misunderstanding on my part, the vice-director told me with a good-natured laugh. “Don’t mix up the two trees,” he cautioned. The tree in the corporate logo came from the outside whereas their tree came from the inside, he explained. While their tree was local, the one in the logo was foreign.

I had to understand the origins of their tree to grasp the true meaning of their tree. Before the opening of the annual S&T trade fair in mid-August, NSTDA sent hundreds of copies of a booklet to government-based agencies and other stakeholders. They felt that there was an urgent need for NSTDA to demonstrate that their work benefitted the Thai society. They felt similarly strongly about the need to increase the visibility of NSTDA in the public domain. Stating facts, and letting the public know what the economic and social impact of our research activities means in a simple and coherent way was important, I learnt. That would then "make it easier for people to understand why the government must raise the annual budget for science and innovation to at least one percent of the annual GDP (up from 0.37 per cent)."

The publishing manager, who joined the meeting sometime later, agreed. She briefly stepped out of the coffee area to get me a copy of the booklet entitled *The Tree of Research, the Leaves of the Economy, and the Fruits for the Society*[29]. Why was there no tree on the book cover? I asked her. "The tree is there," she replied. However, I must have missed it. What I saw was a country map in the shape of Thailand made of assembled fragments of pictures and the corporate logos of NSTDA and its subsidiaries. The leaves of the 'tree of research' stand for the market value of applied technoscientific knowledge, and the fruits for the social impact of innovation that comes from doing basic science. "With statistical data we demonstrate the benefit of new technologies," the vice-director added. "Based on cost-benefit calculations, we tell people how much the rubber harvesting system saves, and we translate that into its market value. Instead of saying what we do, we demonstrate it. Let the facts speak, and say something solid, and not in an abstract way."

The executive manager at the Business Centre, whom I met the year before, made a similar observation. "Not the logo, but what we do and what we promise matters," she had said (Pre-fieldwork records, 5 June 2012). She also had associated

[29] See National Science and Technology Development Agency (2013).

the tree with the positive qualities of a fruit-bearing tree. When we met in 2012 to discuss the composition of the TS-Park community, the park was still recovering from the floods that devastated large parts of Pathumthani province in the autumn of 2011. Apart from making international headlines, it strengthened the community spirit of the park on which the media outlets spent few words. People shared with me stories of solidarity between the various tenants. Voices were raised against building high dykes to protect the park from floodwaters at the expense of the neighbouring residential and industrial zones.

Solidarity among the members of the park community grew even stronger when an existential crisis loomed on the horizon. What that crisis was about prefigures the satirical cartoons on the covers of the twelfth issue of *Horizon* (Science, Technology and Innovation (STI) Policy Office 2013)[30] – the Thai youth science magazine that Durongkaveroj had introduced to me. The ensuing description of these two digital paintings calls attention to how the graphic illustrators of the paintings appraised the potential of the emerging science-city to develop the domestic knowledge economy. The satirical cartoons on the front page and the "Techno-Toon" (Muscular & The Scientist 2013) on the back of the magazine offer a counter-narrative to the policy-oriented and scholarly discourse of technoscience development in Thailand (Sripaipan 1991; Yuthavong, Sripaipan, Kirtikara, Glankwamdee, and Trakulku 1985; Yuthavong 2011, 1978). Both images are polemical and might offend the sensibilities of some readers.

[30] A copy of this issue can be downloaded from the STI Policy Office website at http://horizon.sti.or.th/issue/horizon-12-thailand-science-park.

***Life* /Bios**

The satirical cartoons are painted in the spirit of doubt. Their visual narrative is interlaced with sinister irony that borders on cynicism. They put 'flesh on the bone' of the bioarts hypothesis that holds the aesthetics of the bioarts to be useful for writing the cultures of the sciences and technologies, as well as for writing the imaginaries that may lead to new discoveries (Fischer 2015). The title page shows a park scene in pastel colours reminiscent of children's bedroom wallpaper. The sign set in the centre of this park scenery reads: 'THAILAND SCIENCE PARK'. The back cover shows a digital painting that was published within the "Techno-Toon" series of the magazine. It shows an over-dimensional skull with two disproportionate brain halves.

The sky above the pastel coloured landscape is painted a limpid blue. Trees dot the picturesque park. A bespectacled man in an unbuttoned white lab coat is seen collecting 'fruits' that he puts in his basket. He is stretching out his right arm to the volumetric flasks hanging from the only fruit-bearing tree in the picture. An oversized microscope and Erlenmeyer flasks are scattered among the barren trees. The chemical structure of an unspecified molecule is featured between two trees whose canopies touch one another. The one tree that is enveloped by the molecular structure of deoxyribonucleic acid (DNA) stands in close proximity to those entangled trees, bringing to mind the interconnected tower blocks of the INC 2 that were completed at the end of the year that this issue was published.

The story seems to be telling us that the park is yet to come of age: that the bioeconomy of Thailand is in its infancy, and that scientists want to pocket the fruits that state-planted trees yield. At present, patents resulting from publicly-funded research in Thailand belong to the government. 'Mr Pichet said this regulation has stunted development in research for the mass market. The ministry will amend the

regulation and allow researchers to reap more benefits from their own research,' reported the *Bangkok Post* (2015). It meant that in the future university-based researchers 'could set up their own company with the university's cooperation to develop and sell their research to any interested company' (Wipatayotin, ibid.).

The 'techno-toonists' Muscular & The Scientist painted the scenery of an embryonic science-city with comparable eloquence, but made it louder and gave it darker shades compared to the subtler, though complex critique of the front cover illustrators. The 'Anatomical Analysis' of Thailand is presented as a map showing the state of the country's brain power as of 2013. Their criticism of the slow growth of the knowledge economy that is expected to lift Thailand out of the 'middle income trap' (Jitsuchon 2012; Gill and Kharas (eds) 2007) unfolds in four quadrants (as in a two-dimensional Cartesian coordinate system). The large skull fills the dark-greyish picture and nearly breaks the frame that holds it.

The hollow eyes, the protruding teeth, and the disproportionate cerebrum indicate that something is not quite right in the policy world surrounding technoscience in Thailand that the authors expressed with an artistic 'brainscape'. An artistic rendering of the architectural model of the INC 2 (completed in December 2013) pokes through the left jawbone in the second quadrant. Despite the very low resolution, one easily recognizes the four interconnected tower blocks that changed the skyline of PS-City. A mathematical equation (as in an arithmetic formula) is set in the void of the quadrant above that contains the smaller of the two brain-halves.

The two brain-halves, seen in the first and fourth quadrants, are plainly asymmetrical. While the right cerebral hemisphere is disproportionately large, the left cerebral hemisphere is the size of the cerebellum ('little brain'), which is missing from the left side of the brain. The excessively large right brain-half in the left side of the image gives the impression that the tiny left cerebral cortex is floating above the *calvaria* ('the skullcap').The text under the title 'Anatomical Analysis' reads:

'Inverse variation of the brain size according to the development of the country, Thailand, 2013'.

Apart from the asymmetry of the left and right hemispheres, some brain organs are missing from the 'brainscape' in this digital painting. The left cerebrum in the image has the size of the cerebellum ('the little brain'). From this design detail we infer that the illustrators borrowed older understandings of the higher cognitive functions and where they are located in the brain[31]. In popular views of the brain, the left cerebral hemisphere is believed to be the seat of logic, strategic and analytical thinking, verbalizing, and writing, whereas the right cerebral hemisphere is thought to be the locus of creativity, observation, conceptualization, imagination, empathy, and the appreciation of beauty. To deconstruct their criticism, one needs to focus on the side where authors placed the faint dollar sign.

We may not be surprised that they placed the monetary symbol (for *thaler*, read capitalism) in the background of the right half of the brain. The symbol that stands for the global economy, like an insidious lurking shadow, fills the right side of the picture. From this descriptive account emerges a parental line between the two cartoons, the message that NSTDA sent out with the gigantic plastic tree, and the booklet that NSTD disseminated ahead of the national technoscience fair that attracts tens of thousands of visitors each year (Chen 2014). Their strong criticism points to the observations of Yuthavong and Durongkaveroj about the importance of good education in building the knowledge base from the ground up. Put differently, substantial investment in education, training, research, and innovation is required to lift Thailand out of the middle-income trap.

[31] The higher cognitive brain functions involve not only different sensory organs. They also activate different parts and structures of the cerebrum. A neuroscientific review on the mechanisms and functions of the cerebellum understands the 'little brain' to be involved in language production, which is commonly ascribed to the Broca's area located in the cerebral cortex (Mariën and Manto (eds) 2016; see also Schiller 1992; Broca 1861). Besides controlling and regulating motor functions, the cerebellum can be 'involved in both cognition and language' (Gordon 1996:359).

Referring to the three steps that Indermit Gill and Homi Kharas proposed for a successful economic transition (2007:17-18), Somchai Jitsuchon argued that 'going upward to the next level of competition' required 'more product and process innovation' (ibid., 16). Yuthavong linked innovation with education and financing policy. Take note that none of the trees depicted in the front cover illustration has roots, not even the sole fruit-bearing tree from which a scientist plucks fruits. A gust of wind would easily wipe out both the bespectacled man in the white unbuttoned lab coat and the trees. These design details help one to grasp the condition of Thai science politics in the months before the military coup of 2014. The barrenness of the trees, and their 'unrootedness', hints at the lack of adequate financial resources for developing the domestic knowledge economy. When Durongkaveroj announced the endorsement of the science-city plan, he reportedly said that the decision of the prime minister to cancel the two planned science museum projects in Chiang Mai and Phrae, initiated by the Shinawatra administration, were not related to politics (Wipatayotin 2015).

The diversion of funds, however, was a contentious issue. They called attention to a less discussed topic in the science-city development literature (Krishna and Sha 2015; Irawati and Rutten (eds) 2014; Oh and Phillips (eds) 2014; Clancey 2012; Greenhalgh 2010; Plaeksakul 2010; Emery, Ellis, and Chulavatnatol (eds) 2005; Zhang 2002; Gibson, Kozmetsky, and Smilor, ibid.). That topic is conflict resolution, and that requires us, in the first instance, to lay bare the conflict. The gloomy picture that the satirists painted assigns centrality to the possibility that past achievements could be a passing phenomenon.

Yuthavong cautioned that the situation could improve or worsen (UNU-MERIT, ibid.). Indeed, it did worsen for the people at the TS-Park when dark clouds appeared on the horizon to push into the background the promotional narratives found in the online streamed videos of the Thailand Board of Investment (BOI) North

America (2011), and the Thai Science Park (2014). Their imaginative depiction drew attention to the competition between parks for public and private funding, local and global investment, participation in national and international public-private partnerships (PPP), so-called 'gifted and talented students', and other vital resources for building the parks from the ground up.

Hope

The protest movement that formed at the TS-Park during a lasting conflict between the ruling party and the opposition that supported the Shut Down movement had been reported as a first-time event in the history of the TS-Park. 'It was the first time in the agency's 20-year history that its officials have stood up against their minister' reported the *Bangkok Post* (Wangkiat and Wipatayotin 2013). Because the two *Bangkok Post* reporters focused only on the newer-style park and not on the older-style one that was scheduled for redevelopment in 2013, we heard just one side of the story about the redistribution of government funds. The petition posted on the social forum *Pantip*[32] yielded over a thousand signatures from sympathizers demanding that two ministerial decisions be retracted.

The first time I came across the social movement of scientists and science administrators, whose protest slogan was 'Fight for Science' was during a meeting at the TS-Park. There was a black sticker reading 'Fight for Science' on the glass front that divided the corridor with the open-floor office on the other side of the laboratories. What did it mean? I did not ask the geneticist, because I thought it was inappropriate to raise a potentially contentious issue during our first meeting. By asking the senior science administrator who walked me over to the INC 2 before it

[32] For the Fight for Science blogs, see https://pantip.com/topic/30596117.

officially opened, I was briefed about the latest developments of which she hoped to see a positive outcome in spite of the hardening front.

Figure 20 – Supporters of the 'Fight for Science' sporting paraphernalia of the protest movement inside the perimeter of the Pathumthani Science City (Fig. 3), as seen in a blog of the Thai social forum Pantip.

The ensuing ethnographic fragments are presented not to tell 'war stories', but to cast light on the unification process of a splintered parkscape that developed into the first Thai science-city (for the park list, see Tab. 2A). The events that led to the government's approval of the proposal dating back to 2007 will show that the prospect of discontinued funds had created the community spirit necessary to create oneness at a time of political turmoil. The fear of losing funds brought closer together the techno-parks lying on either side of the Paholyothin Road, which splits the Khlong Luang district on the north-south axis. The ensuing exposition draws on two articles that have already been introduced, and the lyrics of a song written by a US-trained Thai life-scientist. The earlier published article reported on investment plans for redeveloping the TT-Complex (Tipnampa 2013) in the east of the Khlong Luang

district, whereas the later one reported on two parallel protest movements (Wangkiat and Wipatayotin 2013).

The descriptive analysis will enable us to understand why the white fist on the back of the black polo shirts worn by the protesters of the Fight for Science movement was more than a symbol of contestation as normally understood. Besides anger and frustration, it expressed hope: hope for better education, more research, and interestingly, the continuation of art-driven youth camps, since these were at stake. The protesters were not just venting their irritation at a drastic government budget cut, and about additional regulations on project funding. They expressed their 'love' for NSTDA, and their hope for a settlement of the dispute to secure the park's future.

Figure 21 – Hoping for a resolution of the stand-off between the Thai Ministry of Science and Technology and NSTDA. The screenshot is of a televised discussion forum posted on the Thai online platform Pantip. © 2013 Pantip, https://pantip.com/topic/30596117.

When the science administrators, scientists and students at the TS-Park learnt about an imminent budget cut in a fiscal year when the budget for science and innovation had tripled to 44,162 billion Thai Baht (ca. 1,8 billion Singapore Dollars) (Tipnampa 2013), they followed in the footsteps of the protesters supporting the Rural Doctors Society. About five hundred members and their supporters, in black shirts and trousers, were holding up placards that demanded the resignation of the public health minister. Their protest, which stopped short of organizing a mass rally in front of the prime minister's residence, was about the unilaterally taken decision to cut the rural hardship allowance for physicians by fifty percent, and to dismiss the managing director of the Government Pharmaceutical Organization (GPO), a major producer of generic drugs in Thailand.

Akin to the Fight for Science movement, their organized protest took issue with interventions believed to benefit the private rather than the public sector. Such policy reforms, they felt, would 'pave the way for politicians to have greater control over the state drug manufacturer' (Wangkiat and Wipatayotin, ibid.). One of the interviewed protesters told the reporters, 'It seems like the voices of junior government officials like us have always fallen on deaf ears'. The hospital director from a southern province of Thailand then said, 'We have to speak out and express our stance. We cannot rely on senior officials any more'. The senior officials, he continued, 'should take a leading role in protecting junior officials and the public interest' (ibid.). Besides its financial nature, the conflict indexed generational tensions in relation to agency. 'This protest could lead to our voices being heard by the country's top figures,' the protester who had travelled to Bangkok told the two journalists (ibid.).

The TS-Park people shared that same hope when they raised their voices against the two ministerial decisions, one of which related to the provision of funds for 're-landscaping the Techno Thani complex around Rama IX reservoir'

(Tipnampa, ibid.). Again, the protest was about a financial matter, namely the cut in the earlier approved budget, which was going to affect the pay-out of bonuses for the scientists. When the ministerial decision to cut the budget of the National Science and Technology Development Agency (NSTDA) hung like a sword of Damocles over the park community, Phanramphoei Namprachai, aka Jibby, took to the microphone. 'We work so hard and we need our bonus,' sang the TS-Park-based life scientist[33] in the opening lines of her video recorded song "Pigs Don't Cry" (2013), featured in the epigraph (see also Tab. 1G).

With humour and wit she counterbalanced the crushing fear of losing out on government funds in the summer of 2013. I was among the cheering crowd of research scientists sympathizing with her (Namprachan 2013) in Singapore, where she won the *2013 EURAXESS Science Slam* of the Southeast Asian chapter. Even though her cleverly worded song was light entertainment by scientists for scientists, it had agency. It moved her forward. Jibby travelled to Brussels for the *Raising Researchers' Voices – Opinions on Jobs, Careers and Rights* conference. From there, she went to Paris, France, where she joined the Pasteur Institute's junior research fellowship programme (Namprachan 2014). Insignificant though her contribution might seem to an outsider, she left an indelible mark on the community-led roadmap that pushed forward the science-city project that, following the assistant president of NSTDA Rom Hiranpruk, was the idea of the governor of Pathumthani 'a couple of years ago' (Boonnoon, ibid.).

The financial aspect, again, was not the sole preoccupation of the protesting scientists and science administrators. The second point of contestation was the interference of the minister in the financial management of the semi-autonomous

[33] In 2013, Phanramphoei Namprachan, aka Jibby, has been working at the Virology and Cell Technology Laboratory of BIOTEC. She has been a presenter and moderator of the NSTDA television channel. With the other regional winners of the *2013 EURAXESS Science Slam*, Namprachan participated in the European Commission (EC) sponsored conference in Brussels, Belgium, on 22nd November 2013.

funding and research organization. Projects above two million Thai Baht (ca. seventy-eight thousand Singapore Dollars) would newly require the approval of the minister of science and technology. 'NSTDA officials insisted they were not protesting primarily for financial reasons,' but because 'they believed the minister was attempting to make political gains at the expense of scientific development in the country' (Wangkiat and Wipatayotin, ibid.).

Apart from viewing this intervention as 'tantamount to political interference in the scientists', they feared it could 'limit their creativity' (ibid.). The science and technology minister's announcement that the government-administered sites on both sides of Paholyothin Road would be developed further erased the yellow line on the eastern border of the demarcated area on the 2013 satellite map. When I told the taxi driver to take me to the TT-Complex, he said that there was no need to go there. "The place is dead," he said. It was not dead. The gate was open when we reached the place, at the outer corner of the reassessed map that I developed in 2014. From a field-based perspective, I conclude that the unprecedented protest movement of this scientific research community was about emancipation. It was about the coming-of-age of a parkscape that underwent a rite of passage during the testing time of a major political event. Retelling the history of PS-City with a bioart-centred approach has one implication that is constitutive of the methodology, and thus won't go away.

That is: I. I am going to be present in the main narrative of the thesis that bolsters the anthropological argument of the bioarts hypothesis. Although I value George E. Marcus's suggestion that we learn from 'the humbler but more subtler crafts, like scenography engaged with here, behind, and within the scenes of the performance events of theatre and film' (2014:94), I was 'within the scene' most of the time. I was not just an audience, nor was I a *dalang* (tr. puppeteer) behind a screen producing shadow plays. To claim such 'innocence' (Van Maanen (ed.) 1995, see also Taussig 2011) in ethnographic writing would be self-defeating because of the

double-sided epistemological premise of the research methodology. That methodology, I repeat, set out to demonstrate the difference it makes to understand relations (art-science interface) through the relationships (artists-scientists) I was involved with (Strathern 2011) in order to offer a glimpse of the cultural and generational renewal of a science-cityscape centred in Southeast Asia.

Future

The two sci-fi stories that were penned by children enrolled in government-funded youth enhancement programmes that prepare them for future studies in the science and engineering disciplines are also about emancipation. They exemplify education 'in the sense that you are free or liberated to be able to think of something that is quite new and innovative', to use Yuthavong's phrase. The biochemistry professor (appointed a vice-prime minister by general Prayut Chan-o-cha in 2014, and the science and technology minister in the interim government of the retired general Surayud Chulanont) not only spearheaded the youth camps together with their initiator, the composer, founder of the Bangkok Opera, and sci-fi novelist Sucharitkul, aka S.P. Somtow. Yuthavong also contributed two sci-fi comic stories to the pilot project (Suriyakart (ed.) 2010) that tested the viability of future sci-fi comic competitions at the TS-Park.

The individual characters of the fictitious heroes and heroines, and their aspirations, deeds, and hopes that developed the story writers bring into perspective their social imaginaries of science-city life. That is their main asset for this story (Duncan and Smith 2009). The Homunculus Team (2011) won a complimentary award with "Metal Rix", whereas the group using the penname Firered Maximum (2012) was the winners of the sci-fi competition that produced the second volume of

the two annotated sci-fi comic books published by the Cartoonthai Institute[34] in 2011 and 2012. In the "Brain Eyes" story we find an intriguing definition of imagination. 'Imagination is the creation of new memory,' maintained the authors of the story that won the contest. While their story deals with the 'neuroscientific turn' in medicine, the "Metal Rix" story is about the 'artificial intelligence revolution'.

Their chosen subjects prefigure that their stories are not merely pedagogical in the sense of teaching children science, but stimulate the imagination of adults, too. Common to both teams is their creative engagement with the 'great brain debate' (Dowling 2007) that oscillates between biological determinism and existentialism, and the corollary question 'Are we our brains?' (LeDoux 2003 [2002]). Their plots revolve around scientific understandings of the neurobiological self in neuropsychiatry and the development of artificial intelligence agents (e.g. cyborgs, and robots). What makes humans neurobiologically human and sociable is central to both plots, but they tackle the question from different vantage points. Set in a game-like scenario, the story of the Homunculus Team ends with friendship winning over rivalry. Their cyborgs have human-like features. They reason and have feelings. Their story invites the readers to reflect on the ethical consequences and implications of whole brain emulation in artificial intelligence research, and to contemplate the effects of cyberspace gaming on human relationships.

"Brain Eyes" is set in the aftermath of a disaster that resembles the situation on the ground after the 2004 Indian Ocean Tsunami, which I witnessed in person in Chennai, India, and one year on in Myanmar and Thailand (along the Andaman Coastline). At the centre of this story is a fictitious brain repair device that reboots the brain of patients with mental health problems. While plotting these stories, the group was mulling over international high-skill labour mobility. Would it be appropriate for

[34] For a profile of the CartoonThai Institute, see *Southeast Asian Cartoon Art: History, Trends and Problems* (Lent (ed.) 2014).

a Thai scientist to work for a Singaporean company that develops new weapons for the army of the science-city state? The two groups further dealt with nepotism, corruption, loyalty, and integrity.

My Thai-Indonesian research assistant initially thought that "Metal Rix" was childish and "Brain Eyes" confusing. Why bother? We soon realized that their stories were of a greater complexity than we had initially thought. 'Learning to learn,' as Ingold poignantly remarked, implies 'shaking off, instead of applying, the preconceptions that might otherwise give premature shape to their [anthropologists'] observations' (2013:2, insertion added).

> *Story 1* – "Metal Rix" opens with the daughter of an industrialist, named Bene, asking her father to give the lead role to her boyfriend at the forthcoming robot show that his company sponsors. He obliges. With a cheerful "Thank you, Dad, I love you so much," she leaves his office. At the door, she notices that her father had sent for Thor, her bodyguard. She is upset, and phones Byte. Her boyfriend thanks her for sharing the good news that he is to be the protagonist at the show. He promises her to give of his best. Would he like to see his female co-star? "Sure I would," he replies. She then transmits a picture of the woman.
>
> On the day of the trade show, Bene is waiting for him. When Byte arrives, the situation gets out of control. The actress arrives galloping on a cyborg unicorn. "Come with me now, Little Miss!!" she yells at Bene and, grabbing her by the wrist, pulls her up and takes off. Petrified, Byte calls out: "Miss Jerina, what are you doing? Bene isn't in the script." Thor, her bodyguard, runs to her aid. He passes Byte an electronic wave generator with an inbuilt infrared signalling device. However, he fails to stop the cyborg unicorn and her other two cyborgs[35], that resemble a lion and a dragon. Byte mounts a Gryphon Pegasus and takes off, wondering if Jerina was an industrial spy. In

[35] A cyborg is an 'organism composed of a living and an artificial component, in close bidirectional interaction' (Binder, Hirokawa, and Windhorst 2009:922).

a moment of inattentiveness, an android dragon grabs Byte's arm, and breaks it – "Crack!" With resolve, Byte gallops toward Bene's kidnapper.

On the rooftop of a high-rise building, he finds his girlfriend blindfolded and tied to a pole. The giant, fire-spying monster is watching over Bene and Byte, who is approaching heroically to free her. "Mr Byte," Jerina warns him, "don't come near her or else I'll kill the girl." Why was she doing that? Byte asks Jerina. She explains that Bene's father ordered the murder of her father because he had opposed the installation of weapons on robots. When Byte reaches out to Bene to pull her out of that dangerous situation, the cyborg dragon attacks them. They fall off the tower block. On the ground, Byte comforts Bene. Her father would never ever allow that to happen, he reassures her. Back at the robot show, Byte asks Thor about the murder. He claims to know nothing about it. With a mischievous grin, the cyborg dragon muses: "Nobody knows that I am the one who killed Jerina's dad" (English translation by Namaporn Sukhanenya and the author).

Armed drones and humanoid robots seemed to worry the students, who reflected on the prospect of the last barrier that separate humans from machines, namely consciousness, falling. Cyborgs are machines so long as *they* lack self-awareness and subjective feelings. Where remote-controlled tools outwit their creators and producers, they may kill. Fiction catches up with the real world. When discussing the content of the commentary for this story with the NSTDA Science Media Division, I suggested that we include *When Robots Kill: Artificial Intelligence under Criminal Law* (Hallevy 2013). In addition, I proposed that we consider the interview with Donna Haraway (Gane 2006), in which the STS scholar reflects on her career and much-debated manifesto[36] for inclusion in the commented Thai/English sci-fi comic anthology (Sujjaporamst (ed.) forthcoming). Namchai Chewawiwat

[36] Haraway wrote 'A Cyborg Manifesto' in 1991.

recommended that we include Isaac Asimov's three laws of robotics[37] to highlight the ethical dimension of android robotics research.

> *Story 2* – "Brain Eyes" begins with a schoolgirl and her father at their home. They survived a disaster that submerged large parts of southern Thailand. Roong keeps to her routine, whereas her father still suffers from the loss of his wife. She had died four years before his only son, Link, perished in the floods. Five years on, he still has no job, no appetite, no joy in life, and no hope. He speaks to no-one except Roong. Her father stays at home all day. One morning at school, the bell rings. Ordered to stop the unbearable noise, she follows the sound. That is how she meets an older boy. He is manipulating a tool that looks like a pen drive. He seems to know about her father's poor health and promises to liberate him from the sad memories so that he could have a normal life. Roong is inquisitive. She wants to know how the neurotechnological device that he was eager to test on patients worked.
>
> Once the unwanted memories were deleted, tens of thousands of brain cells would change their connections and release chemical energy, the creator of "Brain Eyes 2" tells her. That process would stabilize the hippocampus after the loss of memory. He thought his good deeds would redeem the sins of his late mother. A scientist by training, she left for Singapore to join a company that was developing a new technology for the armed forces. During a validation test, "Brain Eyes" purportedly interfered with the geomagnetic field at the Equator and triggered the devastating disaster that cost many lives in Thailand in 2052 (A.D.).

To find out whether their trepidation surrounding foreign academic migration was reasonable or unfounded, I juxtaposed their story with the initial findings of a

[37] Asimov (1983) maintained that robots ought not to harm humanity, and that one should not watch humanity being hurt passively (Leslie-McCarthy 2007:401).

statistical data set that I had received from Thai government funding bodies. The scope of the examination was to establish whether there was a trend indicating intensified cross-border movement of Thai students who graduated from Thai-government-sponsored youth enhancement programmes, among programmes for students and research fellows that entailed international exchange in the AEC and the ASEN Plus 6 region (Tab. 3A-I). The practice of quantitative research had not been articulated in the research proposal. My offer to have a look at the data materialized in meetings during the second field visit that focused on the composition of these growing community formations in the Thai technoscience belt.

Singapore, a regional magnet for global researchers, was not among the prime destinations of Thai students. The city-state was in the top position neither for graduates of the NSTDA youth enhancement programmes (who pursued their studies overseas), nor for students enrolled in the PhD Golden Jubilee Programme of the Thailand Research Fund (which included an overseas exchange programme) in the evaluated period (Tab. 3A-B). The initial results, which I did not develop further, suggested an increasing inter-Asia mobility (within ASEAN Plus Six). Japan and South Korea were among the countries that attracted students from Thailand because of bilateral agreements with research institutions (Tab. 3 D-E).

What about the opposite flow: were foreign researchers in R&D coming to work in PS-City? A Thai medical scientist asked me that question in Singapore. Why did foreign academics come to Thailand to work (Pre-fieldwork records, 31 May 2012)? A year later, he asked me again. Had I found out what motivated foreign scientists to work in Thailand? While for him it remained a mystery, my reply was limited to the observation that there were fewer than fifty foreign-born researchers at the TS-Park according to official records (Tab. 4), and that none of them was involved in this research that investigated building a Thai science-city from the ground up.

Returning to the youth camps, were the students told what to write about? I asked the deputy director of the NSTDA Science Media Division. “We did not want to restrict the freedom of the students to think while they were hatching out stories.” “Why?” I asked. “Let them use their imagination,” he replied (Pre-fieldwork records, 15 July 2013). Not only did the students use their imagination, they furthermore gave a definition of this *sui generis* human activity. ‘Imagination’, wrote Firered Maximum, ‘is the creation of new memory’ (2012:31). Here we are, I thought. Imagination creates innovation. Imagination creates new imaginaries.

New imaginaries lead to experimental discoveries, which potentially lead to innovation. Their story unsettles the persistent cliché that Asians innovate through imitation, as in the trademarked term ‘iminovation’ of Montri Chulavatnatol (2005) discussed in the *Interlude*. Imagination, as Semir Zeki maintained, was not exempt from the rigours of reality. In opposition to Sigmund Freud’s argument, the pioneer of neuroaesthetics wrote that imagination is not free from reality testing. ‘Quite the contrary,’ wrote Zeki, ‘Imagination develops from interaction of the brain’s concept-forming system with the external reality’ (2009:211). Meanwhile, we have gained a new concept of imagination; namely ‘Imagination is the creation of new memory.’

Interlude

Feeling Forward

Prologue

The *Interlude* parallels the first chapter in attempting to break through the interpretative veils surrounding artworks found in science-dominated environments. It continues the theme of the *arbor vitae* to show how deeply rooted the 'tree of life' is in the semiotic network of this Thai *biopolis* community. The travelogue of a two-day journey crisscrossing PS-City has been combined with secondary literature in writing this cultural historical analysis that traces the origins of PS-City from its introduction in late March 2015 to the seventeenth century Burmese Mon migrations. The reported dialogues of mostly unscheduled meetings at academic and R&D based institutions are strung together and presented in the form of ethnographic fragments.

One needs to be mindful that when I set out to reassess an early territorial and institutional survey of PS-City, the plan to build the first science-city of Thailand in the Khlong Luang district of Pathumthani province was under negotiation. Furthermore, we need to be aware that at that point in time Thailand experienced political instability and economic uncertainty. Day One in the travelogue is 22 April 2014. That was exactly one month before a military coup plunged the country into a state of emergency. The vignettes convey a sense of those three overlapping protest movements that were introduced previously and that provide a record of political conflict.

They are the street actions of scientists against fiscal year budget cuts for basic research, and those of physicians against rural hardship pay cuts and the privatization of the public pharmaceutical production of generic drugs. The general 'Shut Down' protests against the Yingluck Shinawatra administration, besides clogging the streets of Bangkok and the greater metropolitan area for months, divided the constituencies of the investigated science-city (Tab 2A). The frictions elucidated earlier reverberate

in the extracts from field journals which I am going to quote extensively to give a feeling of the conflicted situation that delayed the implementation of the long-planned Pathumthani Science City.

They come to the fore in the overlapping refusals of potential research participants to officially map, name or enumerate the scientific personnel, the students doing research, and the public and private academic and R&D based institutions that played a key in the formation of this science-city. Quite awkward situations arose when I confronted prospective research contacts with the satellite map entitled *Pathumthani Science City* (Kanatharana 2013, see Fig. 3). When faced with information about the survey that had guided me to these places 'where knowledge, technology, and innovation grow' (in the science policy jargon), people displayed very different reactions. While some of them welcomed my intention to reappraise the territory and the knowledge pool of this Thai science-city, others declined to provide the figures that I requested for that purpose (Tab. 2B).

Day Two of the travelogue digs deeper into the rich substrate of this science-cityscape that rose from the marshes of the Chao Phraya Delta. With the driver, a long-time acquaintance, we travelled to historical and archaeological sites of the province named after the lotus flower (see Tab. 2A). The ethnographic historically informed account that draws on this second day trip tells of the foreign explorers, traders, and settlers setting up businesses and dwellings on the riverbanks between the late capital city and the Gulf of Siam. The trading activities of these early foreign settlers, as we shall see, were turning the riverbanks into a cosmopolitan microcosm containing places and spaces of circulation that facilitated the exchange of knowledge, technology, and innovation.

The interspersed historical fragments mention the Siamese court at Ayutthaya that first welcomed foreign traders, and later proceeded to expel the Western ones, eventually readmitting them into the country in the nineteenth century. They mention

the trade treaties between the Kingdom of Siam and Western emissaries, and country-internal reforms. They report the Dutch-led construction of an intricate canal system that drained the vast areas of swamp and turned them into agricultural land. The road system that developed alongside the drainage and irrigation system and the rice fields give PS-City its checkered pattern on maps.

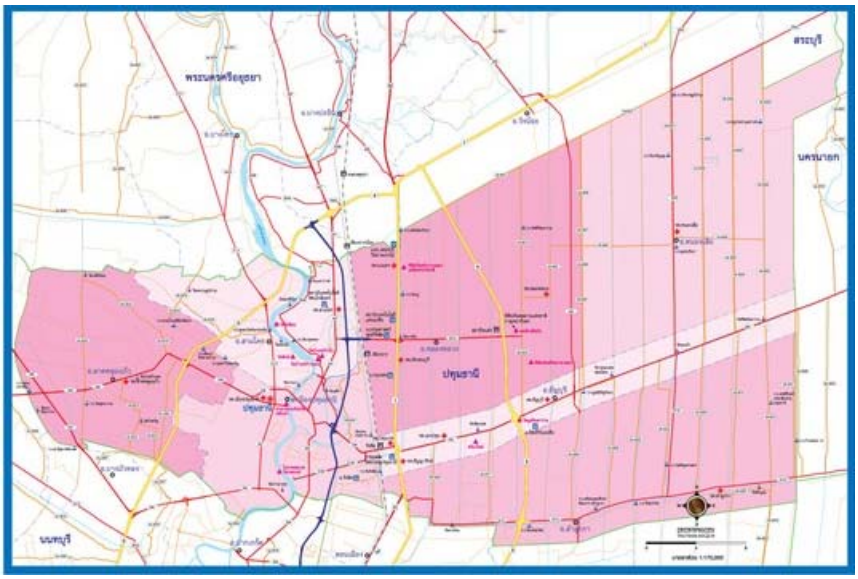


Figure 22 – This political map of Pathumthani province (Mappery 2013) shows the administrative division and the transportation infrastructure. The vertical yellow line to the east of the railway is Paholyothin Road, which in the Pathumthani Science City map of 2013 corresponds to the eastern border (also indicated in yellow) of the catchment area. © 2010 Mappery, http://www.mappery.com.

Without the contributions of residents it would have been impossible to strip away the many layers of the thick cultural substrate on which PS-City is built. In particular, I am thinking of three men. Even though they were not directly involved in the research, they directed me to the cornerstones of the new and the old PS-City. Were it not for the middle-aged security guard at the TT-Complex who told me to visit the Supreme Artist Hall (a repository of the works of artists who received the prestigious National Artist title), I could not explain why “The Growth” by the

National Artist Chamruang Vichienket (Fig. 4) is not just a fine artwork, but also a monument in the strict sense of the term.

Likewise, had *khun* (tr. Mr) Chaon not pointed at the hillock opposite the temple museum that we were going to visit on the following day, I would not have found the archaeological evidence needed to claim that the kiln museum was an 'old' place of circulation of knowledge and tangible goods as framed by this study (see *Preliminaries*). Had the elderly man at the Boat Library of the Bang Prok Mon community not told the driver about the social significance of that place, I would not be able to expound on the deep-rootedness of the *arbor vitae* concept in the social imaginary of the science-city community that spread from the western and eastern riverbanks of the Chao Phraya.

Tracking the Newer History of PS-City

In the summer of 2012, the STI Policy Office director discussed with me how labour market reforms that were designed to enable a freer flow of high-skill professionals within the envisioned ASEAN Economic Community (AEC) might benefit the TS-Park community. He recommended that I discuss the matter with a foreign direct investment (FDI) adviser of the Board of Investment (BOI) at the recently opened One Start One Stop Investment Centre (OSOS) located in the same building on Chamchuri Square. Instead of going directly to that office, I visited the BOI to speak to a foreign investment officer. I tell this story because it shows how I obtained the map that I would use the following year during my journeys crisscrossing PS-City.

Bangkok, 29 July 2013 – An armed security guard at the energy ministry showed me the way. “The entrance to the Board of Investment (BOI) is over there,” he said in Thai. In the entrance hall, I handed over the completed registration form. At the request of the receptionist, I gave her my Singapore stay permit. I repeated in English that I would wear the visitor’s badge at all times. A second security guard directed me to an office that has information about science parks. An office attendant asked me to wait for the investment promotion officer. A quarter of an hour later, she and I would exchange our visiting cards. ‘THINK ASIA, INVEST THAILAND’ read the back of her card, while mine was printed only on one side. I explained the purpose of my visit.

*“*If you wanted to discuss facilitated immigration for high-skill professionals under the Foreign Workers Act, I am definitely not the right person to talk to,” she said briskly. “Sorry, I can’t help.” Cutting short a conversation that had hardly begun, she said, “Go to OSOS.” Taken aback by her reaction to my question, I just looked at her. Did I know the place? “Is it not in the same building as the STI Policy Office?” I responded. She hesitated. Eventually, “I don’t know,” she answered before I left. Inside the tower building on Chamchuri Square, which is signed as a landmark on the Bangkok tourist map that I had on me, two Chinese men and a Japanese man boarded the lift together with me. We stepped out of the cabin on the same floor. They turned left and I turned right. As soon as I approached the glass door, an officer, probably in his late twenties, wearing a fashionable dark suit, white button- down shirt, and polished black leather shoes, strode toward me and bowed. He enquired about my business in Thailand. “I am interested in research,” I replied with a humorous smile. “Then you are in the wrong place,” he said matter-of-factly, and holding open the door for me to leave he said, “It’s over there. Good luck!” Surprised, I quickly explained that I had no appointment with the immigration office. “Your colleague at BOI sent me over.”

The glass door closed again, and we exchanged our name cards. Why was he not at the Thailand Science Park? I then asked him. My remark surprised the business development officer. On hearing the names of two senior research contacts at the organization that had provided the statistical data that I had analysed and brought along

with me, he invited me to follow him to the front window that gave a stunning view of the city. Very politely, he asked if I cared for coffee or tea. He then excused himself for a second and seconds later he returned to take a seat opposite mine. How long had he been living in Japan? I said to break the silence. He choked, apologized, and then put down his teacup. “Ten years,” he replied. “Why?” His exposure to the Japanese culture had influenced his demeanour and the way he spoke English, I told the officer with a distinctively Thai name. Was that a good or a bad thing?

That was not the point, I hastened to say. Explaining that I was interested in the cultural and generational renewal of science-cities, I pulled out the spreadsheets from the folder. A fair number of his Thai colleagues graduated from universities in Japan and South Korea, and the US, the UK, and Europe, he said. “We are a cosmopolitan community,” he added, “but the situation may be different at other parks in Pathumthani Science City,” he said. Had he just said Pathumthani Science City? I asked, surprised. Had I not seen the map? “No, I haven’t”, I replied. Would he be so kind and send me a copy? I asked him, and he agreed.

A few days later, he sent me an electronic copy of the document that contained the map I planned to use for mapping PS-City in the early months of my fieldwork. This mapping exercise followed on from reading an article describing the development of biotechnology in Thailand. ‘Mapping the Terrain’ (Poopat and Tangwisutijit 2010) opens with the observation that ‘Thailand’s first National Biotechnology Policy Framework served as a roadmap for significant progress, but it had a rocky start’. While this article concealed the ‘bumps’ and ‘potholes’ in the road that finally led to ministerial approval of the first Thai science-city, they come vividly to the fore in my attempt to reappraise the situation.

Four years later, and seven years after the science-city plan was made public (Boonnoon, ibid.), I set out to learn what the former science and technology minister meant by saying that the development of science and technology in Thailand had

been delayed many times by internal and external crises. Yuthavong had not specified what these 'crises of our own doing, political and otherwise' (UNU – MERIT 2012) encompassed. Would the two questions that arose from the map that I had received the year before elucidate obstacles that delayed the realization of that plan? One, why did the indicated area on the map only cover the western side of Paholyothin Road, and not the eastern side where the TT-Complex was located? Two, why was the labour pool so small in number?

There was a third question about two dates specifically related to that map. Why was the year 1989 not mentioned in the chart that chronicles the major events in sixty years of Thai technoscience (1956-2016)? And why was the year 1963 also absent from that chart in the Thai children's book *What Science Is For* (Yuthavong 2011:132-133)? In 1989, the Thai government had approved the plan to build a science park in the western part of Khlong Luang district, and what had happened in 1963 will be told in the travel account of Day One.

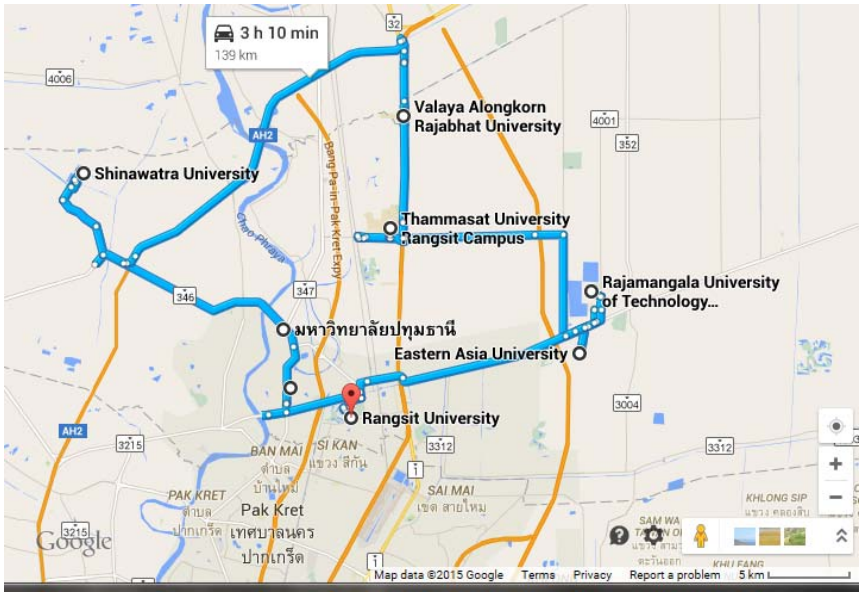


Figure 23 – This cartographic aid was produced with Google Earth and Google Map software. © 2014 Map by B. R. Buergi.

Muang Ake, 22 April 2014 – The taxi driver frowned when he glanced at the map I showed him. “Where you want to go is not on here,” he remarked. I knew that, I replied. The traffic was fluid. At the Rangsit junction, we took a left turn and not long after we crossed the wide bridge over the Bang Luang Chiangrak Canal. At the office of the Bangkadi Industrial Park of Technology I was invited to wait for the senior manager. “Are you truly from Singapore?” asked the manager in disbelief. Under the watchful eyes of the Goddess of Mercy looking down from a shrine, I confirmed my institutional affiliation and gave him my name card. To bolster my request for human resources data, I handed him copies of the approved project and an outline of my research proposal, and the satellite map showing the demarcated area of PS-City as it stood in 2013.

He looked through the bunch of papers and reshuffled them. When he returned the documents, the copy with the map lay on top. “We are not on the map,” he observed. “I know,” I said, “hence the survey,” I added. It was a good thing to check these figures, commented the official of the industrial park that opened to the public in 1987. Regretting that he could be of no help, he said, “We don’t release this kind of data to foreigners.” Empty-handed, I returned to the taxi. Back in the car, I asked the driver to drive through the park. “Look!” he exclaimed, all of a sudden. Had I noticed the brackish brown watermarks on the front-side of the hangar? Slowing down the car, and gesticulating with his left arm, he drew an imaginary line above his head. “The water level was that high,” he said. His first grandchild was born just after the floods, he then said, packing two life-changing natural events into one sentence.

When the tropical storm Nok-ten made landfall at the same time as unusually strong southwest monsoon winds battered the lowlands of the Central Plain in October 2011, the industrial parks of Pathumthani province made international headlines. The floodwaters stained the walls. And worse, they stained the reputation of Thailand as a safe foreign direct investment destination in Southeast Asia.

Continued – A security guard at the Sirindhorn International Institute of Technology (situated on the opposite side of the industrial park) directed me to the basement. The junior office assistant tried to be helpful. “Sorry, go to SIIT admission office, Rangsit campus, Thammasat University,” she apologized in broken English. Did I know where it was? “Next to the Thailand Science Park and AIT,” I replied. She smiled, and said “Yes, yes.” The next academic institution was to the north of Pathumthani City and close to the provincial border with Ayutthaya. As we passed Pathumthani University on the way to the furthermost northwestern corner of the reassessed map (see Fig. XX), I thought about the positive outcome of an earlier meeting there.

* * *

Pathumthani, 3 April 2014 – “Probably you are right,” said the senior administrator at the Office of the President of Pathumthani University. Neither the numbers nor the boundaries of the cartographic document reflected the current situation, he observed. “Our place is here,” he said. He then pointed with his index finger to the Udon Ratthaya Expressway junction where the yellow line ended. Would I excuse him for a moment? “Sure,” I replied. When he returned to the office, he dictated the three figures I had requested from the staff and student enrolment folders that he had brought along with him. “Send us your survey,” he said before seeing me off.

* * *

Continued – After we crossed the wide bridge over the Chao Phraya River, the landscape changed spectacularly. The green swaths of paddy fields, dotted with waterfowl and migratory birds, gave a very different view from that of the heavily congested road corridors dissecting the province on the north-south, and east-west axis. I was taking in the peaceful scenery when the driver stopped abruptly. Irritated by the brisk stop, I looked up. What’s the matter? I was about to say, but kept my mouth shut when I noticed that we had reached a roadblock. One of the three armed officers spoke

to the taxi driver. *Khun* Chaon swiftly produced the requested documents. Pointing at the back seat, the junior officer asked who his passenger was. The driver's answer was short and crisp. A fraction of a second later, we were back on the road. The driver looked at me through the rear mirror. Our eyes crossed. "Relax!" he said. Why did he tell the officer that I was an *acharn*?[38] What else he should have told the officers? Was I not on the research staff at AIT[39]? I nodded and kept quiet until we reached the main campus of Shinawatra University.

Astonished to see so many national flags hanging from the dome-shaped ceiling of the main building (Fig. 24), I failed to notice the office assistant behind me. "We are an international community," the woman said in a soft-spoken voice and with a welcoming smile. On learning the purpose of my visit, she invited me to wait for the director of the admission and development office. "Oh, you are from NUS," the senior administrator said surprised. Did I know Pattana Kitiarsa? Noticing her omission of the title of the recently deceased scholar, I lowered my gaze. Without masking her grief, she said they were in the same cohort at Khon Kaen University (in the northeast of Thailand) and that the Thai research community missed him, too.

Had she heard of Pathumthani Science City? I asked to change the subject. She gave me a confused look. I then showed her the map. Her eyes fixed on the map, she did not respond. "What do you think about it?" I asked her. She looked up. Would she help me to reappraise the survey of 2013? "That is easily done," she replied without hesitation. Before leaving the meeting room, she gave me the numbers of staff, undergraduate and graduate students on a yellow post-it note. Who had told me about the map, she enquired when we stood on the porch of the award-winning building that, from afar, resembles a flying saucer. "A business development officer at OSOS," I replied vaguely.

[38] The Pali term '*acariya*' is used in Thailand for academics and artists alike.
[39] Mr Chaon and I met at the Asian Institute of Technology in January 2006.

Figure 24 – The award-winning building of Shinawatra University, Sam Khok district, Pathumthani province, Thailand. © 2014 Photo by B. R. Buergi.

A long traffic queue had formed near the flyover of the junction where Paholyothin Road and Pathumthani-Nakhon Nayok Road intersect. When we finally reached the other side of the several-lane road corridor, it was already past one o'clock. We stopped for lunch at one of the many food stalls lining the busy road that leads to the Cambodian border. Since we were running behind schedule, I told the driver that we were not going to visit the Lotus Museum. Surprised by the sudden programme change, he asked me to confirm my decision not to go to the Thanyaburi campus of Rajamangala University of Technology. There was not enough time to return to the place where I had met with two men on an excruciatingly hot April afternoon, who told me that the museum organized workshops that brought artists and scientists together. I briefly recall what had happened there two weeks before.

* * *

Lotus Museum, Khlong Ha, 8 April 2014 – "Come, sit with us," called out the older of the two men sitting in the shade on the veranda of the Lotus Museum. "Our visitors

come from all over the world," said the man, who had spotted me taking notes and photographs of water lilies (*Nymphaea lotus*) in the geometrically arranged pots. "We export our products also to Holland," he said, assuming that I was Dutch. Were these visitors mainly cultivars and horticulturists? I enquired. "No, no," they replied in unison. Among the visitors there were industrial design students, artists, farmers, and people from the neighbourhood who wanted to learn about growing and using water lilies, the assistant to the university president responded, and the botanist who oversees the museum nodded, saying "*chai, chai*" (tr. yes, yes).

* * *

Continued – Past the entrance gate of the TT-Complex, the driver slowed down the car. "Turn left?" he asked. "No," I replied. "No?" He stopped the car. "Birgit, the National Science Museum is on the left, remember?" Oh yes, I remembered well the trip there the year before, when we arrived just before the museum closed. "We will go to the museum tomorrow," I said and asked him to proceed to the Thailand Institute of Scientific and Technological Research (TISTR). As we approached the complex, I noticed a sculpture. What was that artwork doing there? I wondered. I asked the driver to drop me right there at the square. I went closer to read the marble plate on the pedestal. On a small piece of paper I scribbled the name of the artist and the title of this work of abstract art and tucked it in my skirt pocket.

On the way to the main entrance, I noticed a large signboard, saying, 'TISTR is the ASEAN's leading organization in research, development, services and innovation'. The work ethos of the government-based research agency was explained in minimalist style. The '(Core Values)' were said to be '(SMART TISTR)' and the '(culture)' was that of '(an intelligence organization. Valuable innovation)'. How cryptic, I thought. Wondering what these values comprising the acronym might be, I took a photograph. Past the tall flagpole I noticed a uniformed security guard. I greeted him in Thai before entering the building. He acknowledged me with a slight nod and then turned away. The younger of the two receptionists in the large entrance hall asked me with whom I

had an appointment. I had no appointment, I explained. “Please wait,” she then said, reaching for the phone and pointing to the waiting area.

Soon after, a female member of staff welcomed me to the institute. I rose to my feet with my visiting card readied. She turned the card over and frowned. “Take a seat, please,” she invited me courteously. After introducing her to the study, I told her about the institutional survey of Pathumthani Science City. “Would TISTR like to consider participating in this elevation data?” I asked her. She looked up. “I’m sorry,” she replied and returned the participant information sheet. The institute was not going to release that kind of information to a foreigner, she replied, and advised me to contact the statistics bureau of the science and technology ministry.

Had she seen the map, I then enquired. “What map?” she replied. I took out the copy from the folder and laid it on the table next to a skilfully arranged fresh flower bouquet. She picked it up. She said nothing for a while. To break the awkward silence, I observed that, although TISTR was listed in the category of ‘Leading Research Institute’ in the inventory, the TT-Complex was outside the demarcated area. I then asked her to turn the sheet by ninety degrees clockwise, which she did. “Academic and industrial campuses to the east of Paholyothin Road are outside the perimeter,” I remarked while she continued looking at the map. She did not comment on my observation, or on the remark that the aggregated number of researchers and students therefore was likely to exceed 35,000. Since she did not reply, I changed the subject.

What did she know about the sculpture near the parking lot? I asked. “What sculpture?” she enquired. “The Growth,” I replied. She gave me a puzzled look. I said I meant the artwork near the roundabout. With my arms raised, I imitated the posture of the two sculpted figures whose arms seem to conjoin in a circle and that instantly brought to my mind Karl Ludwig Börne’s thought image that we stand on the shoulders of our predecessors. “Ooh! The monument you mean,” she said. “No,” I replied. I did not mean the monument at the park entrance, but the sculpture near the parking lot. “What’s the matter?” asked the uniformed guard in colloquial Thai, who must have noticed our conversation getting livelier.

On my behalf, the woman, who was probably a senior administrator, told him that I had come to the institute with a question about the monument. I then produced the crumpled piece of paper with the name of the artist and the title of the sculpture. "The artwork of *acharn* Chamruang is very, very beautiful," I said to the guard in Thai. His face lit up immediately. "Go [to the] Supreme Artist Hall," he advised me, while she told me to revisit their website.

Taking notice of my excitement, *khun* Chaon enquired if, by any chance, I had found what I was looking for. "Not yet," I replied. Wiping the sweat from his face with a handkerchief, and then checking his wristwatch, he asked purposefully where we were going next. "To the Supreme Artist Hall," I replied, and that it was not far. A large road sign on the street running parallel to Khlong Ha (tr. Canal Five) indicated that we had to cross the canal. On the peak of the narrow bridge, I asked him if he knew the name of the building whose architectural splendour was mirrored in the waters of a large lotus pond. He shrugged his shoulders, and offered to ask the parking guard.

The large, high-ceilinged hallway was refreshingly cool. Dazed by the refined interior architecture and elegant design, I forgot about checking the admission regulations, and walked straight down the passageway to the end of the hall. There I stopped in front of a black-and-white photograph. Suddenly, I noticed someone standing behind me. Self-consciously, I cringed. The middle-aged supervisor, wearing a traditional Thai-style, gold-embroidered *sarong*, with her long black hair in a bun, accosted me. In flawless, American-accented English, she said that The National Archives in Commemoration of His Majesty the King's Golden Jubilee was open only to registered visitors. Apologetically, I told her that I had mistaken the building for The Supreme Artist Hall. Her face instantly brightened, and she offered to show me the way.

The museum that curates a collection of works by scholars and intellectuals who received the National Artists award was situated behind the building. It was built in a similar architectural style, but was smaller. At the entrance to the Supreme Artist Hall, a guard welcomed me with the customary Thai greeting gesture. I removed my shoes

before entering the building. “Where do you come from, Miss?” he asked. “From Singapore,” I replied. “Please, follow me,” he said and asked if I spoke Thai. “A little,” I replied. He then directed me to the visitor registration book lying on a wooden desk in the carpeted entrance hall. I signed with my name and made a donation. He thanked me, and gave me a museum guide, a set of postcards, and a compact disk. I thanked him in the same way as he had greeted me. After exchanging these small formalities, I followed a group of giggling teenage boys and girls up the wide winding staircase. Their chatter died away instantly when we reached the Supreme Artist Room.

From the opposite side of the gilded wooden throne, adorned with glass mosaics sparkling in the sombre-lit exhibition hall, I watched the students in their secondary school uniforms coming into the room. A suppressed commotion went through the group when the students at the back realized that those who were kneeling at the balustrade had activated the audio-visual system. Before leaving the hall, I stopped to read the two bronze plaques at the entrance to the permanent exhibition. The translated text, taken from a royal speech occasioned by the conferral of the title of ‘The Supreme Artist’ to the late King Rama IX on 24 February 1986, reads,

> Those who wish to work in art need to possess both academic knowledge and scientific principles so that there can be guidelines for subsequent work. Likewise, academic work involves scientific knowledge and at the same time, artistic ability to further develop those works to their full potential. Similarly, scientific work requires not only academic knowledge but also the heart and determination to better the work. To sum up, these three important components are intertwined. Art is important to work of all natures, and artists are significant persons who truly deserve praise and recognition.

The connection between “The Growth” and the government-based science and technology organization (headquartered at the TT-Complex) is made evident by the below quoted passage about the history of TISTR (http://www.tistr.or.th /). On reading the website along with the inscription on the marble plate (Fig. 4), it dawned on me why this public artwork was a monument and not just a sculpture.

> The Thailand Institute of Scientific and Technological Research (TISTR) was firstly established as a state enterprise of the special category on **25 May 1963**, under the Applied Scientific and Research Corporation of Thailand (ASRCT) Act B.E. 2506 (1963) in order to implement special science and technology policies of the Royal Thai government. After the establishment of the Ministry of Science, Technology and Environment (MOSTE) in 1979, the ASRCT Act was repealed and replaced by the Thailand Institute of Scientific and Technological Research B.E. 2522 (1979) Act. Classified as a state enterprise of promotion category, TISTR has been financially supported via the annual budgets allocated by the government (http://www.tistr.or.th/tistreng/, emphasis added).

Responding to *khun* Chaon’s question, I could now reply “Yes.” I had found what I set out to find with the help of two members of the PS-City community. They had led me to the cornerstone of the newer PS-City. The engraved caption on the white marble plate, written in gold letters, reads: ‘“The Growth”; Sculptor: Mr Chamruang Vichienket, Thai National Artist: Visual art (Sculptor 1996); Established at ASRCT, Bangkhen in **1963**; Restored and re-established at TISTR, **Technopolis** in 2013’ (emphasis added). I felt relieved on making this discovery that adds substance to the bioarts hypothesis, and not just in anthropological theory but also in ethnographic practice.

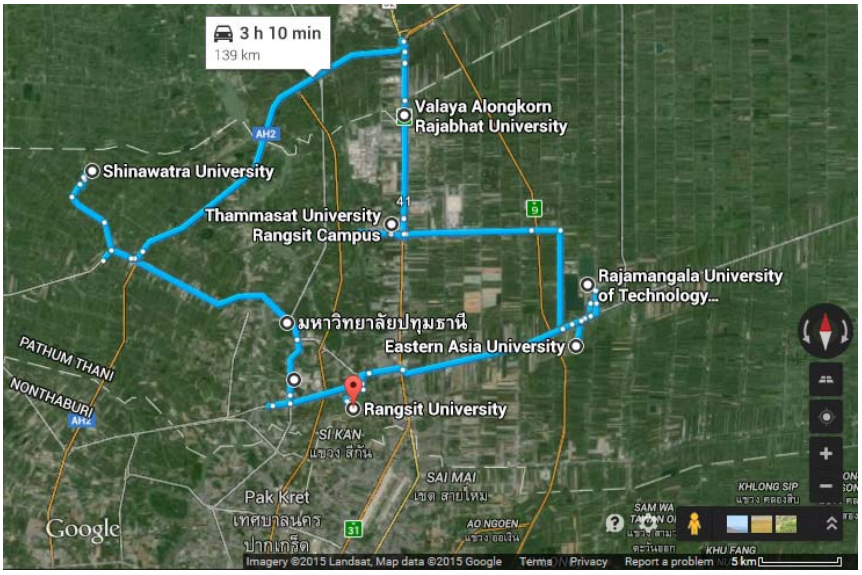


Figure 25 – The circumference of Pathumthani Science city when travelling by road, developed with Google Earth and Google Map software.
© 2014 Map by B. R. Buergi.

Muang Ake, 23 April 2014 – At daybreak, when I showed *khun* Chaon the places that we were going to visit in the morning, he asked why I wanted to go sightseeing. “We go *site-seeing*, and not sightseeing,” I told him with a grin. These “old places,” as he called them, might tell us something about the origins of PS-City. My reply seemed not to convince the driver. Notwithstanding his doubts, he offered to help as he had done on the previous day. Just before we arrived at the first of three Buddhist temples in Pathumthani City that we were going to visit in the morning, I asked him what he knew about *Wat Bot*. In the early nineteen-seventies, he had bought an amulet of Luangpu Thian (Phrakhru Bowonthammakit), he replied. “He did good things.” The amulet brought him luck in his life, he said. Did he still have it? He replied that he kept it in a safe place.

The monk is well respected among the Thai, I learnt later. He is remembered for his advocacy work promoting ‘education for all’ in the Kingdom of Siam. The structure of the temple dates back to 1621, and is among the oldest in town.

Continued – Our next destination was *Wat* Sing in Sam Khok. The driver asked if I wanted to stop at the museum. “What museum?” I asked. He pointed at a hillock on the left side of the narrow road leading to the temple that was on his right-hand side. I must have missed the archaeological site in my travel preparations. “We visit the temple first and then we go over to the museum,” I decided.

Figure 26 – At *Wat* Sing in Sam Khok, Pathumthani province, Thailand, in the early morning. © 2014 Photo by B. R. Buergi.

An information board in front of the temple explained the historical significance of *Wat* Sing in relation to the foundation of the provincial capital city that has the same

name as the province. When King Phutthaloetla Naphalai (1767-1824) visited Sam Khok (earlier 'Samcok') in 1815, the Burmese Mon villagers offered a profuse quantity of lotus flowers to the visiting monarch. Following the royal visit, King Rama II decreed that the place be called Prathum Thai (tr. Thai lotus). During the reign of King Vajiravudh (1881-1925), the settlement was renamed Pathum Thani (tr. Lotus Town)[40]. The temple museum was still closed, and so I told the driver that I would walk over to the kiln museum.

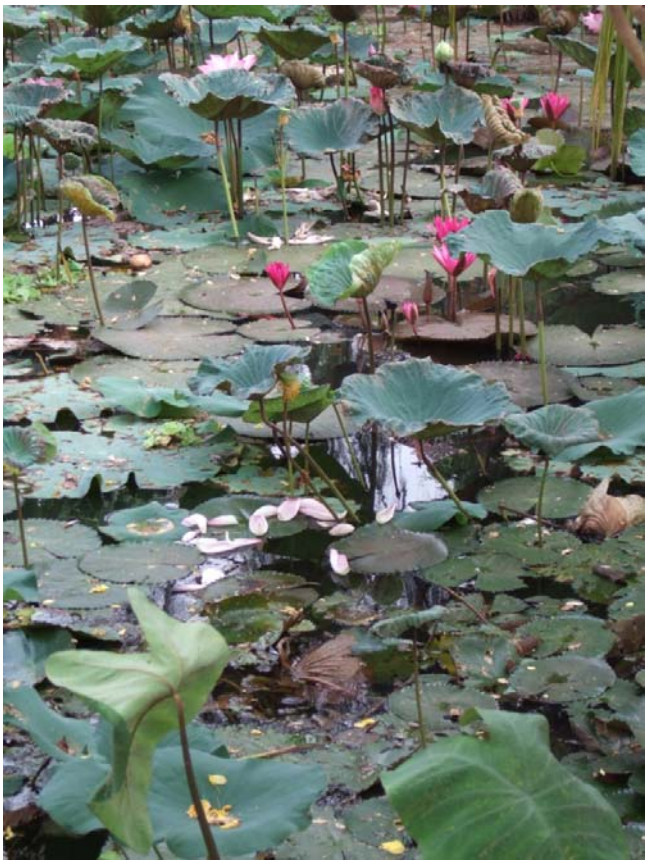


Figure 27 – By the lotus pond at *Wat* Sing.

[40] The pink lotus features in the emblem of the provincial seal, and the coat of arms of Pathumthani University.

The *Tao Ong Ang* (tr. kiln; water jar; water basin) museum is a cultural heritage site located on the *Wat* Sing Canal. The information panels placed around the covered excavation site describe the production processes of the various commodities in which this Burmese Mon community had traded since the seventeenth century. The displays at the open-air museum bear witness to the refined craftsmanship of this community. Remnants of the bricks, mortars, and earthenware, mainly jars and jugs with the distinctive Mon patterns, are exhibited in showcases around the kiln.

Figure 28 – These jar fragments show the delicate patterns of Burmese Mon artisanship. © 2014 Photo by B. R. Buergi.

The Mon were one among other foreign communities that settled along the banks of the Chao Phraya[41] River, which western explorers and emissaries erroneously called 'Menan' or 'Menam' (tr. river). What else did the text next to the two undated maps say, I asked *khun* Chaon. He looked at the panel, and then at me. If I wanted to visit all the other museums before they closed, we had to leave now, replied the driver drily and suggested I take photographs. He was right. We had to cross the Rangsit junction again.

[41] *Chaopraya* refers to a non-royal title in the upper echelon of the Thai traditional social order (Baker and Phongpaichit 2005: xi).

Figure 29 – At the *Tao Ong Ang* Kiln Museum next to the *Wat* Sing Canal that connected the former production site with the Chao Phraya River through which bricks, mortar, and water jars entered the world trade in the seventeenth century. The Provincial Administrative Office of Pathumthani and the Fine Arts Department maintain this open-air cultural heritage site. © 2014 Photo by B. R. Buergi.

At last, I found the two maps that turned out to be useful for reconstructing the earlier history of the commodification and commercialization of specialized knowledge which enabled one of the first cosmopolitan microcosms of Southeast Asia to flourish. Leading me to the two maps was an engraving attributed to Jean Baptiste Nolin (1657-1725), reprinted in Michael Smithies' edited *Descriptions of Old Siam* (1995:50) and shown on an information board at the kiln museum of Sam

Khok, together with the help of a history scholar and a librarian[42]. The engraving depicts Alexander Chevalier de Chaumont (1640-1710) presenting a letter of the French King Louis XIV to the Siamese King Narai of Ayutthaya (1629-1688), as reported by Abbé de Choisy (1644-1724). The map, in French, was published in *Le Petit Atlas Maritime*[43] of Jacques-Nicolas Bellin (1764).

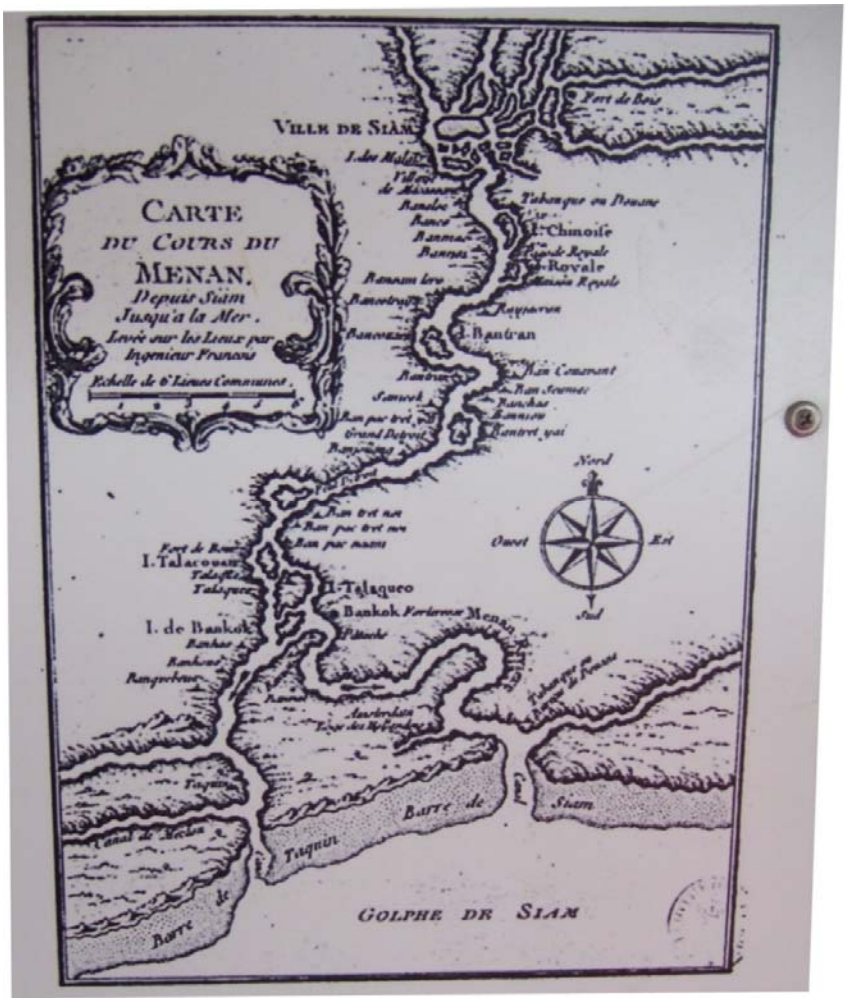


Figure 30 – A reprint of an eighteenth-century cartouche of the Chao Phraya River Delta as seen at the kiln museum. © 2014 Photo by B. R. Buergi.

[42] I acknowledge and thank Fr Dr Agostino M. Bertolotti for providing a digital copy of Bellin's coloured map. Mr Ian Pittock in the Map Room of the Cambridge University Library directed me to the volume that contains the earlier map of the Chao Phraya (see Acknowledgements).

[43] The Paris-born geographer and cartographer Bellin (1703-1772) was the official hydrographer of the king of France, and a member of the Royal Society (Pastoureau 1993).

Mireille Pastoureau, commenting on the compendium with the original cartouches,[44] said it was an 'unusual book which has travelled thousands of miles before you to rest in its elegant home but has revealed none of its history nor – who knows? – its secrets' (1993:65). Taking her comment as an incentive to discover a few of those 'secrets', I searched for elements that reverberate in the built and cultural environment of the first *biopolis* of Thailand. Finding the older map was equally crucial for elucidating the cultural and historical layers of PS-City. The three-masted ship, seen in the bottom right corner of the 'Mapp of the Course of the River Menam from Siam to the Sea', led me to the Dutch and other foreign traders who navigated the Chao Phraya and settled on the river banks between the then capital Ayutthaya and the Gulf of Siam as early as 1604 (Van Neijenrode 1995). Chris Baker and Pasut Phongpaichit wrote that the Dutch 'added their settlement to this ring' of foreign communities (2005:13).

[44] In 1955, the Beinecke Rare Book and Manuscript Library, Yale University Library, acquired the work that Bellin had sent to the Royal Society to support his candidature.

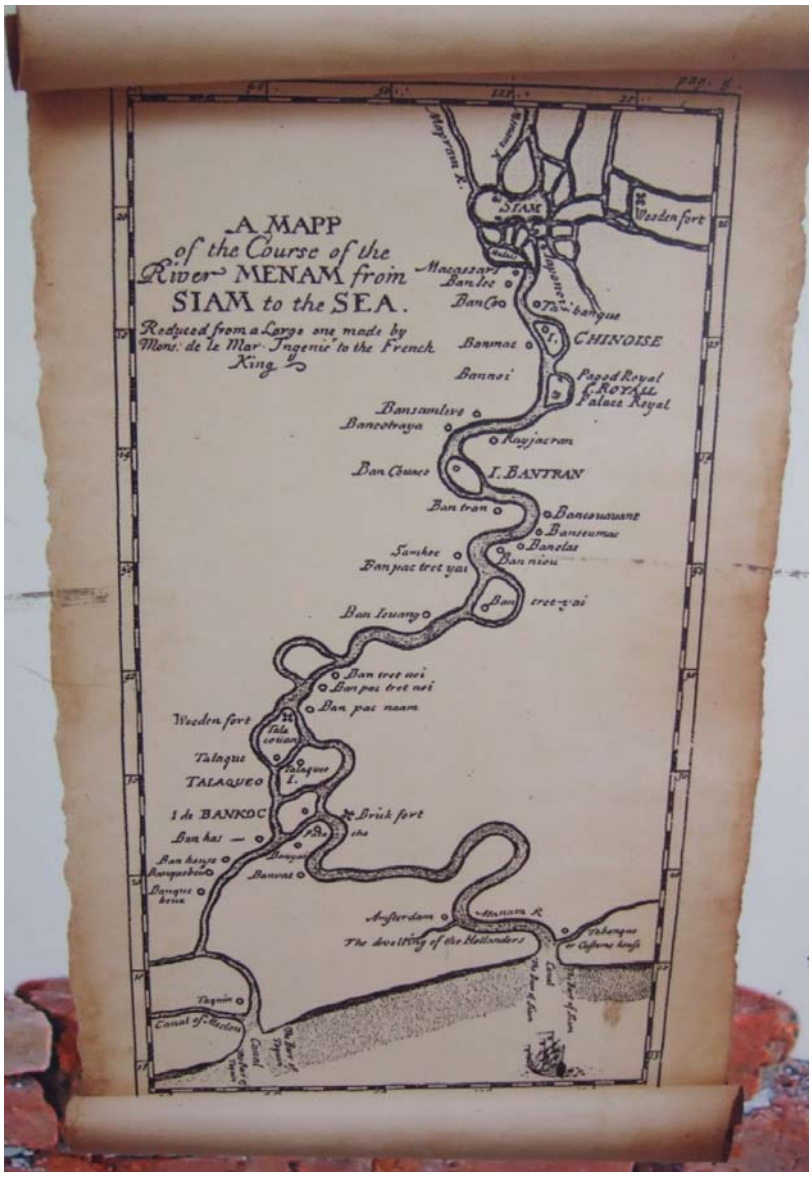


Figure 31 – The seventeenth-century map of the French emissary Simon de La Loubère, pictured on an information panel at the Sam Khok kiln museum.
© 2014 Photo by B. R. Buergi.

Their warehouse was closer to the river mouth, at 'Amsterdam - Loge des Hollandois'[45] south of 'Bancok' (later renamed Bangkok). They kept a 'Factory' (Heeck 1995:26[46]) close to the 'Ville de Siam' – Ayutthaya, the then capital city.

[45] 'The dwelling of the Hollanders' was located opposite the customs office.
[46] Gijsbert Heeck was a surgeon in the service of the Vereenigde Oost-Indische Compagnie (VOC, tr. Dutch East India Company).

There, the Chinese traders and trade administrators established their settlement alongside the trading Malay and settlers from the Celebes employed at the Royal Court. Further north lived the Japanese, working as palace guards. Rising fears surrounding the political influence of this developing cosmopolitan microcosm[47] (Baker and Phongpaichit, ibid.), however, abated with the expulsion of the French from Bangkok in 1688 (Hall 1974:37). The British and other western traders fled (Baker and Phongpaichit, 14), and as a result, the trade between Siam and the Chinese and Malay traders intensified (ibid., 18). After Ayutthaya fell to the military incursion of King Hsinbyushin of Burma (Lord of the White Elephant), the Siamese political, military, and social system collapsed (Hall, 31-32).

Political and economic relations with the western world improved with a number of political reforms and trade agreements. The Burney Treaty of 1825 and the Bowring Treaty of 1855 (Baker and Phongpaichit, 90) were destined to have a lasting impact on the diplomatic and trade relations between the Royal Kingdom of Siam and the British Empire, and other western nations. A reform movement developed in the second half of the nineteenth century. Corvée labour was outlawed, new technologies were introduced and large-scale public works to improve the waterway and road infrastructure were undertaken with western assistance (Baker and Phongpaichit, 45). A lasting constraint on international trade and commerce, however, was the Siamese Kingdom's refusal to accept foreign currency. That last barrier fell with the introduction of the Thai Baht in 1860.

[47] Arab, British, Cham, Chinese, French, Indian, Japanese, Malay, Persian, and Portuguese scholars, emissaries, explorers, traders, officers, servants, and missionaries lived among these foreign communities.

Continued – Driving southwards on the western riverbank, we reached *Wat* Hong Pathummawat. An elderly man, who turned out to be a descendant of the Burmese Mon migrants, saw me watching a group of construction workers replacing the carved, gold gilded wood panels that are a distinctive characteristic of Mon architecture and artisanship. He approached *khun* Chaon to tell him that the visitor centre of the Boat Library was closed for renovation. When I joined them, he pointed to the Banyan tree (*Ficus benghalensis*) and explained that the Bang Prok community gathered right there, near the old boat under the tree, in search of knowledge.

Figure 32 – At the Boat Library of Bang Prok next to *Wat* Hong Pathummawat, Pathumthani province, Thailand. © 2014 Photo by B. R. Buergi.

Knowledge (*logos*), technology (*techné*), and tree (*arbor*): in this triangulation we find a deeper genealogy of the tagline of the TS-Park. At the centre of this constellation is the *arbor vitae* around which this three-century-old community continues to gather. This combination of knowledge, boat, and tree in the collective imaginary of this community is passed down from generation to generation. That

conceptual view is deeply rooted in the cosmological order of the past and present generations of skilled workers contributing to the growth and prosperity of this densifying science-cityscape. As we have seen repeatedly, this imaginary of cultural and generational renewal endures. We have encountered it in the indications of the descent of this elderly member of the Bang Prok community. We have repeatedly heard about it in the conversations about the meaning of the pixelated tree logo that features in the bottom right corner of the map that I showed to people when surveying the area.

In light of these ethnographic findings, the tree/park conundrum that I initially mobilized as a proxy makes little sense. The relational knowledge that developed from the question of whether the tree or the park came first revealed that people understand the people and the community as one. Their understanding of the life cycle of cultural production and reproduction had little or nothing in common with the picture of the tree taken in front of the new park entrance leading to the INC 2. And yet, it was useful to give a nuanced account of why the park director repeatedly said, “Tree and park go together.”

If we were to search for an element that made possible the unification process of an erstwhile divided science-city, we could find it in this shared conception of developing and cultivating a knowledge driven community. Further, it tells us about the resources that generate ‘valuable innovation’ in the understanding of this community, and what the policy paradigm STI (science, technology, and innovation) Enculturation means in the sociocultural context of this science-city. When the first immigrants came to Siam, they did not fill the buildings that were there. They built their own. That is reflected in the architectural style of temples and public buildings, as well as of techno-parks. The deeper genealogy of the concept underlying the tagline of the TS-Park came to the surface slowly, and often unexpectedly. The statement of the elderly man at the Boat Library put the statement of the then park

director into the context of this three-century-old knowledge ecology that I investigated through face-to-face encounters.

The culture that has developed from the co-presence of many and diverse foreign communities trading and/or settling in the Chao Phraya River Delta over several centuries endures. Borrowing Zaha Hadid's concept, we can say that traits of this heterogeneous indigenous culture that developed from within these places and spaces of circulation are discernible in the artificial landscape formation of PS-City. We find them in the visual aesthetic properties of the built, cultural, and agricultural environment, as the following four examples illustrate. The miniature paddy track seen at the NSTDA booth during the *National Science and Technology Fair*, which is a contemporary site of circulation of knowledge, technology, and innovation, is one such example, for reasons detailed below.

Figure 33 – Recreated miniature paddy tracks at the booth of NSTDA inside the Bangkok International Trade & Exhibition Centre (BITEC), Thailand. © 2013 Photo by B. R. Buergi.

The National Artist, credited for introducing abstract art into the Thai art canon, wove that shared imaginary of the cycle of cultural and generational renewal of a technoscience research community into the visual narrative of his sculpture "The Growth". The influence of the Burmese Mon architectural style is perceptible in the architectural style of PS-City. We spot it, for instance, in the architectural details of science buildings. The triangular shaped roof of the passageway at the INC 2 incorporates those visual aesthetic properties of roofing in the Burmese Mon architectural tradition brought to the Kingdom of Siam by immigrants from Bago (formerly Pegu, and Hongsawadee). This architectural detail confirms the proposition that the cultural heritage of Thailand is 'a wellspring of inspiration for new sacred and public architecture' (Sthapitanonda and Mertens 2012:244).

Figure 34 – Gilded wooden panels of the cultural centre of the Burmese Mon community at Bang Prok near Pathumthani City, Thailand.

'The size and function of many of these buildings encourage architects to adapt features from traditional religious and royal style,' wrote Nithi Sthapitanonda and Brian Mertens. Integrating these specific features in residential applications 'would be inappropriate', they caution, specifying that 'they are approached with sensitivity' (2012:244), to which I would add not only with sensitivity, but also with extreme caution by the analysts. The same may be said when researching the socio-technical infrastructure of a *biopolis*. One needs to be alive to the cultural and historical sensibilities of the science-city population under investigation so as not to come across as insensitive, especially in politically conflicted situations. Though the last of the four examples is about inherited traits found in the transportation and communication infrastructure, it is inextricably intertwined with the first example concerning the cultivated land.

When Simon de La Loubère made inroads into Siam on the Chao Phraya in 1687 and 1688 , he described the 'Countrey' as one 'intersected with 'Channels', and

compared the then capital city Ayutthaya with Venice. 'The *Siameses* have cut a great many Channels […] called by the *Siameses Cloum'* (1693:6, original italics). The French emissary recorded an aspect of the landscape expanding in front of him that was crucial for the economic, social, and cultural development of Pathumthani province. The sustained digging of canals marked the beginnings of a radical transformation that progressively turned the marshland in the Delta into profitable land. The early artificial riverine system recorded in the French emissary's *A New Historical Relation of the Kingdom of Siam* improved significantly over the years. It improved further in the late-nineteenth century with the large-scale drainage and irrigation system devised by the Dutch Homan van der Heide (Brummelhuis 2007; Baker and Phongpaichit, 82).

Wetlands, a previous natural refuge from foreign invaders, were gradually turned into habitable and arable land. Shops sprang up in Rangsit, then a strategic location in the public waterworks project. It was the nodal point in that large-scale development project that is still visible. The municipality lies at the intersection of the vertically (north-south) built Khlong Luang Canal (tr. Royal Canal) and the horizontally (east-west) built Rangsit Canal. That places Rangsit in relation to the Pathumthani province as Greenwich is to the world (on a far smaller scale, of course). The vertically built canals to the east are numbered in increasing order, starting at Rangsit with Khlong Luang. Hence, Khlong Ha is the fifth canal to the east of the canal that runs parallel to Paholyothin Road.

The road and rail systems follow on from the early waterway structure nurturing the paddy tracks that give the province its checkered appearance on satellite and political maps. At the point where the east-west road corridor (connecting Cambodia with Myanmar) intersects with the north-south corridor (linking Laos with Malaysia), we find the Rangsit road junction. The planned monorail that will link the TT-Complex with the TS-Park via Rangsit Station under the science-city

development scheme (Wipatayotin 2015) will add one more layer to this strategic transportation and communication grid that has significantly eased commuting between the Thai capital city and PS-City.

> *Continued* – We reached the Rangsit junction before it clogged. When we arrived at the parking area of the National Science Museum (NSM), several coaches with number plates from a northeastern province were parked on the lots reserved for long vehicles. The entrance was crowded and there were queues at the ticket booths where dozens of primary and secondary school students were waiting for their tickets. On entering the building, I followed a museum guide to the temporary exhibition on the ground floor. Her explanations to the children were interspersed with English words. She spoke of "healthy living" in relation to nutrition and made them aware of the risks associated with obesity. Through the window of the *Science Land Exhibition* on the second floor, I saw toddlers playing under the supervision of nursery teachers and carers. The permanent exhibitions on the third, fourth, and fifth floor were recognizably themed to 'valuable innovation', as featured in the large panel at TISTR on the opposite side of the TT-Complex.

A general indication of the meaning of the often-used phrase 'valuable innovation' in Thai policy jargon was provided in the introduction to *Thailand Competitive Innovation Strategies* by Silvio L. Emery, Wyn Ellis, and Montri Chulavatnatol (2005) that introduced the trademarked 'iminovation' concept. The co-edited book, with its image of a sculptured android head, fashioned after a traditional *khōn* mask (Clontz 2014), on the title page, described innovation as ***'an application of knowledge to create economic and/or social value for the betterment of mankind'*** (2005:4, original emphasis). A proscenium-like installation from the *Science and Technology in Daily Lives* collection helps to elucidate how the world of

economics and the world of genomics and computational biology (Tongsima, Tongsima, and Palittapongarnpim 2008) are intertwined in the concept of 'valuable innovation'.

The display to which I shall refer as the 'living cell of R&D' model has three elements. A three-dimensional cell model is fitted in-between two large panels. The bilingual text on these panels explains how to grow a science-city population. The right poster, showing a baby in nappies, explains the growth of knowledge in biological terms, while the left poster explains economic growth also in biological terms. Investment in the education of that baby is fundamental for creating the kind of jobs that grow the national knowledge economy, which is thought to lift the country out of the middle-income trap (Jitsuchon 2012; Gill and Kharas, ibid.). Hence, the growth of a science-city population depends on the growth of basic research on which applied research and innovation depend. This intertwining of the logic of the neoliberal market economy and cell biology creates a perpetual circle that shields itself from any possible criticism since it is self-referential. It closes in on itself, thereby forming a protective ring around the suggested allocation of one percent of the annual GDP to science and innovation (Yokakul, Promwong, and Zawdie 2014), as though it were a magic number.

Asked about the socio-economic significance of increasing the public R&D expenditure, the director of the TS-Park administration authority replied, "Do it, or die" (Pre-fieldwork records, 22 August 2013). 'Do it' (you may recall) was written by the Thai artist as the caption of his "Robots Factory" installation sketch showing the interconnected buildings as we know them from the Singapore Biopolis and the TS-Park. These science-cityscapes are not frozen in time as they are in architectural models. Once in operation, they develop a life of their own. People, who make these institutional ecologies prosper, do not function in the same way as the models of designer organisms within the confined and controlled environment of a Petri dish.

That was revealed by the lingering conflict between the two park communities in the Khlong Luang district. It took years for them to come closer, as suggested in the biography of the PS-City to which I have added a chapter, with the art produced and consumed by the people moving within these places and spaces of circulation. A question that arose from trying to unveil the meaning of 'valuable innovation' in the Thai context related to the earlier mentioned notion of 'iminovation'. Chulavatnatol's trademarked concept is problematic because it ignores the archaeological evidence that Thailand has been a space of circulation of knowledge, technology, and innovation for several hundred years, if not for thousands of years (see ch. 4).

The riverine system of the greater Mekong has facilitated the movement of people, knowledge, ideas, and goods since the time people had the means to travel by water. Why then cling to the widespread cliché that no genuine innovation comes from Asia? The problem lies in an ideological bias that renders this notion flawed. In the starkest terms, it makes Southeast Asia neither 'a region of significant cultural innovation' nor 'the recipient of advances achieved elsewhere' (Woodward 2003: 3-4) but a hybrid of these two extreme views. As Hiram Woodward argued, such biases compromise the study of the propagation of culture in Thai history, to which I add the study of the Thai science-cityscape, whose artistic and creative energy is under-researched.

> *Continued* – The penultimate 'station' of the *Science and Technology in Daily Lives* exhibition caught me unprepared. As I pulled back the black curtains of the installation, I found myself inside a mock-surgical theatre. I swallowed twice. The neatly folded green drapes on the operation table, and the surgical appliances and dressings on the shelves endowed this recreated surgical setting with a surreal atmosphere. I did not stay long, since I left the premises the moment a group of elementary school children entered the curtained mock operation theatre and started to play patient and surgeon.

These newer museum collections, apart from evoking curiosity in the viewer, shed light on the art-science interface as it is playing out in the everyday life of a science-city community. The surgical table around which Thai schoolchildren were playing has affinity with the social reality of biomedical practice. For instance, the mock-surgical lab at the Boston Children's Hospital employs a professional puppeteer who helps neurosurgeons by making their practice sessions feel more real (Weintraub 2015). This is a concrete example of the cross-pollination of art and brain science, which is the topic of *Part Two*.

Looking Back in Anticipation of What Is to Come

What initially might have appeared meandering, but which I constructed to resemble the deliberate meanders of the river (tr. *menam*), encircling and conveying one amidst the urban cacophony to key conjunctions, events, insights, and verbalizations, honed in on the inner sociality of a nascent science-city. Yes, the Chao Phraya flows in many directions in the delta that gets flooded every now and then because the land is sinking and monsoon storms are erratic. A major breakthrough in the early reconnaissance trips was the unpredictable discovery of artistic works that are about science-city life and that helped to elucidate an important chapter in the history of PS-City. The *soi-disant* season of discontent affirmed the considerable determination, perseverance, and imagination that it took to consolidate a parkscape and bring it to the level of a science-cityscape.

The supporters of the Fight for Science demonstrated that this sense of oneness did not develop from connecting tower blocks or filling them up with local and foreign talent. They showed that community-led science-city development and renewal is neither fast nor smooth. The unification process took time. Against the

backdrop of the discoveries made during my visits to academic, cultural, and religious sites, we may now say that the unification process was aided by the shared cultural heritage that created the sense of oneness which won over the park divisions that hard-engineered structures could not heal. I reached these conclusions by asking one set of three questions. The first two questions related to the survey that reappraised the size of the territory and the pool of the high-skilled labour force, university students included. The other questions related to two dates that marked a turning point in the history of the first *biopolis* of Thailand. The year 1963 commemorated the laying of the foundation stone of PS-City science-city, while 1989 was the year when the government approved the proposal to build a new techno-park in the western part of the Khlong Luang district. The corporate logo of the TS-Park, and later, the artistic creations, led us deeper into the arteries of this pulsating Thai science-city in the Chao Phraya River Delta.

The collection of art and design works, discussed in *Bioarts as Appraisal*, further substantiated the bioarts hypothesis with ethnographic evidence. How the literary and artistic aesthetics of the visual narratives of these artistic creations may be employed to detect trends that indicate the formation of newer imaginaries was shown in the bold definition of imagination in the "Brain Eyes" story. According to Firered Maximum's definition, imagination was the creation of new memory. Their description of people suffering from the loss of lives, property, and mode of existence, is echoed in eyewitness reports of the 2004 Indian Ocean Tsunami that devastated large swaths of the Thai Andaman Coast. In that respect, their story provided a counterpoint to Bloch's conceptualization of imaginative thinking in fiction. 'In fiction, poetry and other creative activities, whether these are artistic or scientific, imagination enables us to live in other worlds, while knowing that these are *not* the here and now' (2012:109, emphasis added).

The mode of thinking that influenced the "Brain Eyes" and "Metal Rix" stories challenges this conceptual understanding of imagination in creative writing. Common to both stories was the fact that their narrative engendered utopian and dystopian elements, as well as elements that they extracted from an environment that they knew. Since the enhancement programmes are open to so-called gifted and talented children from all the provinces, I must mention that among the sci-fi competition participants were boys and girls who had been exposed to floods or to the persistent violent conflict in the southern Thai provinces, where fears of armed drones are real. Their imaginative stories thus help us to see imagination as a cognitive resource that enables people to live in other worlds while knowing that these *are* the here and now.

The criticism that Firered Maximum levelled against the deregulation of domestic labour markets for high-skilled labour in the ASEAN region is not unfounded, since it links up with the national dialogue on STI Enculturation and Youth-focused Innovation. For instance, the stories' plotters felt strongly about 'THINK ASIA', which they associated with increased competition. In view of the received idea that mental health issues are a taboo topic in Southeast Asia, it is interesting to see that this younger Thai generation engaged with the body-mind conundrum in relation to severe grief and post-traumatic stress disorder (PTSD)[48] in a disaster-affected community. They talked about it as a physical health problem, and moreover one that warranted further clinical research. With due caution, since no interaction with these underage students took place, one might say that the fictive world and the everyday world were collapsed in their plots, as in Nancy Munn's notion of 'presencing' (2013:374) that describes this temporal overlapping in our surroundings.

These coexisting spatiotemporal worlds are found in the sci-fi comics, the "Techno-Toon", and Jibby's "Pigs Don't Cry", which opened a window onto the

[48] For an overview of the symptoms associated with PTSD, see Shear (2015:157).

inner sociality of science-cities that is mostly shielded from public view. These reflections lead me to conclude that artistic interventions function in a manner akin to traditional science fiction. They explore the future that is already present but unrecognized within a social lifeworld that has evolved and is continuing to evolve from 'synergistic interaction' between 'new science and technology and endogenous culture' (Yuthavong, Sripaipan, Kirtikara, Glankwamdee, and Trakulku, ibid.). The creators of these works further showed us how they espoused the many and diverse foreign cultural influences that make not just the TS-Park, but the entire PS-City, 'Thai by default'.

Regarding the theoretical and analytical currency of the bioarts for studying *biopolis* sociality, there is one more observation worth considering before proceeding to *Brainscapes*, which explores and discusses older and newer theories of the organization of the human brain through the dialogues with artists. The descriptive analysis of the sci-fi comics has revealed that, besides Bloch's conceptualization of imagination, they also challenge Latour's argument that 'imagination is never the source, but rather the *receptacle* of beings of fiction' (2013:246). In the understanding of the youth camp participants as well as of their mentors, who understand themselves neither as teachers nor as masters, this *sui generis* human activity (Sneath, Holbraad, and Pedersen 2009:27) is the source and not the receptacle.

We heard from the vice-director of the NSTDA Science Media Division that the organizers of the sci-fi comic competition did not want to restrict their freedom of thought because they wanted the students to use their imagination. Their creative and imaginative engagement with culturally stabilized knowledge was pushing the boundaries of 'what can be done and of what scientists themselves plan and dream' (Fischer 2009:161).The fictive cyborg that threatened to kill the 'knight' in the "Metal Rix" story silently confessed to the murder of the protagonist's father.

Unaware of that fact, the heroine believed that *she* was in control of the robots that were her asset. Of course, she was wrong. They were not at her service; she was at their mercy. In this imaginative master-subordinate relationship in which artificial intelligence outsmarts human cognition, figure and ground were reversed.

As suggested by the picture explaining the imaginary neurotechnological device that re-tools the psyche of Roong's father, feelings of grief that change a person's behaviour emanate from the brain. Grief, for them, is a neurological state, rather than a culturally conditioned one. Feelings of grief, hence, have a neurobiological basis that must be located somewhere in the brain. We find a similar position in a discussion of two neuroscientists about future directions in the brain and cognitive sciences. With their eyes turned toward neuroscience in the year 2064 (AD), Christof Koch and Gary Marcus maintain: 'the final challenge, indubitably, will be how subjective feelings, how consciousness itself, emerges from the physical brain' (2015:269). This unresolved question was going to break up one day, they predicted, as did Erwin Schrödinger's (1967) question 'What is Life'. As happened with the ascent of genetics, biochemistry, and microbiology in the mid-twentieth century, brain scientists were going to overcome that 'final challenge', they projected. Firered Maximum's conceptual understanding of the link between the brain and behaviour raised the question of where these intricate neuronal processes producing grief happened in the brain.

Would it be accurate and adequate to say that the affective, cognitive, and behavioural functions associated with PTSD were situated in a specific area of the brain, and that their location was detectable with neuroimaging scanners? The question arose in the translation of the "Brain Eyes" story, and again, when drafting the commentary with the Thai life scientist Namchai Chewawiwat. These conversations led the inquiry to examine the bioarts hypothesis in the sub-disciplinary field of neuroanthropology to see if it might bring a set of more intriguing research

questions to brain function imaging, as Downey and Lende surmised (2012:36). Through the voices of a group of artists, we shall see how they deal with neurobiological representations and interpretation of the brain and human consciousness.

They will tell us, especially, how they approach questions raised by neuroimaging pictures of which Andreas Roepstorff said the following: 'There is something strange lurking in these pictures – the "mysterious stuff" that fails to fit into any of the obvious categories.' Taken aback by their mysteriousness and strangeness that is difficult to capture in words, the anthropologist signalled that neuroimaging was an area 'one should perhaps rather try to avoid, by simply navigating around it' (2009:201). To render the idea of the peril one might encounter, he offers the thought picture of navigating safely through Arctic waters to avoid a collision with floating ice blocks. Neither the authors of "Brain Eyes" nor the artists we talk with in the second part of the thesis, shied away from those difficulties. On the contrary, similarly to the Portuguese-born artist Marta de Menezes, whose neurobiologically informed artworks had been discussed first with science-city contractors and their corporate clients in Singapore and later in Bangkok, these artists are dealing head on with the question 'Are we our brain?'

Part Two

Neurocultures

Art in the 'Age of the Brain'

If myth can to some degree be considered a highly coloured map of brain neuroanatomy, ritual may perhaps be thought of, however crudely, as given its momentum by brain physiology.

– Victor W. Turner, 'Body, Brain and Culture'

Brain Art in Science-Cityscapes

Surprised by the scant attention that art in Southeast Asian science-cities has garnered from STS scholars, I broached the topic with a British-born architect and engineer and his client from Beijing who were visiting Singapore. How did they view the integration of art-devoted spaces in science buildings and industry-oriented R&D campuses? I asked them in my introduction to the art-in-science-city-phenomenon. Their replies put in context not solely the difficulty of quantifying the actual economic benefit of art, but also the value gained from the specialized knowledge and cognitive contribution of diverse stakeholders, including artists, to topical questions in the field of the brain and cognitive sciences. They agreed that building inclusive research communities from the ground up was more complicated than Fache's 'bet on culture' suggested (see *Beginnings*).

While the Singapore-based architect-engineer firmly supported the allocation of floor space to art spaces in science buildings and campuses, the vice-president of the China R&D headquarters of a global UK-registered pharmaceutical company cautioned us not to take the argument lightly. "Floor space should be allocated to the arts only if the exhibited works are 'better than wallpaper'," I quote the dinner host as saying. "Would you stop to look at the work, or simply walk away?" he asked us. If the viewers stopped to look at the work, then there must be something in it to stir them up, surmised the executive manager. Rather than focusing on the economic value, one should try to establish the ability and capacity of particular artworks to stimulate, entertain, provoke, and captivate a scientifically trained audience, he maintained (Diary entry, 7 October 2013).

The wallpaper analogy was certainly not a flattering remark. Yet, his observation introduced a new topic for our conversation about art and science-cities.

We started talking about the social value of the scientific arts, bioarts, and experimental design, and moved on to discuss their cognitive value. Do artistic knowledge and skills contribute to 'old' problems, and if so, in what ways? We pondered this question when considering how the aesthetic response of the viewer to works of art could be harnessed for scientific purposes. Between them, they agreed that the decisive factor in the assessment of art adding value to science-city life was whether the exhibited artworks inspired the thinking of the people working there.[49]

In their view, the cognitive value of the arts for the neuro disciplines was far greater than their aesthetic beauty or market value. Taking stock of our discussion as it drifted away from the utilitarian value of the bioarts to the cognitive value[50] of the arts (Dryden 2004), I introduced them to the neurobiologically informed travelling exhibition *Functional Portraits* by the Portuguese-born artist Marta de Menezes (2008, 2007). The neuroscientific question that her work deals with relates to the explanatory gap between neurobiological functions and a person's identity or personhood. De Menezes's research subject could be framed in the terms used by Koch and Marcus, who argued that the 'final challenge' in the brain sciences was to understand 'how *subjective* feelings, how consciousness itself, emerges from the physical brain' (2015:269, original emphasis).

This conundrum of what it is to unify the mind and the brain can be assigned to the category of general aporia (undecidabilities), given the limitations of current research methods in brain function imaging (i.e. brain mapping). This issue has garnered interest from anthropologists (Dumit 2014, 2012, 2004; Cohn 2011, 2010, 2009a, b; Roepstorff 2009) researching how brain scientists, and little how artists

[49] An interesting parallel to this observation is an installation that George E. Marcus (2016) and colleagues mounted at the headquarters of the World Trade Organization (WTO) in Geneva, Switzerland, hoping that it would cause those who worked in the building to stop and reflect on their activities.

[50] In the delineated context of the art-in-science-city phenomenon, the notion of cognitive value refers to the added value generated through the cognitive contributions of different knowledge practitioners to an entrepreneurial project, programme, or undertaking.

(Pepperell 2011) are dealing with the controversy-ridden ridden nexus between the brain, vision, and our identity (Eagleman 2015; Swaab 2015; Glannon 2009; Noë 2009; LeDoux 2003 [2002])? Let us now look at how de Menezes explained her art project that takes up the knotty question 'Are we our brain?'

> In this work, I present two self-portraits. In one of them, my brain activity was recorded while I was making a drawing of the Gulbenkian Foundation's gardens while watching a photograph from the gardens. In the second portrait, my brain activity was recorded while I was making a drawing of the same gardens but using my memories alone. The two portraits have been displayed side by side, together with the two drawings and the photographs from the garden. It is fascinating to note the differences in brain activity between the two portraits. However, as some scientists have pointed out, we cannot conclude from the two portraits that the brain areas involved in drawing from a picture or from memories are the ones represented. In order to make such assertions it would be necessary to repeat the same procedure with different people to demonstrate that the results observed are true observations (2008:14).

The inconclusive results concerning the spatial organization of specific brain functions that her artist-in-residence project evidenced brought into the foreground the known limitations of bio-molecular brain mapping technology and techniques. A year later, when I introduced the Thai artist who, like de Menezes, was working with his own brain scans, I asked him to watch a short online streamed video about a neuroscience building with an art gallery,[51] which might be interested in his neurobiologically informed work. In *Building the Future of Brain Sciences* (Edmond

[51] An architectural model of the new Edmond and Lily Safra Centre for Brain Sciences (ELSC) was exhibited during the *Foster + Partners: Art of Architecture* exhibition (4 April-29 June 2014) at the Bangkok Art and Culture Centre (BACC), Bangkok, Thailand.

and Lily Safra Centre for Brain Sciences (ELSC) 2014), Norman Foster informs the viewer that there is going to be a gallery "devoted to works of art, again, associated with the study of the brain" (ibid., my transcription).

The visual arts were going to permeate the scientific spaces and give the building a "very strong cultural dimension," the London-based architect said. "Almost certainly, the facilities this project will offer, in terms of its spaces and the individuals, who will contribute to research, will undoubtedly make this a cutting-edge project" (ibid., my transcription). The president of the Hebrew University, Menahem Ben-Sasson, struck a similarly optimistic note in his elaboration on the development of an integrated research community inside the new building. It 'must connect all understanding of human creativity and influence,' he said. It was "the heart" of the campus because it was going to bring into that building all departments devoted to generating new knowledge about brain health and brain disease. Without it, the institute was not going to achieve "the interdisciplinary meeting of all departments into the process of solving the problems of the twenty-first century enigma: the brain" (ibid., my transcription). Eilon Vaadia, who directs the ELSC, clarified in his account of the value of the new building that it will bring "all the members to one place for fruitful and synergistic interactions" (ibid., my transcription).

In all three accounts the biopolis concept reverberates, as used by the Scottish urban planner and social reformer in the development of the Geddes-Mears masterplan of Mount Scopus in 1919. All three speakers underline the importance of building a culturally rich and diverse research community. The integration of artists into the social fabric of science-dominated communities, however, can be challenging. That is suggested by the two personal experiences of de Menezes, who worked in an environment that has an affinity with the ELSC, and Noraset. In Thailand, there was still 'a long way to go for the art to become more

multidisciplinary' he told the *Bangkok Post* reporter who reviewed his installation exhibition *Fault Lines* (Pongpipat 2014b).

The artist told me that he was keen to collaborate with neuroscientists, but had not yet had a chance to do so in his native country, and he doubted that a collaboration with a neuroscience establishment was going to materialize any time soon (though he did not exclude that possibility). Doubt has proved to prevent the arts and sciences from flourishing together. The lingering doubts of the Portuguese that she had contributed to the advancement of knowledge suggest that the integration of artists into a *biopolis* community can be troublesome even when neuroscientists are cooperative. De Menezes writes,

> Although my work is not based in scientifically designed experiments, occasionally my artistic experiments produce unexpected results. Such results are frequently a consequence of attempts to use the technology in new ways. […] I believe that any experimental procedure, providing it is adequately recorded, it can be potentially useful for science. However, when I work in a laboratory I am not making science: My aim is not the advancement of knowledge. Motivations and strategies are significantly different between artists and scientists, even those working in the same laboratories (2008:225-226).

Her self-critical remarks are surprising because her experimental exploration of the visual pathways involved in the formation of an image through reproducing it from vision (seeing) or memory (thinking) revealed a known limitation of functional brain imaging. They are even more surprising inasmuch as scientists had pointed out to her that 'it would be necessary to repeat the same procedure with different people to demonstrate that the results observed were true observations' (2008:14). From the two

portraits that she produced of her neurobiological identity, which she coupled with her professional identity, one could not conclude that the brain areas involved in drawing from a picture or from memories were the ones represented (ibid.). In short, her self-portraits, produced with colourful and sharp structural images of her cerebrum, made visual a weakness of brain activity mapping with functional magnetic resonance imaging (fMRI) technology (Logothetis 2008). Noraset dealt with that same topic. Like de Menezes, he underwent brain scanning, but unlike her, he obtained his scans from a private clinic in Bangkok.

The reasons why de Menezes doubted that her work had any cognitive value for the research community that gave her access to neuroimaging scanners more powerful than those used for medical diagnosis (de Menezes, 223) can be found in a footnote. She invoked the so-called 'two culture divide' (Kegan 2009; Snow 1953) to support her argument that her aim was not the advancement of knowledge. She was not doing science, but her involvement with science created an artwork that scientists said had cognitive value. Her artistic presentation and interpretation of higher cognitive brain functions made tangible the difficulty of locating the neural basis of drawing from vision and drawing from memory, and productively so. Further tests would be required, her collaborators were saying.

The recognition that her neurobiologically informed self-portraits had cognitive value supports Fischer's hypothesis. It upholds the argument that the visual aesthetics of the bioarts might be useful for writing not only the cultures of science and technology, 'but also the imaginaries that inform new experimental discoveries' (Fischer 2015). Moreover, it shows that the bioarts hypothesis is useful not just in the anthropology of science and technology, but also in neuroanthropology, which channels the analytical energies into the cognitive and implicit ways of knowing (Bloch 2012). Whilst her remark could be dismissed as mere rhetoric (in view of what was said above), she indicated that tensions between the artist and scientific circles persisted.

They persist. Despite investment into building inclusive and culturally diverse research communities, and even despite the 'subjective turn' in the neurosciences (Koch and Marcus 2015) that happened around the time of the neuroscientific turn (Littlefield and Johnson (eds) 2012), they persist. With intent to provoke, I told the two British expatriates that de Menezes's comment about her artistic experiments not being 'based on scientifically designed experiments' was flawed. Her installation work was formally rigorous, and her use of high-resolution neuroimaging technology must have followed a rigorous scientific and bioethics research protocol (to ensure that the scanner was used according to its normal modes). The vice-president of the multinational developer of neuropharmacological drugs responded first. In artworks like "Functional Portraits" he saw an alternative approach to the usual brain disease and mental health awareness campaigns that the multinational firm sponsors (Diary entry, 7 October 2013).

Our discussion brought to the fore three more aspects of the art-brain interface in a *biopolis* context, which we could glean from the way bioartists spoke about their research practice, and which I then integrated into the investigation of bioarts in science-cityscapes. One, the setting of the art gallery in the described social context was *not* simply a shift from one specialist environment to another, as Kac (ibid., 39) argued when he proposed a larger experimental programme that went beyond 'ready-made, conceptual art, situationism, or social sculpture' (ibid., 19). Two, to show that neuroanthropology was well placed to lead the worn-out nature versus nurture debate in fresh directions, one might turn to individual artists who produce neurobiologically informed works that are not 'replaying the tired narrative of recuperation of the avant-garde', as argued by Kac. Three, the need to find artists engaging with neuroscientific questions became a research priority for this study when the vice-president asked if there were any artists in Thailand who did the kind of work de Menezes had done at a neuroimaging laboratory at the University of Oxford, UK.

Averse to replaying the tired narrative that recuperates either the avant-garde or the nature versus nurture controversy, my investigation set out to find artists in Bangkok who 'take into account subjectivity, cognition, symbiosis, communication (from molecular to audio-visual), cultural patterns, and their interaction with the environment' (Kac, ibid.). This analytical shift was considered an essential step in establishing the ethnographic potential of the bioarts to trace a fresh line in the neuroanthropological study of personhood, and more generally, in the propagation of culture outside the Western hemisphere. Since each of the listed elements (subjectivity, cognition, symbiosis, communication, cultural patterns, and the environment) denotes the felt or phenomenal qualities associated with experience, the analysis initially clung to the so-called problem of *qualia* (Blackburn 2008:301) as the larger frame of the art-brain science interface in the exploration of the art-in-science-city-phenomenon in the Neuroworld.

According to the author of *Anthropology of the Brain* (2013), the presumed barrier to the communication of *qualia*, i.e. the feeling of pain, the hearing of sound, the viewing of colour, etc. 'exemplifies the most difficult problem to solve' (Bartra, 31). As such, the conundrum of how neural impulses are translated into the language we speak has attracted interest from scholars across the spectrum of those neuro disciplines (neuroanthropology included), medical humanities, and science studies (STS) that approach the problem of *qualia* as an empirical, rather than a philosophical question. Hence, the ethnographic dialogic engagement (i.e. the principal method of this research study) with the artists (who are presented individually at the end of this introduction) set out to cast light on their attempts to circumnavigate these presumed, and contested, barriers to communication through their art of concepts based on experiential feelings.

The Synaptic Self

Is personhood merely brainhood, or are there other than anatomical, biochemical, and genetic factors that influence who we are? Is the mind reducible to the brain, say to packets of neurons (Crick 1995 [1994]), or to the 'human connectome' (Seung 2012), as 'materialist' philosophers, such as Patricia S. Churchland (2013; 1986) and Paul M. Churchland (1995), argue, or is the mind recalcitrant to reduction? Put differently, is it how the brain is wired that makes us who we are and determines how we behave and understand the world surrounding us? These were the kind of questions that I pondered when analysing the fieldwork material for writing *Brainscapes*. Another, perhaps sharper, formulation of the general conundra debated in artistic and scientific circles, might be formulated as: Is culture reducible to 'skill acquisition' (neural-behavioural) or is it non-reducible information (semiotics, symbolic) and hence, irreducible to behaviourism? Can one explore images produced with advanced neuroimaging technology (e.g. CT, fMRI, PET, SPECT (single-photon emission computerized tomography), etc) to 'see' diseased brains as opposed to healthy ones?

These are among the questions (much distorted through public media) that the artists have woven into their dialogic cultural critiques. Their works of art elucidate why many in the arts and the medical humanities find the reduction of the self to synaptic and biochemical processes in the brain and nervous system as problematic. Their exhibited and unpublished works will reveal their search for alternative understandings of the biophysical mechanisms whereby the brain forms the concepts that we use to instil meaning into the world and orient ourselves in it. Besides commenting on the large speculative leaps required from the kind of data that can be produced experimentally, the artists offer complementary methods for interrogating the translational processes of visual stimuli into communicable ideas and concepts in the language/s we speak.

They do so by drawing on scientific knowledge where they can. The ways in which they speak of themselves as finding such alternative and complementary approaches to general and more specific problems, brought into the discussion by the artists, illuminate how they are working the complex terrain of the art-brain science interface in a Thai cultural setting. Though the bioart scene remains distinctly embryonic, there are signs that the contemporary and experimental art scene is growing. Their artistic responses to the question 'Are we our brains?' are discernible in their elaborations of the artistic techniques they use to achieve the desired aesthetic effects. To bring to the surface and elaborate on the tacit themes of their exhibition works, our dialogues tried to filter out what they intentionally left unexpressed and that which they unintentionally expressed.

How the personal art coefficient (to borrow Duchamp's idea of the earlier described relationship that distinguishes an artwork from an ordinary artefact, i.e. a brain scan from a painted brain scan) acts out in the social reality of an exhibition is illustrated by the reported account of a visitor to the *Mould Boy* exhibition. This sight-specific artwork by Be Takerng Pattanopas was on show at the Industrial Design Gallery in Bangkok in 2006. On record, the Sino-Thai artist and art scholar said,

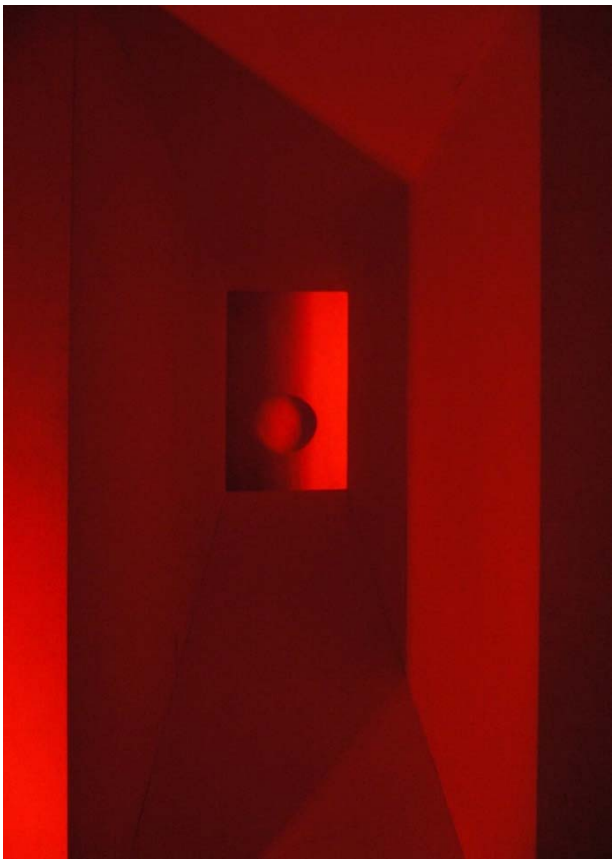


Figure 35 – The installation view of "Mould Boy" (2006) by Be Takerng Pattanopas at the Industrial Design Gallery, Bangkok, Thailand. © 2006 Be Takerng Pattanopas, by courtesy of the artist.

[BTP]: That installation was viewed by just a few people, but those who saw my work were kind of – became very emotional. Without telling them the context of the work, one younger friend looked at it, and I left the room for him to contemplate on the work. When I came back, I saw him crying. He said the work reminds him of his experience in his mother's womb. I am not sure he meant it literally, but at least, the image in front of people in this space --

[BRB]: Provoked a strong emotional reaction.

[BTP]: Yes, yes.

Before we dismiss the young man's pre-birth existence as weird, or worse, as a lie, two observations are in order. Neuroscientific studies have shown that learning begins in the womb. Prenatal behavioural research has demonstrated that the unborn child hears and remembers the voice of the mother and therefore begins to apprehend the outside world in the foetal environment (Moon, Zernzach, and Kuhl 2015; Dirix, Nijhuis, Jongsma, and Hornstra 2009). Therefore it stands to reason that the translation of the mother's sensorial perception into spoken language during pregnancy impacts on the language acquisition of the child in the womb. From a phenomenological point of view, we may say that the young man embodied this experiential sensation as a genuine, real event. He wept. Therefore, we could say that his articulation embraced the *amor fati* as in Stoic ethics.

The young man seemed to be signalling to Be that his pain existed before he did, as in Joë Bosquet's description: 'My wound existed before me, I was born to embody it' (Hallward 2006:41), to which Deleuze (1990:148) referred. One may wonder how an artificially induced visual illusion is capable of awakening such deep-seated feelings. Even though the artist had not revealed to the audience that the body cast was that of a woman's abdomen, taken a few days before she gave birth to a son, this viewer was able to read the tacit theme of this work. How the Bangkok-based art professional, who had previously worked with researchers at a cognitive science laboratory in England, produced that visual effect, which 'tricks' the brain, emerges from an excerpt of our dialogue at Be's art studio.

> **[BRB]**: The mould created the [hollow-mask] illusion. It was a mould, but the perception of it – was protruding.
>
> **[BTP]**: Protruding.

[BRB]: You just got the right angle and the wavelength to produce that effect. There is a technical issue that you mentioned earlier. It has to be – the angle is critical --

[BTP]: It is critical.

[BRB]: **--** for producing this illusionary effect.

[BTP]: Yes, the angle and the level of diffusion of the light. It has to be heavily diffused to get rid of the fact that the shadow is the shadow. It diffused the edges of the shadow to the point that it becomes shading that renders the form, rather than cast the shadow onto the form.

[BRB]: It is then again about keeping out the disturbance.

[BTP]: Exactly (Tab. 1A, 5.1).

The ambivalent nature of this work serves here to elucidate the fact that 'there is a continuum in the operation of the brain, the basis of which is to seek knowledge, which it does through the formation of concepts, to instil meaning into the world' (Zeki, 97).The following passage reveals the various steps in the development of the hidden narrative of the *Mould Boy* installation exhibition, which the visitor, who wept on seeing the illuminated exhibit, apprehended through mechanisms reminiscent of those described by Salman Rushdie in *Imaginary Homelands* (2010). 'Reading Calvino, you are constantly assailed by the notion that he is writing down what you have always known, except that you've never thought of it before' (Rushdie, 255). How is it possible to know something without having thought about it before? Let us first consider the making of "Mould Boy"; a white cement life cast.

[BTP]: One of my closest friends [name omitted], who is a ceramic artist herself, became pregnant. She knows my earlier works that deal with body cast, live cast. She approached me, asking if I would be interested in helping her cast

her pregnant belly to record her memory in the physical sense. At the point, she was just one week before she gave birth to her first son, so we did it. At that point, I got a commission from [corporate name omitted] to use their material, which is white cement, to use that, out of an architectural context and use it to do something else, especially to art. I agreed to make this piece. It turned into an installation. We finished the live cast and then we turned the live cast into the so-called mould. The mould of the pregnant belly made of cement, and that piece was hung behind the tunnel as an installation. We tried to light it, because the magazine [name omitted], well a paper magazine, was supposed to be in to take photos of that, but we ran out of time. Out of the blue, within fifteen minutes, which is very unusual for my work, we managed to get the right lighting and it was beyond my expectation because I expected just a kind of spherical form floating in darkness. But the way we lit it, it turned out to be the spherical form that is floating in red light. It was flooded, bathed with red light, but the kind of shading area of the backdrop of the floating, pregnant, belly, or this sphere, looked almost like it was lit from a giant star. A red star and so it turned out to be.

[BRB]: Like Mars, the Red Planet.

[BTP]: Exactly. That was to everybody's surprise (Tab. 1A, 5.1).

Hans Belting, the author of *An Anthropology of Images: Picture, Medium, Body* (2011) proposed that we enter the realm of aesthetics with the illusion of depth: 'It is only in the realm of aesthetics that we take pleasure in the ambiguity of fiction and fact, of image and medium' (2011:21). Would the young man have had the same aesthetic response if he had seen the body cast at the art studio? We have good reason to doubt it, since the illusions all disappeared in the absence of the lighting effect. Unlit, "Mould Boy" lost the aesthetic effect of awe and wonder that it had at the art gallery when the figure was flooded with red light.

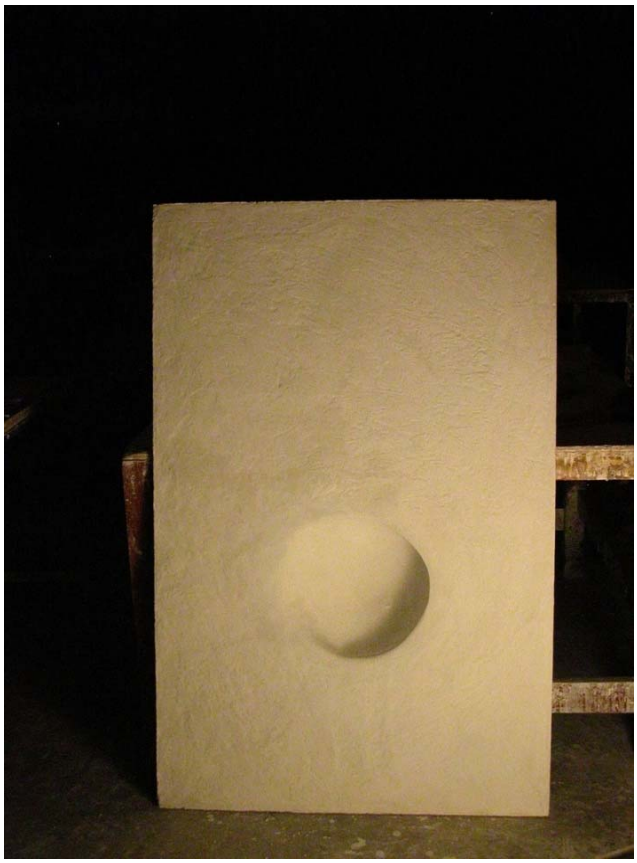


Figure 36 – Work in progress: “Mould Boy” unlit at the artist studio. © 2006 Be Takerng Pattanopas, by courtesy of the artist.

Since the gallery-goer associated the installation artwork with a pregnant womb, we may ask how he apprehended the hidden narrative of this artwork’s realization. How could he possibly have known that the body cast, in fact, was that of a woman taken a few days before she gave birth to a son without having known the circumstances beforehand? A possible reply can be found in Floyd Merrell’s argument that feeling exists prior to ‘sensing and thinking, before labelling and cognizing, without clearly and distinctively being able to say how it is one knows at this level’. What Rushdie observed about the Italian novelist, for some artists, scientists, thinkers and writers is a commonplace feeling.

As examples of this way of knowing through feeling, Merrell recalls Blaise Pascal's concept of the 'heart that has reasons that reason cannot know', and Pablo Picasso, who reportedly told a friend that he did not know in advance what he was going to put on canvas any more than he decided beforehand what colours he was going to use (2010:40). Bartra contended that 'We do not need to analyse the art of, let us say, Dmitri Shostakovich, Isadora Duncan, and Pablo Picasso' to demonstrate that 'at least part, perhaps a small part, of modern symbolic expressions (both discursive and non-discursive' is closely linked to neuronal networks that relay on the existence of external connections' (2014:67). And the examination of the selected artworks turned to that 'small part' of which Bartra speaks in relation to the propagation of culture.

It is in this purportedly small part that links the brain and the mind that neuroanthropological knowledge may be made relevant to art-interested neuroscientists and neuroscience-interested artists researching the neural basis of art appreciation. This epistemological position requires taking into consideration that 'certain brain regions of the human brain genetically acquire a neurophysiological dependency on the symbolic substitution system […] in order to synthesize and break down symbolic and imaginary substances in a particular anabolic and catabolic process' (Bartra, 7). Consequently, one needs to distance oneself from the view that symbolic forms of expressions involve only a very small part of the brain because human cognition is intrinsically social (Ingold 2015, 2007), and acknowledge that they have a neurological basis (Bloch 2015; Turner 2015; Whitehouse (a) 2012) Sperber 1996). The artist's anecdote, and above all his comment that he was not sure whether his friend meant literally what he said, exemplified the essentially subjective nature of sensorial experience, be it joy or pain, which despite being private is shared across cultures.

The innate ambivalence of bi-stable images opens up a field that brings under one roof the disciplines that deal with the formation of concepts, emotions, feelings, and memory. Zeki maintains that ambiguity destabilizes certainty and absoluteness, and has a function of protection. Protection, as we well know, is critical for survival. 'Ambiguity,' he writes, 'is a protective characteristic that the brain has developed but which has been put to good use in enriching many works of art' (2009:63). When we look at bi-stable pictures, we may be inclined to favour one over the other, which implies that our preconceptions might 'give premature shape' to our observations. However, we may also see something that someone else told us to see. That is the case with the art photographic images of Piyatat, discussed in *Bioarts as Memory*, of which he said that they offered a deeper look into nature to seek visual inspiration as to the source of religions and cultures.

These preliminary observations, illustrated with two neurobiologically informed artworks by a Portuguese-born and a Sino-Thai contemporary art practitioner, have provided the background for casting light on the artistic domains of the Neuroworld as they unfold in Bangkok. The premise of the set task draws on Zeki's proposition that 'the function of art is an extension of the function of the brain, namely the acquisition of knowledge about the world'. Since 'the brain acquires knowledge by forming concepts of all that it experiences', one may suppose that 'the mechanisms used to instil meaning into this world are the very ones used to instil meaning into works of art' (2009:96).

An Ethnographic Anthropological Approach to the Art-Brain Interface

There was a continuum in the operation of the brain, the basis of which was to seek knowledge, which the brain did through the formation of concepts to instil meaning

into the world, wrote Zeki (2009:97). This understanding has been critical in unravelling what is seen, and unseen but yet perceptible, from looking at the works of art discussed in the artist chapters. Zeki's argument that the basic mechanisms used by artists in creating their works are those same mechanisms that the viewers use to interpret their achievements (2009:97) has helped this inquiry to establish a link between art and brain science at a practical level. It has been helpful to use it, together with Duchamp's concept of the personal art coefficient (1957, quoted in Arman, ibid., 50-51), to research the selected artworks in a neuroanthropological framework. Both arguments proved useful in that they gave structure and guidance to the dialogues and helped the social anthropological analysis to extrapolate the essence of the artists' work, which deals with the continuum that the pioneer of neuroaesthetics spoke of when comparing artists to neurologists (see ch. 2).

This approach shall not be confused with a philosophy of art that uses psychoanalysis of artists as a methodology. Let me give a concrete example to dispel that implication. For instance, the hollow mask illusion that Be extended to other parts of the body (e.g. the female and male abdomen) prompts the question of how our brain records form. Depending on where we stand, and how we look at the body cast, we are likely to conceive this work of art as a three-dimensional, geometrically shaped figure. Extracting depth from a two-dimensional image is 'one of the most difficult problems the brain has to face' wrote Crick (ibid., 44). From a neurocentric perspective, he surmised that the brain needs not only 'to discover how far away things are from the observer but also to see the 3D shape of each object'. Now, keep looking at the reproduced photograph of "Mould Boy". Is the round-shaped figure concave or convex? Having seen the body cast in its 'raw' form, you may respond that the sculpted figure is hollow. Do look again, and move your head slightly to the side. What do you see now? The figure is protruding, you might say. To achieve this distinctive visual aesthetic effect of "Mould Boy", Be co-opted these two

characteristics of how the human brain perceives, processes, and understands form. We see the installation as a three-dimensional figure, although the photograph is in a two-dimensional plane. We see a convex figure where seconds earlier we saw a concave figure.

Crick explained that visual illusion as follows. 'The impression of depth comes from the shading produced by the incident light' (ibid.), and the 'hollow or bulges' experiment proves it. Whether you see the body cast as a concave or convex form depends on where your brain assumes the light comes from. The artist explained that the heavily diffused red light diffuses the edges of the shadow of the cast to the point where the shade renders the form. The diffused light denies the fact that the shadow is the shadow. Aside from elucidating this phenomenon artistically, Be's work shows the problematic use of feature-based units in neuroscientific studies of art appreciation (Chatterjee, Widick, Sternschein, Smith and Bromberger 2010), such as abstraction, symbolism, and emotional expressiveness[52].

Category errors are inevitable. The problem with these errors is that they interfere with the accuracy and specificity of the conclusions reached, with tests using categories that bioartists are challenging. This problem of categorizing art and splitting it up into conceptual, abstract, new media, or even 'non-high art' is problematic, since artists are challenging these conventional divisions. We have seen it in the art installation of the Malaysian multi-medium artist. For realizing his *Operation Bangkok* exhibition project, he mixed new media art with conceptual art and ready-made, art mapping, drawing, performance art, and other art forms and genres of twenty-first century art praxis.

The two neuroscientists quoted earlier who pointed out the subjective turn in the neuro disciplines proposed replacing the Cartesian proposition *cogito ergo sum*

[52] The 'Assessment of Art Attributes' test, for example, works with these categories (Chatterjee, *et al*. 2010).

with the phrase ‘I am conscious, therefore I am’ (2015:269). The difference between these two epistemological positions and the statement ‘I feel, therefore I am’ (Damasio 2010) was explored by the artists informing *Bioarts as Introspection* and the ensuing chapter *Bioarts as Dialogue*. These differences, as we shall see, raise questions about the seemingly subjective and private nature of the parallel processing-perceptual systems of visual consciousness (Crick and Koch, 119) that Bartra understands to be ‘the most difficult problem to solve’ (2014:31), and which Crick and Koch call the ‘hard problem’ of studying how subjective feelings arise from the physical brain empirically.

‘No one has produced any plausible explanation as to how the experience of the redness of red could arise from the actions of the brain,’ contended the two neuroscientists. However, the artist of “Mould Boy”, like de Menezes, puts his search for understanding the visual brain into a language that, borrowing Zeki’s phrase, is ‘extremely similar to the language that a modern neurobiologist of vision would use, except that he would substitute the word “brain” for the word “artist”’ (1998:77). The experience of red is believed to be subjective and essentially private, and yet Brent Berlin and Paul Kay’s (1969) ethno-linguistic studies of naming colours[53] against spectral analyses demonstrated that colour perception is not merely private, but shared across cultures (Saunders 2000). However, this does not tell us the neurobiological basis of colour vision and associated feelings.

Crick and Koch understand that it is fruitless to tackle head-on the problem of unifying a first-person subjective experience of colour, pain, and other neuronal impulses, with a representational description of these sensorial experiences (2003:119). At this juncture we begin to see more tractable and interesting problems for elucidating the explanatory gap ‘between neural activity and subjective feelings,

[53] Berlin and Kay, drawing on Sylvia Forman’s research, assign the Thai language to ‘Stage VII’. The basic colour terms in Thai are white, black, red, green, yellow, blue, brown, purple, pink, and orange (1969:101).

between the brain and the conscious mind' (Koch and Marcus, 269). For instance, instead of pondering whether we see bulges or hollows in the "Mould Boy" installation, we consider the felt and phenomenological qualities of this ambiguous object.

Rather than pondering the redness of red of this work, we expand the inquiry to the kind of aesthetic responses that the work triggers in the viewer. The problem of *qualia*, in fact, provides 'the common ground at which those interested in cognitive neurobiology usually arrive', namely how 'we explain our individual experience when we perceive the colour red' (Bartra, 31). Since the two neuroscientists assume that explaining the neuronal correlates of consciousness in *causal* terms makes the problem of *qualia* clearer, we may consider what happens in the brain 'when a luminous ray of a determined wavelength enters the retina' (ibid.). This can be done by studying the felt and phenomenological qualities of a bi-stable artwork, like "Mould Boy" or the *Titans* collection discussed in *Bioarts as Memory*.

As mentioned at the outset of the thesis, what neuroscientists may think and say about these works is reserved for future research, and hence, remains unexplored in this study. The insights gained thus far, however, foreshadow possible avenues for studying the art-brain interface with bio-artistic works that decentre the 'barriers standing between the personal, subjective appreciation of beauty and the scientific objective analysis of brain activity' (Cela-Conde and Ayala 2014:277). The anthropologist Bartra maintains that 'Yes there is communication and therefore translation functions adequately'. The notion of adequacy poses a problem.

What does 'translation functions adequately' mean in relation to the view that 'a vast cultural fan made up of language, art, myth, artificial memories, mathematical reasoning, symbolic orders, literary tales, music, dance, classifying mechanisms, and kinship systems' plays an important, and even a fundamental role in translating neural impulse into spoken language (ibid., 31-32)? The Japanese-born artist Eiji Sumi (b.

1970) contested this evolutionary view of art making and art appreciation (Chatterjee 2014; Davies 2013; Dissanayake 1992) when he argued that appreciation of the aesthetic beauty of an art object or of a natural phenomenon was not universal.

> **[BRB]**: You mentioned the importance of beauty and charm in your artwork. In terms of aesthetics, what would you say about emotions?
>
> **[ES]**: Yes. Ah, do you know the lightning bug? *Hotaru*, the insect that lights.
>
> **[BRB]**: That is the lightning bug.
>
> **[ES]**: If you have experienced seeing that, it is quite a beautiful experience, right? It is just something very special. Now, usually it is supposed to be seen in very clean nature, healthy, and not polluted, because they are very fragile creatures.
>
> **[BRB]**: They are glowing.
>
> **[ES]**: Yeah, it is quite a precious experience if you are able to see that. I saw a beautiful, beautiful rainbow two days ago […]. Not everybody can see it. It is the experience that gives you a very special feeling. Art should be that […]. I am an artist […], so I want to let people feel the extraordinary feeling that something say, of course, they have not seen before. That is always my challenge (Tab. 1A, 8.1).

The underlying complexity of the interconnectedness of experience, memory, feelings, and cultural norms and values that influence the way we respond to artworks emerges clearly from this passage. Not everyone, following the artist, has a predisposition for appreciating the beauty of a bug that glows at night, or a rainbow. There is a cultural dimension to it, which resonates in the remark by the curator of the art installation discussed in the second chapter that a conceptual work like that was not often found in Bangkok. ‘We often question whether this kind of work is art or

not,' he told the interviewer, explaining that there was 'always a question like this in this region because our understanding of contemporary art still exists in a limited space' (Ark Fongsmut, quoted by Kaona Pongpipat (2014a)).

The challenge of which the Japanese-born artist speaks regarding his artistic practice, and that of which the Thai art critic speaks in relation to experimental art curatorship in Southeast Asia, comes down to the problem of *qualia*. Their critical comments reveal their efforts to overcome those disputed barriers in communicating with an audience that may be local, international, and/or cosmopolitan. Concurring with Bloch, I would say that situating the problem of *qualia* in a field-based study of what unifies the brain and the mind requires a 'resolutely anthropological approach – as opposed to a merely ethnographic one'. In relation to a bioart-oriented methodology, it would mean a 'reversal of figure-ground relations in analysis', because, as Downey argued, 'a powerful "person centred" approach' would help in 'refocusing our theoretical energies' (2012:248).

As Bloch contended, 'To talk of pain as though it was located in one's leg,' was convenient. However, 'to be successful in developing effective painkillers' one had to 'step outside the illusion: the pain is not in the leg' (2015:221), but in the brain and the nervous system. Like love and beauty, pain is an 'ingrained brain concept', Zeki maintained (2009:157), for reasons elucidated in the *Bioarts as Dialogue* chapter. 'Rather than treating the nervous system as the medium for culture's propagation', Downey suggests, 'neuroanthropology focuses on how the nervous system adapts to social, material, and cognitive environments' (ibid., 248). In positioning neuroanthropology in the 'midst of the relationship of the contending *logoi*', to reiterate Rabinow's phrase (see *Preliminaries*), the chapter *Bioarts as Memory* argues that we cannot sideline the view that we see art with our cerebral cortex, rather than with our eyes (Zeki 1998). Rather, we should consider this and other views of knowing through seeing. Only by establishing a dialogue between

opposing views do I see scope for an aesthetic-based neuroanthropological approach making clear that 'the senses serve as channels for deep enculturation', and that these pathways, visual and otherwise, 'are themselves liable to enculturation' (Downey, 250).

In light of Downey's suggestion that we refocus our theoretical energies through methodological approaches centred on the person (2012:248), I have made inroads into the emerging cultural niches at the margin of the Neuroworld with the artists named in the *Acknowledgements*. From the dialogues with the four artists we shall see that, for them, to treat the brain as either the medium or a 'tiny cog in the wheel' in the propagation of culture represents opposite ends of a continuum as showed the argument between Bloch (2012) and Ingold (2007) in a recent issue of the *Social Anthropology/Anthropologie Sociale* journal (Regnier and Astuti (eds) 2015). The artists who inform this second part of the thesis concur that the painfulness of pain, or the redness of red, has a neurological basis.

To communicate our subjectively felt experiences to others, neuronal processes in the brain translate the privately experienced sensation into shared concepts, such as 'pain in the leg'. Downey argues along those lines when he proposes focusing 'on how the nervous system responds and adapts to social, material and cognitive environments' (2012:248). Bloch observes that 'The knowledge so obtained is not necessarily, nor need be accessible to consciousnesses' (ibid., 183; see also Bechtel 2008). The Malaysian-born artist and creator of the "Operation Bangkok" installation gave a demonstration of how the body in a comatose state interacted with the external environment. Our dialogues concerning his artistic technique gradually revealed that the conceptual idea of how he divided the exhibition hall in his mind had formed in his brain, as he put it, while he was temporarily in a reduced state of self-awareness (i.e. a coma) after neurosurgical treatment for a tumour.

The Artists and their Work in Context

The empirical chapters of *Brainscapes* discuss the ways in which Be Takerng Pattanopas, Roslisham Ismail, aka Ise, Noraset Vasayakul, and Piyatat Hemmatat are 'neurologists', in terms of Zeki's observations on the kind of conclusions that artists reach about the organization of the brain (Zeki 1998), and 'clinicians of civilization' in Gilles Deleuze's sense (1990). The exposition of their unique techniques and their achievements bring into perspective the ways these artists have carved a niche in the 'liminal technoscientific spaces' (Fischer 2015b[54]) of the Neuroworld. Their experimental research is based both on their experiences of neurological testing, including neuroimaging, brain trauma, and altered states of self-awareness, and on their art. Most of them have training in physics, biology, engineering, or physiological perception. Such training motivates their search for alternative and complementary experimental approaches to the study of how concepts, ideas, images, thoughts, feelings, memory, and consciousness form in the brain and nervous system.

Be Takerng Pattanopas (b. 1965) completed his doctoral research in three-dimensional studies at the School of Fine Arts, Cheltenham & Gloucester, UK. He co-founded the Centre for Visual Studies at Chulalongkorn University, where he is the programme director of the Communication Department of Industrial Design (CommDe), Faculty of Architecture. His artistic practice addresses the notions of light and space in relation to the perpetual force of life in the face of the inevitability of death. He is interested in both the physics of perception and the emotions elicited by special lighting effects, which one might also call forms of phenomenology, but forms grounded in a kind of scientific experiment. His earlier work "Mould Boy" (2006) served as an introductory example of an artwork of perceptual illusion. Shadings with red light made the body cast look alternately convex or concave,

[54] See also Fischer and Avery on art installations as institutional therapy (2003, 2000).

floating, or possessed of a varying sense of solidity. In this work, he tried to figure out the right angles and wavelengths with which to achieve each visual aesthetic effect. Be can be said to be intrigued by the strong emotional reactions of viewers to this piece of art, which, after all, is a matter of positioning and precision in red lighting. Be received the 'Thai Research Council Invention Award' in 2006.

The Kelantan-born multi-media artist **Roslisham Ismail, aka Ise** (b. 1972), is the co-founder of the Malaysian art publication *sentAp!* His conceptual work centres on personal experiences of urban communities. In the recent past, he held art residencies in Australia, Japan, and the USA. The exhibition title of his installation *Operation Bangkok* refers to two things: surgery that the artist underwent for a brain tumour, experiencing pain and peculiar structuring of light and dark while in surgery and then in a coma; and the aftermath, when he gradually recovered from this life-threatening and traumatic experience. It further refers to a kind of mapping of the unconscious urban structures of political and psychic repression that he witnessed during an artist-in-residency project in Bangkok. Ironically, the exhibition was shut down prematurely because of the military coup of the 22nd May 2014 – an *operation*, indeed.

Central to Ise's thinking is the way his sudden illness focused him on the psychology of perception and its structuring by the brain. His way of speaking about the artistic technique that he employed for 'cubing the white cube' recalls the magnetic currents 'cutting' and 'slicing' his body when he was in a coma and undergoing several MRI and CT (computed tomography) brain scans. His visual renderings from this period, and later reflections on his illness, express modes of feeling forward through pain and anxiety: the piercing knife of the surgeon, the experience of blood, emergence of memories repressed for months, violence, and blackness. A reproduced drawing of an effigy of himself, silhouetted on the page of a sketchbook and first drawn shortly after he was discharged from hospital, helped us

to see this work in a fresh light and, therefore, relate to it in an unprecedented way. Ise's sketches of seemingly unfinished works are accomplished in their own right. They articulate visually how he experienced the intensive care unit ('glass room') physically and emotionally, and how he struggled to find a way back into the art world.

The independent Thai conceptual and new media artist **Noraset Vaisayakul** (b. 1975), who trained at the Rijksakademie Van Beeldende Kunsten in Amsterdam, The Netherlands, comments on the consumerism of urban lifestyle, a lingering political crisis, and a general sense of an uncertain future seizing the psyche of Southeast Asian urbanites. The two still life paintings "Study of My Own Brain I" (2014), and its sequel, later renamed "Brain in the Dark" (2014), were the centrepiece of the mixed-media installation *Fault Lines* curated by the Bangkok-based art writer Brian Curtin (H Project Space 2014). From a bio-artistic point of view, they were self-portraits. It was not the representational aspects of portraying his neuroanatomy that deeply engaged his interrogation of the relationship between the anatomical brain and personhood, however. More important than finding a matching symptomatology for brain disease and neuropsychiatric conditions that he investigated through pictures of the cerebrum produced with magnetic-resonance imaging (MRI) scanners, he insisted, were the psychodynamic processes as a means of exploring beyond what brain scans could see.

Similar to Ise, he said that his artwork was an ongoing dialogue with his neurobiological identity after a painful event forced him to reorient himself. In Noraset's conversation with his neurobiological identity, he wanted the viewer to consider how to ethically evaluate experimental technology whereby sufferers or patients were put at risk, and even the best results rested on uncertain explanatory structures (Whitehouse (b) 2012). Like the other artists featured in *Brainscapes*, he drew on scientific knowledge where he could. He was interested in older theories of

the criminal brain, and had a particular interest in an Asian brain atlasing project for the experimental art show that we deconstructed together in order to see it in a new light.

Piyatat Hemmatat (b. 1976) graduated from Chelsea College of Arts, University of the Arts London. On his return to Bangkok, he founded the RMA Institute. He is the initiator of the triennial Photo Bangkok Festival. Piyatat mainly works with experimental procedures that investigate the emotional effects of lighting wavelengths and position of the viewer, not unlike Be, Ise, and Noraset. Like them, he set up his study space inside the gallery as one that playfully ensnares the visitors to observe how they react to ambiguous images that evoke memories deeply ingrained in the collective imaginaries of cultures and traditions across eras.

Chapter Two

Bioarts as Introspection

Artists are neurologists, studying the brain with techniques that are unique to them and reaching interesting but unspecified conclusions about the organization of the brain.

– Semir Zeki, *Art and the Brain* (1998)

"I'm the Artwork"

"'Why are you so personal?' she asked me. Why was I so personal?" Ise exclaimed, impersonating the voice of a female artist who had criticized him for publicly speaking in personal terms about his work. From her position, as a defender of a Cartesian view of the brain-mind relationship, she could not but contest and disapprove of his openly displayed non-objectivity. Since this brisk exchange unnerved the artist visibly, let me provide a preamble of what had happened before.

> *Singapore*, 13 June 2015 – The studio talk was well into the proceedings at the time when I reached the designated block at *Gillman Barracks*[55]. The room was tightly packed with visitors. Standing far back, close to the door, I scanned the room. My eyes then rested on the artist who had invited me to the session. "Why was he so silent?" I wondered. Ise was listening to his colleague, who was explaining her artwork in the conventional registers of cultural disintegration, uprootedness, ancestry, and a longing for the pre-colonial, pre-neoliberal era. The usual stuff, I thought. Only after the moderator turned to Ise did he break his silence. Slowly, but with a firm voice he began to speak about his ongoing art project. It was about healing, about the healing of the mind, the brain, and the body, which he maintained were one.
>
> His slow-paced talk captivated the audience. One short, concise sentence followed the other. The tension in the room increased. After the group exhibition in Paris (France)[56], the artist felt fatigued. The exhibition work had taken away his strength. It consumed his aching body, he told his audience. Healing was a process, a passage. It transformed the body, and was lasting. It was physical as much as

[55] This contemporary arts cluster is located opposite the Alexandra Technopark in south-west Singapore.
[56] Ise referred to his participation in the *Archipel Secret / Secret Archipelago* group exhibition with "ChronoLOGICal" (2015) at the Palais de Tokyo, 27 March-17 May 2015.

psychological. His body was locked in a momentary state of in-betweenness, releasing him little by little, he said. Physical pain was focalized in the brain and in the nervous system, he told the audience, while their eyes were riveted on him. The artist to his right and the moderator to his left looked pensive, gazing downwards. They sat, almost motionless, listening to Ise who was stringing together an intimate narrative of healing and lingering pain out of fragments we would be seeing in the adjacent room. There was no rustling of papers or people going through their bags, no checking of mobile phones and texting, no getting up and leaving the room, and there was none of the murmuring heard at so many other such public events in Singapore.

Ise concluded his talk on a formal note. He thanked the art centre for hosting him, the sponsors for giving him the opportunity to experiment with suffering and healing, and the visitors for coming. After the generous applause ebbed, the tall young audience member standing close to me during the talk said, "This man has courage." I nodded with approval. Was he an acquaintance of mine? the man asked. "He is," I replied. Was I an artist? "No, I am not an artist," I answered. He followed me to the studio exhibition. Standing in front of a wall containing experimental drawings, he remarked, "This work looks sketchy." Did it not reflect what the artist had just said about his residency project? I countered. "Astutely observed," the Englishman replied before quickly moving on to greet an acquaintance. Sketchy! I repeated silently to myself, and in my notebook, I wrote 'Looks sketchy.'

Experimental art that emphasizes the processes rather than the 'final product' can look sketchy, especially when presented during an art-in-residence programme. Did the newly arrived man from England not understand the nature of transitions in the career of an artist who relies on sponsorship to advance his research? The exhibited works of the *Melawan Kejahatan* (tr. Fighting the Evil) collection (2015) were unsettling and disconcerting. So was the artist's earlier exhibition in Bangkok whose contours were laid down in an unpublished sketchbook (Ismail, aka Ise 2014)

and gained sharpness in the exhibit, and the post-exhibition drawings that, following Ise's trail, concluded the residency project in the Thai capital city.

Similar to the various segments of the *Operation Bangkok* exhibition, the drawings shown during an open-studio session unravelled a self-narration of pain and healing in an abstract form and style. The images became brighter with the unfolding of the visual narrative. In the beginning, there was blood. There were knives. Violent scenes with iconic figures, almost fairy-like, dominated the course of events related to water, mountains, fire, and evil. The darkness would gradually lose its grip, recede, and subside, giving way to more subtle colours. The thick strokes of black ink literally liquefied[57] in these later drawings of this residency project. When the artist approached me, I congratulated him on his achievement. What did I make of this newer body of work? he wanted to know. In the presence of so many people, I felt uneasy about expressing my view of his latest works. I was evasive. "They reminded me of the journey we walked together," I finally said.

We agreed to meet again later on and if possible before he left for Vietnam. "I'll text you," came back his reply. Ise had not told me the subject of his art talk. Nor had he revealed his intention to give a practice-oriented demonstration of his experimentation with the aesthetics of illness and healing (Fischer 2000; Desjarlais 1992). The event description said nothing about healing, but mentioned the artist's interest in oral history and storytelling, and that his work was 'always participatory, embedded in conversation, friendship and the experiences of simply living life among a multitude of communities internationally' (Nanyang Technological University – Centre for Contemporary Art (NTU – CCA) 2015).

Ise and I would meet only at the preview of the *Photo Bangkok Festival* (29 July-4 October 2015), where I would introduce him to two other artists participating in the envisaged brain art exhibition. After we had spoken to Be and Piyatat, Ise

[57] Ise applied a classic Chinese ink wash painting technique that he learnt from a local master.

agreed to go over the work with me one more time, and recapitulated how we had arrived at the two main conclusions. One, the conceptual foundation of *Operation Bangkok* was laid when the artist was in a coma. Two, the artistic technique Ise had developed and applied in realizing his exhibition project in Bangkok made visible the difference between saying "I am conscious, therefore I am", and "I feel, therefore I am".

> *Bangkok*, 31 July 2015 – "How did the rest of the evening at Gillman Barracks go?" I asked Ise. He sighed. "People refused to understand," he replied. "Who refused to understand? What do they refuse to understand?" I asked. Ise paused before recounting what had happened that evening after I had left. "How can I possibly be distant?" he asked, shaking his head in disapproval. After a pause, he exclaimed, "It's about my work!" I did not interrupt him. "That's me, me! I really don't understand," he repeated, looking at me from behind his thick, dark-rimmed glasses.

His irritation suggested that he was seeking a deeper engagement with objectivity and subjectivity in contemporary art practice. Siding with neither Ise's nor his artist colleague's position in my reply to him, I elaborated on the origins of their dispute as arising from the accusation that he lacked objectivity and rejected the view that truth lies in objectivity. While his fellow artist maintained that the mind and body were separate substances, Ise adhered to the view that the mind was a product of neurological stimuli and processes. Since their respective views on the brain/mind relationship were irreconcilable, I proposed considering the view of the neuroscientists Crick and Koch, who suggested that feelings are subjectively experienced, and hence, belong and are accessible only to the owner of the brain. Without arguing for or against the subjectivity of material objectifications of

experiential suffering, the artist and I tried to expound on our aesthetic sensibilities and sensitivities associated with life and death.

Let us stay focused on the decisive moments in the short path that we had walked together to clarify our discoveries, I suggested to him, and put to one side the argument that he had with his colleague after the studio talk. Did he recall our second meeting at the open-air eatery in the neighbourhood of Singapore Biopolis? I asked Ise. "Sure," he replied. Did he remember what he had said while we were standing in the shadow of a tree waiting for a taxi to take him back to Gillman Barracks? He gave me a puzzled look. From my pocket agenda, I quoted what he had told me two days before he captivated the audience with his public artist talk: "My body is the work" and "I'm the artwork." Did he recall our meeting in Kuala Lumpur in late September? I then asked him. Ise remembered that we sat on the veranda of the Royal Lake Club.

It was his birthday, he recalled. He then added that he had said, "It's all in the brain." Indeed, during that meeting in Kuala Lumpur, Ise explained that his illness had taught him the neuropsychological side of life. On record he said, "It is the brain *who* generates everything about our belief" (Tab. 1A, 4.3, emphasis added). Through this statement, we recognized that he defined the function of art in a way that, following Zeki, "a modern neurobiologist would not only understand but feel very sympathetic to" (1998:77). "It was a long journey," Ise remarked (Post-fieldnotes, 31 July 2015). When we agreed to 'dig' the *Operation Bangkok* exhibit together we decided to put aside the perpetual body-mind conundrum and focus on his use of the notion of 'operation'.

Introspection and self-narration were our key instruments with which to disentangle the puzzle that Ise presented to the readers of the *Bangkok Post* reporter's exhibition review of *Operation Bangkok* (26 April-24 May 2014), and to the visitors. Curious to see what the artist called a "mock-laboratory" and a "fake lab", and hoping to clarify the link between the installation and the title of the work, I decided to visit

the art show on the following day, which was 22 May. Did the exhibition title refer to the poster of the 1966 film *Petch Tad Petch* (*Operation Bangkok*, in the English translation), starring Mitr Chaibuncha and Petchra Chaowaraj? Or did it refer to a field mission to visit places that Bangkokians advised the foreign artist to visit during his residency? Or did it relate to recent brain tumour surgery, as a reviewer of the exhibition stated (Pongpipat 2014a)? Or, was there perhaps any other hidden link, which the artist wanted the gallery-goers to discover while mingling with them? I was confused, and resolved to find out how these different meanings might hang together.

My plan to visit the art exhibition on the day after the publication of the review did not materialize, however. The exhibition had no tomorrow. Prematurely, but adding significance to the exhibition, *Operation Bangkok* closed when the military coup leaders decided that all universities must close for four days. Notwithstanding the political circumstances, the artist and I would meet. The deeper meaning of the artist's use of the notion of operation could be recognized only retrospectively through introspection, and not by looking it up in the exhibition review (ibid.) or the catalogue (Bangkok University Gallery (BUG) 2014a). Ise's curator Ark Fongsmut described the experimental artwork as follows.

> The mock-laboratory or fake laboratory was built from what he had faced in this contradictory city through collections of found objects from many places. Unintentionally, it is quite similar to the idea of Cabinet of Curiosities in the West but here shows the collected and categorized objects in relation to natural history, archaeology, religion and belief (of Bangkok). He presents found objects through a trail in the map. It is Bangkok from a foreigner's point of view who does not and cannot comment much except invite the audience to participate in this fake lab in order to operate Bangkok … before the upcoming Bangkok Governor election (ibid., 5).

***Making* Operation Bangkok**

"Come here before 11 o'clock," said the female voice on the other end of the phone. "I'll try to make it," I replied. In the taxi, I reread the passage in the exhibition review that I had circled in red. The *Bangkok Post* reporter wrote, 'ISE recently had an operation to remove a tumour from his brain, and this, he says, is where his inspiration came from. His exhibition is an operation into his memories and experiences in the capital during his 45-day stay as an artist in residence' (Pongpipat, ibid.). What did an operation into one's own memories and experiences mean in relation to writing an account with objects that the artist collected, and drawings and videos, which he used 'as his medium of expression'? How, I wondered, did this latter remark of the reporter link with the curator's explanation that 'The collection of these little things cleverly shows the concept of an operation'? I thought.

The gallery was very quiet when I arrived. It seemed as if the eeriness of the world outside had crept into the building. The gallery manager, who had kindly granted permission to visit the exhibition despite its having already closed, informed me that the artist was not there, and that his crew would arrive at any moment to take down the installation. As she switched on the lights, the artist appeared in the doorway. "I'm here," Ise said with a bright smile. He had probably been informed of my visit, since a few weeks later he told me that he was positively surprised to hear that someone from NUS wanted to meet with him. "Very unusual," he said. How had I managed to arrive at the gallery in less than an hour? he asked, surprised. There was barely any traffic, I explained. Had I seen the tanks in the street? "Yes," I answered him. I had seen them. Was I going to leave Thailand? the artist asked. "No," I replied at once. There was a pause. My fieldwork had just started, I said[58]. With the dry comment "I understand," he closed the subject.

[58] I thank the Deanery of FASS, NUS, for approving my appeal to remain in the field.

"This is for you," Ise said. "What is in it?" I asked. The artist did not reply, but chuckled. The label on the brown transparent laboratory-sampling bag read: CHEMICAL IDENTITY: Operation Bangkok; MANUFACTURER: Bangkok University Gallery; GENERATOR'S NAME: Roslisham Ismail aka ISE; DATE: 26 April-24 May 2014. None of the four boxes next to Health, Flammability, Reactivity, and PPE was ticked. The bag contained the exhibition catalogue. How weird, I said to myself. It was essential, Ise told me, that I understood the technique he used to organize the stuff that he had brought in from the library, a science laboratory, laboratory suppliers, flea markets, and other places. It was "a really chaotic well organized thing" he said, while I took notes.

With his right arm stretched out, he drew sharp horizontal and vertical lines in the air. He was cutting and slicing the space, he said matter-of-factly. I must have looked puzzled. He repeated the two earlier movements, explaining that cutting and slicing divided the white cube into discreet, manageable, and localizable mini cubes. The lamps hanging from the ceiling 'cut' the space vertically while the bookshelves 'sliced' the room horizontally. This approach to the division of the room prevented the natural light and the large size of the exhibition hall from killing his work, he explained. Light equalled entropy, causing chaos, and leading to bodily decay and, finally, death, I learnt. "Shadow makes things stay put," he clarified.

A few weeks later, Ise would demonstrate the visual effect of shadow on a piece of paper. "See, now the figure is grounded." What was the purpose of the random arrows on the floor? I asked. "They are crossing the cube," was his reply. "That's the grid of *Operation Bangkok*" Ise told me, and repeated his earlier gesture, together with the same words, 'cutting', 'slicing', and 'crossing'. Transfixed by the strong terminology the artist used for describing the essence of his work, I stopped. He stopped, too. We looked at one another. Did Ise sense my growing uneasiness despite my saying nothing? "The lab is a map," the artist continued. "What?" "The

lab is a map," Ise repeated. He wanted people to understand and believe in what he was doing, he said. I made an effort to understand and believe in his intentions, hoping that this would unlock the mystery of the origins of the exhibition title and its specific meaning or meanings.

My gaze fell on a radioactivity-warning sticker on a shelf, on top of which the artist had placed a glass jar filled with water, covering up to the jaw the decapitated head of a female mannequin. What a creepy thing! I thought. The stickers were an essential detail, Ise explained while we stood in front of a medical education poster of the human body. Above the wall-painted jars containing a human liver, lung, and heart, the artist wrote in black capital letters the name of a university-based medical museum. "This is when I was on a mission to visit the death museum," Ise said. Visiting this place was part of the operation, he specified. I was confused.

Figure 37 – The cardboard buildings in this medical section of the "Operation Bangkok" installation denote those buildings on the medical campus of Mahidol University hosting the Siriraj Medical Museum. © 2014 Photo by B.R. Buergi.

"What operation?" I wanted to ask him, but did not say a word. The strong smell of antiseptic solution suddenly made me feel queasy. I grabbed a desk chair. Leaning against a white lab coat, labelled with the 'chemical identity' of the exhibition, I watched a fighting fish swimming in an Erlenmeyer flask, while I tried to make sense of what the artist said about gridding and cubing the space. My head was pounding. Ise looked at his wristwatch. It was past twelve o'clock. His crew was going to be there shortly. The Taiwanese assistant curator arrived first. She offered to take pictures of us and so I gave her my camera.

Standing against the wall with the drawing that put on record his visit to the early twentieth-century Café de Norasingha inside the Phramongkutklao Hospital complex in the Dusit area[59], I forced a smile. I thanked the artist for the private tour and we agreed to meet in Kuala Lumpur the following month. When I stepped out of the gallery, I took a deep breath. The rain had stopped. I looked for a cab. There was none, and so I started to walk (Fieldnotes, 26 May 2014).

A few weeks later, we met in the capital city of Malaysia for our first audio recorded dialogue session. It was on the Friday before the start of Ramadan and there was excitement in the air. Inside the Royal Lake Club near the botanical gardens, we ran into a local art collector. He enquired about the purpose of my visit. "Work," Ise replied quickly. Where had we met? "In Bangkok," I volunteered, and asked if he had seen Ise's latest work? "No," he replied. He had not seen it, but could imagine well what sort of work it was. "Uncollectable," he remarked. "As I say, it is uncollectable."[60] Ise glanced at me sideways. His gaze then shifted to the plate in front of us. "Curry puffs, sardines, or --" Before he could finish the sentence, an acquaintance of the art dealer interrupted him abruptly, and they left.

[59] Dusit Thani was built after an early twentieth-century miniature utopian town plan (Baker and Phongpaichit, 101).
[60] Among the public and private art institutions that acquired works by Ise are The National Art Gallery in Kuala Lumpur, the PETRONAS Gallery, the National Gallery Singapore, and the National Taiwan Museum of Fine Arts.

"Many people here in Malaysia think it is not art what I am doing," Ise said with an expression that shifted between defiance and resignation. After we had left the snack bar for the quieter veranda of the Sports Bar, Ise said, "I brought this with me." Looking up from the audio recorder manual, I asked what it was. Holding the installation sketchbook of the *Operation Bangkok* exhibition (Ismail 2014) almost ceremoniously in his hands, he declared: "This is the brain and the memory of *Operation Bangkok*." I was baffled because I had not thought he would bring it to our meeting, especially since he had specified its value when we met in Bangkok. Would he take me through the sketchbook page by page? I asked. "Sure," Ise replied (Fieldnotes, 27 June 2014).

The first image was the sketch showing a smoking pot of ice cream featured in the exhibition catalogue. "I keep telling myself that I want to go out from this comfort zone […] I need to challenge myself to make something different," he remarked and turned the page swiftly. What came next was truly very different from the *Lankasuka Cooking* project (Maravillas 2014). We were looking at an outline of a room drawn in two-point perspective. Just above the upper demarcating line, Ise wrote '*Operation Room*'. Below the line indicating the floor, he wrote '*Operation Bangkok*'. The text underneath reads: 'spaces look like operation room'. On the lower left side, he had jotted down the various sections of the imagined installation and on the lower right side, a microscope.

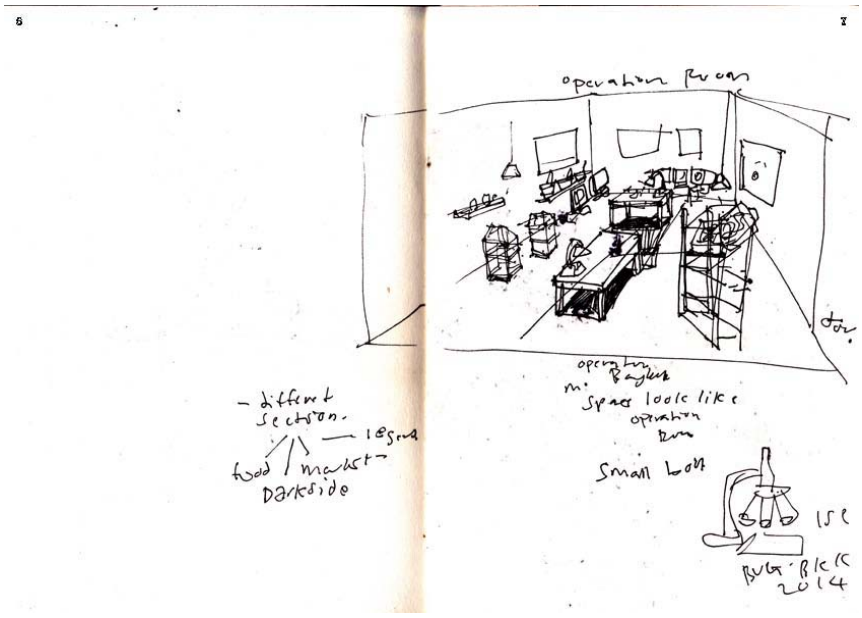


Figure 38 – The beginning of the *Operation Bangkok* artist-in-residence project seen in the artist's unpublished sketchbook. © 2014 Roslisham Ismail, aka Ise, by courtesy of the artist.

Did Ise use the notions of '*Operation Room*' and '*Operation Bangkok*' interchangeably? What did 'legend' and 'Darkside' denote? I wondered, but hesitated to ask since it seemed insensitive to raise (private) medical health issues. Did the exhibition title refer to the poster, as the artist had told me? I did not question his account since I was still feeling a way forward in my effort to learn *from him* how he dealt with the ordinariness of life (BUG 2014a: 4) artistically.

> **[BRB]**: Perhaps you could tell me something about what this is about, and at what stage the project was here.
>
> **[ISE]**: Actually, this is the first ever drawing that I made when, after three weeks, I hang around. I think, first, because I am – there were two things I was scared about starting the project. It is about how do I want to compile my idea to become an artwork, and second, the space is super big, super huge, a white cube. With the natural light coming down, that is really a struggle for me,

> because how can I handle this kind of thing? In a technical way, I think that if I just make a drawing the space will kill my, my, – eating my work easily. So either one, I have to design the thing to make the space. I kill the space or the space will kill, kill my work. Because of the title itself, I got the title from a film, an old Thai movie poster called *Operation Bangkok*--
>
> **[BRB]**: Yes.
>
> **[ISE]**: -- that I found at a night market. I started to feel that the process I made is – For three weeks, I am going around with a map, asking Bangkokians to, to suggest where I should go, like a mission, something like a mission. I have to go here, here and there, and then it is like an operation thing. Then, I try to combine all this kind of thoughts, and I decided – I got an idea about making a lab of the – like an operation room. For sure, I really like the old school thought of operation room that we have like a huge blackboard and we can write something, and then, try to make a setting like, yeah, like a lab (Tab. 1A, 4.1).

Ise said that he had tried to string together all these thoughts. He achieved that, in both theory and practice, by stringing together the various conceptual meanings of the polysemic notion 'operation'. The Thai film poster, the surgical theatre, the mission to visit places Bangkokians suggested that he explore, the photocopied street maps on which he put signposts tracing his mental and physical journey through Bangkok, and his hospital experience, were all linked to that one word: operation. The sketch that the artist called 'a simple drawing' synthesized the key elements that made *Operation Bangkok* a map of the unconscious urban structures of political and psychic repression. This proved wrong his curator's surmise that a foreigner's point of view on the 'legend' and 'Darkside' did not and could not contribute much 'except invite audience to participate in this fake lab' (Fongsmut 2014).

The nexus between *Operation Room* and *Operation Bangkok* was more difficult to discern compared to the connection between the 'legend' and the

'Darkside'. The tacit theme of this art project lied below the ethnographic surface. That connection was not directly inferable (see ch. 3). The ensuing dialogues will make it clear that this linguistic detail matters. It matters first and foremost because the transition from one operation (i.e. *Operation Room*) to the other operation (*Operation Bangkok*) draws attention to the importance of channelling one's energies into the cognitive as argued by Bloch (2015, 2012) and the debate that ensued from this seminal work (Regnier and Astuti (eds.) 2015). By closing in on the underlying thought processes we will gain access to the hidden narrative of this art installation, and thereby a richer phenomenological understanding of this multi-medium installation in Ise's body of work.

> **[BRB]**: You entitled it *Operation Room*, right?
>
> **[ISE]**: Right, *Operation Room*, it is not like *Operation Bangkok* or whatever, yet [….]. It is still the first thing. Then there is a thing, I think this was the next day because I always, I know that when I get the, the idea, the thing becomes better. Like, I have the energy to make a drawing. So, so I know the positive side is coming out now of me, like --
>
> **[BRB]**: You already have more colours. I mean, I can see white and yellow.
>
> **[ISE]**: Yeah, this is like, I, because, as part of my research, I went to all the second-hand markets and I saw this lampshade, I really love this kind of, like rustic green thing, and then I think I need to put a little bit of colour in the, in the installation itself. So yeah, because I am not buying the lamp, but, but I already have in my, I try to sketch, in my mind, that I want to use this kind of thing. Then this is the first time I try to put a figure, just a suggestion of a figure.
>
> **[BRB]**: They are in white, so --
>
> **[ISE]**: Yeah, just because I --
>
> **[BRB]**: Wearing lab coats?
>
> **[ISE]**: Yes, I really wanted to have them wearing lab coats (Tab. 1A, 4.1).

Why was there a microscope in the early sketch? How did he get hold of not just one, but three microscopes? I had saved this question for our next encounter to see if it would reveal something about the artist's connection to the local bioscientific community and his involvement with life scientists. When I eventually put this question to the artist, he made an admission that would be crucial in laying bare the mutual relationship between *Operation Room* and the 'fake lab' in the conceptual thought process that brought this installation into being.

> **[BRB]**: The microscope.
>
> **[ISE]**: It already has the microscope. I always have this kind of imagination that a laboratory must have a – That's the key element […]. That's why early, that is why I just put a drawing here to make sure that this is a priority of my installation. For me to get one microscope is already OK, but I must have. […] One day, when we walked through the Thief Market, we saw an old microscope. But at that time, I didn't have any idea about the lab. We did not buy the thing. […] A few weeks later, we tried to find it. It was not there anymore. Then, I think that I am quite fussy about it. If I want something that is really important, I need to have it. We used all kind of networking to get the microscope.
>
> **[BRB]**: Where did you get it from, finally?
>
> **[ISE]**: Suddenly, we were lucky. My assistant curator, her father is a scientist [laughing]. Yeah, we proposed it to him and then, he lent us three. We got three real, functioning microscopes from a real lab (Tab. 1A, 4.2).

"At that time, I didn't have any idea about the lab," the artist had said, and yet he did, as we would discover together. His technique, he realized, was for the work to have already formed in his mind at the time he went to the night market. It was there.

The microscope was just one of the many specific items Ise wanted in order to recreate a mini-microcosm of contemporary Bangkok life according to a scheme that had formed in his head just weeks before he started the residency programme. But he was not conscious of it until we were 'digging deeper' to pull back the layers that formed around the term 'operation'.

What was it like to see and feel the world by cutting, slicing, and crossing the space? I wanted to ask the artist, whose feelings of pain I sensed during the visit to the exhibition, and again later, when we leafed through his sketchbook. I wanted to tell him that it hurt me to see him cutting and slicing the sultry air, again, and again, while repeatedly saying, 'cutting, slicing, cutting, slicing, cutting'. However, I waited to tell him, and in the end, decided not to tell him why the installation distressed me. As we were looking at a black-and-white installation sketch visualizing his approach to cubing the space, I remarked that he had drawn a similar sketch without the arrows earlier.

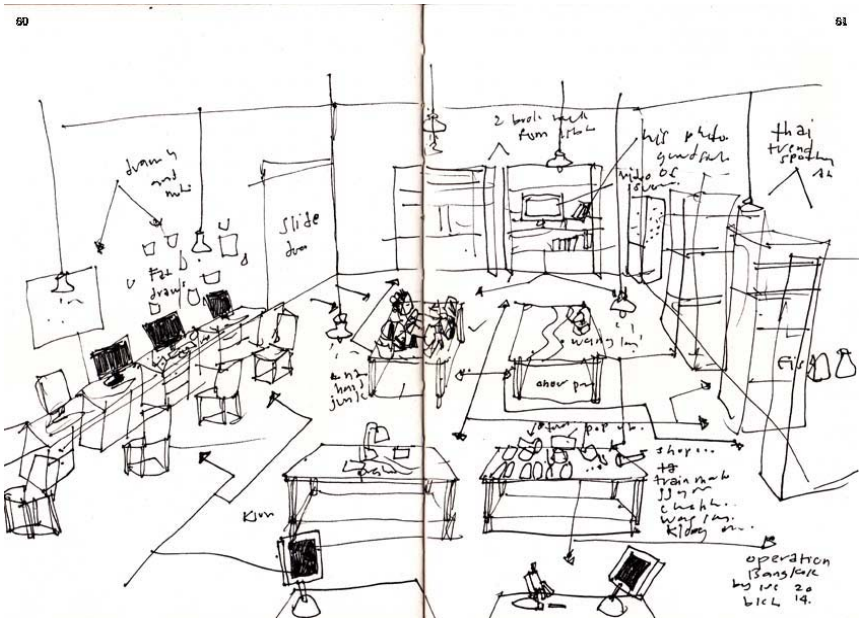


Figure 39 – Ise's 'cutting, slicing, and crossing' technique used for 'cubing' the space.

[ISE]: I need to see three-sixty degrees. It is about how I want to make sure that the space, that I am not just facing one face […]. I try to change what you see from this angle, which means I will not lose grip of the whole space. Because that is why I really like to see the floor plan and then, how I arrange the things, so I can see it in the top view.

[BRB]: Back to this idea of the, the cube --

[ISE]: Yes.

[BRB]: -- which you mentioned in the beginning --

[ISE]: Yes, because at that time the space is still big for me until when I, we, me and Ark, go to the library to check the things we can borrow. Then, I realized the bookshelf is really interesting because first, we can adjust the height of the platform --

[BRB]: Of the bookshelves?

[ISE]: So at the end of the day, it is really like slicing the thing --.

[BRB]: Right, so you have flexibility.

[ISE]: Yes, the flexibility. […] I realize that I really can play around with that kind of like the horizontal line, actually. Then, yeah, also about the technical side, about the lighting, why I want the lighting to drop down because it really like distracts the eyes of people. If not, you can just go in and that is like an empty space because the ceiling is so super high. It is really like hollow because nothing is there. By dropping down the wire, the black wire with the light automatically distracts. The line distracts the vertical line of the space, and so it automatically, is like cutting.

[BRB]: I see. So, you have the cutting, and you have the slicing part. While the cutting is horizontal, sorry vertical, the slicing is horizontal.

[ISE]: Yes, horizontal. So, at the end of the day it is like making the cube. The cube segment of the – like we automatically, in the mind, we are cubing small, small, portions of the whole space.

[BRB]: Of the entire space?

> **[ISE]**: Then it starts getting easy for me to handle the section. Every section I can start to manage, to arrange everything […].
>
> **[BRB]**: I see. As you are explaining it, there is, in addition to the floor plan, a grid of what is above the floor.
>
> **[ISE]**: Yes, so, yes, that is on the technical side of, like how I want to kill the space (Tab. 1A, 4.1).

As our dialogues drew us deeper into the labyrinth that had been created by the entwined associations of the exhibition title that, according to Ise's curator, showed 'funny originality', it turned out not to be that funny after all. What about the white figure that he drew with a few strokes in one of the early sketches? "Is it you?" I asked Ise. "No," he replied. It was not him. He gave a similar response during an interview printed in the catalogue. "Will you be in the lab as a scientist?" the interviewer of the *Fine Art Magazine* asked Ise. The artist laughed it off. "Hahaha, no, we will have somebody else" (BUG 2014a:13). Why did the artist keep himself out of the installation in which the viewers, according to his curator, were to find 'personal traits' (BUG 2014a:4)? Fongsmut remarked that Ise's 'free-hand drawings with bits of colour' were 'lively' and suited 'his character' (ibid.). In what way was this art installation autobiographical? It would take us several months to understand better the intricate connection between his cutting and slicing technique and his experience of repeated brain scanning before, during, and after the process of surgical removal of a tumour from his brain.

Unmaking Operation Bangkok

"You see the present through the junk of yesterday," Ise remarked colloquially during the guided exhibition visit. Later, and on record, the artist said it was part of the process of the study and the best way to present his idea of an operation, because for this installation he wanted "to use as much of an object as a challenge to represent the idea" (Tab. 1A, 4.1). "Did the idea relate to the brain surgery, as stated in the *Bangkok Post* exhibition review?" This explanation, however, would imply that this work originated from a sedated brain, which is a big presumption. Assuming this was the case, one could expand Zeki's (2009) proposition that imagination develops from interaction of the concept-forming system of the brain with the external reality, to situations of reduced self-awareness.

We then resumed our discussion about the compartmentalization of the 'white cube' (the art space). Ise conceded that the exhibition visitors might not have been able to see the imagined grid through which he could see the various sections that he had signalled in the first sketch (i.e. food, market, legend, Darkside). "We have this segment, maybe people cannot see, but I can see the grid," he explained in relation to what he had told me at the gallery (Tab. 1A, 4.1). He wanted his audiences to understand and believe in what he did. During a roundtable organized as an iteration of fieldwork at my home department in Singapore, Ise said: "It is like the whole work is a map, like a living map from my vision" (Tab. 1D, 2). Again, his audience may have found it difficult to grasp the sense in which *Operation Bangkok* was a living map drawn from his creative imagination.

What to the viewer might appear as a disorganized chaos was indeed structured and organized. Intention and purpose shaped every detail of his process-based and interactive exhibition, as would emerge from Ise's interaction with the audience during the exhibition (Bangkok University Gallery (BUG) 2014b) and his account of

setting up and dismantling the exhibit. Without pressing the artist about the argument, I let the question rest until after my return from a study trip to England. We had just arrived at the Sports Café when I gave Ise an exhibition catalogue from the British Museum in London (Taylor and Antoine 2014).

"Wow!" Ise exclaimed, and thanked me for presenting him with a birthday gift. I watched him leafing through *Ancient Lives New Discoveries*. He looked at the body scans of the eight mummified people produced with X-ray computed tomography (CT) and said nothing. After a while, he closed the catalogue and put it aside, still not saying anything (Fieldnotes, 26 September 2014). Was he ready to start the session? I asked him. He looked at me and said, "Yes."

> **[BRB]**: In *Operation Bangkok*, the substrate was a map and you drew on the map, but it wasn't just about the map, but about stories. You followed the --
>
> **[ISE]**: Instructions by Bangkok people.
>
> **[BRB]**: Exactly, you called it a mission.
>
> **[ISE]**: Yeah.
>
> **[BRB]**: So, it is their stories that are on the map.
>
> **[ISE]**: Yeah […]. It is like mapping in a different way. Physically I go, experience the thing and then, and then, I think the best way to represent it by, also make people have to walk around, to go inside the map. That is why I decided the installation is a map, is a lab, but also, it is a map that you have to discover by yourself. You have to go inside and discover, see things. You can feel it (Tab. 1A, 4.3).

Indeed, I could feel it. Again I felt the chilling effect that *Operation Bangkok* had on me. In inexplicable ways, the exhibition revived memories of an episode in my life that I had forcibly repressed, or in the words of Paul Ricœur (2004), had lost

to ‘forgetting and the effacing of traces’. The artist and I had never spoken about my experience of neurological testing because of a suspected tumour, and I had no intention of raising the matter, chiefly because of medical confidentiality. It was Ise who opened up, telling me how he remembered the time when he lay in a coma.

> *Bangkok*, 25 December 2014 – It was Christmas at the British Club. We were the last diners in the Suriwongse Room. Seated facing me, Ise opened his sketchbook. On an empty page, he began drawing lines with a black pen. “Cutting and slicing, cutting and slicing,” he repeated several times. Startled, I held my breath. He had done it before, he told me. The silhouetted person in the sketch must be an effigy of his self. Seconds later, Ise confirmed my premonition. He had used those same words when he had explained the grid structure in practice and by application, and not just as subject matter inside the gallery, I remarked. He looked up from the sketch and right into my eyes. I thought of our third audio recorded dialogue in Kuala Lumpur, when Ise said:

> > When I saw the thing, when you came from the British Museum, about the CT scan, and MRI, and then – now, I start to think about, maybe this kind of inner experience when I experienced in hospital, when I had been scanned like five times CT scan, two times MRI. Actually, it reflects about the whole thing when I was – without my noticing, when I came to Bangkok. Now I see. Now it makes more sense, about me, and my work, of how I conceptualized things, and everything. We are not talking about more physical work but more about the concept. It is funny we have work now (Tab. 1A, 4.3).

The reader may think that I coaxed the artist into making that statement, and that I led him to this conclusion, based on my untested assumption that his experience

of brain scanning might be the link between *Operation Bangkok* and the *Operation Room*. But it had never been my intention to test that assumption; it developed from our dialogues. And interestingly, that was not the case. That idea had formed in the head of the artist long before we first met. Was there anything else I wanted to add? Ise enquired before we left the dining table. My throat felt dry, and my palms were sweaty. The grid structure of which Ise spoke repeatedly showed 'brain reality coming into play', as Zeki might have put it.

By mobilizing the polysemy of the word 'operation' imaginatively, the artist was able to express the lived experiences and memories of Bangkok through those he experienced when his brain had been mapped before, while, and after he was in a coma. That is where these multiple meanings of 'operation' came together and created the coherence which gave integrity to this experimental artwork. Therefore, to discuss the aesthetic quality and cognitive value of *Operation Bangkok* in relation to the bioarts hypothesis from a neuroanthropological position, we could start by examining the connection between the *Operation Room* and *Operation Bangkok*. This lies in the artist's lived experience, memory, and imagination.

The conclusion was that all given interpretations of the polysemic notion were valid and involved both memory and experience[61]. It was reached by analysing closely how Ise's exhibition was 'an operation into his memories and experiences in the capital during his 45-day stay as an artist in residence' (Pongpipat, ibid.). When Ise asked me whether there was anything else that I wanted to add, I enquired whether he had noticed that he had used the two notions of cutting and slicing as two different categories of movement; as if cutting indicated a vertical dimension, and slicing a horizontal dimension. His technique made a difference, whereas the jargon of neuroscientists fails to make one. MRI cross-sections of the brain are referred to as 'slices' regardless of the direction.

[61] For a neuroscientific explanation of the higher levels of ambiguity see Zeki (2009:87ff).

For instance, the introductory text on brain scans[62] that I had shared with the artist described the coronal plane as 'a slice that looks at the brain face first'. The axial plane was described as slicing 'the brain from the top down, like layers of a cake', which corresponds to the (horizontal) slicing in Ise's understanding, whereas the sagittal plane sliced 'the brain from the side'. This observation on a linguistic nuance may well seem trifling, but it was important when Ise and I tried to establish the origination of the *Operation Bangkok* project.

> **[ISE]**: Sometimes I feel I am sick. If I remember the period, I am scared, but I have to make my brain to think about like, to be positive, to make sure that I feel […] not nervous anymore. It is about, I think --
> **[BRB]**: Do you think, in retrospective, the idea of the fake lab came from your personal experience, of being in hospital for a considerable time?
> **[ISE]**: I think so. I think so, it's --
> **[BRB]**: Earlier, you have not had the idea of setting --
> **[ISE]**: No.
> **[BRB]**: -- up a fake lab.
> **[ISE]**: No, no, no. I, I think it is coming from inside. That is why I see more clear when I saw the CT scan just now of what happened in the British Museum. It makes sense. […] without planning itself, it keeps coming out from. This is why I say to you, if you were not coming to see my exhibition on my last day, the work had just finished there (Tab. 1A, 4.3).

In the dialogue recorded before year-end, Ise removed any doubt that remained about the origins of the exhibition. An excerpt from our fourth transcript (Tab. 1A,

[62] Neurosurgery Basics, n. d., see http://neurosurgerybasics.com/brain/brain-mri-a-systematic-reading/.

4.4) explains why he would say a few months later that he was the artwork. In conclusion, his introspective narrative made visible the difference between saying "I feel, therefore I am" and "I am conscious, therefore I am." It is grounded in the artist's understanding that he did not remember anything about the twelve days following his operation, but that conceptually he was able to express it *visually* and thereby externalize his experience of a life-changing episode.

> **[ISE]**: I was in a coma like for twelve days and then, when I came out of the coma. It's really weird because I cannot remember anything of these twelve days. Until now, it's actually confusing as I try to remember. I just listened to what my friends or my family told me about what had happened to me in these twelve days. It was very critical. When I was in a coma, they put me in the intensive care unit. They put me isolated in the glass room […]. So, I still, it's blurred of what happened to me and then, I still try hard to remember, but I cannot remember […]. Yeah, and then, when I woke up from the coma, I am lucky that I survived. I am still thinking about what happened to me in these twelve days but it's really blurred, it's really, like erased. It takes me a few weeks to remember everything after like, when I came out of the coma, like my brain had stopped. I could not remember anything but I am lucky. Slowly it's coming back --
>
> **[BRB]**: Slowly you recovered.
>
> **[ISE]**: When I recovered, I started to remember many things, everything actually. When I recovered a little bit, I was discharged from the hospital and I went back to my hometown, and met my grandma. Then, we had a long chat. She told me how scared she was. That maybe she might not see me again, because I was in the glass room. Then the glass room, it represents almost –. Not many people have a chance. Even the doctor said that my chances were maybe thirty percent, but I survived. From that point, when she was talking

about, clearly talking about the glass room, she made me recall all that I had been doing all my life. Challenging the space […].

[BRB]: In this case, the space challenged you. It became life threatening.

[ISE]: Yes, and then, so because I am doing this kind of sketches, since before I was sick --

[BRB]: Before going into hospital, you had a project that was on space.

[ISE]: Yes. Then, what I was doing is I just went back after talking to my grandma. I am – I feel something curious. I suggested going back to my house and I start to – because I have graph paper. Normally, I am joining the graph paper to see, like, I like to see the space. By putting one line, you can see different dimensions. I always play around with that. What I am doing is, I go back and just draw, join the lines, so they become a box. Then, I start to make more lines inside the box, inside this box. You can see very different things, and then, because I have this, because I am doing it now, after I talked to my grandma about the glass room. Then, I have this figure, a stamping figure. I bought it in Korea long time ago. Always, if I am lazy to draw, I just put this guy. I am stamping this guy in my drawing, and then it automatically, it represents me. Like, "Oh, this guy is me, my alter ego". I have this at my home. So, when I draw the box with all the lines crossing inside, I thought, "Why don't I just take the guy and stamp the guy inside this thing?" That is the first time. I still don't know exactly what happened to me during those twelve days, but conceptually, I know what happened to me. I cannot say it in detail. But because I started to see this figure, like when you are putting it there, like automatically, all the lines are slicing, crossing, it is as I am already, I've become a part of like of --

Operation Bangkok.

Chapter Three

Bioarts as Dialogue

My life has just completed a big circle and come back to its starting place: a room blown out.

– Tomas G. Tranströmer, *Preludes*

Artists as Patients and Clinicians of Civilization

> *Clinicians who are able to renew a symptomatological table produce a work of art; conversely, artists are clinicians, not with respect to their own case, nor even with respect to a case in general; rather they are clinicians of civilization.*
>
> – Gilles Deleuze, *The Logic of Sense*

"Does my brain have a problem?" Noraset Vaisayakul asked the neurologist who was explaining to him the results of the MRI brain scan during a consultation at a private clinic in Bangkok. The fear that there might be something wrong with his brain troubled the artist deeply during a period of his life that his friends compared to a 'rollercoaster' (Tab. 1A, 9.1). In an interview with the reporter, who reviewed *Fault Lines* for the *Bangkok Post*, Noraset was quoted as saying: 'The filthy environment reflects a really terrible period in life that I went through. It's something that's still hovering in my conscience' (Pongpipat 2014b). The unease felt when looking at visualizations of one's own brain and at those of other people in so-called brain maps and brain atlases (hence, the notion of brainscapes) resounded strongly in this later installation project of the foreign-trained and internationally exhibited Thai media and conceptual artist and art scholar.

Noraset's introspective dialogue with his neurobiological 'I' that he artistically intertwined with the lasting debate about the known technological limitations of fMRI (introduced earlier in relation to the Portuguese artist's *Functional Portraits* series) opened up a space for revisiting the problematics of what the trained eye of the clinician could see in high resolution images of the brain. The artist's dialectical cultural critique of the use of brain function imaging for diagnostic purposes emerged more clearly from our dialogues. Our face-to-face discussions sought to tease out the link connecting his autobiographical narrative with the social critique of classifying

people according to categories of the person based on anatomical, genetic, and other neurobiological traits that differ and vary from those of a healthy brain.

The joint effort to elucidate the artist's unique technique, making the explicit and inexplicit narratives of his show flow into one another as in a dream, had mainly driven our collaboration. We therefore considered in greater depth and detail the artistic technique of this ambitious exhibition project that sought to set in motion a national dialogue about a socially repressed theme. To the *Bangkok Post* reporter Kaona Pongpipat (2014b), Noraset said that he had read some research about the minds of serial killers showing that their brains were different from the ones of ordinary people. 'My theory is that the issues we have with society or with other people could be the result of the physical nature of each person's brain. It could be the rules and customs constructed by society that have turned some people into perverts,' he was quoted as saying. His curator Brian Curtin explained that this represented 'The tacit theme of the distortions and conflicts of universal experiences – love, lust, life and death – and how these distortions and conflicts occur through relationships between internal and external forces' (H Project Space 2014).

Upon entering the experimental art space, the visitor saw two large paintings. At first, the artist and I concentrated on the 'filthy environment' enveloping the brainscapes seen on the two canvases "Study of My Own Brain I" and "Study of My Own Brain II". Asking the artist repeatedly about the role and function of the flies in the centrepiece of his art installation helped to close in on the tacit theme of the *Fault Lines* exhibition (11 September-9 November 2014). What had prompted the artist to paint two flies mating on top of one of the twelve brain slices shown in the axial plane, and one fly feasting on the brain slice seen in the sagittal plane? When I returned to the gallery the next time, the flies were gone. What had prompted the artist to subject the two paintings to such a radical transformation? As we shall see, this artistic intervention was an integral part of questioning the proliferation of newer

categories of the person with the aid of non-invasive neuroimaging technology (e.g. fMRI, CT, PET scanners).

The painting of the flies, and their later removal, was inextricably intertwined with the self-reflective statement of the artist that brought to my mind the passage in Tranströmer's *Preludes* quoted in the epigraph. 'I think I'm more mature this time, the works are smaller, the mechanics used are much simpler but everything is clearer', and revealed the analysis of the ethnographic material in contrast to the dictum of Gilles Deleuze (2004 [1994]) quoted as an epigraph. The French philosopher maintained that the renewal of symptomatological tables amounted to a 'work of art'. In return, artists were clinicians of civilization, but they were not clinicians with regard to either a case in general or their own case (Deleuze, 273).

Noraset's process-based installation "Fault Lines" demonstrated that that was not the case. By exposing his inner self in the public domain, the artist showed that the intimate dialogue with his neurobiological self, through which he entered into a dialogue with his audience, made him not just a 'clinician of civilization', but also a 'clinician' with respect to a general case and his own case. Namely, he sought in the physical brain the reasons why we think and behave the way we do and the way we are. In light of these introductory elucidations of Noraset's engagement with the conflicted question 'Are we our brains?' the overarching theme that carries his installation, in fact, is the disputed use of pictures of the brain in relation to symptomatological tables in clinical and forensic research and practice.

While Deleuze understood matrixes, such as that of Katherine M. Shear (2015:157) which differentiates between the affective, cognitive and behavioural symptoms of complicated grief, major depression, and post-traumatic stress disorder (PTSD), to be works of art, Noraset developed tables like those used in clinical and scientific research settings into an interactive and process-based art installation. Why Noraset first painted the flies (*Musca domestica*), and later decided to remove them

from the colourful paintings that showed slices of his brain at different stages of the scanning process, came to the surface over the course of five workshop-style sessions with the artist. The importance and significance of his post-*vernissage* intervention will lead to the conclusion that it was not the representational aspects of his work that deeply engaged him, but the psychodynamic processes as a way of exploring beyond what neuroimaging pictures reveal.

Seeing the Neurobiological 'I'

> *How can one come to know oneself? Through contemplation never, more likely through action. Try to do your duty, and you shall know at once what you are.*
>
> – Johann Wolfgang von Goethe, *Wilhelm Meister's Journeyman Years or The Renunciants*

The opening paragraph of the curatorial note of Noraset's experimental art installation at Gallery H in the Silom area of Bangkok reads,

> Fault Lines is an installation that continues to explore the artist's interest in human behaviour, perception and control. Employing video, interactivity and deceptively painted surfaces, Fault Lines functions as a laboratory to test the limits of visitors' capacity to determine a relationship to the space and claim a definitive understanding. Fault Lines includes iconography related to the human body and metaphors of aberration and anomaly. The installation shifts between abstraction and seeming clarity, suggesting partially concealed codes and enticements to revelation; but, as Noraset's low-lit installation plays with our perception, essential knowledge always remains beyond our grasp. Instead, the peculiar, different and dislocating is emphasized (H Project Space 2014).

Drawing nearer to the presumed polarized social force field, compounded by internal and external forces, as Brian Curtin's curatorial note suggested, has been central to the dialogic engagement with the author of *Fault Lines*. The conversation with his brain was revealed as engaging Noraset in the controversy-ridden debate about extrapolating neuropsychiatric symptoms from functional magnetic resonance imaging (fMRI) pictures and biochemical analyses of synaptic processes in the brain and the central nervous system. How accurate are they? The accuracy of brain scans and the questioned adequacy of their use in medical check-ups was a major preoccupation as he looked at his brain scans when painting "Study of My Own Brain I" and the sequel. I was puzzled as to how the artist had decided where to place the flies in these two paintings. Who told him? I wondered. Before elaborating on these two critical aspects of accuracy and adequacy in Noraset's exploration of the 'sick' brain, I shall expound on our first encounter, which drew us into the problematics of neurobiological understandings of subjecthood.

> *Bangkok*, 15th September 2014 – "The gallery sitter barks no more," I said to the man coming toward the *atrio* of the nineteenth century mansion that houses the American-owned Gallery H. He looked at the tail-wagging dog, then at me, and smiled. "I'm Noraset," the artist introduced himself. Without beating around the bush, I told him that my visit was related to an anthropological inquiry into art-in-science. "Alright," he replied. "Come, I'll show you around then." At the landing of the upper floor that leads to the H Project Space, he suddenly stopped. "After you," he said formally. Inside the exhibition room, I sensed that the artist was watching me. I turned around abruptly. Almost immobile, he stood there looking at me, as if I were an element of the artistically engineered brainscape surrounding me (Fieldnotes, 15 September 2014).

‘There is always a great deal of art involved in the grouping of symptoms, in the organization of a *table* where a particular symptom is dissociated from another, juxtaposed to a third, and forms the new figure of a disorder or illness,’ observed Deleuze (2004 [1990]:273, original emphasis). Noraset was going to show us why, and he did it by ensnaring the viewer in the double-folded narrative which he developed around the art of reading and interpreting brain scans in the diagnostic of neuropsychiatric disease and disorder. To make his audiences resist the temptation to give biomedical identities to people based on interpretations of brain scans, he induced them to stop in wonderment. The way Noraset had set up the installation made me feel trapped in a world from which I wanted to escape quickly; but I was caught in his net. His piercing eyes made me feel like a voyeur. As the curator wrote, *Fault Lines* functioned as a laboratory. However, it took me a while to realize that his visitors were his research subjects, who had tacitly given their consent to participate in his artistic project the moment they stepped over the threshold of the exhibition room.

Getting deeper inside this artfully engineered brainscape, unfolding over two canvases, was the main intention when I asked Noraset after the tour if he was willing to walk me through the imaginary world that he had created and that was his own. Noraset gave me a probing look. Had he recognized the sentence[63] that I took from the *Slow Down* exhibition catalogue (Art Centre, Chulalongkorn University 2011)? I repeated my question. Would he take me into the imaginary world that he had created and that was his own? He paused before replying “Yes.” The introduction to the exhibition made evident that the imaginary world that the artist had created and set up as a social laboratory was not only his own.

[63] ‘Life is so lonely. As an artist, what I am trying to create is an imaginary world that is my own. However, by doing so, I realize I am isolating myself from others around me. No matter what aspect of life is involved, I tend to search my own subconsciousness without considering what is really happening in the so-called real world,’ reads the full statement.

> While the artist's explorations are based in personal preoccupations with philosophical inquiries into what it means to pursue the truth of things, Fault Lines also suggests great significance for contemplating how the manipulation of personal agency and comprehension can be understood for urgent social and political contexts in the contemporary world (H Project Space 2014).

Wittingly or unwittingly, the Thai media artist carved a social niche into the Neuroworld with a story that exposed the viewer to the local neuroculture, which was firmly embedded in the global dynamism of the social world surrounding the healthy and diseased brain. During our first dialogue, Noraset confirmed that my sensation of being trapped in his imaginary neuroworld (writ small) that absorbed 'what is really happening in the so-called real world' was correct. On record, Noraset said,

> I try out my theories. If I make something like an architectural plan, people get a little bit familiar with this box, this room. That is my, how to say, my hypothesis. It should be that I could answer my hypothesis. Like, people nowadays are controlled by their education, or by the media, or by things somebody else tells you what you should think. It is quite, I mean – well, I don't know. As you and people like my friends, who came to this exhibition, first they stop. "Hmm, what are the white lines? Do I have to follow this route?" "Up to you!" First, the first reaction is, "Do I have to follow this route?" But it is just a white line. So, I think this is quite effective (Tab. 1A, 9.1).

Noraset's curator remarked that the installation functioned as a laboratory, testing "the limits of the capacity of visitors to determine a relationship with the space and claim a definitive understanding". "How true," one might say, after reading the

anecdotal account of my first visit. “Essential knowledge always remains beyond our grasp,” observed the curator, adding that “instead, the peculiar, different and dislocating is emphasized.” The intended ambiguity left the viewers in doubt of what they saw in the image. Doubt and doubting was central to Noraset’s conversation with his neurobiological self that began with concerns about his brain health. Doubting what neurologists could detect in brain scans was central to the visual narrative of Noraset’s *Fault Lines* installation project. Doubts about the conclusiveness and validity of these high-resolution pictures led the artist to question whether they conclusively showed the difference between a ‘criminal brain’, a ‘depressed brain’ and a ‘normal brain’.

Of particular concern for his exploration of what brain scientists can do with neuroimaging tools was the use of these colourful brain images in clinical neuropsychiatry and forensic neuropathology. Their use in courtrooms and clinical medicine is disputed because their accuracy remains disputed. The anthropologist Roepstorff called into question the notion of ‘clean’ brain scan results (2009:198). He cautioned that ‘the images, which may to the uninitiated reader look like a “snapshot” of the brain, should not in semiotic terms be considered realistic “icons,” governed by relations of similarity.’ He suggested that they were ‘better thought of as “symbols,” where a number of conventions govern the link between the image and that which it represents’ (2009:194).

Noraset dealt with the ‘symbolicity’ of brain scans with a symbol – at first, the common housefly, which he associated with dirt and sin. What had motivated Noraset to remove the mating flies from the first painting, and the prying fly from the sequel? His decision to create a ‘blank line’ was at the core of our dialogues following my second visit to the gallery. Questions about the title of the paintings and the exhibition provided an entry point from which to generate a relational understanding of the tacit theme of *Fault Lines*. Primarily, they helped in elucidating what the artist meant

when he told the exhibition reviewer that the filthy environment he had created was 'an image of his thoughts and dreams rather than a straightforward representation of the reality' (Pongpipat, ibid.).

> **[BRB]**: I was wondering why you haven't used, as a title for your Study of The Brain I and Study of, sorry, Study of My Own Brain I --
>
> **[NV]**: Yes?
>
> **[BRB]**: -- and Study of My Own Brain II, for instance, the title Self-portrait?
>
> **[NV]**: Eh, yes?
>
> **[BRB]**: Have you thought of calling them self-portraits?
>
> **[NV]**: It is. It can. You mean, instead of using that title?
>
> **[BRB]**: To use self-portrait.
>
> **[NV]**: OK, yes. I see, I see. It could be. It could be that word as well. Probably it is even better, because it is getting deeper, I think (Tab. 1A, 9.3).

It took several working sessions with Noraset to expose how his autobiographical narrative in the two works deals with biomedical and bioethical questions revolving around brain scanning, brain mapping, and brain atlasing. After transcribing our first session, it appeared that what the artist had said about conversing with his brain eluded me. As Brian Curtain had remarked, essential knowledge always remained beyond the grasp of the viewer. Without abandoning the idea of bringing to light the tacit theme underwriting the installation, I returned to the gallery. Noraset was there. We barely talked. He would want to know what I thought of the changes afterwards, he said, while I wondered what changes he had made.

Figure 40 – "Study of My Own Brain I" (2014) by Noraset Vaisayakul after the post-*vernissage* intervention at H Project Space, Bangkok, Thailand.

Leaving the exhibition, I felt bewildered and disconcerted. How to orient oneself anew in this purified brainscape, cleansed of the insects that we commonly associate with filth and putrefaction? My first reaction to the paintings was comparable to that of the exhibition reviewer who wrote, 'In the low-lit gallery space the golden glow from the background of the canvas makes a series of differently shaped brains which Noraset painted in blue look as if they were still alive and functioning' (Pongpipat, ibid.). With the flies missing, I felt a vast emptiness streaming out from the centre of the installation. Undecided as to how to deal with the changes to this experimental art installation that called attention to the intrusiveness of neuroimaging technology into our most intimate spheres of life (i.e. love, lust, life, and death), I let it rest.

A reference to Immanuel Kant in Ned Block's essay *Consciousness, Big Science, and Conceptual Clarity* (2015) rekindled my interest in the dialogue we had initiated. Paraphrasing Kant, Block writes, 'concepts without data are empty; data without concepts are blind' (ibid., 175, see Kant 1787:75). From this it follows that

‘Only through their unison can knowledge arise’. When Noraset replied to his curator’s question as to why he had not just put up ‘the real scan result’, he explained that he did not just want to put the information on display because it was the learning and understanding about himself through the process of painting that mattered most (Pongpipat, ibid.). Block’s citation shifted the initial focus on the flies to the ‘blank line’, which gives the work the conceptual depth it acquired *after* the artist altered the painting inside the gallery.

The “Empty Box”

Making visible the link between Noraset’s conversation with his neurobiological self and the scholarly discourses of brain function imaging developed into a key task of the analysis. A first step in the direction of the so-called blank line that the artist had added to the painting by subtracting the symbol which he associated with dirt and sin was to enquire how he had decided where to place the flies. The second step entailed tracing why Noraset told his interviewer that he felt as though he were operating on his own brain every time he applied paint to canvas with his brush (Pongpipat, ibid.): a position that he earlier rejected, but later would confirm. After introducing him to research on the processual nature of the hand/brain interaction in the literary culture (Wise Berninger (ed.) 2012), Noraset compared the act of painting “Study of My Own Brain I” and “Study of My Own Brain II” to a surgical intervention. ‘It was like cutting my brain open and learning how it works and functions, discovering the roots of my troubles,’ he told Pongpipat (ibid.).

[BRB]: Why did you position the fly in this particular image, and say, not at an earlier or later stage?

[NV]: This is probably, I guess [laughing]. This is probably in the centre of the brain.

[BRB]: I see. You thought the problem must be located at the centre.

[NV]: [Laughing].

[BRB]: The material you used, is it on canvas?

[NV]: On canvas, like paint, acrylic paint, and gold, and the real gold.

[BRB]: Gold.

[NV]: Yes, and gold (Tab. 1A, 9.1).

The surreal brainscape that he had painted acquired an even more bizarre appearance after he removed the symbol. A known problem of dealing with symbols is the difficulty of accessing the original sense, because of the implied 'contemporaneity and equivalence between an object or event and the idea associated with it' (Jackson, ibid., 71). Michael Jackson cautioned that a symbol 'ranks the idea over the object or event, while privileging the expert who deciphers the idea even though he or she may be quite unable to use the object or participate in the "symbolic event"'. That was precisely what the dialogic engagement with Noraset sought to avoid because 'speaking of bodily behaviours as symbolizing ideas conceived independently of it' was misleading (Jackson, 71). With a view to learning more about the biographical event captured in the visual narrative of the two paintings, I asked the artist to elaborate on the exhibition title.

[BRB]: Now your exhibition Fault Lines is over and we have never really spoken about the title of your exhibition.

[NV]: Hm. Yes.

[BRB]: What did you mean by fault line? What is the significance of it?

[NV]: Ehm, actually, the fault line is – I did not think about it myself. The curator, Brian, he just gave this name for the exhibition, but I kind of liked it. Because, after we discussed about my life, my quarrels over bills for making a living nowadays, he kind of, he found it. "Well, what a funny thing," he said. I should go to see, to discuss with a doctor, or a therapist, because […] why, for example […], "Why you don't think, why don't you think straightful?"

[BRB]: I see.

[NV]: He talked to me like this. OK, probably I didn't walk straight on the line. It's like --

[BRB]: So, the fault line is in regard to your emotional, say psychological state.

[NV]: Yes (Tab. 1A, 9.4).

From these elucidations it appears that it was not the symbol, which the artist first mobilized and then retracted, that gave the bioart installation the distinctive artistic aesthetic quality that makes it interesting for an anthropological analysis of contemporary neurocultures. To grasp the link between the autobiographical element and his view and understanding of the categorization of people based on their synaptic self, which produced this powerful dialectical cultural critique of categorizing people according to their anatomical and synaptic 'identity', one has to understand the interaction between the artist and his brush while dialoguing with his neurobiological self.

[NV]: I feel the fly I put in the beginning was too much telling the story. It came out from, like I want to make it symbolic, which is too illustrating. So, I just tried out to do that. It is like, to see how it will affect it. But I found it is too much illustrating. It's too, it's like a --

[BRB]: Too shouting?

[NV]: Yeah, too shouting, like it says too much, and even too --

[BRB]: Too revealing?

[NV]: Yeah. Something like that.

[…]

[NV]: I'm not sure if I'm going to work with the fly or with something else, because the symbolic meaning of those kinds of animals, like flies, snake, they have a dark, like a dark meaning. I'm not sure, I should use it or not.

[BRB]: I see.

[NV]: Yeah, because it is too much, like shouting like you say, and this is like, I want to let people feel, like, I want to have, like, like a blank line for people to put the word by themselves. Most of the time, I make works like that […].

[BRB]: I see. So, it is up to your audience --

[NV]: Yeah.

[BRB]: -- to, to --

[NV]: Yeah, I think it is has more effect in that way, because --

[BRB]: -- to elicit a social discussion. Is that what you hoped for?

[NV]: Yes, I hope people see this blank line or empty box, and then, they see some, they see the surrounding of this box and add the word, or they add the feelings of themselves into this box. Then, they will get into that point by themselves.

[BRB]: They can read into it by themselves?

[NV]: This is quite going to stick in their heart. That is what I hope, or that is –. No, that is not what I hope. That is the way I try to make my work, work (Tab. 1A, 9.3).

Without the use of symbols, commonly thought of as a staple item in the toolbox of an artist, Noraset communicated feelings associated with emotional stress through a translational process that one may describe in Merrell's words. By exposing

his inner self to the audience he gave a practical demonstration of what it means to sense and think before 'labelling and cognizing, without clearly and distinctively being able to say how it is one knows at this level' (2010:40) In technical terms, we may say that Noraset demonstrated that 'this notion of non-cerebral, non-conscious, kinaesthetic-proprioceptive-somatic body mind feeling […] has always been commonplace for some artists, scientists, and thinkers and writers'. The point he wanted to make came out more clearly after he altered the visual content without, however, compromising the concept of the project.

Figure 41 – "Brain in the Dark" by Noraset Vaisayakul within the *Fault Lines* exhibition (11 September-9 November 2014) in Bangkok, Thailand. © 2014 Noraset Vaisayakul, by courtesy of the artist.

Noraset had performed the removal of the flies with surgical precision. I went up close to the canvas to see if there were any traits left, but no, the flies painted in painstaking detail were gone. With the flies gone, the overpowering aesthetic effect that left me stunned in the first place was gone. I felt a big void. I told the artist this with undisguised frankness, after the visit. He looked at me but said nothing. Perhaps

that was the effect he hoped to achieve by blowing a gaping hole in the canvas. Through our dialogues, I reckoned that the 'empty box' or 'blank line' was essential for getting across to the viewer the message about interrogating the accuracy of neurobiologically derived data used to 'fill' a concept. Noraset maintained,

> It is not an old-fashioned idea, but it is, say, I want to have a conversation with my own painting, or say, at least, with my own art. I am not a good painter, but when I try to make a painting of my own brain, that means, I am searching how my brain, how my own brain, how my own anatomy, the anatomy of my brain works. That is, that is why I say Study of My Own Brain (Tab. 1A, 9.5).

With the intention of attaining a deeper knowledge and understanding of the "Fault Lines" installation, I expanded the phenomenological view of perceptual and non-perceptual consciousness by replacing Maurice Merleau-Ponty's proposition with a newer understanding of the brain/mind relationship. By viewing consciousness not as a matter of 'I can' (rather than 'I think', quoted in Jackson, 71), but as a matter of 'I am', as Koch and Marcus proposed (2015:269), we begin to see the nexus that holds together Noraset's narrative of gaining self-knowledge through contemplative self-awareness and his critique of reductionist understandings of the mind-brain relationship. The ensuing excerpts from the transcripts will clarify further the technique through which the artist revealed himself to himself and to the viewer by challenging the iconography of cognitive neuroscience that has developed its own symbolicity, to borrow the notion that Roepstorff used in relation to the 'art' involved in producing, reading, and interpreting brain scans accurately and adequately.

This art is comparable to the art of 'grouping symptoms in the organization of a *table* where a particular symptom is dissociated from another, juxtaposed to a third,

and forms the new figure of a disorder or illness' (2004 [1990]:273). These two art forms, metaphorically speaking, fall into the gaping hole that Noraset 'blew' into the two canvasses after the exhibition opened to the public. He wanted his audiences to see, feel, and fill the 'blank line' or 'empty box', which he had added by painting over the flies. Therefore, the post-*vernissage* manoeuvre by no means compromised the integrity of the installation. On the contrary, it made clearer the point that Noraset wanted to make. That is to say, he is in the paintings as you see him (see below).

> **[BRB]**: You used these MRI scans for this artwork. Perhaps you could describe the technique to me.
>
> **[NV]**: I found, I kind of got a feeling – it's OK. I didn't have any problem with health, with the bo –, with the physical health. But I, but I got to see inside myself with more detail, like in that kind of section. This is like, "Oh, it is, it is quite interesting to me. Maybe I study it, and copy it." […] I found that when I paint, when I paint my, my own brain, I feel like I do surgery (Tab. 1A, 9.1).

Seconds later, the artist retracted what he had just said about painting his brain on canvas. "It is not like surgery, sorry." He meant to say studying and not doing surgery. What made Noraset correct the statement he made in his art studio, and later in the gallery, that he felt he was doing surgery when painting his brain? The reason he reiterated that same statement in the *Bangkok Post* interview relates to our earlier discussion of whether it would make sense to extend the processual nature of the hand/brain interaction to the culture of painting in a world that increasingly communicates through visuals.

[BRB]: Surgery perhaps not in the sense --

[NV]: Yes?

[BRB]: -- of using a scalpel, but you used the brush.

[NV]: Yes, it makes me understand. First, I understand the anatomy of my own brain, but second, it is – I got very curious about that. "What is this part working for? What is that part working for?" So this is, "OK. My eyes say OK, this is connected to this." It makes me go beyond the physical of it (Tab. 1A, 9.3).

"Going beyond the physical": that was the core concept of the *Fault Lines* project. Hence, the flies, central to the early dialogues with his neurobiological self, had to go. The artist pointed out his interest in the connectedness of the various brain areas and the ordinariness with which the media speak about clinical and forensic brain mapping. He thus confirmed his search for alternative ways to approach the neuronal correlates of feelings and moods that are shaped by genetic, biochemical, environmental, social, and cultural forces (i.e. the internal and external forces in the curatorial note). His responses to the set of questions that revealed his intention to make tangible the limitations of brain mapping by going beyond what brain scans can see (by manipulating them) confirmed the following two points.

First, his experimental exploration of brain anatomy and the neural basis of subjective feelings and social behaviour showed that from a neurocentric perspective love is 'an ingrained brain concept' (2009:157) that, as Zeki argued, transcends cultures and time. Second, his neurobiologically informed self-portraits demonstrated that it was misleading to see the body as simply a 'representation of a prior idea or implicit cultural pattern' (Jackson, 71). Put in the words of John Berger, his two neo-realist paintings were telling the exhibition visitor: '*I am as you see me*' (1991 [1980, 1972]:50, original emphasis). Noraset said,

> This is, I mean, this is the whole concept. It leads me to this technique. Because the painting – how to say? The old-fashioned painting, let's say, it makes me able to contextualize, to have a dialogue with myself. When I draw or paint, or I think about which colour I want to put on this thing, on this image, on this painting, it is, is like I talk to myself. I talk to my work. Let us say, I talk to myself, like "Oh, I make surgery of my brain." In some moment, I feel I just put the, put some colour on some little piece of brain. I feel like, "Oh, this is like here or there, maybe here." I was thinking of, like, I am imagining being inside of my brain itself. I think this is itself one of the most effective ways to do this project. It is, is, is like I go to, I go to the surgery room by myself, and I just like cut, cut my brain by myself and I just like digging deeper inside my head (Tab. 1A, 9.3).

The *Bangkok Post* reporter quoted Noraset as saying, 'I use my hand and that's a link and interaction with the brain.' As indicated earlier, we had looked at neuropsychological research into the hand/brain interaction in writing. The clinical results did not quell Noraset's doubts about his health. His search continued. Weeks later, when I was reading up on the connectome as a DNA sequencing problem (Zador 2015), I stumbled upon the image that served the artist as a template for "Study of My Own Brain II", which the artist renamed "Brain in the Dark". It featured on the front page of the UK-South Korean Asian brain-mapping project (The University of Nottingham 2012). Yes, the Neuroworld is expanding. Noraset's body of works attests to it, and to the fact that 'negotiations of the basic terms of our categories of the person' (Dumit, ibid.) are happening in places of which the growing anthropological literature of neurocultures says little, such as Bangkok.

Through our conversations that shifted between clarification and introspection, speculation and affirmation, Noraset gradually revealed himself as a clinician with respect to his own case, and a case in general, as well as a clinician of civilization.

The way he got involved with the neuroworld, as both an artist and a patient, has opened up an avenue along which to cast our eyes forward, as well as backward, to better understand where Bangkok is on the cultural map of the contemporary Neuroworld.

The Symptomatology of (In-)Sanity

The two 'boxes' that Noraset created, namely the social laboratory that he had set up in the gallery to test his theories, and the one he had placed inside the two canvases to allow people to decide what notion to apply to the portrayed condition, created a discursive platform for pondering the relationship between brainhood and personhood from an artist's perspective. Noraset told the *Bangkok Post* interviewer that the transfer of the digital brain scans onto canvas involved a sort of manipulation, thereby producing a distorted representation of the brain. The artist and I began to speak about brain mapping and atlasing when we discussed the *Functional Portraits* collection (de Menezes 2008, 2007).

How had he decided on the colours of the brain slice, seen in the mid-sagittal plane, that had helped me to discern the presumed mental state of the synaptic self, pictured in "Study of My Own Brain II"? Rather than asking him up-front where he had gained the knowledge to decide which colour of paint to put on his brush while dialoguing with his neurobiological 'I', I raised a technical question. What did he do to achieve that aesthetic effect emanating from the deep and vast blackness in the second painting, which presents a stark contrast to the vivid bright and shiny "Study of My Own Brain I"?

[BRB]: Is it just black?

[NV]: No, no. It's like, I made two layers of it. It is like, like flat black.

[BRB]: Yes.

[NV]: Yes, on the base, and then, after that, I painted, I painted the brain. I covered, I covered it by the, how to say, the liquid, the glossy liquid --

[BRB]: I see.

[NV]: -- to, to protect it, the brain. It should be inside the water, or something. That's the kind of idea (Tab. 1A, 9.1).

Months later, when I was in the midst of analysing the transcribed dialogues, I came across an obituary of Vernon Mountcastle in the *International New York Times.* The brain cartographer was remembered for saying that in the mid-twentieth century, when he began his cortical studies of sensory functions, 'the brain was still very much a black box, as dark as the ocean floor' (Carey 2015). Around the same time, Gerhardt von Bonin signalled that it appeared to him that there was 'ample room for an anthropology of the brain'. A move in that direction, however, would require 'a serious effort' (1955:509). During that half century, non-invasive neuroimaging has made considerable advances and gained ground in clinical and forensic neuropathology and neuropsychiatry.

Anthropology has renewed its interest in the physical brain in the early twenty-first century. Signs of how neuroanthropology, or the anthropology of the brain, could bring more intriguing questions to brain imaging research, and aid the neurosciences 'to abandon unproductive understandings of culture, including dichotomies between East and West' (Downey and Lende 2012:36), are detectable in the exposition of how the two artists, Noraset and Ise, dealt with older and newer theories of the diseased and criminal brain. Knowing that Noraset had had an MRI, but not an fMRI brain

scan, I asked him about the kind of literature he had read to inform the creation of *Fault Lines*.

> **[NV]**: I did not follow the image. I searched from the Internet about the medical, about the medical – like, how they can do like this, like computer scan and then see --
>
> **[BRB]**: So this is not based on your --
>
> **[NV]**: It is not based on my, I mean the colours, not the image, the colours --
>
> **[BRB]**: The colours are not based on your scan, but the form, it is your brain.
>
> **[NV]**: Yes.
>
> **[…]**
>
> **[NV]**: Depressing people have more, more, purple colour. So, then I just pick the image of the --
>
> **[BRB]**: The depressed brain --
>
> **[NV]**: Yes, of the depressed brain (Tab. 1A, 9.1).

What else did he read aside from neurobiological studies of neuropsychological and neuropsychiatric disorders? I asked Noraset. He mentioned the names of Michel Foucault and the Marquis de Sade. With a bit of imagination one could see the link between the better known works of these two French authors and the tacit theme of *Fault Lines*, which was said to be love, lust, life, and death. However, it turned out to be the artist's interest in the older theories of passion and crime that got him interested in the use of neuroimaging technology and techniques for developing and redefining categories of the person in forensic neuromedicine, neuropsychiatry, and neuropsychology. Zeki's proposition that there must be a strong neural link between beauty, love, and eroticism, and that that link was detectable from products of the

brain (2009:149), drew into the analysis the case of Si Quey that featured prominently in Ise's exhibition *Operation Bangkok*.

The analytical descriptions of these two art projects that evolved from conditions of illness, anxiety, distress, and reduced self-awareness, established that both artists dealt constructively with painful experiences that occur through relationships between body-internal and body-external forces. 'Beauty and love,' Zeki maintained, were 'never far from erotic desire, since the most intensive love is strongly coupled to sexual desire and the two faculties share common areas in the brain' (2009:148). While Noraset dealt with that 'common area' in the brain during the conversations with his neurobiological I to try to understand why his character and behaviour was the way it was, Ise became interested in this correlation when he was advised to visit the Siriraj Medical Museum by a musician. The ensuing passages from the transcribed dialogues call to mind what the two installation artists shared with me about the forensic case that continues to haunt the people of Bangkok.

Ise and I were looking at his installation sketch showing a silhouetted man encased in a cabinet. It was the same male figure we had encountered earlier on the wall in the exhibition and in the post-exhibition drawing in the artist's Kelantan studio, and that stood for the terms 'legend' and 'Darkside' (see Fig. 38). Ise said,

Figure 42 – This is the sketch of Ise's visit to the permanent exhibition of the Songkran Niyomsane Forensic Medicine Museum at the Siriraj Medical Museum, Bangkok, Thailand, reprinted in the *Operation Bangkok* catalogue (2014).

This is about Siriraj Hospital. Somebody took this – actually, it is a very famous singer from [name omitted], a very famous band in Thailand. I met him […]. Suddenly he said, "Oh, I can suggest to you, I think your curator is right, you have to go to this hospital." Everybody said like, "Whoa!" Nobody thinks about that thing. It is a taboo for many people to ask, or even to suggest it. This music guy suggested it to me. I waited for my friend, for my Taiwanese friend to come because nobody from the Thais wanted to go with me. It is taboo for everybody. At the end, we experienced the scariest thing. We saw Si Quey, the serial killer (Tab. A1, 4.1).

Ise's and Noraset's art installations, as well as a film by Thai university students on the Siriraj Medical museum, to be introduced shortly, situate the lasting disputes on framing personhood in neurobiological terms in the sociocultural and historical context of neuroforensic medicine in Thailand. What did he know about Si Quey? I asked Noraset without beating about the bush. At first, he did not understand whom or what I was talking about.

> **[BRB]**: When you mentioned in our first conversation normalcy/abnormalcy and changes that might be visible in the brain, have you, by any chance, come across Si Quey?
>
> **[NV]**: CV?
>
> **[BRB]:** Si Quey who is in the Siriraj Medical Museum.
>
> **[NV]**: Eh, eh?
>
> **[BRB]**: The serial killer.
>
> **[NV]**: CV? Sorry, I don't know. I am not sure I actually understand.
>
> **[BRB]**: In the nineteen fifties, there was a Chinese immigrant.
>
> **[NV]**: Oh, Si Quey, OK, OK. Si Quey.
>
> **[BRB]**: Si Quey, I apologize for my poor pronunciation.
>
> **[NV]**: Oh, no, no, no, no. You mean in Thailand.
>
> **[BRB]**: Do you know him?
>
> **[NV]**: Yeah, yeah. I just read about him. I actually don't know why I read again about him [laughing].
>
> **[BRB]**: What did you read?
>
> **[NV]**: The history, or the story of how many he killed, and how --
>
> **[BRB]**: The report you read, did it say something about his brain?
>
> **[NV]**: No, no, no, because, I think, this is, this is unfair to analyse people in that way. At the, I mean, it is like old-fashioned to analyse people in that way. Let's say there, this is in a, in a, how to say, in a documentary film.

[BRB]: You saw a documentary film?

[NV]: Yeah, yeah, a documentary film. They say how bad he is, but they don't say how sick he is. They don't say about his back – just a little bit about his background, but really in a simple way […].

[BRB]: Did you know that they operated on him and looked into his brain? Did they mention that in the film?

[NV]: No, no.

[BRB]: Did you know that?

[NV]: No, no, I mean, I heard it […] (Tab. 1A, 9.3).

Noraset did not specify the title of the film that he had watched about Si Quey. Intrigued by his and Ise's accounts, I searched for filmic material on that criminal case. The short film *Siriraj Medical Museum* (Jennunthakajorn 2012) considers the question of why countries have museums. The group of undergraduate communication and new media students at Thammasat University who produced the film, which includes a very short theatrical play on the life and death of Si Quey, said that they believed people could not "make or improve new good things without being concerned about the past, and what happened in the past" (ibid., my transcription). On those grounds, they maintained that the museum on the medical campus of Mahidol University was the "most valuable museum". Their interpretation could seem teleological and even naïve. Yet, their view that this museum was valuable because it related to *their* lives, and their inclusion of a theatrical play about the alleged cannibal, made this online streamed film production an intriguing object of study for elucidating the art-brain science interface in the milieu of a Thai science-cityscape.

The film producers dedicated one chapter to the forensic case of an alleged psychopath who immigrated to Thailand from China, a case which acquired the status of a myth in Thailand (Poshiyananda 2010: 139). Did Si Ouey Sae Urng have a

'criminal brain'? To establish his sanity, Nited Songkranniyomsen, reportedly a 'passionate man of anatomical science' (Meyers 2003), conducted a surgical inspection. He concluded that the brain of the accused man showed no significant anomaly. Medically, he was not insane, hence he was not legally insane, the court concluded. Based on the medical report, Si Quey was sentenced to death. The scars on the skull of the alleged murderer and presumptive cannibal attest to the admittance of results of anatomical brain inspections as forensic evidence. The events that led to his death and the exhibition of his body are described according to their reportage[64].

> The camera follows the two female moderators (dressed in the classic white blouse/black skirt university uniform). They are walking from the Ellis Pathological Museum[65] to the Songkran Niyomsane Forensic Medicine Museum. The underlying musical score becomes portentously mysterious and swells. The camera zooms in on the glass cabinet labelled 'Si Quey'. The first interview is with Surasak Suvouttho, who is an infectious disease specialist. The museum was built for the Siriraj Hospital for teaching purposes. It was open to the public, he said. Two street interviews follow. The elderly man maintained the story was true and scary, and that he would not have wanted to meet with Si Quey, whereas the motorized traffic police officer said behind aviator sunglasses that the story was untrue, and used to frighten people and especially children. A detailed description of Si Quey's life ensues.
>
> Si Quey had a wrong belief, Suvotho said. He had a tiny body but he wanted to be powerful. He confessed to hearing a voice that was telling him to boost his power by eating the hearts, livers, or interior organs of humans. Si Quey had to kill many children to eat their livers. Eventually, he was arrested by Thai police officers. They sent him to jail. There was a doctor, Dr Nited Songkranniyomsen, who examined him

[64] The text is drawn from the English subtitles.
[65] The museum is named after the American-born founder Professor Dr Aller G. Ellis (1868-1953), who documented pathologies and congenital anomalies prevalent in Thailand (Sukpanichnant 2007).

and did research about him. Medically, he suspected two symptoms. Either he wanted to eat human organs, or he was insane. Si Quey was tested. Finally, the doctor found that Si Quey was not insane. He was sentenced to death by shooting. Because Si Quey had no relatives, the doctor asked to keep Si Quey's body. Before concluding that the accused was sane, he had performed 'an operation to find abnormality'. That was noticeable from the scar around his head. 'Si Quey was the first generation in Thailand that we operated body to find abnormality', read the subtitles.

The title of a video recorded theatrical play appears next on the screen. *A Short Story of Si-Quey* stars three male students. It opens with a frenzied young man scaling a wall with a rope in the darkness of a tropical night. His sweaty, lecherous face suggests an emotional rush. Noticing that he is being chased, his ecstatic expression of lust instantly turns into one of fright. He tries to flee the scene. He runs, but in vain. He falls to the ground. He is arrested at gunpoint, and thrown into jail. There, he is seen banging his head violently against the iron bars, clutching them with both hands in agony and despair. Seconds later, we see the prisoner standing blindfolded, with his arms stretched out, awaiting his death. A gunshot is fired. The screen goes black.

The video camera, capturing the tragicomic portrayal of Si Quey, illuminated a darker corner of neuroforensic medicine in Thailand. On what scientific basis did the neurosurgeon conclude that Si Quey had a 'criminal brain'? The play leaves this question unaddressed and so did Apinan Poshyananda's essay on the visual aesthetics of pleasure in eating. Keeping in mind Zeki's observation that eroticism and beauty were attributable to a particular brain region, we begin to see the complexity of the topic that Noraset and Ise wove into their visual narrative. An additional point to arise from the juxtaposition of different views on the Si Quey case, which has analytical appeal for this inquiry into neurocultures developing in science-cityscapes, was the risk of category error. The Thai art historian mentions Si Quey alongside a more

recent criminal case of ‘bizarre behaviour related to jealous amour’ in which a medical student shot dead and dismembered the body of his lover (2010:139).

Was Si Quey jealous? Did he commit a crime of passion? Suvouttho’s account suggested that Si Quey was ‘murderous’ and not ‘jealous’. That is then a blatant category error, and one that is not insignificant. It exemplifies the crux of the matter as regards developing categories of the person based on neurobiological tests. Crick, who humorously compared the self to a ‘pack of neurons’, was reminding his readers that categories are human inventions (1995 [1994]:9). Deleuze, for his part, cautioned that there was always ‘a great deal of art involved in the grouping of symptoms, in the organization of a table where a particular symptom is dissociated from another, juxtaposed to a third, and forms the new figure of a disorder or illness’ (1990:237). Zeki argued that ‘true ambiguity’ was often ‘a characteristic of great art’ (2009:86), but the ‘art’ of reading brain scans and renewing symptomatological tables (Deleuze, ibid.) was not made great by ambiguity.

People’s lives are at stake (Ropper and Burrell 2014, Whitehouse (b) 2012; Cohn 2011, 2010, 2009a; Turner 1985). Block, regarding the complex relationship between the physical brain and the human psyche, observed, ‘Isolating consciousness in the brain may depend more on being clear about what we are looking for than on massive investment in new technologies’ (ibid., 175). What are we looking for? Noraset put that same question, denoting the knowledge gap in matters of how subjective feelings arise from the brain, to the viewer of “Brain in the Dark”. Knowingly or unknowingly, he demonstrated to his audiences that the ‘magisterium of experience’ (Koch and Marcus, 269) was little understood.

‘We still don’t fully know why experiences feel the way they do,’ Koch and Marcus conceded (ibid., 269). Considering the ‘patchy’ understanding of the link between consciousness and experience, how can functional brain scans solve that problem? Where are we looking in the absence of knowledge of how consciousness

and subjective feelings arise from the brain? As these final observations and questions that warrant further research have shown, we have ‘entered a space of active negotiation of the basic terms of our categories of the person’, as Dumit anticipated over a decade ago (2004:185), and not just in the United States (Davis 2017), but also outside the western hemisphere of the Neuroworld.

Chapter Four

Bioarts as Memory

Things I've lived through here become visible on the walls like Egyptian paintings, murals from inside of the grave chamber. But the scenes are getting fainter, because the light is getting too strong.

– Tomas G. Tranströmer, *Preludes*

Seeing Titans

Definitions of Titans: Titan, in astronomy, is a satellite of the planet Saturn. A titan, in everyday parlance, is somebody of great intellect and importance. Titans are the gods born of the union between Uranus (Heaven) and Gaia (Earth) in Greek mythology. The "Titans" in Piyatat's art photographic collection (Sundaram Tagore Gallery 2014) crisscross these cosmological orders. The figures and faces one sees in these images are optical illusions. They trick the brain into seeing something that exists in our imagination. They belong to the imaginary world of the artist as much as to our quotidian imaginary world. That was revealed in the dialogue with the artist about what he saw and what the viewers saw in these ambiguous pictures that inform this last empirical chapter. The figures and faces, as we shall see, are the result of chromogenic colour printing that the artist used in his exploration of alternative perceptual image formations shaped by chemical processes.

Figure 43 – "Titans, no 33" (2014), a digital copy of a chromogenic print, Kodak Endura paper on Dibond, exhibited at the group exhibition *Anthropos New York* (4 September-4 October 2014). © 2014 Piyatat Hemmatat, by courtesy of the artist.

When Piyatat and I were looking at "Titans, no 33" in his art studio, he asked me what I saw in the above photograph. Was Piyatat probing my cultural competence through my visual literacy of this bi-stable image? I wondered, and bit my tongue. "It was a religious image," I said evasively. Yes, I saw the iconic figure he had seen when covering one eye with his hand and looking out onto the Andaman Sea from a cliff. Viewers who are acquainted with Buddhist, Hindu, and Jain iconography are likely to see the head of the semi-divine serpent in Indian epic literature, known as the *nāga*. With the right index finger, I indicated the lines of the figurative representation of the *Mucalinda* – of Siddhārtha Gautama (also Gautama Buddha), as seen in the classic Thai art canon, shielded by the snake-like being known as the King of Serpents, when meditating under the *Bodhi* tree. Assuming that this was the image that Piyatat thought I could see in the phantasmagorical picture, given my cultural background, I asked him if I was right. I was right, he replied. A fair number of viewers had seen the *nāga*.

Did we truly see the same image? With due caution, we may claim to have experienced this image of Lord Buddha combined with the *nāga* in similar ways. Possible variations and differences in how Piyatat, I, and the other viewers who said they detected the key figure in this image, which influenced the way we felt about it, cannot be excluded. How we experience the felt and phenomenal qualities when we look at the print may vary, based on the (contested) premise that feelings are subjectively experienced and private in nature. If the artist had given each of his viewers a pencil with the instruction to draw a line around the figure and the face, those nuances would have become visible. Let us ignore these variances between the lines separating the figure (positive space) from the background (negative space). Then we may consider whether Piyatat's artistic experiment with the way our brain registers data, and processes form in the visual brain, skirted the presumed barrier to the communication of *qualia*.

By questioning my ability to see the figure that Piyatat had seen when shooting the photograph with one of his analogue cameras, he revealed his research interest in the parallel processing-perceptual systems of visual consciousness. The question of whether I could see the *nāga* in the images raised the same problem of seeing the redness of red, in the concreteness of artistic practice. Central to Piyatat's investigations into perceptual image formation was how concepts form in the brain, and how we express those concepts that form from neural impulses, as when a luminous ray of a particular wavelength enters the retina, in the language/s we speak. "Titans, no 33" and the other ambivalent pictures in the *Titans* collection, revealed an interesting object of study similar to Be's "Mould Boy". Though useful, the generic definition of the philosophical problem of *qualia*, as in Bartra's seminal work (2014:31), needs to be narrowed to frame *Titans* neuroanthropologically.

We may reformulate the phrase and consider the problem to consist in how to unify the first-person subjective experience of contemplating a bi-stable picture with the third-person description of a cognitive neuroscientist, who defines the sensation as the activation of certain neuronal networks. The earlier discussed "Mould Boy" installation made tangible the way an artistic approach opens a fresh perspective on the presumed mutual unintelligibility of these two procedural systems in the brain, and not just because the object was red when lit. Toward the end of an earlier cited dialogue passage, where Be elaborated on how the visual aesthetic effect that stunned and captivated the viewers had materialized, he provided the following explanation.

He said that the body cast was flooded with red light of a wavelength that diffused the edges of the shadow of the cast to the point where the shading rendered the form, rather than casting the shadow onto the form. Light and shadow are critical in how we see and look at the "Mould Boy" installation and the *Titans* collection. My immediate reaction was to tell the artist that the red object reminded me of Mars, the

Red Planet[66], floating in the universe, whereupon Be replied "Exactly." That particular aesthetic effect that materialized during a photo shoot for a magazine had surprised everybody, he recalled [Tab. 1A, 5.1]. The neuroscientist Crick explained this phenomenon through the way the brain registers form. One clue that the brain uses to extract depth information is 'the shading of an object produced by the angle of the incident light' (ibid., 44).

While it helps to have two eyes, the scientist wrote that 'the shape of an object can often be seen by using only one eye, or by looking at the photograph of it' (ibid.). Piyatat did both. He covered one eye while closing in on the object that he saw in his imagination. With a software programme he flipped the image that he had captured on film along the central axis; hence the symmetry. A specialized printing house that collaborated with the artist mechanically reproduced the image that seduced us to believe that there was a figure and a face in the image. "Mould Boy" and "Titans, no 33" are works of art that challenge the parallel processing-perceptual systems of visual consciousness, and hence enable us to see them 'at work' when we try to describe them by turning visual content into conceptual content. While we may tell the artist that we could see an image that resembled the *Mucalinda*, our emotional response may vary according to how we relate to Buddhist scriptures.

What might a cognitively-based approach to religious (Whitehhouse (a) 2012; Turner 2015) and cultural experiences (Bull and Mitchell (eds) 2015; Downey 2015; Domínguez, Turner, Lewis, and Egan 2010).

tell us about those felt and phenomenal qualities that come into play at the intersection of epistemologies and representational practices? Such a line of inquiry in neuroanthropology comes into view when we engage with the bio-artistic practice of these two artists dealing originally and prospectively with perspectivism and

[66] The celestial body is alternatively called the 'Red Planet' in common speech, and the astrological symbol of Mars '♂' (shield and spear) is used to indicate the male sex.

corporeality in bi-stable imagery ethnographically. Be listened to my intention to integrate into the research study the neuroscientific premise according to which the brain acts as a medium for cultural propagation on the neurocentric premise that symbolic forms of expressions have a neural basis. He then remarked that I was dealing with a contentious argument which many in the contemporary art scene would disagree with (Post-fieldnotes, 29 July 2015). 'The language of those writing about art betrays the view that we see with our eyes rather than the cerebral cortex,' observed the pioneer of neuroaesthetics.

The position that we see art with the cerebral cortex derives from a view that understands the intellect to mean the brain (Zeki, 77). Ise's statement, "It is the brain **who** generates everything about our belief," shows that Zeki's view is present in the contemporary art world also. There are artists who concur with the view that the brain and nervous system formed the medium for the propagation of culture. As a result, I felt compelled to broaden the analytic frame to accommodate these conflicting positions, occupying the opposite ends of a broad spectrum that was introduced earlier with the question 'Are we our brains?' Piyatat and I were still looking at "Titan, no 33" when I asked him if he would have been able to see the second figure that I saw in the symmetrical image, although not simultaneously.

Could he see the fairy-tale figure that reawakened memories of my childhood? He gave me a puzzled look. Was there yet another figure in this image? I reformulated the question. Could he see the princely consort that my vivid imagination had associated with the protagonist of one of my favourite children's book – *The Snow Queen* by Hans Christian Andersen, illustrated by Toma Bogdanovic (1968 [1845])? Without replying immediately, the artist looked intensively at the picture. After a few seconds, he looked up, saying that he could see the figure that I had seen in this picture of his with its Rorschach-like potentials. He

said he could see the furry Cossack-style hat and the delicate lineaments of the face that I had associated with the snow prince of my girlhood fantasies.

Within seconds, the glittering Andaman Sea turned into a Siberian snowstorm. Whether or not Piyatat could feel the coldness that had overcome me, in spite of the heat and the lavish tropical vegetation at our doorstep, I am unable to tell. My reaction was physical. The sight of the icy landscape had raised goose bumps on my skin. What remained constant for him as well as for me was that we would see either the *nāga* or the snow prince, but never at the same time. Remember the visual illusion that Be's lighting effect produced in the gallery, when everyone present was surprised to see the body cast no longer as a hollow, but as a bulging figure? That is the mechanism of bi-stable images.

The initial observations of "Mould Boy" and "Titans, no 33", however, do not end here, because they are more complex than the 'hollow-bulges' and 'duck-rabbit' bi-stable images. Our feelings about what figure we see in the image are likely to be different because of the problem of *qualia*. The young gallery-goer, presumably, would not have wept in the art studio where the installation was lit with ordinary light. We are likely to feel differently about the two images seen in the chromogenic print that was exhibited during the *Anthropos: New York* group exhibition at the Sundaram Tagore Gallery (4 September-4 October 2014). To complicate matters in regard to seeing *Titans*, let us think of prospective viewers who see neither the *nāga* nor the snow prince in the above image due to an acute or inherited condition known as prosopagnosia ('face blindness').

What would their interpretations reveal about the processes involved in the translation of neural impulses, triggered by a luminous ray of a particular wavelength entering the retina, into communicable concepts that exist in our culture and language, but not in nature? The responses of people diagnosed with face recognition problems to these artistically created ambiguous images would amplify the empirical

question of what and how we see and speak about forms and figures that are shared or not shared between and across civilizations and epochs. We can see one composed figure with a face, two figures with a face, or a figure without a face in the above image. These three scenarios push the dialogue about Piyatat's experimentation with perceptual image formation into an area of study of the art-brain interface that appeals to neuroanthropologists and possibly neurobiologists.

At the core of the conundrum of the communicability of what is visually perceived and conceptually expressed are the translational processes between the language of neural impulses and the languages we speak. Whether they are mutually intelligible is disputed in discussions of how concepts, and feelings about those concepts, form in the brain, and are used to interact with our surrounding world. Why this topic is appealing from a neuroanthropological perspective relates to the ambitious agenda that Downey and Lende advanced: that is, to help the neurosciences to abandon reductionist interpretations of culture, such as dichotomies between East and West. While the analysis of *Titans* is open to the first proposition, it rejects the second on the ground that if we abandoned the binary opposite between eastern and western cultural traditions, we would cut out our cultural memory and the important faculty of our 'plastic' brain.

The cultural concepts of the *nāga* and the snow prince, for instance, allow us to travel between two geographical realms and their cultural heritage. Thus, it is suggested that we treat this inherited dichotomy as a resource rather than a curse in the study of the role and function of the brain in the propagation of culture across space and time. These preliminary observations foreshadow how the artistic aesthetics of the bioarts could be employed to write the imaginaries that may inform experimental discoveries and validate tests. They have been made possible by these exhibits that engage the viewers originally and constructively with the disputed barrier to the communication of *qualia*. In fact, they take us to a point where the

views of what connects the brain and the mind tend to differ sharply. Where the neuroscientist Vailayanur S. Ramachandran sees a problem, the anthropologist Bartra sees none.

If it were the case that one could explain the sensation of red through speech, but not the experience of red per se because it was lost in translation, neither art nor literature would exist, argued Bartra (ibid., 31). Piyatat's "Titans, no 33", not unlike Be's "Mould Boy", showed that both scholars had a point. Did Piyatat, and other people, when saying that they could see the fairy-tale figure in the bi-stable image,[67] feel the sensation that I felt and tried to put into words? One would have to ask them in order to know how they experienced the aesthetic effects of that picture which, confusing the visual pathways involved in the formation of concepts, refers either to the object, or to the subjectively experienced sensation of that object. The *nāga* and/or the snow prince exist in our universe. They exist in our culture. They exist in our language. They exist in our memory. They live in our imagination.

'They also appear in our brain map,' wrote Bartra, with reference to the language categories of 'red' and 'arm'. Even as we lacked the certainty that the representation of the colour red or the arm are there, the category of red and arm existed, he specified. From a brain-centred perspective, one would understand these objects labelled 'red' and 'arm', or '*nāga*' and 'snow prince', as 'ingrained brain concepts', acquired in the course of human evolution. They also appear in caves, Piyatat interjected, as we looked at yet another bi-stable photograph that he produced during one of his outdoor field trips. So they do, in the form of the hand stencils and handprints in prehistoric caves that later were used as places of Buddhist worship (Munier 1998), and which work on the same principle of ground and figure (i.e.

[67] The artwork was discussed in the paper '*Framing the "nāga-snow prince" image neuroanthropologically*' presented at the *Photography in Academic Research: photography + (con) text* international conference, jointly organized by University College London (UCL), Birkbeck College, both University of London, and the Royal Anthropological Institute (RAI), in London, 8-9 September 2016.

negative and positive space). In the ambiguous picture below, are you able to see the eyes of a giant-like figure below, shot from inside a cave? Or does it bring to mind anatomical images of the sinuses, or the female reproductive apparatus?

Figure 44 – "Titans, no 28", a digital copy of a chromogenic print, Kodak Endura paper on Dibond, seen at the Sundaram Tagore Gallery in New York, NY, USA.

This collection of ambiguous pictures raises intriguing questions about the inter-linkage of perceptual image formation and the formation of conceptual notions that we use to communicate knowledge visually. Instead of siding with supporters of the view that these figures are a cultural concept (acquired through socialization processes), or an ingrained brain concept (acquired in the course of evolution), or encultured in the brain (centre-field position), our dialogue differed. It, like our analysis, was receptive to varying views of the brain-mind relationship that is at the core of the nature versus nurture debates. A non-confrontational attitude, we believed, would allow us to work with his bi-stable photographic image prospectively. Thus we envisioned making them accessible to art-interested cognitive neuroscientists researching the translation of neural impulses into verbal forms of expression in patients with visual perceptual disorders.

Bartra's hypothesis of the two languages, presumed to be mutually unintelligible, offered an elegant way of circumnavigating hardened positions on the

subjective and, hence, private nature of the parallel processing-perceptual systems of visual consciousness. ‘Certain brain regions of the human brain genetically acquire a neurophysiological dependency on the symbolic substitution system,’ he surmised. That system was passed on through social and cultural mechanisms. It was ‘as if the brain needed the energy of outside circuits in order to synthesize and break down symbolic and imaginary substances in a particular anabolic and catabolic process’ (2013:7).

This hypothetical construct could serve us in future in evaluating the analytical and theoretical potential of the bioarts. It could bring a set of more intriguing research questions to brain function imaging and to the cognitive neurobiology that deals with the ‘hard-wiredness’ of the brain and the ability of the brain to ‘rewire itself’; hence the term ‘brain plasticity’ (Doidge 2015). With a view to moving in that direction, we would need to draw closer to the controversial proposition that the brain acts as a medium for cultural propagation. The reason given is that symbolic forms of expression involve a considerable, and not just a small, part of the brain. Before considering that step, we may first elucidate why Piyatat maintained that his artistic works gave “nature a complete face and figure” (Tab. 1A, 3.3).

Producing **Titans**

To steer the dialogue with Piyatat to his experimental exploration of the visual brain, I asked the artist to expound on the production process of the exhibited *Titans* collection. How did he compose the images that he saw by blocking out the other side? What was his intention, and what did he hope to achieve by challenging our visual literacy? The dialogues that address such questions will prepare the ground for examining the printing techniques that the artist used in the past, and continues using,

to realize the specific aesthetic properties that change depending on the art medium used in the process. Before turning to the collaboration between the artist and specialized printing houses, let us consider how the images that give nature a complete figure and face came onto the film. Piyatat said,

> Yes, I am quite obsessed with symmetry. I like the idea of symmetry because it is like, it is very –. It can be quite playful visually, particularly the Rorschach test that I used to play around with when I was younger, when I was a child. But, it was not like a Rorschach test. It wasn't the test environment. It was more in experimental art class. When my teacher instructed us to put blotches of ink in the middle of the page of an A4 sheet of paper and then, spread the ink around, then you unfold and you see the symmetry of ink and colour. I like that. It kind of struck me since. I like the effect and the wonder, and the effect that it provokes you to imagine that you see certain things. It is a very interesting element for me to express in some of my projects that feeling of provoking the viewer; for them to see whatever they see. It is even better when each one sees a different thing. I think that is what I am really interested in, particularly with *Titans*. But, with *Titans*, the intention was enough for people to get my idea of revealing a certain type of visual, of figures and faces, of nature, only because the photograph that I use to initiate the project, before I mirror the image, are photographs of nature. By applying symmetry to some of my Landscape photographs it is like giving nature a complete face and figure […]. People recognize these faces, and figures, immediately because we are hard-wired. We are so used to interpret faces and so many other things with symmetry (Tab. 1A, 3.3).

The artist made explicit that he was intrigued by the effect that his ambiguous images with Rorschach-like potential provoked in the viewers. Regarding their aesthetic properties, Piyatat said that they pushed the viewers to imagine seeing certain things. At the same time, he continued, they would trigger a feeling that provoked the viewers to see "whatever they see". What they see, it has been proposed, mattered as much as what viewers might not see in the ambiguous image. With regard to the conundrum of *qualia*, the following observation of the artist may be worth exploring in greater depth. His intention to work with symmetry was the core concept of *Titans*.

By means of this experimental photographic work, the artist blended two contrasting views of the role and function of the brain in the propagation of culture. The figures and faces that the viewers see in the mirrored images of nature are 'brain concepts', to use Zeki's notions, because our brains are "hard-wired". Yet, these figures and faces that viewers extrapolate from the ambiguous pictures are deeply ingrained in their cultural repertoire. The clever intertwining of these two opposing views is a remarkable achievement because the artist created a discursive platform for a dialogue that transcends the trite nature versus nurture debate. Piyatat's intention, he said, was simply to enable people to access his ideas of what he saw when he had covered one eye. Besides seeing the contours of the same iconographic image, the artist created a room for alternative interpretations, as "Titans, no 33" exemplified.

The artist explained that his project did not end there. His lasting inquiry into what people could discern in the images that, following his understanding, give nature a complete face and figure, was premised on the view that each viewer might see a different thing, in addition to the imaginary image. This he intended to reproduce by exploiting the presumptively private nature of the parallel processing-perceptual systems of visual consciousness. To clarify the relevance of the distance between the viewer and the works in the process of interpreting these ambiguous

images, Piyatat expounded on the printing techniques that were an integral part of his experimental exploration of the neuronal architecture of the visual brain.

> **[BRB]**: Perhaps we could start with the first of four techniques you employed. I would appreciate it if you could explain the technology and technique of the first two images [the two daguerreotypes of the *Landscape: 2007-2014* exhibition, discussed later].
>
> **[PH]**: Well, the daguerreotype is an old technique dating back before the time, before, even before, photographs could be printed on paper. It was when people were racing to find the best way to reproduce print, a photograph. Louis Daguerre came up with a technique to transfer and print a photograph onto a silver plate, involving mercury as well. It is a very complex and very hazardous process. I don't know exactly the steps, but I know that it requires a silver plate and also mercury vapour. Normally, you have to prepare the plate, and use it right there and then. You put the plate as a negative, like a film, behind the camera and you capture a photograph inside the camera and using this plate as a film. It is, ultimately, like a Polaroid. It's a one-off. Therefore, in terms of reproduction or reprinting, it's kind of a dead end. Since then, and shortly afterwards, after Louis Daguerre established the daguerreotype, somebody else invented a way to fix photographs onto paper. That made the daguerreotype almost obsolete. Now, of course, you have some specialists still making it for an alternative process. I found this printer in Paris, who is also an artist, who makes the daguerreotypes for me. Normally, the daguerreotypes are made in small sizes. Usually, people produce portraits of people, or their loved ones. I have always been attracted to the daguerreotype because of the reality, the three-dimensional property that it has. A lot of the time, it feels like the portraits in the daguerreotype are like, it feels like it imprisons, or it traps, that person within it for eternity.

[BRB]: Well, I had that impression when I first saw it ["Landscape: 2007-2014, no 28" printed on paper] […] it looked flat. When I saw it on the wall in that large, wooden frame, it was like a sculpture. It came out like a cross. It was very physical (Fig. 11).

[PH]: Yes, yes, I think the medium really brings out the entity within an image. It really optimizes whatever it contains in it, whether it is a portrait or a scene. It always has been my intention to explore this technique. I wanted to experiment with this printing technique for the longest time, since I became interested in photography, but I could never really afford it, or let alone finding somebody who can do it for me. […]. There was kind of a digital revolution that happened not too long ago, maybe, five or six years ago. Basically you can reproduce a photographic negative digitally. This allows me to venture into experimenting with alternative printing techniques. Because what happens is, I shoot all my photographs on film, on my film cameras. Once I got my films, I scan them and put them into a digital file. Then, I adjust my curve level so that the contrast and everything looks right to my eye. Then I will output it, into film again. That film, I send to my printers so he can use this film, this adjusted film, to print, using alternative printing techniques, like platinum print, or daguerreotype.

[BRB]: I see, you mentioned the platinum print, but those photographs were printed on *washi*.

[PH]: Yes, on *washi* paper, which is a traditional, ancient paper. In fact, it has been in production for many, many thousands of years. It was invented by the Chinese. The process of making it is very natural. It doesn't have any chemical or any artificial materials in the process of making it. Therefore, the paper itself is very natural, and technically, it will last for many, many years, for thousands of years, due to its purity. It is like alchemy. It is like turning a tree into a sheet of fibre, while you can write or print a picture on it.

[BRB]: To my eye, the black colour looked like ink, but you told me that it is not ink.

[PH]: Yes. Well, I found the paper from a papermaker in Japan. I supplied the paper to my printer in Tokyo. My printer, whom I collaborate with, he is – I consider him a master printer […]. Before I gave him this *washi* paper, he was more used to printing platinum print or silver print on a more standard paper, kind of watercolour paper […]. But, for me, those papers are quite common. I see them being used in quite a few exhibitions and for my *Landscape* I wanted to be slightly different, to be something more special. So, I challenged my printer. I supplied him with this paper, which he had never used before. It took him like ten months to be able to produce working prints for me. He had to learn the nature of the paper, and the way to tackle it, and the way to work with it […]. He is very persistent, and he was willing to go there with me. It is quite, quite challenging to find printers who are willing to go there with you, because sometimes, they are already established, and doing something that they are comfortable with […].

[BRB]: The ink effect, is it a result of --

[PH]: A chemical that he mixes. The chemical is clear. It contains the platinum, within the chemical, within it, in a liquid form. What he does is, basically, a light sensitive chemical containing platinum. Platinum is what oxidizes and reacts with light turning from clear into grey and black. Once he mixes the chemical, he applies it with a brush onto the *washi* paper. That is why you get the kind of brush effect on the edges. But when he applies it, it is obviously clear. He has to mark with the pencil the small pencil marks, so he knows where to project the light through my film. Once he projects the light through the film onto the chemically treated paper, then the light reacts with the chemical. Then he puts the paper into a developer, and that is when the chemical reaction happens. The clear chemical starts to oxidize and the grey tone and the grey starts to appear. Once the image appears, he has to fix it. To stop it, first he puts it into a stopper, in the second chemical bath, and the stopper obviously does the – it holds the oxidization, because, if you leave it in the developer, the longer you leave it the --

[BRB]: Darker it becomes.

[PH]: It's intensifying, yes. It becomes, it becomes darker. So you have to stop it at the right time […]. The final bath is the fixer […] (Tab. 1A, 3.4).

Reasons why the two art photographic collections *Titans* and *Landscape: 2007-2014* are believed to be of possible interest to neuroscientific researchers are premised on Marcus's proposition. The neuroscientist proposed that 'to understand the neural basis of human cognition, we will need to understand, in particular, what linguists call *compositionality*: the way in which our brain allows us to put together smaller elements (like words) into larger, straightforwardly interpretable complexes (like sentences), even when those larger complexes are novel' (2015:212). "There has to be some kind of balance between the space and the object to create a more balanced or harmonious composition," Piyatat said in relation to his experimentation with perceptual image formation (Tab. 1A, 3.3).

The American art photographer Ralph Gibson, who commented on Piyatat's work, wrote that he had always considered photography 'to be a discipline centred around "the presence of this versus the absence of that"… In the beginning was the word and the word was frame' (2012, original emphasis). The presence of this versus the absence of that is the interplay between figure and ground observable in these artistically composed pictures. This interplay between negative and positive space, as shown by these three observations from a neuroscientist and two art practitioners, provides a platform for a dialogue between a humanistic and a neurobiological understanding of perceptual image formation, cultural memory, and the propagation of culture.

[BRB]: I would appreciate it if you could take me through the first three images that were exhibited at the *Anthropos* exhibition in New York.

[PH]: Well, *Titans* is not done. It is not finished yet, meaning that I am still developing the project. I intended *Titans* to come out after my *Landscape* project, which is what I am doing this year, but my plans never work out. The sequence never works out the way that I like it to, but *Titans* ended up showing first in 2014 in New York. What I gave to the gallery was seven shots that I had already completed. The rest is still in development. *Titans* is really a deeper look into nature to seek the visual inspiration of where religions and cultures may have come from. In my theory, everything came from nature. *Titans* clearly demonstrates that, I think. Like, for this photograph, for example, you can see the prominent figure, standing, with a kind of a *nāga* behind.

[BRB]: Right, the serpent.

[PH]: A Buddha statue has this kind of *nāga*, serpent, on the back of the Buddha.

[BRB]: Right.

[PH]: This shows where that image might have come from […]. Some people see a kind of South American Aztec art direction [in the image below]. Some people say that they see a lot of dead bodies piling up on top of one another, and many countless faces, depending on the distance you view the photograph from. When you look from the distance, you see something. When you look closer, you see something else. For that, I think, this photograph is the most successful for it allows more interpretations from different people, while the other has a kind of a key figure that people can recognize immediately.

Figure 45 – "Titans, no. 31", a digital copy of a chromogenic print, Kodak Endura paper on Dibond, that was included in the *Anthropos New York: Navigating Human Depth in Thai and Singapore Contemporary Art* exhibition catalogue.

This one here (Fig. 44), for me, emphasizes the eyes. As you know, I have an obsession with, with eyes and the notion of being looked at, or you get the sense of someone looking at you. I'm really kind of, a little bit obsessed with that, but, somebody saw the female organ, the ovaries --

[BRB]: Right.

[PH]: -- within this photograph, which I thought was also a very interesting interpretation.

[BRB]: Because of the creation.

[PH]: Yes, exactly, the Mother Nature […]. I love all of these interpretations that people share with me because my interpretation is not so important, I think because I enjoy to hear about what other people see and feel when they encounter my work. The approach to this project is quite tricky because, when I shoot *Titans*, I basically try to look for half a face, or half a figure. So, often I put my hand up and close one eye, just to have a clear view of one side, of like half a face or half a figure, and once I recognize that, then I know that this would work or not.

[BRB]: That is for the symmetry.

[PH]: Yes […] Because, it doesn't quite work when I aim with two eyes. I see too many details on the other side. So, I often just close one and just block the other side like that. So, I only view with one lens instead of the stereo.

[BRB]: This one is coloured.

[PH]: Yes, yes. I mean there is a mixture of black and white and coloured. This is coloured, but my colours are quite muted, quite --

[BRB]: Subtle.

[PH]: Subtle, and not too vivid.

[BRB]: And, in this one, one audience associated with the ovaries, is it a cave?

[PH]: It's a cave.

[BRB]: Looking onto a plain, or the sea, because it is bluish?

[PH]: Yes, looking out into the sea.

[BRB]: Into the sea.

[PH]: And it's on a cliff. It's on, it's quite high up. I had to climb up from a different entrance to get there.

[BRB]: And in case of the *nāga* shaped figure, is it a rock?

[PH]: It is a rock. Yes, that like a peninsula rock goes into the sea.

[BRB]: Like a promontory.

[PH]: I guess. It looks quite volcanic to me. It looks like a volcanic rock, but you, know, again, I aim, and I look for the half a face, and I notice the *nāga*-shape when I was at the location. That's what attracted me. So, it's like that, originally.

[BRB]: Indeed.

[PH]: A doctor saw a sinus in this (Fig. 44), which I thought was quite interesting as well […].

[BRB]: And in this one, what is the --

[PH]: It is fire.

[BRB]: Ah, it is fire.

[PH]: Yeah, originally it's like that, shooting up. This is the only one that I set up the shot myself. I built a campfire, knowing that there is something in the fire. What I got is not too far off from what I imagined. I knew that there will be kind of a demon flame, kind of a satanic creature, but I -- most people would be scared of this, but, for me, it's kind of positive […]. Yeah, I mean there are many faces in there. That kind of gives you a bit of clue of where the demon,

the visual of the demon might have come from. Maybe people in the old days sat around the fire and saw the same thing.

[BRB]: The centre is almost like the face of a cat.

[PH]: Yes, and you see here. I see this as a kind of a prominent head with eyes, and jaw, with teeth, and a kind of a horn.

[BRB]: Ears or horns.

[PH]: Or, you can focus at the top with a kind of a head with the arms stretching out […].

[BRB]: It sets an inspiration for imagination.

[PH]: Yes, I think. Titans: I am very happy that they can communicate that point quite clearly. The mythology, and the gods and the goddesses, they all symbolize nature anyway. For me, Titans are my visual mythology, which I am hoping to build on and, hopefully, have more substantial shots and figures within the project so that I can create my own mythology.

[BRB]: You bring nature alive at the scale of the myth. You said it's a dead coral (Fig. 45).

[PH]: Yes, dead corals in the Thai Gulf from one of the islands […]. To my sadness, I found this vast area of dead corals.

[BRB]: *Pakarang* in Thai.

[PH]: Yes, *pakarang*, yes. Again, I aimed for half a face and half a figure. I knew that there was a lot happening within this photograph […]. The fact is that it is dead corals, but it is clearly not dead (Tab. 1A, 3.2).

Inside the 'Black Cube'

The photographer, capturing the aesthetic response of the young woman looking at "Landscape 2007-2014, no 28," stood between her and me (Fig. 11). Did she see the same image that I saw? From the distance, I saw a shining, cross-shaped figure. The key figure, however, was not a cross. It was an illusory effect. The young viewer,

standing sufficiently close to mirror herself in the polished silver plate of the daguerreotype below, is likely to have recognized the sea creature trapped in this image. On the last day of the exhibition and of my fieldwork, I told the artist inside the gallery that I had returned to see that particular work one more time. Besides exemplifying the fact that when we look from a distance we see something different (e.g. a cross-shaped figure) from what we see when we stand close to the image (e.g. a dolphin), this ambivalent image brought into perspective the temporal dimension of art making and art viewing. As we were standing in front of the two daguerreotypes, Piyatat said that this exhibition was a kind of a "cave of our time" (Fieldnotes, 24 April, and 31 May 2015).

When the artist compared the *Landscape: 2007-2014* exhibition to "a cave of our time" and an "archive for the future", he hinted at the mutualistic associations arising from the interplay between the neural frame and the spoken word. The artist not only exploited the translational processes of the two presumptively unintelligible languages (of nerve impulse and speech) to illuminate the problem of *qualia* from a perspective that created a dialogue between a neurobiological and a humanist understanding of consciousness. He also brought into the dialogue the temporal dimension of the instrumental function of the brain in the propagation of culture from a human history (evolutionary) point of view.

[BRB]: The negative and positive space, how does it play into it [your experimentation with perceptual image formation]?

[PH]: When I was learning live drawing in boarding school, my art teacher emphasized that what I am drawing, what I am putting down on paper, is about not only the object, or the subject in front of me. It is also about the negative space around the figure, or the object that I am interpreting, meaning what is

within the frame, the paper, or within the frame of the photograph. There has to be some kind of balance between the space and the object to create a more balanced or harmonious composition.

[BRB]: They live together.

[PH]: Yes, they definitely are as important.

[BRB]: The negative space becomes as important as the figure.

[PH]: Absolutely, absolutely, and I explored this notion further when I seriously got into photography […]. With the large format camera, when you view the composition on the ground glass, you see the image upside down and inverse. So you can no longer compose with how you see normally. You automa -- but you have to grasp something, but, everything becomes much more disoriented. What I had to do was to recognize, and to kind of play around more with shapes and shadows and light […].That is when the object and the negative space come into play (Tab. 1A, 3.3).

This balancing act produced ambiguous pictures. Crick maintained that if we could not describe the (visual aesthetic properties) of an object unambiguously, we were likely to find it difficult to explain those properties in reductionist terms (ibid., 9). That difficulty provides an opportunity for artists and neuroanthropologists to engage with the neuroscientists to consider together those properties that are difficult to explain in reductionist terms. Ambiguity becomes a resource, and not just a characteristic of great art (Zeki, ibid.); a resource that may lead to new insights in fields of research that deal with the interconnectedness of perception, cognition, memory, and self-awareness in perceptual image formation. Classic illustrations of how the brain deals with ambiguous interpretations of the same and different visual categories (Zeki 2009:82) include the “Wife-Mother-in-Law” and the “Rubin Vase-

Rubin Face" bi-stable images[68]. Bi-stable images produce bi-stable facts that are stable in one moment. The *Titans* collection both exploits and demonstrates this particular characteristic of visual indeterminacy experimentally and empirically.

'The Gestaltists' Laws of Perception,' argued Crick, 'should not be regarded as rigid laws but as useful heuristics' (ibid., 41). Piyatat, knowing or unknowingly, took stock of that view. His symmetrical forms challenged our desire for a clear and coherent picture. The *Titans* project brought out corporeality in the form of fantastical sculptural metaphors that the artist used to write legends of our time. Would these works be useful in future examinations of the question: 'What processes are operating to produce these appearances of these "laws?" Many visual psychologists are trying to discover just that,' wrote Crick in relation to the *Gestalt* theory. Separating figure from ground was an important operation, the scientist observed. Piyatat confirmed the importance of this cognitive process in his elucidations of what he had learnt from his secondary school teacher in England, which set him on the course of experimenting with the way images form in the brain to produce visual illusion.

The important operation in the translational process of forming a concept from an object perceived through vision formation is found across civilizations. Early evidence for this cognitive faculty of separating ground from figure (i.e. the negative from the positive space) is found in the handprints and hand stencils discovered on the walls of prehistoric caves in the western and the eastern cultural hemispheres. The recently discovered Palaeolithic handprints in caves not only cast light on the importance of separating ground from figure in forming concepts and reproducing them visually. These parietal handprints and hand stencils in the Moros Karsts caves in Indonesia (Aubert, Brumm, Ramli, Sutikna, Saptomo, *et al*. 2014), and those found

[68] "The Rubin vase or Rubin face" is a figure-ground image that either can be seen as two faces or as a vase, developed c. 1915 by Danish psychologist Edgar Rubin. The wife-mother-in-law image was made famous by the cartoonist William Ely Hill in the magazine *Puck* in 1915, though the image predates him. The chin of the young woman is the nose of the old woman. It became an exemplar in psychology in the 1930s.

in various parts of Thailand (Higham and Thosarat 2012; Munier 1998), look strikingly similar to those discovered on Sulawesi Island. What they further tell us is the important place of the hand in human history

'The hand may be regarded as the part of the body that appears most frequently in the field of human vision' (1989:20), suggested Adrian Frutiger. Researchers of brain plasticity (Doidge 2015) consider the hand[69] an object of significant interest in the study of illusionary effects. The category of people 'engaged with cultural diversity and the neurological consequences of developmental environments […] brings to (the anthropological) mind another peer group' proposed Strathern. The so-called *Knowledge in Hand* comprises 'all those subjects of studies of manual expertise, of craftwork and handwork: namely, the owners of the hands' (2012:433). Speculations about the meaning of prehistoric ideographic structures are a reminder of the deep genealogy of figure and ground.

The dialogue with Piyatat showed that his works decentred Walter Benjamin's observation: 'Even the most perfect reproduction of a work of art is lacking in one element: its presence in time and space, its unique existence at the place where it happens to be' (2013 [1968]:220). Piyatat introduced a temporal dimension into his artistic engagement with the problem of *qualia* and turned the exhibition space into a social laboratory to register and research the aesthetic reaction of his international audiences[70]. He thus displaced Benjamin's argument that in photography, 'exhibition value begins to displace cult value all along the line' (ibid., 225-226). When the artist referred to the gallery as "a kind of an archive for the future" and "a cave of our time", he alluded to the session during which we discussed the motifs of prehistoric rock paintings discovered in the Southeast Asia region (Higham 2014; Higham and Thosarat 2012; Munier 1998).

[69] The 'rubber hand illusion', for instance, is a study topic in phantom limbs research.
[70] Photographs of the exhibition opening are available at https://ocula.com/art-exhibitions/serindia-gallery/landscape-2007-2014/.

We talked about it because of figure and form. The hand stencils and handprints exemplify what the artist explained to me when I discussed how he developed an interest in producing images with Rorschach-like potential. If the prehistoric cave painters had knowledge of figure and ground, and the skills and the technology to record concepts that they shared on the walls of caves and rock shelters, then we have good reasons to argue that art making started in prehistoric Thailand. To know whether these caves were ancient places and spaces of circulation, we would need to establish whether people from Sulawesi and Southeast China (Liu, Martinón-Torres, Cai, Xing, Tong, *et al*. 2015) travelled westwards along the intricate riverine system of mainland Southeast Asia.

To confirm possible connections, we would need to know the age of these rock paintings made by people who mastered the controlled use of fire (an essential technology for cave painting). According to Charles Higham and Rachanie Thosarat (2012), a major obstacle in trying to confirm early human migration routes (Callaway 2015) was a lack of accurately dated prehistoric material culture in Thailand. 'These many examples of a vibrant artistic tradition have the potential to add much to our appreciation of the prehistoric people of Thailand, but first and foremost, there needs to be a dating programme so that we can relate them to the cultural sequence' (Higham and Thosarat, 165).

A Thai scholar at the *Sood Sangvichien Prehistoric Museum and Laboratory* of the Siriraj Medical Museum (interviewed by Thammasat university students, commenting on why countries had museums) blamed a general lack of concern for 'stone age Thais' (Jennunthakajorn 2012, transcribed from the video subtitles). The roots of Thai art are commonly indicated in the country with the Dvaravati period in the sixth to thirteenth century (Krairiksh 2012l Subhadradis 1991), and not with rock art. This neglect of the Palaeolithic heritage of Thailand puts at risk the conservation of the prehistoric cultural heritage, such as the red-ochre wall paintings found across

Thailand[71]. The *Bangkok Post* reported that, even though the Fine Arts Department and local communities had sought legal protection for the Neolithic caves[72] in the southern part of the Khao Na Wang Mi Mountain, geophysical prospecting activities in the area (Svasti 2015) made their future uncertain.

Damage to these wall paintings, recorded in the Indochina travelogue of the early twentieth-century French explorer Étienne Lunet de La Jonquière (Munier, 187), and attributable to the Middle Holocene, could not be excluded since they lay in a rock blasting concession zone. Asian prehistoric and protohistoric migration routes (Higham 2014; Murphy 2013) were not considered for this study of spaces of circulation of knowledge, technology, and innovation. They nevertheless should be put onto the map of the Neuroworld since they evidence the symbiotic and synergistic relationship between neurobiological and sociocultural cross-fertilization in the propagation of *ars* and *techné*.

[71] It has been suggested that they were made between 4000 and 2000 BC (Higham and Thosarat 2012; Woodward 2003; Munier 1998).
[72] These caves are close to excavation sites where bones of Neanderthals and tools of the Late Pleistocene Age were discovered (Anderson 2005).

Conclusions

I shy from something that comes scraping crossways through
the blizzard.
Fragment out of what is to come.
A wall gotten loose. Something eyeless. Hard.
A face of teeth!
A wall, alone. Or is a house there,
even though I can't see it?
The future… an army of empty houses
feeling their way forward in the falling snow.

– Tomas G. Tranströmer, *Preludes* (selected from various verses)

I shy from something that comes scraping crossways through the blizzard

"With bioarts," I replied in response to the question of how I intended to research the political and social agency of science-city populations in a Southeast Asian cultural setting, if not through the anthropological critique of neoliberalism and the internationalization of technoscience. Knowing little about art production and consumption in the bio-corridors of Singapore and Thailand, I had nothing to add to the last intervention made by the director of the *Centre on Migration, Policy and Society* and co-director of the 'Future of Cities' programme at the University of Oxford, UK[73]. Silence fell on the well-attended boardroom, followed by warm applause. That was on 9 May 2013, a few days after the planned meeting with the Thai molecular scientist whose artwork intrigued me deeply, and the spontaneous encounter with the American architect and lab designer on the edge of Biomedical Grove.

These two face-to-face encounters in Singapore Biopolis were critical for laying out a workable plan to research the inner sociality of science-cities with a bioarts centred methodology. The field-based interrogation of the 'art-in-science-city phenomenon' departed from a shared observation that Fischer made in relation to 'communities of concern'. He had remarked on how articulate and thoughtful people were in their technological lives, and about the scientific arts that were part of those lives, compared to how reduced discourse became in the so-called public sphere (Fischer 2013:402). Setting out with two lines of inquiry contemporaneously, I forged a path into the cultural niches that develop from the social encounter of art and science in the inner lifeworlds of technoscience. The instrumental role of cultural and

[73] I thank Professor Dr Michael Keith for his invitation, and Professor Dr Biao Xiao for liaising, and the seminar audience for their valuable observations and appreciated suggestions.

generational renewal in enabling park-communities to reach the level of a science-city community was the central theme of *Part One*. How a group of Bangkok-based artists engaged in their research practice with older and newer theories about the anatomical structure and the functional organization of the brain was the thematic focus of *Part Two*.

Unlike the imagined man in the poem of Thomas Tranströmer (1931-2015), I looked forward to that encounter of the 'two truths' – one coming from the outside, the other from the inside – which one may variously interpret either as an intersubjective encounter or as an inner-personal encounter, or both at the interface of epistemologies, technologies of imagination, and representational techniques and practices. The mapping of the unconscious urban structures of political and psychic repression through feeling a way forward into a poorly charted terrain of the Neuroworld understood that metaphorical encounter as a dialogue cutting across those inner and outer truths.

When I saw the commissioned artwork of the Thai microbiologist, who repeatedly stated that it meant nothing to her, it felt like that 'something that comes scraping crossways through the blizzard' in Tranströmer's *Preludes*. That something lay beneath the ethnographic surface of things. To reach there, one had to reach at the implicit by channelling one's energies into the cognitive, as Bloch prefigured. To understand what was going on in these emerging cultural niches that form in science-cityscapes necessitated an aesthetics centred approach that employed the ethnographic self as a primary resource through the dialogue with research participants. What the authors of these works intended but left unexpressed, and that which they unintentionally expressed, created the stage from which we explored together how they intended to contribute to alternative and complementary understandings of the brain and human consciousness. When I immersed myself in the embryonic bioart scene of Bangkok, I did not know whether I would find artists

dealing with biological neuroscience, neuropsychiatry, forensic neuromedicine, brain imaging research, and related subfields of the neuro disciplines, such as neuroaesthetics and connectomics.

In contrast to the exploration of PS-City, I had no pre-existing contacts with the art world of Bangkok at the outset of the study. The connections with the artists, who agreed to collaborate on the planned brain art themed group exhibit *Shadow and Light: Art in the 'Age of the Brain'*, materialized from gallery visits after immersion in fieldwork. Devising a coherent and consistent methodological strategy grounded in ethnographic anthropological research was a challenging undertaking. Unlike what one might have expected, the study started with a generic symbol. The pixelated tree in the corporate logo of the TS-Park provided the first testing ground for establishing the viability of writing a nuanced account on the formation of the first science-city of Thailand. The primary insights into science-city life, gleaned from querying the social meaning of the 'tree' in the vernacular of PS-City, were crucial for the analysis of the tree/park conundrum.

It took time to become familiar with the tree-rich vocabulary that the dialogue partners mobilized when the topic of conversation was the difficulties to consolidating and growing the 'parkscape' into a science-cityscape. Like the acquisition of any foreign language, the process was frustrating, at times, albeit rewarding. A sense of that frustration, I assume, was conveyed by the insistence on what might have seemed an insignificant design work. The slow but sure conceptualization of that iconic tree as the *arbor vitae* made apparent its theoretical and analytical relevance and significance for elucidating the deeper genealogies of the triangulation of knowledge, technology, and innovation in the social imaginary of the PS-City community. Without it, I would have missed an opportunity and the possibility of 'digging deeper' into the historical and cultural development of the first Thai *biopolis* which rose from the cosmopolitan microcosm that formed on the

eastern and western riverbank of the Chao Phraya River Delta in the seventeenth century Siam.

Fragment out of what is to come

The 'tree of life' of this Southeast Asian science-city community, in its manifold guises (and disguises), emerged from the semiotic networks in which the iconic tree is embedded as a symbol of life; hence the appellative – *arbor vitae*. We have gained much knowledge of the culturally and historically rich terrain on which PS-City is growing and expanding. This knowledge has provided a fuller picture of the compound forces that have influenced and shaped the life history of this science-city that has received little attention from anthropologists of science and technology, and STS scholars. The persistence in following the graphic symbol that eventually led me to works of scientific art, fine art, and popular art denoting life/bios, paid off. Pushing the boundaries of the catchment area in the literal sense, finally revealed new things about how an unprecedented phenomena came to take on new meanings in the so-called 'season of discontent'.

The protest movement of science administrators and scientific researchers that adopted the slogan 'Fight for Science' to make their voices heard by the people in authority and the public, exposed the vulnerability and precariousness of science and technology innovation. Their articulations have brought into focus a topic less discussed among science-city planners and developers; namely the downscaling of operations in times of political instability and/or an economic slump, or a natural calamity, as for instance the inundation of large parts of PS-City in autumn 2011. The redistribution of funds between two government-administered parks in the Khlong Luang district raised fears and incited park rivalry. When a ministerial decision to

reduce the budget of the National Science and Technology Development Agency (NSTDA) hung like a Damocles sword over the park community, the topic of park decommissioning surfaced during a conversation with my taxi driver. The same subject emerged during an audio recorded teleconference call with the American architect and lab designer, and his senior colleague who joined one session.

"They may become just dried out plant spaces in the air. Well, that's a bummer!" exclaimed the senior of the two American architects and lab designers. "That's a bummer!" repeated his colleague emphatically (Tab. 1F, 2). Startled by the bluntness and staggering simplicity with which they articulated the possibility of the demise of a science-city, I held my breath. Their remark was as unexpected as that of the Thai life sciences professor who repeated that without the trees the park was dead, when we discussed community-building activities, such as the art-in-science/science-in-art youth camps (Pre-fieldwork records, 15 July 2013). What she meant was that, without public funds, the park had no future. The future was the new generation of scientists and engineers. The explanations of the pictogram that science policy advisers gave before the completion of the second expansion phase, compared to the explanations obtained later on, revealed a significant change of the meaning of the arboreal icon. Meek in the first decade of the park, it became cheeky during the negotiations that ended with the adoption of the ministerial plan to invest in the development of the two major science parks on both sides of the Khlong Luang district. 'The tree' was defiant when it surfaced at the annual science and technology fair to secure a future for the park to which it belonged.

"Do it, or die," said the director of the TS-Park administration in response to the plan of raising the government budget for science and technology innovation to one percent of the annual gross domestic product. Without hastening to the same conclusion, I channelled my energies into exposing the effort it takes to build the social amalgam from the ground up. What it takes to cultivate "a new breed of

scientists and engineers", to repeat the phrase of the Swiss neuroscientist I met in Singapore, and 'a new breed of science-based artists', to use the phrase of the Malaysian artist and art scholar I met once in Kuala Lumpur, prefigured the *Robots Factory* group exhibition. 'Do it', Jitti wrote in the caption of one of the "Robots Factory" installation sketches that captured the spirit that drives the science-city life as he knew it from circulating inside PS-City. The tree/park dilemma was initially used as a proxy for drawing nearer for deconstructing the satirical cartoons on the title page and the back cover of a *Horizon* issue dedicated to the TS-Park that I have begun to analyse and theorized as 'cities of life' with the *arbor vitae* concept.

A wall gotten loose. Something eyeless. Hard. A face of teeth!

Eyeless was the skull through whose protruding jawbones shone the contours of the INC 2 of the TS-Park in the 'anatomical analysis' of the development potential of the Thai knowledge-based economy by Muscular & The Scientist. Hard was the critique of the front cover illustration that showed a single scientist plucking fruits from the only fruit-bearing tree in the parkscape in which none of the trees had roots. With their imagination let loose, the sci-fi writers of "Brain Eyes" and "Metal Rix" allowed the heroes and heroines of their plots to speak up against policies that caused controversy in Thailand. Firered Maximum and the Homunculus Team grappled with topics that raise political questions. Policy reforms to aid developing Thailand into 'a melting pot of researchers worldwide' (Chongkachornphong 2013) was among the current issues that preoccupied them as they witnessed the gradual formation of the ASEAN Economic Community (AEC). They also addressed ethical issues in robotics R&D and bioethical matters arising from advances made in diagnostic brain-imaging.

Jibby's video recorded song "Pigs Don't Cry" that she performed live at the Paulaner Bräuhaus on Millennia Walk in Singapore received a standing ovation from the audience. Imaginatively and with biting wit she wove one of the two key arguments of the Fight for Science movement into the lyrics of her song that obviously appealed to the cheering crowd of scientists, engineers, and university students. The descriptive account of the large tree effigy under which I sat during the 2013 National Science and Technology Fair opened a window onto the 'storm' that broke loose after the ministerial announcement to axe the earlier approved bonuses of research scientists within the remit of a significant budget cut of the semi-autonomous NSTDA. The second point of contestation was the announced policy to seek the approval of the science and technology minister for substantively funded research projects.

The protest movement receded after an agreement with the newly appointed minister had been reached, even though the tensions between various constituencies of the future PS-City did not end there and then. This protest movement, and the one that medics, and public health administrators staged at about the same time as the standoff between the science and technology minister and the TS-Park community, elucidated the ways in which technoscience was entangled in the meshes of a national political crisis. The art-science interface does not happen in a bubble, but in the social pockets that form at the intersection of artistic and scientific knowledge circles. These pockets exist, like the research communities, in the politicized force-field of science and innovation funding for incentivizing the national bioeconomy. By drawing attention to the precariousness of science, in terms of project funding and other infrastructural support, the creators of the artistic and artful creations discussed in the first chapter signalled their commitment to a common cause. That is the growth of the domestic high-skill labour market to improve the international competitiveness of Thailand beyond Southeast Asia.

This first collection of artistic creations first and foremost served to foreshadow how I intended to study what I had found 'in the field'. These works have been used as 'something that we work with prospectively, a technology that enables the creation of new things', to borrow Nicholas Thomas's phrase. The two sci-fi comics that were included in this study of the inner sociality of a science-city with artworks illuminated Fischer's view that 'the arts are often early adopters of technique, yet often lag behind the frontiers of what can be done and of what scientists themselves plan and dream' (2009:161). Firered Maximum's "Brain Eyes" story, in which imagination was defined as the creation of new memory, dealt with the conundrum that the neuroscientists Christof Koch and Gary Marcus considered the 'final challenge' in the brain and cognitive sciences. That is to solve the enigma of the brain-mind relationship. "Brain Eyes 2", the imaginary neurotechnological device that was going to re-tool the state of mind of the father who lost his wife, son, and job in the tsunami-like event, provocatively suggested that grief is locatable in a particular area of the brain. Neuroaesthetics and connectomics research challenges such older understandings of the structural and functional organization of the brain. Where to look in the search for dissociative behaviour in the anatomy of the brain is a controversially discussed topic in clinical and bioscientific research of brain health and brain disease.

Where these intricate neuronal processes that produce emotions occur in the cerebrum has been a recurrent topic in the art collection discussed in the second part of the thesis that engaged with the question 'Are we our brains?' The conceptual and experimental artworks were analogues to the previous collection. They were used primarily as a technology for generating relational knowledge about how the artists spoke of themselves as finding methods alternative and complementary to reductionist understandings of the organization and functions of the brain and/or mind. My attempt to find out how they were 'neurologists' in the sense of Semir

Zeki's thought-provoking argument, and 'clinicians of civilization', was the ethnographic platform from which this anthropological inquiry into the viability of the bioarts hypothesis in the neuroanthropological study of the propagation of culture took off.

A wall, alone. Or is a house there, even though I can't see it?

Two-British born dialogue partners in Singapore enquired whether I had knowledge of artists in Thailand who were producing neurobiologically informed works similar to the "Functional Portraits" by the Portuguese-born artist that have travelled the world. I replied that I would try and find out the next time I visited Bangkok. Finding artworks with a brain motif in the embryonic bioart scene of the Thai capital city was one task; unravelling their hidden narrative was an altogether different task. The exhibition catalogues and reviews, and sources of grey literature, were useful to a limited extent, as the brief email exchange with the curator of Piyatat's *Titans* at the *Anthropos: New York* group exhibition exemplified. In her curatorial essay 'Detachment (Toward an Encounter of Titans)', Loredana Pazzini-Paracciani (2014) wrote that the exhibiting artists offered alternative approaches to the human theme of anthropos. They employed the human visual signifier as a point of departure, or detachment, to negotiate conventional cultural, social and geographical ties. About his work, she says that in his investigation of the human condition, he detached himself 'from ordinary sight, inspecting his surroundings with a scrutinizing eye'.

From the transcribed dialogues we deduced that when the art photographer covered one of his eyes, he was not detaching himself from ordinary sight, but was trying to complete that sight by giving 'nature a complete face and figure.' Hoping to clarify that conflictive point, I asked the Singapore-based art historian for

clarification of the term *anthropos*. “I think the best answers for your questions are in the curatorial essays I wrote for both shows, catalogues attached here for you. In particular the show in NY (where Piyatat was featured) develops further the dimension of *Anthropos New York: Navigating Human Depth in Thai and Singapore Contemporary Art* as a cosmic yet anthropological entity,” she wrote in her reply (Email, 26 January 2015). The curator’s definition of *anthropos* as ‘a cosmic, yet anthropological entity’ did not make sense to me. Nor did her description of the human visual signifier as a point of departure, or detachment, to negotiate conventional cultural, social and geographical ties, make sense in view of the discussion of the *nāga*-snow prince image Piyatat and I, and other people, detected in “Titans, no 33”.

Seeing faces and figures in these ambiguous images showed the crucial involvement of the imposition of other concepts that could dictate what we perceived in images that confuse the visual brain and activate the visual unconscious when translating visual stimuli into the language we speak. Our interpretations shed light on intersections of epistemologies and representational practices in the formation of social imaginaries. How could one possibly detach oneself from the neurobiological processes and cultural memory that are involved in perceptual image formation? How could one possibly detach oneself from the religious, social and geographical influences that shape our neurobiological identity as does our genetic makeup from a cognitively-based perspective? Someone who is unacquainted with Buddhist iconography, or a person diagnosed with prosopagnosia (colloquially known as face-blindness), is unlikely to discern the image of the *Mucalinda* in this phantasmagorical image that awoke childhood memories in me.

‘The fact that other areas, beyond the essential nodes, may become involved in shifts in the perceptual state implies that other influences, including memory, may be brought to bear on what it is that we perceive with the same stimulus,’ explained Zeki

in relation to how the visual brain deals with ambiguous imagery (2009:86). Neither Piyatat nor I thought it possible to detach ourselves from 'ordinary sight'. The correspondence with his curator stopped there, whereas our collaboration on the brain art exhibition production continued.

Be had cautioned me about getting into deep water by incorporating two diametrically opposed theories of how higher cognitive functions, such as perceptual image formation, develop in my anthropological analysis that examines the intersections of artistic and scientific epistemologies and representational, and interpretative practices ethnographically. He is likely to have experienced the difficulties of positioning oneself in that conflicted terrain of his experimentation with optical illusions when he collaborated with a neuroscience team in the United Kingdom. 'Anthropologists', Rabinow argued, 'must seek to explore in terms of both how their own inquiry is organized, conducted, and circulated and even more so, how it is being lived by those we choose to observe' (2008:100). Embracing this position implied that reflexivity was inbuilt in the research methodology and not taken as an afterthought, as it were. My presence in the text was inescapable because of the ethnographic dialogic engagement that upheld the research methodology. One might consider this constellation to be the strength and the weakness of the developed and applied method that hoped to generate a relational understanding of bioarts in the social lifeworld of a Thai science-cityscape.

The future… an army of empty houses feeling their way forward in the falling snow

'Mining' *Titans* and the *Landscape: 2007-2014* art projects, and the process-based art installations of the *Operation Bangkok*, *Fault Lines*, and the sight-specific *Mould Boy*

exhibitions, together with their authors, proceeded in a non-linear fashion. The dialogues moved back and forth between the images, art media and techniques and the origination of their works to elucidate how they tried to scale the presumed barriers to the communication of *qualia*. By going on in that fashion, the artists and I identified a host of more tractable problems compared to contemplation of why we might experience the phenomenal qualities associated with the colour 'red', or the 'painfulness of pain', in the same way or differently. How this group of artists tried to manipulate the mechanisms by which our body translates the language of neural impulse into the language we speak drew out the sessions that closed in on how Be, Ise, Noraset, and Piyatat exploited the specificities and peculiarities of the 'hard-wired' and the 'plastic' brain .

Neither the artists nor I pretended or expected our research findings to *explain* the 'authentic mystery' (Bartra, 31) revolving around the mutual intelligibility of these two language systems. We held no such grand aspirations when we discussed their artistic experimentation from a position receptive to the view that symbolic expressions form in the neuronal networks of the brain – as in Ise's introspective statement: "It is the brain *who* generates everything about our belief." By 'digging deeper' into his conceptual work we reached the conclusion that the concept informing the technique applied to realize this artist-in-residency project originated when he was in a coma after a brain surgery and having several CT and MRI scans. Adding 'crossing' as the third dimension to 'cutting' and 'slicing' provided the three-dimensional 'grid' of *Operation Bangkok*. This grid that the artists used for mapping the unconscious urban structures of political and psychic repression onto the installation resulted from visiting places recommended by Bangkokians, and that were in the news, and from revisiting his feelings during and after a brain surgery.

The workshop style sessions with the artist led us to conclude that his 'cutting and slicing' technique developed from the pain that Ise felt in the coma, and not from

the brain surgery itself, as stated in the exhibition review in the *Bangkok Post*. His realization that he was the artwork was formed through the elucidation of the entanglement of the multiple meanings of 'operation' in the narrative of the artist that was examined by trying to understand the passage from 'operation room' to *Operation Bangkok*. In an interview, Ise said that his crew was in the installation, and that he was not in it. That view was no longer tenable after he exposed the life-changing event that enabled him to visualize the difference between saying "I am conscious, therefore I am," and "I feel, therefore I am." This he shared with a public audience during an open studio talk at the Gillman Barracks in the bio-corridor of Singapore. His process of feeling a way forward through the pain to realize the *Operation Bangkok* exhibition drew into the discussion the formation of new concepts emanating from a comatose brain. While 'we have a clear understanding of the dynamics by which information passes into awareness,' Koch and Marcus write, 'we still don't fully know why experiences feel the way they do' (2015:269). The 'subjective turn' in cognitive neuroscience, I concluded, stood neuroanthropologists in good stead, in that the final challenge ,provides an opportunity and possibility of considering, along with neuroscientists, questions raised by artists, and artworks that challenge inherited knowledge on the higher cognitive functions of the healthy and diseased brain.

Unable to speak about his suffering in the 'glass room' (the intensive care unit), Ise used the tool that he uses the most in his art practice. With a pen he drew lines on graph paper. Pointing at the stamping figure that he had printed in the midst of those straight lines splitting up the two-dimensional plane, while repeatedly saying 'cutting', 'slicing', and 'crossing', was his silhouetted *alter ego*. About a year after we started "digging *Operation Bangkok*" together, he admitted that "this guy" was him. "I am the artwork," he said in the shadow of a tree while we were waiting for a taxi in the neighbourhood of Singapore Biopolis. The realization that his bespoke

technique emanated from efforts to remember what had happened to him during those weeks in hospital showed that new concepts can form in a state of reduced self-awareness.

While this observation points to the experiential link between neural impulse and linguistic speech, it does not explain, but describes, a subjectively experienced feeling of a comatose state. Excited about the discovery, Ise said he would tell his grandmother about our discovery on his return to his native town. Regarding his artist-in-residency at the Bangkok University Gallery, and those that followed in Berlin, New York, and Tokyo, the Kelantan-born multi-medium artist said that they supported him in finding a way back into his life. Using Zeki's description of artists creating a discursive field on canvas 'through the visual medium without the necessity of using words', Noraset and I concluded that even the symbol he initially used to visualize a feeling that he associated with 'dirt' and 'sin' was superfluous. It was too loud and said too much. It disturbed, and thus had to go.

A "blank line" was far more effective, the artist maintained. His dialectical cultural critique of mapping out psychopathological behaviour with neuroimaging technology developed into the main topic of the analysis of *Fault Lines* by the Dutch-trained Thai conceptual and new media artist. His social commentary on the proliferation of symptomatological tables used in the diagnosis of associative behaviour drew on older and newer theories of the brain-mind relationship in forensic neuromedicine and neuropsychiatry.

The elucidation of how he achieved the intended visual effects that made his brain look as though it were alive and functioning on the two canvases (that were the centrepiece of this neurobiologically informed installation) cleared a way into his artistic 'brainscapes' that were elaborated portraits of his neurobiological self. These were painted on the large canvases entitled "Study of My Own Brain I" and "Study of My Own Brain II". My proposition that we regard as self-portraits these artistic

renderings showing the neurobiological identity of the artist led our discussion deeper into the problematics of 'picturing personhood' (Dumit 2004). The intimate dialogue between the artist and his neurobiological self, however, was not self-referential. By exposing himself to the audience, he created a dialogue that we deconstructed by examining the polysemy of the notion of 'fault lines', using the same technique that he had applied to critique reductionist understandings of mental health problems, namely a dialogic engagement with the visible and invisible in brain scans.

The examination of the visual aesthetic expressiveness of the two self-portraits before and after the artist covered the realistically painted flies was aided by Duchamp's conceptual notion of the 'personal art coefficient'. It helped us to steer away from confidential medical records, and to channel our energies into what the artist left unexpressed but intended to convey, and that which he unintentionally expressed. A further aid in reaching below the ethnographic surface of these works was the observation of his curator Brian Curtin that the installation held potential for contemplating 'how the manipulation of personal agency and comprehension can be understood for urgent social and political contexts in the contemporary world'. Not only did Noraset offer a way out of the labyrinthine concept of how the sciences feed off the arts and vice-versa, he prompted the enquiry to consider the viability of the bioart hypothesis in the anthropological study of the brain and material neuroculture.

"See!" Noraset seemed to be telling his audiences in the gallery space that he had turned into a social laboratory for researching people's aesthetic response to this work, which makes us conscious of how we are implicated in the creation of human categories based on neuroimaging pictures. Analysing the dialogue transcripts, I began to see how Noraset made visible and more enjoyable Victor W. Turner's analogy between myth and brain maps, quoted in Robert Turner's neuroanthropological essay on ritual action. 'If myth can to some degree be considered a highly coloured map of brain neuroanatomy, ritual may perhaps be

thought of, however crudely, as given its momentum by brain physiology' (1985, quoted in Turner 2015:31). Robert Bartra, similarly to Roepstorff, related the problem of seeing neuropsychiatric symptoms on anatomical brain maps to the limitations of 'skilled vision' in the interpretation of images of the brain.

Bartra maintained that the truth was that we still could not 'read the "synaptic hieroglyphics," as Jean-Pierre Changeux called them, to be able to understand the precise operations that the brain performs when the hand moves' (Bartra, 30). However, he recognizes that 'neuroscience is getting closer to the explanation, especially to the degree to which it has been moving away from the idea that the consciousness of having and moving a hand or of looking at a sunset implicates the existence of a small "I" that lives in the brain and contemplates the representations of the fingers and the back of the hand, or the colour movie of the beautiful end of an afternoon' (ibid.). Ricœur addresses that same representational problem that poses an interpretative problem when he writes that 'the hieroglyphs would still have to be deciphered, as when the age of a tree is read by the concentric circles drawn on the tree stump' (2004:426). He concludes, 'the metaphor of the imprint does not resolve the enigma of the representation of absence and distance' (ibid.).

While the dialogues with the artists do not resolve this conundrum in brain research, their artworks help us to illuminate that metaphor of imprint in relation to 'how the nervous system responds and adapts to social, material and cognitive environments' (Downey 2012:247; see also Rose and Abi-Rached, 157). Piyatat's experiments with the translational process of neuronal impulse into the language we speak brought to light the relationship between perceptual image formation and symbolic expression. This 'manoeuvre' created a discursive platform for revisiting the argument that only a small part of the faculty of symbolic expressions is anchored in the neural networks of the brain since human cognition is intrinsically social. Art is a function of the brain/bios, maintained Zeki. At the opposite end of that spectrum,

we find the argument that art is a function of culture. The aesthetic responses to Be's "Mould Boy" and Piyatat's "Titans" revealed that perceptual image formation is intrinsically biological and social. In addition, the "Titans" collection challenged the view that consciousness involved some form of short-term memory, and so did "Mould Boy," if we give credit to the reported accounts of the artists about people's aesthetic response to their works.

When the viewers of these bi-stable images tried to discern the form (convex or concave) of the live body cast of a woman while she was pregnant, and the figures and faces in the ambiguous photographs, their long-term memory was activated, too. That suggested the notions belonging to the distinct and different language categories that surfaced in these articulations (e.g. '*nāga*'; '*Mucalinda*'; 'snow prince'; 'sinuses'; 'Aztec patterns'). These interpretations seemed to suggest the visual literacy engendered alongside the brain reality that is shaped by internal and external influences (Zeki 2009:208), an archaic, primordial memory passed down from generation to generation through symbolic forms of expression. Based on these initial insights, it stands to reason that the mechanisms used to instil meaning into this world are the very ones used to instil meaning into works of art because they help us to access the implicit, which, as Maurice Bloch contended, refocuses our energies on the cognitive.

Piyatat likened his operational mode out in nature to auto-piloting. Noraset practised contemplative self-narration before the exhibition and later, inside the gallery. Ise's mode was the attempt to express verbally how he felt when he was in a coma, but was unable to articulate this traumatizing experience in words when he return to his native place. He drew it on graph paper, and gradually he was able to speak about it, as our final audio recorded dialogue in Bangkok at year's-end demonstrated. Be was conducting his dissertation research in collaboration with

visual brain researchers when he attempted to demonstrate that body parts other than the face can prove the hollow mask effect.

The juxtaposition of how the Malaysian-born artist incorporated the 'urban legend' into the *Operation Bangkok* project, and the ways in which a group of Thai undergraduate students framed the persona of Si Quey – an alleged serial killer who presumptively ate the inner organs of his victims – elucidated a darker corner of anatomical brain inspection. Noraset, who commented on the case poignantly, pointed out that the dominant discourse about this Chinese immigrant worker revealed that "they said how bad he was, but not how sick he was". He and Ise, as well as the student film production that comprised a theatrical play about the final hours of Si Quey, made evident the importance of 'knowing back', as pointed out by Aristotle, and the recognition that all plots have *pathos*.

The ethnographic analysis of the primary research material that was brought into dialogue with the anthropological critiques of brain function imaging prefigured the viability of the bioarts hypothesis in the field of neuroanthropology. Strathern, in her reflections on this newer sub-disciplinary field of anthropology, advanced the idea that through paying attention to individual nervous systems, new embodiments of the relational person may also become apparent for study (2012:433). The relational knowledge gained through the ethnographic dialogic engagement with the artists, which elucidated their work not just by subject matter but also by practice and application (Strathern, 433-434), moved the dissertation in that direction.

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Appendices

Tables

1. Audio-recordings

* Transcripts with an asterisk inform the thesis body, but are not cited *verbatim*.

A. Dialogues with Artists

1. Max Coppeta (Mr)*
   Duration: 00:45:30; Milan Image, Art and Design Fair (MIA&D), Marina Bay Sands, 10 Bayfront Ave, Singapore 018956, Singapore, 25 October 2014.

2. Leo Fernekes (Mr)*
   Duration: 00:40:35 (Part One); Artist studio, Sensacell, 99/41-99/42, Ratchadaphisek Road, Din Daeng, Bangkok 10400, Thailand, 4 May 2015.*
   00:34:49 (Part Two); ibid.

3. Piyatat Hemmatat (Mr)
   Duration: 00:56:43; Artist studio, *RMA Institute*, 238, Soi Sainamthip 2, Sukhumvit 22, Road, Klong Toey, Bangkok 10110, Thailand, 4 February 2015.
   Duration: 00:55:11; ibid, 18 February 2015.
   Duration: 00:32:31; ibid, 16 March 2015.
   Duration: 00:30:11; ibid, 5 May 2015.

4. Roslisham Ismail, aka Ise (Mr)
   Duration: 01:24:58; Sports Café, The Royal Lake Club, Jalan Cenderamulia, Wilayah Persekutuan, Kuala Lumpur 50480, Malaysia, 27 June 2014.
   Duration: 01:40:20; ibid, 5 August 2014.
   Duration: 00:46:28; ibid, 26 September 2014.
   Duration: 01:03:00; The William Warren Library, 4th Floor, Henry B. Thompson Building, 6 Soi Kasemsan 2, Rama 1 Road, Wangmai, Pathum Wan, Bangkok 10330, Thailand, 30 December 2014.
   Duration: 01:07:00; Colbar Eating House, 9A Whitchurch Road, Singapore 138839, 12 May 2015.

5. Be Takerng Pattanopas, Dr (Mr)
   Duration: 00:52:11; Artist studio, Frank & Release, 76, Soi Phaholyothin 8, 1 Phaholyothin Road, Phaya Thai, Bangkok 10400, Thailand, 26 April 2015.

6. Jitti Jumnianwai (Mr)
   Duration: 00:39:08; *Bangkok Art and Culture Centre (BACC)*, 939 Rama 1 Rd, Pathum Wan, Bangkok 10330, Thailand, 18 December 2014.

7. Simona Meesayiati (Ms)*
   Duration: 00: 27:25; Kamin Kab Poo (Restaurant), Thaksin Road 1, Muang Ake, Lak Hok, Pathumthani 12000, Thailand, 15 March 2015.

8. Eiji Sumi (Mr)
   Duration: 01:00:49; Churchill Bar, The British Club, Silom 18, Suriya Wong, Bang Rak, Bangkok 10500, Thailand, 7 August 2014.

9. Noraset Vaisayakul (Mr)
   Duration: 00:51:41; Churchill Bar, The British Club, Silom 18, Suriya Wong, Bang Rak, Bangkok 10500, Thailand, 2 October 2014.
   Duration: 01:04:53; ibid, on 8 October 2014.
   Duration: 00:40:13; ibid, 19 October 2014.
   Duration: 00:54:21; ibid, 7 November 2014.
   Duration: 00:44:31; Foyer, *BACC*, 939 Rama 1 Rd, Pathum Wan, Bangkok 10330, Thailand, 11 February 2015.

B. Art Forum*

1. *Forum: Long Thien Shih - His Time with Malaysian Art*; Auditorium, National Visual Arts Gallery, 23B, Jalan Bachang, Batu 2 1/2, Jalan Ipoh, Kuala Lumpur 51200, Malaysia, 27 September 2014.
   Part One: 00:37:35; Part Two: 00:38:40; Part 3: 00:38:10; Part 4: 00:00:13.

C. Artist Talks at Curatorial Meeting

Duration: 02:14:40; RMA Institute, 238, Soi Sainamthip 2, Sukhumvit 22 Road, Klong Toey, Bangkok 10110, Thailand, 21 March 2015.

1. Leo Fernekes (Mr); Duration: 00:13:25.*
2. Jitti Jumnianwai (Mr); Duration: 00:12:45.*
3. Piyatat Hemmatat (Mr); Duration: 00:10:40.
4. Simona Meesayiati (Ms); Duration: 00:08:41.*
5. Be Takerng Pattanopas, Dr (Mr); Duration: 00:23:45.
6. Eiji Sumi (Mr); Duration: 00:25:28.*
7. Noraset Vaisayakul (Mr); Duration: 00:16:12.

D. Roundtable

Duration: 01:32:57; *Artist-Curator Hybrids: Negotiating Curatorial Tactics and Artistic Knowledge in Contemporary Art and Design*, Graduate Student Research Seminar (GSRS) series 'The Visual Turn'. Department of Sociology, National University of Singapore (NUS), Singapore, 16 April 2015.

1. Ellen Yi-Luen Do, Professor Dr (Ms); Duration: 00:15:40.*
2. Roslisham Ismail, aka ISE (Mr); Duration: 00:15:48.
3. Maurizio Martinucci, aka TeZ (Mr); Duration: 00:16:35.*
4. Eiji Sumi (Mr); Duration: 00:19:04.*

E. Interviews

1. NSTDA Division Director, Dr (Ms)*; Duration: 00:52:19; National Science and Technology Development Agency (NSTDA) Headquarters, 111 Thailand Science Park, Phahonyothin Road, Khlong 1, Pathumthani 12120, Thailand, 24 July 2013.
2. NSTDA Senior Advisor, Professor Dr (Ms)*; Duration: 1:02:58; NSTDA Headquarters, 9 August 2013.

F. Teleconferences

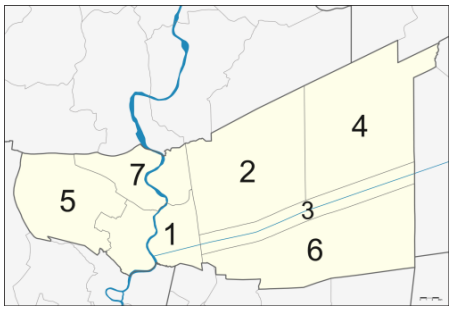
American Architect and Lab Designer (Mr), and Colleague (Mr)

1. Duration: 00:58:30; US-based Global Engineering Company, 18 July 2013.
2. Duration: 00:03:03; ibid, 23 July 2013.
3. Duration: 01:16:59, ibid, 30 July 2013.*
4. Duration: 01:17:56, ibid, 20 August 2013.*

G. Transcript of "Pigs Don't Cry" (Namprachan 2013)

Pigs Pigs … Pigs don't cry [Repeated twice]
My name is Phanramphoei and I go by Jibby.
I' ma tell you about my work, Are U ready?
I'm a scientist, I'm working on a virus.
We work so hard and we need our bonus
This virus's so bad. It's killing piglets.
Pork price is so high, losing money in da pocket
Disease is Porcine Epidemic Diarrhoea Virus
Need to fix it fast, it's definitely a rush
Making vaccines for sows as a preventive
Colustrum lgA to the babies' protective
We made the virus using Reverse Genetics
This technique's so fly. so academic
First we clone its whole full length DNA
Total of all huge 30 kilo bases Kay
Propagate this in a plasmid vector
pCC1 BAC with GMV promoter
Transfecting it to Baby Hamster Kidney cells
Expressing so strong APN receptors so well
Virus transcribed using host machinery
And it replicates
then goes off for assembly
It become an in-vitro made virus
It will be a vaccine that we all can trust
Cuz the important thing
about the strain we made
It causes no disease, it IS attenuated
When it's ready, it will go to the piglets
Immune stimulated, the pigs are protected
The pigs are saved and we all are happy
There will be no waste, we keep all our money
BBQ pork, ribs will be available We can find it around, there will be no trouble
For now,
I'm the Jibby and I wanna save some lives
Common everybody, Can I have a high five?!!
Pigs Pigs … Pigs don't cry
Pigs Pigs … Pigs don't cry
Pigs Pigs … Pigs don't cry
Pigs Pigs … Pigs don't cry
No more tears baby … No more, No more, No more
Don't cry … don't cry anymore

2. Institutional Inventory of Pathumthani Science City



1. Mueang Pathumthani
2. Khlong Luang
3. Thanyaburi
4. Nong Suea
5. Lat Lum Kaeo
6. Lam Luk Ka
7. Sam Khok

A. Institutions visited

Academic Institutions

Asian Institute of Technology, AIT

Bangkok University, BU, Rangsit Centre

Eastern Asia University, EAU

North Bangkok University, NBU, Thanyaburi Campus

Pathumthani University

Rang Sit University, RSU

Rajamangala University of Technology Thanyaburi, RUTT

Rajamangala University of Technology Thanyaburi, RUTT, Rangsit Center

Shinawatra University, SIU

Sirindhorn International Institute of Technology, SIIT, TU Rangsit Centre

Sirindhorn International Institute of Technology, SIIT, Bangkadi Campus

Thammasat University, TU, Rangsit Campus

Valaya Alongkorn Rajabhat University, VARU

R&D Organizations

Institute of Scientific and Technological Research, TISTR

National Science and Technology Development Agency, NSTDA

Thai Microelectronics Centre Thailand

Industrial Parks

Bangkadi Industrial Park
Nava Nakorn Public Co. Ltd.
Technopolis / Technothani
Thailand Science Park

Religious Institutions

Wat Bot
Wat Hong Pathummawat
Wat Singh

Cultural Institutions

Boat Library and Bang Prok Community
Lotus Museum
Muai Thai (Thai Boxing)Institute
National Geological Museum
National Science Museum & Planetarium
Tao Ong Ang, Kiln Museum
The Golden Jubilee Museum of Agriculture
The National Archives in Commemoration of
H.M. the King's Golden Jubilee
The National Memorial
The Royal Thai Mint Museum
The Sirindhorn Science Home
The Southeast Asian Ceramics Museum
The Supreme Artist Hall
Wat Sing Museum

B. Human Resources Data of the Surveyed Institutions

1.

Name	**Asian Institute of Technology – AIT** (international, est. 1959)
Address	58 Moo 9, Paholyothin Highway, Khlong Luang, Pathumthani, 12120
Visited	01/04/2014
UG Students	360
Grad. Students	1,730
PhD Students	530
$\Sigma_{n\ Students}$	2,620
Faculty Members	66
$\Sigma_{n\ Students\ and\ Faculty}$	2,686

2.

Name	**Bangkok University – BU, Rangsit Centre** (private, est. 1962)
Address	9/15 Paholyothin Road, Khlong Luang, Pathumthani, 12120
Visited	12/02/2014, and 17/02/2014
UG Students	10,003
Grad. Students	0 (post-graduate courses on offer at BU, Bangkok Campus)
PhD Students	
$\Sigma_{n\ Students}$	10,003
Faculty Members	724
$\Sigma_{n\ Students\ and\ Faculty}$	10,727

3.

Name	**Eastern Asia University – EAU** (private**,** est. 1996)
Address	200 Rangsit-Nakhon Nayok Road, Khlong 5, Thanyaburi, Pathumthani, 12120,
Visited	12/02/2014, and 08/04/2014
Data	Pending

4.

Name	**North Bangkok University – NBU**, **Thanyaburi** (private, est. 2001)
Address	59/2 Nakhon Nayok Road, Khlong 2, Pathumthani, 12130
Visited	23/04/2014
Data	Pending

5.

Name	**Pathumthani University** (private, est. 1999)
Address	Pathumthani City, Pathumthani, 12000
Visited	03/04/2014
UG Students	2,372
Grad. Students	118
PhD Students	
$\Sigma_{n\ Students}$	2,490
Faculty Members	180
$\Sigma_{n\ Students\ and\ Faculty}$	2,670

6.

Name	**Rangsit University – RSU** (private, est. 1986)
Address	52/347 Mueang Ake, Lak Hok, Pathumthani, 12000
Visited	11/04/2014
Data	Pending

7.

Name	**Rajamangala University of Technology Thanyaburi – RUTT** (public, est.1975)
Address	Rangsit-Nakhon Nayok, Khlong 6, Pathumthani, 12110
Faculty Members	917
Visited	12/02/2014, and 08/04/2014
UG Students	N/A
Grad. Students	N/A
PhD Students	N/A
$\Sigma_{n\ Students}$	20,000
Faculty Members	917
$\Sigma_{n\ Students\ and\ Faculty}$	2,0917

8.

Name	**Rajamangala University of Technology Thanyaburi – RUTT**, **Rangsit Centre**
Address	87, Paholyothin Road, Pathumthani, 12000
Visited	10/04/2014
UG Students	1,820
Grad. Students	25
PhD Students	
$\Sigma_{n\ Students}$	1845
Faculty Members	79
$\Sigma_{n\ Students\ and\ Faculty}$	1,924

9.

Name	**Shinawatra University - SIU** (private, est. 1999)
Address	99 Moo 10, Bangtoey, Samkhok, Pathumthani,12160
Visited	12/02/2014, 08/04/2014, and 22/04/2014
UG Students	256
Grad. Students	297
PhD Students	240
$\Sigma_{n\ Students}$	793
Faculty Members	N/A
$\Sigma_{n\ Students\ and\ Faculty}$	N/A

10.

Name	**Sirindhorn International Institute of Technology – SIIT, Rangsit Campus** (private, est. 1992)
Address	Khlong Luang, Pathumthani, 12120
Visited	31/04/2014
Data	Pending

11.

Name	**Sirindhorn International Institute of Technology – SIIT, Bangkadi Campus** (semi-autonomous, est. 1992)
Address	131 Moo 5, Tiwanont Road, Bangkadi, Pathumthani, 12000
Visited	21/04/2014, and 22/04/2014
Data	Pending

12.

Name	**Thammasat University – TU, Rangsit Campus** (public, est. 1934)
Address	Khlong Luang, Pathumthani, 12120
Visited	31/03/2014
UG Students	22,905
Grad. Students	1,528
PhD Students	342
$\Sigma_{\text{n Students}}$	24,775
Faculty Members	1,878
$\Sigma_{\text{n Students and Faculty}}$	26,653

13.

Name	**Valaya Alongkorn Rajabhat University – VARU** (public, est. 1932, formerly Petchburiwittayalongkorn Teachers College)
Address	1 Moo 20, KM 48, Paholyothin Road, Khlong Luang, Pathumthani, 13180
Visited	16/04/2014
UG Students	7,762
Grad. Students	1,523
PhD Students	
$\Sigma_{\text{n Students}}$	9,285
Faculty Members	391
$\Sigma_{\text{n Students and Faculty}}$	9,676

Total (eight institutions that fully and partly provided the requested data set)

$\Sigma_{\text{n Students and Faculty}}$	76,046

3. Mobility Patterns of Recipients of pre-university and university Thai Government Co-funded Scholarship and Research Fellowship Programmes

A. NSTDA 2009 WSD (World Science Day) Student Delegates of 'Talented and Gifted Students' (29*) (Residency as per July 2013)

Code	Geographical Academic Mobility	Sex	Total	Total / Code	% [Excl. 1 person]*	% AEC region	% ASEAN +6
T0	Thai citizen – Country of origin	F M	17 7	24 / 28	85.7	85.7	89.3
T1	Thai citizen – ASEAN country	F M	0 0	0 / 28	0	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	Thai citizen – ASEAN + 6	F M	1 0	1 / 28	3.6	14.3	10.7
T3	Thai citizen – Other	F M	3 0	3 / 28	10.7	**Total** 100	**Total** 100
$\Sigma_{n=28}$	**Thai (ASEAN) citizens**	**F** **M**	**21** **7**	**28/28**	**100**		

* No information available

B. Royal Golden Jubilee PhD (RGJPHD) Scholarship Programme (3403)*, 1998-2012

	Geog. Acad. Mobility	**Sex**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**$\Sigma_{n=7}$**	**Σ**	**%**	**%**	**% AEC**	**% ASEAN+6**
T0	ASEAN to C.o.O	F M	5 16	15 27	23 25	40 45	73 63	159 76	203 128	518 380	898	57.7/42.3	26.4	27.1	48.5
T1	ASEAN c. to ASEAN	F M	1 1	3 -	4 3	1 3	3 1	1 2	- 1	13 11	24	54.2/45.8	0.7	**% N AEC**	**% Non ASEAN +6**
T2	ASEAN c. to ASEAN +6	F M	79 52	84 56	75 52	67 43	69 40	59 31	16 5	449 279	728	61.7/38.3	21.4	72.9	51.5
T3	ASEAN c. to Other	F M	206 140	204 111	194 124	202 99	154 97	118 54	32 18	1110 643	1753	63.3/36.7	51.5	**Total 100**	**Total 100**
	Total $\Sigma_{n=3403}$	**F M**	**291 209**	**306 194**	**296 204**	**310 190**	**299 201**	**337 163**	**251 152**	**2090 1313**	**3403**	**61.4/38.6**	**100**		

* To ease a manual calculation of this sample (in the absence of a statistics software programme), it was split into six sub-totals of 500 (1-6), and one of 403 (7).

RGJPHD by Projects (2882), 1996-2012

Code	Type of Geographical Academic Mobility [assuming Thai nationality]	Total	%	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	0			1.2	30.7
T1	ASEAN citizen – ASEAN country	34	1.2		**% Non AEC**	**% Non ASEAN +6**
T2	ASEAN citizen – ASEAN + 6	852	29.5	30.7	98.8	69.3
T3	ASEAN citizen – Other	1996	69.3	69.3	**Total** 100	**Total** 100
Total $\Sigma_{n=2882}$	**ASEAN citizens**	**2882**	**100**	**100**		

C. FAOBMB (Federation of Asian and Oceanian Biochemists and Molecular Biologists) Young Scientist Programme (YSP) Fellowships (28), 2012†

Code	**Geographical Academic Mobility**	**Sex**	**Total**	**Total**	**%** $\Sigma_{n=28}$	**%** **AEC region**	**%** **ASEAN +6**
T0	ASEAN citizen – Country of origin	F M	N/A	4	14.3	28.6	60.7
T1	ASEAN citizen – ASEAN country	F M	N/A	4	14.3	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	F M	N/A	9	32.1	71.4	39.3
T3	Other – ASEAN country	F M	N/A	-	-	**Total** 100	**Total** 100
TX	Unspecified* – ASEAN country	F M	N/A	11	39.3		
Total $\Sigma_{n=28}$	**ASEAN citizens**	**F/M**	N/A	**28**	**100**		

* FAOBMB member countries may include ASEAN, and ASEAN + 6 countries, and the developing country could be an ASEAN nation.
† 23-25 November 2012, Sirindhorn Science Home, Thailand Science Park.

D. NSTDA (National Science and Technology Development Agency) JSTP (Junior Science and Technology Programme) Alumni Awarded International Scholarships (70), 2001-2012 (Residency as per 2013)

Code	**Geographical Academic Mobility**	**SEX**	**Total**	**Total / Code**	**%**	**% AEC region**	**% ASEAN +6**
T0	ASEAN citizen – Country of origin	F M	1 9	10	14.3	14.3	31.4
T1	ASEAN citizen – ASEAN country	F M	0 0	0	0	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN citizen – ASEAN + 6	F M	5 7	12	17.1	85.7	68.6
T3	ASEAN citizen – Other	F M	10 38	48	68.6	**Total** 100	**Total** 100
Total $\Sigma_{n=70}$	**ASEAN citizens**	**F / M**	**16/54**	**70 / 70**	**100**		

Degree-awarding country

Code	Geographical Academic Mobility	SEX	Total	Total / Code	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	F M	0 0	0 / T0 0 / T0	0	0	17.1
T1	ASEAN citizen – ASEAN country	F M	0 0	0 / T1 0 / T1	0	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN citizen – ASEAN + 6	F M	4 8	12 / T2	17.1	100	82.9
T3	ASEAN citizen – Other	F M	11 47	58 / T3	82.9	**Total** 100	**Total** 100
Total $\Sigma_{n=70}$	**ASEAN citizens**	**F / M**	**16/54**	**70 / 70**	**100**		

E. NSTDA TAIST (Thailand Advanced Institute of Science and Technology) -Tokyo Tech (Tokyo Inst. of Tech.) (302/8), 2007-2013

Code	Geographical Academic Mobility	Sex	Total	Total	%	% AEC region	% ASEAN +6
T0	ASEAN citizen [THA] – Country of origin	F M	N/A N/A	294	97.3	97.6	98.3
T1	ASEAN citizen – ASEAN country	F M	- 1	1	0.3	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	F M	1 1	2	0.7	2.4	1.7
T3	Other – ASEAN country	F M	- 5	5	1.7	**Total** **100**	**Total** **100**
	ASEAN citizens	**F** **M**	**N/A**	**295**	**97.6**		
	ASEAN + 6 citizens	**F** **M**	**N/A**	**2**	**98.3**		
	Asian other citizens	**F** **M**	**N/A**	**5**	**1.7**		
	Total $\Sigma_{n=302}$	**F** **M**	**N/A** **N/A**	**302**	**100**		

NSTDA TAIST-Tokyo Tech Programme, Foreign Students (8) 2007-2013

Code	Geographical Academic Mobility	Sex	Total	Total	%	% AEC region	% ASEAN +6
T0	ASEAN citizen– Country of origin	F M	- -	- -	- -	12.5	37.5
T1	ASEAN citizen – ASEAN country	F M	- 1	1	12.5	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	F M	1 1	2	25	87.5	62.5
T3	Other – ASEAN country	F M	- 5	5	62.5	**Total** **100**	**Total** **100**
	ASEAN citizens	**F** **M**	**-** **1**	**1**	**12.5**		
	ASEAN + 6 citizens	**F** **M**	**1** **1**	**2**	**25**		
	Asian other citizens	**F** **M**	**-** **5**	**5**	**62.5**		
	Total $\Sigma_{n=8}$	**F** **M**	**1** **7**	**12.5** **87.5**	**100**		

F. BIOTEC (National Centre for Genetic Engineering and Biotech) HRD (Human Resource Development) Asia-Pacific Alumni (39) 2001-2012

Code	**Geographical Academic Mobility**	**Sex**	**Total**	**Total / Code**	**%**	**% AEC region**	**% ASEAN +6**
T0	ASEAN citizen – Country of origin	F M	5 3	8	20.5	38.4	74.4
T1	ASEAN citizen – ASEAN country	F M	4 3	7	17.9	**% Non AEC**	**% Non ASEAN +6**
T2	ASEAN citizen – ASEAN + 6	F M	6 6	12	30.8	61.6	25.6
T3	ASEAN citizen – Other	F M	2 7	9	23.1	**Total** 100	**Total** 100
TX 1	Other – ASEAN + 6	F M	1 1	2	5.1		
TX 2	Other – Other	F M	1 -	1	2.6		
Total	ASEAN citizens	F M	17 19	36	92.3		
Total	Non ASEAN citizens	F M	2 1	3	7.7		
Total Σ_{n39}	**ASEAN, and Other**	**F / M**	**39**	**39**	**100**		

BIOTEC HRD Asia-Pacific Alumni from ASEAN Region (36) 2001-2012 (Residency as per 2013)

Code	**Geographical Academic Mobility**	**Sex**	**Total**	**Total**	**%**	**%** **AEC region**	**%** **ASEAN +6**
T0	ASEAN citizen – Country of origin	F M	5 3	8	22.3	41.7	75
T1	ASEAN citizen – ASEAN country	F M	4 3	7	19.4	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN citizen – ASEAN + 6	F M	6 6	12	33.3	58.3	25
T3	ASEAN citizen – Other	F M	2 7	9	25	**Total** 100	**Total** 100
Total $\Sigma_{n=36}$	**ASEAN citizens**	**F/M**	**17/19**	**36**	**100**		

G. BIOTEC CLMV (Cambodia, Laos, Myanmar, Vietnam) Programme Alumni (32), 2001-2004

Code	**Geographical Academic Mobility**	**Sex**	**Total**	**Total**	**%**	**%** **AEC region**	**%** **ASEAN +6**
T0	ASEAN citizen – Country of origin	F M	- -	-	-	100	100
T1	ASEAN citizen – ASEAN country	F M	15 17	32	100	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	F M	- -	-	-	-	-
T3	Other – ASEAN country	F M	- -	- -	-	**Total** 100	**Total** 100
Total $\Sigma_{n=32}$	**ASEAN citizens**	**F/M**	**15/17**	**32**	**46.9/53.1**		

Successful Applicants (32), 2001-2004

Code	Geographical Academic Mobility	Sex	Country	Total	Total	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	N/A	THA	-	-	-	100	100
T1	ASEAN citizen – ASEAN country	N/A	KHM LAO MMR VNM	5 10 6 11	32	15.6 31.3 18.8 34.3	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	N/A	-	-	-	-	-	-
T3	Other – ASEAN country	N/A	-		-	-	**Total** **100**	**Total** **100**
Total $\Sigma_{n=32}$	**ASEAN citizens**		**AEC**	**32**	**32**	**100**		

H. BIOTEC HRD Programme in Biotechnology* (135) 2001-2012

Code	Geographical Academic Mobility	Sex	Total	Total	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	F M	- -	-	-	91.9	91.9
T1	ASEAN citizen – ASEAN country	F M	64 60	124	91.9	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	F M	- -	-	-	8.1	8.1
T3	Other – ASEAN country	F M	8 3	11	8.1	**Total** **100**	**Total** **100**
	ASEAN citizens	**F** **M**	**64** **60**	**124** **51.6/48.4%**			
	Asian other citizens	**F** **M**	**8** **3**	**11** **72.7/27.3 %**			
	Total $\Sigma_{n= 135}$	**F** **M**	**73** **62**	**135** **54/46 %**	**100** **100**		

*Age <32

Applicants (673) 2001-2012

Code	Geographical Academic Mobility	Country	Total	Total	Total	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	THA	-	-	-	-	94.5	95.2
T1	ASEAN citizen – ASEAN country	KHM VNM MMR LAO PHL IDN MYS	49 257 113 86 31 70 30	636	-	94.5	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	CHN	5	5	641	0.7	5.5	4.8
T3	Other – ASEAN country	MNG Pacific I.	22 10	32	32	4.8	**Total** **100**	**Total** **100**
	ASEAN citizens	**AEC**	**636**	**94.5**				
	ASEAN + Six citizens	**AEC + 6**	**5**	**0.7**		**95.2**		
	Asian other citizens	**Non-AEC**	**32**	**4.8**		**4.8**		
	Total $\Sigma_{n=673}$	**Asia**	**673**	**100 %**	**673**	**100**		

Successful Applicants (135) 2001-2012

Code	Geographical Academic Mobility	Country	Sex F/M	Total	Total	Total	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	THA	- -	-	-	-	-	91.9	91.9
T1	ASEAN citizen – ASEAN country	KHM VNM MMR LAO PHL IDN MYS	3/8 22/23 20/6 8/11 6/7 4/4 1/1	11 45 26 19 13 8 2	124		91.9	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	CHN	-	-	-	124	-	8.1	8.1
T3	Other – ASEAN country	MNG Pac. I.	5/- 3/3	5 6	11	11	8.1	**Total** **100**	**Total** **100**
	ASEAN citizens	**AEC**	**64/60**	**124**					
	Other	**Asian other**	**8/3**	**11**					
	Total $\Sigma_{n=135}$	**Asia**	**72/66**	**135**	**135**	**135**	**100**		

Successful/Unsuccessful (S/F) Applicants (135/538) 2001-2012

Code	Geographical Academic Mobility	Sex	Country	Total	Total	S/F	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	N/A	THA	-	-	-	91.9	91.9
T1	ASEAN citizen – ASEAN country	N/A	KHM	11/38	49	22.4/77.6	**%**	**%**
			VNM	45/212	257	17.5/82.5	**Non AEC**	**Non ASEAN +6**
			MMR	26/87	113	23/77		
			LAO	19/67	86	22.1/77.9		
			PHL	13/18	31	41.9/58.1		
			IDN	8/62	70	11.4/88.6		
			MYS	2/28	30	6.7/93.3		
T2	ASEAN + 6 citizen – ASEAN country	N/A	CHN	-/5	5	-/100	8.1	8.1
T3	Other – ASEAN country	N/A	MNG	5/17	22	22.7/77.2	**Total**	**Total**
			Pacific I.	6/4	10	60/40	**100**	**100**
	ASEAN citizens	**N/A**	**AEC**	**124/512**	**636**	**19.5/80.5**	**100**	
	Other	**N/A**	**NON-AEC**	**11/26**	**37**	**29.7/70.3**	**100**	
	Total $\Sigma_{n=673}$	**N/A**	**Asia**	**135/538**	**673**	**20.1/79.9**	**100**	

I. BIOTEC Internships (299) 2006-2013

Code	**Cross-country Academic Mobility**	**Sex**	**Total**	**Total**	**%** $\Sigma_{n=290}$	**% AEC region**	**% ASEAN +6**
T0	ASEAN citizen – Country of origin	F M	- -	- -	- -	61.4	96.9
T1	ASEAN citizen – ASEAN country	F M	115 63	178	61.4	**%** **Non AEC**	**%** **Non ASEAN +6**
T2	ASEAN + 6 citizen – ASEAN country	F M	58 45	103	35.5	38.6	3.1
T3	Other – ASEAN country	F M	5 4	9	3.1	**Total** 100	**Total** 100
TX	N/A – ASEAN country	F M	4 5	9	-		
Total $\Sigma_{n=299}$	**ASEAN citizens**	**F/M**	**182** **117**	**299** **(60.9/39.1%)**	**100**		

4. Thailand Science Park (TSP), Academically-trained Foreign Professionals, August 2013 (48)

A. Public, and Private Sector S&T Corporate Companies

Code	Geographical Academic Mobility	Total	%	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin [THA]	-	-	-	22.9	72.9
T1	ASEAN citizen – ASEAN country [THA]	11	22.9		% Non AEC	% Non ASEAN +6
T2	ASEAN + 6 citizen – ASEAN country [THA]	24	50	72.9	77.1	27.1
T3	Other – ASEAN country [THA]	13	27.1	27.1	**Total** 100	**Total** 100
Total $\Sigma_{n=48}$		**48**	**100**	**100**		

B. Public Sector S&T Corporate Companies

Code	Geographical Academic Mobility	Total	%	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin [THA]	-	-	-	18.2	54.6
T1	ASEAN citizen – ASEAN country [THA]	2	18.2		% Non AEC	% Non ASEAN +6
T2	ASEAN + 6 citizen – ASEAN country [THA]	4	36.4	54.6	81.8	45.4
T3	Other – ASEAN country [THA]	5	45.4	45.4	**Total** 100	**Total** 100
Total $\Sigma_{n=11}$		**11**	**100**	**100**		

C. Private Sector S&T Corporate Companies

Code	Geographical Academic Mobility	Total	%	%	% AEC region	% ASEAN +6
T0	ASEAN citizen – Country of origin	-	-	-	24.3	78.4
T1	ASEAN countries	9	24.3		% Non AEC	% Non ASEAN +6
T2	ASEAN + 6	20	54.1	78.4	75.7	21.6
T3	Other	8	21.6	21.6	**Total** 100	**Total** 100
Total $\Sigma_{n=37}$		**37**	**100**	**100**		