ssig/kcent/material/Youth%20&%20Terr%5B1%5D.%20Conf.%20ABSTRACT%20-%20Dr.%20Christoph.pdf (accessed on 14 September 2010). The event also featured a Royal Address by HRH Raja Nazrin Shah Ibni Sultan Azlan Muhibbuddin Shah, the Crown Prince of Perak.

2. At the time of writing, this reviewer was working (for the IAIS Occasional Paper Series) together with friends from Muar, Johor, on a pictorial biography of the late Abdulqadir bin Said, a soldier and member of the police force, who was highly decorated by several Sultans of Johor, a member of UMNO who also served as liaison with MCA, the ethnic-Chinese *Barisan Nasional* component party. He was fluent in Cantonese (from which he used to translate simultaneously during joint UMNO–MCA meetings) and at various incidences travelled to Taiwan with his friends from MCA, representing UMNO.

Arun Bala, *The Dialogue of Civilizations in the Birth of Modern Science*

(Singapore: Institute of Southeast Asian Studies, 2010), xii+230 pp.

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Arun Bala has produced a significant and timely book addressing the roots of contemporary civilisational misunderstanding between European-American exceptionalism and the emergent global cosmopolitan worldview. Bala is a reputable physicist who taught history and philosophy of science at the National University of Singapore, and presently heads a project at Singapore's Institute of Southeast Asian Studies studying the Chinese, Indian and Islamic scientific traditions with their role in the rise of modern science in Europe. His book brims with concise condensations of controversies in the history of science that convey the gist of complex issues in a fluid digestible style. It unveils vast historical perspectives linking continents and weaving through centuries, replete with comparative analyses of major intellectual, scientific and cosmological topics. It also sparkles with genuine insights proffered as hypotheses awaiting criticism and testing.

Arun Bala presents in 183 pages an incisive corrective to the prevailing Eurocentric bias of 'modernity' coupled with his call to broaden and deepen the basis for a vital truly universal science. This is a richly nutritious read opening new vistas upon our current civilisational dilemma and its implications for late-modernity. His work is also humbling and ego-deflating for proponents of one's own particular civilisational uniqueness when claiming a unique copyright for scientific originality – whether European, Islamic, or Asian. This review can only touch on several of his more important themes and arguments with an eye to the challenge posed for renewal of civilisations.

Bala asks "Why did modern science develop in Europe and not elsewhere?" – or more crudely, "Why didn't the Chinese or the Muslims beat Europeans to

the Scientific Revolution?” So – “Is modern science a multicultural or European phenomenon [...] or a dialogical product that can be seen as both?” (p. 47). But if contemporary scientific knowledge is taken to be universal and global and uniquely associated with Western culture, having displaced all other traditions of science which existed in non-European civilisations, then does it constitute “the only possible universal and cosmopolitan tradition of science” (p. 11)?

Bala proceeds to dismantle the hegemonic claims of ‘modern science’ as it unfolded from the seventeenth century onward in western Europe and diffused round the globe by European imperialism over the nineteenth and twentieth centuries, currently cemented into place by Euro-American capitalism in its neo-liberal free market incarnation. He dissects the dominant one-sided interpretations of the Renaissance and Copernican Revolution, which laid the basis for the emergence of the modern physical worldview at the heart of contemporary science. He highlights the prevailing view that presumed cultural deficiencies and inhibiting social and religious factors precluded the emergence of modern science in other major scientific traditions before the birth of modern science. These ‘traditional’ scientific teachings include the Egyptian, Greek, Arabic, Indian and Chinese traditions. (By ‘Arabic’ Bala denotes the Islamic tradition largely *written* in the Arabic language, but not exclusively.)

This widespread urge to identify deficiencies and obstacles in non-European traditions arises from the presupposition that modern science constitutes ‘the only possible universal’ scientific tradition. Religion in particular is frequently seen as a negative factor inhibiting the emergence of the modern scientific worldview, as well as a major cause for the decline of traditional science (whether in India or in Islam).

Bala uncovers the progressive links between the Ash‘arite theologian al-Ghazālī’s critique of *falsafah* and its Aristotelian conception of causation – whereby regularities of perceived connections became viewed not as necessary cause-and-effect, but as ‘the habits of God’ – and which led ultimately to Newton’s view that God created atoms and laid down laws mediating their interactions.

Bala observes that the new science arrived at this conclusion by induction, replacing God’s habits by human habit and custom; and he cites Professor Osman Bakar who had already pointed to the close parallel between Hume’s view and the teachings of Ash‘arite theologians. Furthermore, the very concept of universal natural law discoverable by empirical methods should be seen as conditioned by debates between philosophy and theology in Islam (pp. 119–23).

Dogmatic errors die slow deaths, and the ‘porter’ theory of Islamic civilisation bearing Greek science and thought into Renaissance Europe is still alive and well in Western universities. It is only the prevailing distortion of Eurocentric histories of Islam “as merely having the role of preserving and transmitting the Greek heritage” (p. 109) which leads Euro-American historians of science to “ignore the wider

context of the philosophical and scientific ideas they inherited from the Arabic tradition” (p. 108), and to emphasise only their own older Hellenic roots for these ideas while ignoring the seminal contribution of other civilisations. Bala accurately portrays such arrogant supposition as “aggrandizement”, and he systematically dismantles this fanciful delusion by his detailed marshalling of evidence regarding Indian, Islamic and Chinese scientific and intellectual achievements.

Incidentally, he observes that the ‘myth’ of the Middle Ages in Europe with “its view of Arabic civilization as a mere carrier and European civilization as the legitimate heir of the Greek tradition” (p. 61), was invented in order to avoid the charge that translations of Arabic texts into Latin brought the transmission of Islamic thought and science into Europe. The confluence of Muslim science and philosophy, along with Chinese technologies through (Mongol occupied) Eastern Europe, initiated the Renaissance and the birth of modern science in Europe. In chapter 10 ‘Integrating Hellenic and Indian Traditions’, Bala reminds us that Islamic scientific and intellectual experience actually represents a creative fusion of Indian, Persian, Greek and Chinese traditions, elements that mingled and cross-fertilised under the umbrella of the Islamic religious and cultural synthesis.

In chapter 8 ‘The Alhazen Optical Revolution’, Bala treats the remarkable work of Ibn al-Haytham (d. 1030) and his profound influence on optical science in Europe from the thirteenth century onward paving the way to major advances by Huygens and Newton. This brings Bala to a fresh appreciation of how Muslim scientists privileged mathematical realism, sensory observation, and the accurate unbiased observation of nature. Beyond this, he links Alhazen’s achievements with Enlightenment epistemology which enthroned vision as the master sense in modern thought and inspired Descartes’ visualist paradigm, and the perspectival, aesthetic and epistemic methods in art and architecture. Here again, Bala is forced to complain of the lack of objectivity of Euro-American thinkers in failing to give historical recognition to the great originality of Ibn al-Haytham “in creating the ocularcentric perceptual and conceptual reorientation to nature [...]. The main problem appears to be the dominant Eurocentric orientation of historical studies in science, which makes it difficult to accommodate and acknowledge the dialogical influences that have conditioned both modern science and its philosophy” (p. 93).

In two major chapters (chapter 7 ‘The Narrow Copernican Revolution’ and chapter 13 ‘The Wider Copernican Revolution’) Bala covers the fundamental shifts in planetary and astronomical models and changing notions of impetus, gravitation, and mathematic realism unfolding from Copernicus through Galileo, Kepler, Descartes and Newton. Here he integrates his summary of remarkable advances accomplished by Indian mathematical astronomers from Aryabhata (d. 550), Brahmagupta (d. 670) and Bhaskara II (d. 1185), who impacted directly

upon Islamic thinkers. Chapter 13 consists largely of an extended critique of Thomas Kuhn's portrayal of the birth of modern science from Copernicus until Newton, with Bala taking him to task for adhering to dogmatic Eurocentrism. The significance of this chapter is difficult to exaggerate. Bala's independence of mind is demonstrated in his discussion of the alchemical and occult roots of the heliocentric vision entertained by Copernicus and motivating Newton, which Bala traces to the impact of Hermetic philosophy rooted in ancient Egyptian solar cosmology (pp. 152–7, 162, 173–4). He rightly dismisses T. Kuhn's identification of such ultimately Egyptian elements as merely neoplatonic (i.e. Greek), this being an instance of Eurocentric aggrandizement.

Bala provides an informed historical critique and persuasive intellectual synthesis which attains a sustained level of consistent plausibility. His work will surprise and intrigue many, deflate the self-assured vain confidence of others, and mightily enlighten those thirsting for a global perspective on our human search for a more adequate model of the universe. What is at stake in these pages is nothing less than the urgent need to forge new 'corridors of communication' between civilisations and polities – beyond the trite outmoded notions of competition or clash, and toward conversations yielding reciprocal cooperation and mutual convergence. Arun Bala is to be congratulated for the vigour and originality of his thoughts and for the energy and conviction which dish them out to nourish his readers.

**James A. Roumasset, Kimberly M. Burnett and Arsenio Balisacan (eds),
*Sustainability Science for Watershed Landscapes***

(Singapore: ISEAS, 2010), 346 pp. ISBN: 9789814279963. US\$14.90

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The word 'sustainability' has blossomed into so many ideas (some count 500) that it risks losing any scientific value. The authors of *Sustainability Science for Watershed Landscapes* take a concept of positive sustainability that posits sustainable growth as neither an objective nor a constraint. Their most important contribution is their effort "to embrace policy sciences" (p. 3, Ravago et al.).

We seem to have in the field research and studies that are scientific, and writing that is political, activist, and advocacy. Even within this volume, it is not obvious that the two directions can merge or even speak to each other. On the political side, we have a particular analysis of a problem:

'greedy growth,' the proliferation of government entities, projects and regulatory policies to transfer rents from taxpayers to the 'iron triangle' of politicians, bureaucrats, and special interests. (Ravago et al., p. 16)