

Green is Graceful:¹

Some Practical Lessons from the History of Islamic Science and Technology

by
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1. Introduction

If “Small is Beautiful” characterizes the system of “economics as if people mattered” envisaged by E. F. Schumacher in his visionary book *Small is Beautiful*,³ then “Green is Graceful”⁴ would characterize the system of “science and technology as if culture and nature mattered” nurtured throughout in the 1001-year history of Islamic science and technology.⁵ And the whole purpose of learning about this history is to revive it by drawing practical lessons⁶ from it in order to bring back culture and nature into the centre of science and technology in the contemporary age. The current global concern about the manner in which modern western (*kafir*) science and technology (coupled with the liberal capitalist political economic system supporting it⁷) have systematically wrought havoc on both the natural and cultural worlds over the past century or so,⁸ provides a golden opportunity for thinking Muslims to address that concern by developing an alternative science and technology rooted in and directed by Islamic values, in the way much of Schumacher’s alternative economic thought was inspired by Buddhist values. And the surest way to demonstrate that these values are not mere pie-in-the-sky idealism but real, viable and practical is to study the manner in which these values have been realised in history before the relatively recent “westernization of the world.”⁹

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³ (New York: Harper, 1989).

⁴ My inspiration for this phrase is the hadith related by Muslim, “The world is sweet and verdant, and God has made you His representatives in it, so look to how you behave...,” cited in Imam al-Bayhaqi, *The Seventy-Seven Branches of Faith*, translated with introduction and notes by Abdal-Hakim Murad (Singapore: Pustaka Nasional, 1990). “Verdant” means covered with lush green grass and vegetation, invoking the feeling of being in a lush pleasant garden or forest gurgling with swift flowing streams, in which one is to “tread gently upon the earth” (*yamshuna ‘ala al-ardi hawnan*) “and walks in quiet solitude, seeking grace in every step he takes.”

⁵ Salim T. S. al-Hassani, ed., *1001 Inventions: Muslim Heritage in Our World* (Manchester: FSTC, 2007); see also the website of the book at www.1001inventions.com. See also the very important, ongoing series by IRCICA on *History of Ottoman Scientific Literature* (Istanbul: IRCICA, 1997, 1999, 2000, ongoing).

⁶ *la qad kana fi qasasihim ‘ibratun li ulil-albab.*

⁷ Most fiercely and pertinently criticized by Karl Polanyi in his *The Great Transformation: The Political and Economic Origins of Our Time*, 2nd ed. (Beacon Press, 2001). (Karl Polanyi was brother of the famous chemist and philosopher of science Michael Polanyi who wrote the important *Personal Knowledge*). For an interesting and insightful comment on the book in relation to the current global credit crunch, see Adrian Pabst, “Introducing Karl Polanyi: Step aside, Keynes: the only economist to grasp the real limitations of capitalism and socialism was Hungarian,” at <http://www.guardian.co.uk/commentisfree/2008/nov/09/economics-creditcrunch>. Many thanks to Sachi Arafat for bringing this book and this article to my closer notice.

⁸ T. J. Winter (Abdal-Hakim Murad) says, “In a few short generations, kafir civilisation has ravaged the earth, poisoned its air and seas, and killed thousands of species birds, animals and plants....” (p. 25 on the reference in note # 3, above). Similarly Professor al-Attas says that western knowledge and the science and technology generated from it “has, for the first time in history, brought chaos to the Three Kingdoms of Nature; the animal, vegetal and mineral.” (*Islam & Secularism*, Chapter V on “The Dewesternization of Knowledge,” 133).

⁹ Serge Latouche, *The Westernization of the World* (London: Polity Press, 1996) ; cf. Syed Muhammad Naquib al-Attas, *Islam and Secularism* (Kuala Lumpur: ISTAC, 1993).

Before we go further to look at what Muslim scientists and technologists can learn from the history of Islamic science and technology, we all have to really sit back and do some reflection about the meaning of science. For our purpose here, it is sufficient to take the current definition of science at face value, namely, *science as the systemic study of nature*, and then to do a bit of conceptual analysis on it. And so we find that this definition only makes sense if the cognitive pursuit of science and its pragmatic realization in technology *do not* entail the diminishment of nature and its eventual desolation and disappearance altogether. And since science is done by scientists who are basically people like other people, then the the scientific pursuit *should not* result in the impoverishment and destruction of human culture either. Hence the intellectual curiosity of science and its resultant technological utility demand a concomittant moral responsibility toward nature as the object of study and toward people as both the agent and beneficiary of this study. Thus the thinking scientist can go on reflecting on the meaning of science in this or similar way and thereby come to terms with his or her own particular area of scientific and technological work by asking in all seriousness: “Is what I am doing right now *really* contributing to the preservation of nature and culture?” And “Am I pursuing a science that integrates intellectual curiosity, technological utility and moral responsibility?” If your answer to these and similar questions is yes in all seriousness and sincerity, then you are doing Islamic Science, otherwise you are doing KAFIR science, even if you pray five or ten times everyday before going into your lab or office!

With that self-critical, introspective mode of thinking firmly in place, we may now look into our long technoscientific history to see what we can learn and revive to build a contemporary, green and graceful science and technology, and hence address in a constructive manner one of the great civilizational challenges of our sorry age.

2. Green Energy

One striking aspect of Islamic civilization is the way in which much of its energy requirement was met by renewable, pollution-free wind and water power,¹⁰ as compared with, say, the modern western civilization. When we think of industries and factories and industrial production in general our minds go back to the so-called “industrial revolution”¹¹ of 18th century Britain with the invention of the steam engine fired by coal (which we now know as a very polluting, non-renewable fossil fuel). We generally fail to envisage an even earlier industrial revolution powered by what we call now green energy, namely wind and water power, producing output on a scale sufficiently large to provide for the needs of some of the largest cities of the world at that time, such as the city of Baghdad with its estimated population of between one to two million souls at the time of, say, the Caliph Harun al-Rashid. Once we cast away the eurocentric blinkers on world history we can come to realize that Britain did not originate the “industrial revolution”; at most it originated the “grey” industrial revolution that blackened the skies of its industrial cities and those cities of Europe and America that followed the British example. In contrast, we are not too much way of the mark to say that the industrial revolution was started in the great cosmopolitan cities of Islamic civilization, and it was also a “green” revolution to boot. There was output on a large industrial scale, large even by modern standards,¹² minus the dust and the smog and the general sense of dissipating dreariness so vividly captured in the great novels of Charles Dickens.¹³

¹⁰ For very many examples of these such as windmills and watermills, see www.1001inventions.com and www.muslimheritage.com.

¹¹ As a matter of fact, the so-called Industrial Revolution of Britain was made possible by the British annihilation of Indian Muslim and Hindu manufactures; see Clairmont below.

¹² For the high and advanced industrial and agricultural output of India under Muslim and Hindu rule before the British conquest of the country, see Frederic F. Clairmont, *The Rise and Fall of Economic Liberalism: The Making fo the Economic Gulag* (Penang: Southbound & TWN, 1996), 97 ff on “The Indian Dossier.” Cf. Zaheer Baber, *The Science of Empire: Scientific Knowledge, Civilization and Colonial Rule in India* (Delhi: Oxford U. Press, 1998), 14—105 passim.

¹³ Read, for insatnce, his novel *Hard Times* (London: Penguin Classics, 2003).

3. Waste Not Want Not

An aerospace engineering friend of mine by name of Naguib Muhammad Nor, now Chief Operating Officer (COO) of Strand Aerospace Malaysia (SAM) first brought to my attention the incredible website dedicated to the Islamic scientific heritage, www.muslimheritage.com. One of the very many scholarly articles therein concern oil-lamps in which the sooty effluent, instead of being discarded as waste, was instead collected and recycled into ink. Similarly the reusing of water used for household washing (what we now call "gray water") for irrigating the farm, as in the case of aspects of traditional housing in Iran.

Biomimicry (also called biomimetics)¹⁴ is a relatively new approach in science and technology that seeks to imitate the process in nature by which, for instance, many useful chemical compounds are synthesized at ambient temperature (hence conserving energy) without generating waste or harmful by-products (hence conserving resources). From the Islamic the underlying principle is this:

if the way in which the Creator does things in the natural environment generates no waste or nothing that is in vain or superfluous (*rabbana ma khalaqta hadha batilan*), then shouldn't we as His servants imitate that divine ethics of cosmic conservation and hence avoid generating wasteful, harmful and superfluous by-products and effluents in our artificial environment?¹⁵

In the Qur'an we are always exhorted to look and ponder at the multifarious signs (*ayat*) of divine wisdom and mercy in so self-evident in creation and to draw lessons from them, among of the most important of which are: do not generate waste (*wa la tusrifu*); be merciful to the world (*rahmatan lil-'alamin*); respect for other, non-human communities on earth (*wal-arda wada'aha lil-anam*); and gentleness, peacefulness (*qalu salaman, marru kiraman*) and humility (*yamshuna 'ala al-ardi hawnan*); together with balance, harmony and justice (*mizan, 'adl, qist, adab*). And all these ethical precepts can be translated into technical innovations embodying those precepts if we, as scientists, engineers, technologists, industrialists, technicians, inventors and businessmen, are truly serious and not cynical or worse, lip-servicing. As Kenneth L. Hausen puts it so eloquently:

Let me begin by saying I have a BS in chemical engineering and an MSPH in environmental engineering, so I am not some sort of uneducated, naive, "new-age" dreamer, who has no concept of what is practical and what is not. Moreover, I have now worked for over 16 years at various industrial facilities (chemical, textile, and other manufacturing) as a process engineer and an environmental consultant. I've seen what's out there in the industrial landscape.

With that said this is simply the BEST non-fiction book I have ever read. It is chock full of fascinating "earth-friendly" ideas that are simply crying out to be implemented. It is written in a very "personal" tone, which I believe amplifies the book's message. In fact, don't let this tone make you think the book's technical depth is lacking. On the contrary, this book delves into some very complex concepts, but does so in a manner that a non-technical person can follow.

For those areas where I have specific knowledge (such as elements within industry who actually WANT to comply with all environmental requirements and WANT be "GREEN"), the author is on target and displays an

¹⁴ Janine M. Benyus, *Biomimicry: Innovation Inspired by Nature* (New York: Harper, 2002); for her Biomimicry Institute, see <http://www.biomimicryinstitute.org/about-us/>; for her interesting and inspiring talk on design ideas from nature, google http://www.ted.com/index.php/talks/janine_benyus_shares_nature_s_designs.html. Cf. Kevin M. Passino, *Biomimicry for Optimization, Control, and Automation* (Springer, 2004).

¹⁵ My formulation.

excellent grasp of what's going on. Thus, for those ideas and concepts in the book that were new to me, I have no reason to believe that the same does not hold true.

As long as you are able to set aside the cynicism that seems to have risen to such high levels nowadays, this book will make you THINK about better ways of doing things. Just two simple examples include: (1) Designing a perennial "community" for agriculture mimicking the natural plant community that otherwise would be there, rather than planting a non-diverse, single species, requiring annual reseeding, fertilization, insecticides, herbicides, etc.; and (2) Developing industrial processes that mimic what nature has already evolved over millions of years (i.e. photosynthesis) rather than relying on the old-style of "heat, treat, and beat" to make the various products and materials that we now are so reliant upon.

This book speaks to the incredible and imperative need of the "human species" to transform beyond the ideas of the industrial revolution into an ecologically-appreciative mindset that treasures the planet we ALL live upon. If you want a book that is well-written and full of practical ideas and solutions for the future, I heartily recommend *Biomimicry* by Janine M. Benyus.¹⁶

4. The Original Green Revolution¹⁷

Most of us have heard of the so called "green revolution" in modern agriculture of the sixties and seventies, predicated on the intensive and expensive inputs of synthetic chemical fertilizers and pesticides, monoculture planting and large-scale centralised irrigation projects which generated large yield over the short term but impoverished both the land and the farming community over the long term. Although it was not stated quite bluntly so yet in practice "chemo-agriculture" is motivated by the motto *profiting by poisoning*. Yes, it was a green or rather a grey revolution and a very violent one indeed, on both nature and culture.¹⁸

That the modern western style of agriculture should be violent, poisonous and exploitative should come across to us as rather unsurprising once we know that it largely grew out of the post World War II excess chemical capacity of the munitions factories.¹⁹ Once western and westernized nations (like Japan) were done with killing human beings by the millions, they simply have to redirect their murderous efficiency to the killing of nature in order to go on keeping their nitrate factories up and running. To do this they have to create a new style of capital and chemical intensive agriculture and market it aggressively throughout the globe while at the same time disparaging traditional organic farming as slow, outdated and inefficient. But today the destructive nature of chemical intensive agriculture has been largely exposed,²⁰ researched and documented, and people are slowly (or rather too slowly) returning to agriculture in the true original sense of the word, namely to cultivate a healthy symbiotic relationship between all stakeholders in any farming project, human beings, wildlife and the natural landscape, for the earth He has laid out for all His creatures (*wa al-arda wada'aha lil-anam*).

To think and hence act out of this poison-and-profit box, Muslims can of course look into the various modern forms of organic agriculture such as permaculture and biointensive agriculture,²¹ both of which are essentially based on the ecological principles of biomimicry, but they can also perhaps more profitably look

¹⁶ Book review at <http://www.amazon.com/dp/0060533226#>.

¹⁷ For a good comprehensive article on the "Muslim Agricultural Revolution" google it in Wikipedia.

¹⁸ Vandana Shiva, *The Violence of the Green Revolution*; idem, *Monocultures of the Mind*; cf. Peter Hazell, "The Green Revolution: Curse of Blessing," at <http://www.ifpri.org/pubs/ib/ib11.pdf>.

¹⁹ For the genesis of modern day chemointensive agriculture, see

²⁰ The classic book on this is Rachel Carson's *Silent Spring*.

²¹ For instance, Bill Mollison's *Permaculture*.

into **the original green revolution**²² of their forebears who transformed much of their arid landscapes into verdant edens of peace and plenty. This way they may come to realise that the organic food movement is not an alien new-age fad of pagan mother-earth worshippers but something whose essential principle of harmony between man and nature finds perfect resonance with divine mercy as the stamp of creation²³ (*rahmatan lil-'alamin*) and with the best agricultural traditions and practices of over more enlightened Muslim forebears in Andalusia, India, Yemen²⁴ and the Malay-Islamic Archipelago.

*Al-hikmah dallat al-mu'min!
Therefore, return to your own hikmah!*

5. *Hima*: Symbiosis of Nature & Culture

Just as systematic scientific organic agriculture (*filahah*) on a large scale was an original Islamic innovation which generated the original green revolution, so was large scale systematic nature and wildlife conservation (*hima*) in which large areas of wilderness and semi-wilderness was set aside as inviolate communal land in order to maintain the general socio-ecological well-being of the region or locality. For more on how Muslim and also non-Muslim conservationists can learn from this age-old practical tradition in symbiotic man-nature relationship, the following articles and links listed in the footnote below should be useful and inspiring.²⁵ Here, we give an excerpt from a very engrossing article on the *hima* system of conservation in Islam:

Early in the seventh century, soon after Muslims established themselves in what is now the holy city of Madinah (formerly Yathrib), the Prophet Muhammad surveyed the natural resources in the region—the *wadis* (riverbeds); the rich, black volcanic soil; the high rangelands—and decreed that they be preserved and set aside as a *hima*, an Arabic term meaning “protected place.” “Verily Abraham declared Makkah a sanctuary and I declare al-Madinah, that which lies between its two lava flows, to be a sanctuary; its trees shall not be cut and its game shall not be hunted,” he told his followers. Considered by some to be the world’s oldest conservation system, the *hima* was not unknown to the nomadic tribes of Muhammad’s day. Ruthless or self-serving tribal chieftains had used *himas* for centuries for their own enrichment, or to oppress locals by cutting them off from resources. But the socially conscious Prophet of Islam transformed the *hima* from a private enclave into a public asset in which all community members had a share and a stake, in accordance with their duty as stewards (*khalifa*) of God’s natural world. “Muslims have a common share in three [things],” the Prophet declared, “grass, fire and water.” With one eye to this Islamic past, and another to the environmental challenges of the present, some Middle Eastern conservationists and environmental planners are looking to the ancient model of the *hima* to address the modern problem of preserving threatened habitat throughout the region. Their means and objectives are essentially no different from those of the Prophet: to help rural communities protect natural areas such as woodlands, grasslands and wetlands from over-exploitation, in the interest of biodiversity and their own economic well-being.

²² Zohor Idrisi, “The Muslim Agricultural Revolution and Its Influence on Europe,” at www.muslimheritage.com; cf. A. Watson, *Agricultural Innovation in the Early Islamic World* (Cambridge: Cambridge U. Press, 1983).

²³ Umar Faruq Abd-Allah, “Mercy: The Stamp of Creation,” at www.nawawi.org.

²⁴ Daniel Martin Varisco, *Medieval Agriculture and Islamic Science: The Almanac of a Yemeni Sultan* (Seattle: University of Washington Press, 1994).

²⁵ See the interesting section by S. Nomanul Haq on “The legal tradition: principles of *hima*, haram, and discourses on wastelands,” in Dale Jamieson, ed., *A Companion to Environmental Philosophy* (Oxford: Blackwell, 2003). <http://www.iucn.org/where/asia/?255/Al-Hima-Revives-Traditional-Methods-of-Conservation-and-Poverty-Reduction>; <http://www.ericademon.co.uk/EH/EH1208.html>; http://www.uwm.edu/Library/AGSL/cgp_toc/ap2a5958.pdf;

Instead of cutting people off from the land, as in a formal protected area, himas encourage traditional uses that are compatible with or contribute to the environmental health of a site. Restricted activities in himas, for example, include grazing in certain areas or at certain times, as well as the indiscriminate cutting of trees and grasses. Hunting is also tightly regulated. "The overall goal is to fuse traditional practices with recent developments in conservation science as a way to achieve sustainable development," said Assad Serhal, director general of the Beirut-based Society for the Protection of Nature in Lebanon (SPNL), the organization spearheading the initiative to revive himas in Lebanon and throughout the region. Working closely with SPNL is a host of local and international conservation organizations, such as A Rocha Lebanon, BirdLife International and the International Union for the Conservation of Nature (IUCN). There were at one time thousands of himas across the Arabian Peninsula, owned by tribal chiefs who used them for hunting or the exclusive grazing of their personal flocks. According to the ninth-century jurist Imam Al-Shafi (for whom the Shafi'i school of Islamic jurisprudence is named), the boundaries of a hima were determined by how far away the tribal leader's dog could be heard barking from a centrally located high point of land. As Islam expanded, so did the concept of the hima, as rehabilitated by the Prophet. Though known by different names in different parts of the Muslim world, the hima remained consistent in its philosophy: to entrust the preservation of the land to local people, for the sake of the people themselves and the environment, within the framework of Islamic law (*shari'ah*). "The Prophet Muhammad laid down guidelines that transformed the hima into one of the essential instruments of conservation in Islamic law," said hima advocate and authority Othman Abd ar-Rahman Llewellyn, of the Saudi National Commission for Wildlife Conservation and Development. "It is the most widespread and long-standing indigenous, traditional protected-area institution in the Middle East, and perhaps on Earth." But with the emergence of post-colonial modern Muslim states, with their complex bureaucracies and centralized governments, himas were engulfed by ministry-controlled swaths of public land. Though a handful of academics, such as Llewellyn and others, continued to study and advocate himas as an important and viable conservation model (not to mention an important cultural institution), the hima system was all but forgotten by the late 20th century. That was until SPNL, surveying the boundaries of an important migratory-bird flyway in the southern Lebanese hilltop town of Ebel es-Saqi, discovered old maps of the region drawn during the French mandate of the 1930's. "We noticed large areas on the maps that were designated as himas, a concept that had slowly dissipated since Ottoman times," said SPNL president Ramzi K. Saidi. Inspired by the potential of a system that was already familiar and community-based, as opposed to remote and government-imposed, SPNL, in partnership with BirdLife International, worked with residents of Ebel es-Saqi and the marshland village of Kfar Zabad in Lebanon's western Bekaa Valley to establish himas in both sites in 2004. Working with residents, SPNL set up "site support groups" composed of local farmers, town officials and such specialists as agricultural engineers, botanists and even archeologists, whose input is sometimes required in a part of the world where the casual turn of a spade can sometimes unearth Biblical-era treasures. The groups meet regularly to discuss the status of the himas and monitor the progress of projects that provide sanctuary for wildlife as well as economic opportunity for locals. At Hima Ebel es-Saqi, for instance, the use of traditional shepherds' paths as hiking trails has attracted eco-tourists, especially birders, who come to catch glimpses of the Dalmatian pelican, the pygmy cormorant and the white-tailed sea eagle, among other endangered species, migrating between Europe and Africa. This influx of tourists provides local bee-keepers and goatherds with a ready market for their products and offers bed-and-breakfast opportunities for enterprising families. "The hima has had a very positive effect in this community," said Kasim Shoker, mayor of Kfar Zabad. "Not only has it helped improve the economy, but it has made local people recognize the

value of the land and have greater respect for its biodiversity.” Outsiders have come to appreciate the value of himas as well. By cordoning off and protecting parcels of land, hima conservationists effectively create living laboratories where researchers can study local habitats. “Himas can be valuable for studying the interactions between plants and human beings,” said Lebanese botanist Houssam Shaiban, on a visit to Kfar Zabad. “Because grazing is controlled and not random, we can see how this affects the regeneration of certain endemic plants.” Himas, established in places from the Dead Sea to the rocky wadis of northern Oman and in indigenous forests of juniper, olive and jujube, can provide valuable seed banks for rehabilitating rangelands threatened by overgrazing and development. Himas can also play a role, said SPNL officials, in combating desertification and sand-dune encroachment. Fauna also benefit from himas, in sometimes surprising ways. “We’ve seen the return of endangered species to areas where we’d given up hope of seeing them again—places that had become dump sites, or where there was hunting,” said SPNL’s hima site manager Dalia al-Jawhary. By restricting hunting and allowing tall grasses to regenerate, local farmers in Hima Kfar Zabad—one of Lebanon’s few remaining wetlands—not only have created safe havens for wildlife, but are saving money and cutting back on the use of harmful agrochemicals. “Birds feel safe in the tall grasses and reeds,” said Sami Abu Rjayli, a local farmer and site support group coordinator for Kfar Zabad. “They also like to eat rodents. Since the birds have come back, I haven’t had to use rodenticide on any of my crops.” Other fauna that Abu Rjayli has seen making a comeback include red fox, swamp lynx and the river, or Eurasian, otter, listed as “near-threatened” by the IUCN. “Pesticides and human activity such as hunting typically make an area uninhabitable for otters, and this was the case at Kfar Zabad,” said al-Jawhary. “So we didn’t expect to see the otter come back, but were pleased and surprised that it did.”

Criteria for a Hima: To be valid under Islamic law, a hima must meet the following requirements:

1. It must be constituted by the legitimate Islamic governing authority.
2. It must be established in the way of God —that is, for purposes pertaining to the public welfare.
3. It must avoid causing undue hardship to the local people by, for example, depriving them of indispensable resources.
4. The actual benefits it brings to society must be greater than its societal costs.

And in this war-torn yet remarkably resilient country, himas have even provided safe haven for humans. During the July 2006 war in Lebanon, hundreds of refugees fled the southern parts of the country and settled in Kfar Zabad, putting a strain on resources. Spnl responded by helping displaced people find work and distributing food donated by neighboring countries and relief agencies. The initiative, said Serhal, helped form lasting ties between conservationists and locals. “In times of war, governments are paralyzed, whereas people on the ground keep mobile and active,” Serhal said. “This is why conservation management should be decentralized in countries like ours.” Thus, himas shift responsibility for the land from the in-baskets of beleaguered or indifferent bureaucrats and onto the shoulders of the local population. By doing so, “himas create a connection between the community and the land,” said al-Jawhary. “When people feel ownership of the land, they begin protecting it.” This is not surprising, since environmentalism and Islam are entirely compatible, and have been so from the very beginning, say Muslim scholars. To be a Muslim, one must always have respect for

nature, according to Dr. Abdul Fattah Al Bizm, grand mufti of Damascus. “Every Muslim is called upon to protect and deal with nature in a way that will lead to its own protection, as well as to benefit from it,” said Bizm. He cited the presence of himas in northern Syria and along the Syrian–Lebanese border, where goats are allowed to graze in accordance with hima tradition and in spite of government-imposed forestry-protection acts. He also noted that, until 1930, there was a unique, 100-hectare (250-acre) hima set aside for retired horses in downtown Damascus, in an area called al-Marj al-Akhdar (“lush green meadow”) extending from the Umayyad Square into the Salihiya district, a neighborhood now engulfed by shops, hotels and urban sprawl. But before the sprawl and government laws, it was Islamic law, *shari’ah*, and the revelation of the Qur’an that guided Muslims in their relationship with nature. “It is He Who hath made You (His) agents, inheritors of the Earth,” reads the Qur’an (6:165), in a passage that is interpreted as referring to stewardship. Humans are also cautioned to “Do no mischief on the earth, after it hath been set in order” (7:56)—an order that is divine in nature: “And the earth We have spread out (like a carpet); set thereon mountains firm and immovable; and produced therein all kinds of things in due balance” (15:19). In consideration of these and other such Qur’anic injunctions, Muhammad’s establishment of the first Muslim hima for the use of his cavalry in the wadi of al-Naqi, near Madinah, set the precedent for all subsequent himas as institutions that are ultimately derived from God. “There is no hima save for God and His Apostle,” reads a famous *hadith* (saying), often quoted in the literature on the history and practical applicability of himas. While strictly a secular organization, SPNL recognizes and respects the religious nature of himas and, in fact, relies on this relationship with Islam to help establish new himas or revive old ones. “In many villages, respect for the tradition of the hima is stronger than respect for the government’s environmental laws,” said Serhal. “Across the Arab world, people already understand that you can’t be a Muslim if you pollute the Earth and destroy habitat. What we are doing is tapping into the collective memory to help introduce a new generation to an old idea.” Spnl is now working with local fishermen, BirdLife International, IUCN and EuroNatur (European Nature Heritage Fund) to establish the first marine hima in the coastal village of Qoleileh in south Lebanon and another in the northern cedar forests of Hermel, an ancient site of historical significance at the head of the Orontes River valley. Meanwhile, inspired by Lebanon’s success, conservationists in other Muslim nations, from the Arabian Peninsula to sub-Saharan Africa to the Pacific Rim, are investigating the reestablishment or creation of himas in their own countries. In May of 2008, Qatar joined the effort with a donation of one million dollars to BirdLife International from Sheikha Jawaher bint Hamad bin Sahim Al-Thani, consort to the nation’s heir apparent. The funding will help conserve birds and promote sustainable use of natural resources and management across the Middle East, including himas. While the reintroduction of himas has tremendous potential in the Muslim world since they conform to Islamic law and custom, there remain modern questions that this ancient solution has yet to answer. “There is a gulf between Muslim jurists, who tend to be more preoccupied with ritual, theological and family-type legislation, and people in conservation, who are used to working with secular laws,” said Llewellyn, who raises important questions, even as he advocates the return of himas to Saudi Arabia and elsewhere. How will private land adjacent to himas be affected, especially if that land is needed for the management of the hima? Under what circumstances should compensation be made to those who claim they have been denied access to the hima’s resources? Because there is no mention of coastal or marine himas in the Qur’an or the sayings of the Prophet, can they be legally established? “I have spoken with jurists who say these issues can be worked out, but [hima advocates] need to provide them with scientific information, so that they can understand how the environment works,” said Llewellyn. Meanwhile, Serhal spends much of his time crisscrossing the Middle East, talking with local communities and ministry officials,

hoping to convince them all that himas are both a viable and culturally acceptable solution to the challenges of preserving habitat and supporting local economies. His efforts have even attracted the attention of environmentalists outside the Muslim world, where the hima is unknown, but intriguing. "We are meeting with MedWet in Greece, an NGO that is focused on preserving wetlands and coastal areas throughout the Mediterranean," said Serhal, who barely had time to touch ground between his trips to Qatar and Athens. "Their objectives and ours are the same: to preserve their environmental heritage, while providing local people with pride of ownership of the land."²⁶

In short, the traditional Islamic nature conservation principle of *hima* not only preserve wildlife but also cultural life through a dynamic harmony of "soil, soul and society."²⁷

6. Technology, Industry & Conviviality

The radical thinker and Catholic humanist-priest Ivan Illich wrote and published a book called *Tools for Conviviality*,²⁸ and though he was focussing more on social conviviality, I think one can extend his insights thereof to industrial conviviality, or forms of industrial production on the moderate human scale in which humaneness, artistic creativity and spiritual satisfaction are respected, nurtured and promoted, generating in turn products of both functionality and beauty (*itqan, ihsan and jamal*), for God is Beautiful, He loves beauty (*inna Allaha jamilun yuhibbu jamal*).

In Islamic civilization, industrial production is centered on the trade and craft guilds,²⁹ in which everyone is a craftsman in a system of master craftsman-apprentice work relationship directly and thoroughly involved in the whole creative and production process from start to finish, and hence no one was a mere worker or labourer just another cog in the wheel of a larger impersonal factory, and hence of course no one was merely the boss or the supervisor aloofly watching over his charges. To illustrate the nature of Islamic industrial production we may do well to quote the following words of Umar Vadillo:

In Islam the guilds reached a level of perfection and balance thanks to the *Shari'ah*. As an example, in Europe, in Al-Andalus, the guilds enjoyed a great splendour for several centuries. The manufacturers of this region achieved a degree of fame higher than their scientific and literary counterparts. The ceramic work, with its mosaics of vivid metallic colours and their golden glazes; crystal work, that was invented in the 19th [sic., 9th] century by Ibn Firmas from Cordoba; the metalwork, with its glorious lamps; the jewellery; the arms produced in famous centres such as Toledo, Seville, Cordoba, Granada, Almeria and Murcia; textile work, which produced magnificent tapestries and rich material from wool and silk; and the leather work, plain and printed, especially from Cordoba with its renowned cordovan leather were the most appreciated products as specialized items in the West. A desire to know and to improve led the guilds to technical advancement in most areas of production, including agriculture, where they developed the most efficient systems of irrigation in

²⁶ Tom Verde, "A Tradition of Conversation," in *Saudi Aramco World* (November/December, 2008).

²⁷ Alastair Macintosh, *Soil and Soul: People versus Corporate Power* (London: Aurum Press, 2004).

²⁸ (New York: Harper, 1973); see also his *Energy and Equity*.

²⁹ Umar Vadillo, "The Return of the Guilds," at <http://www.islam.co.za/awqafsa/sorce/library/Article%2014.htm>. Cf. Bernard Lewis, "The Islamic Guilds," in *The Economic History Review*, vol. A8 no. 1 (2008); cf. Gabriel Baer, "The Organization of Labor," at http://books.google.com/books?id=YHp3uXJOuuMC&pg=PA37&lpg=PA37&dq=bernard+lewis+on+guilds&source=bl&ots=yJ1OEh_N8X&sig=13ezCIP67BC3ORSEWvI_IsJwE0Y&hl=en&ei=iD-dSeLNEZK-kAXeHeWaBQ&sa=X&oi=book_result&resnum=1&ct=result#PPA31,M1.

the West during that epoch. The Sufi *tariqas* were integrated into the guilds, and this added a spiritual dimension fundamental to their development which in turn contributed to the birth and growth of new guilds. Each guild had its own internal statutes which incorporated four basic categories: masters, officials, apprentices and a chief, sometimes called the amin, who had no salary but whose job was to regulate the fulfillment of the statutes by the members and to resolve disputes among them.³⁰

In short, it was through the craft guilds of the Islamic Civilization that a mode of industrial production based on partnership, mutuality, reciprocity and conviviality was perfected, a mode of making and manufacturing that we may now call in Malay, *technology mesria*,³¹ or convivial technology. It was mode of technology, industry and manufacturing that promoted political economic democracy by serving as an effective check against the despotic excesses of the central government as pointed out by Bernard Lewis:

The bazaar merchants, the craft guilds, the country gentry and the scribes, all of these were well-organized groups who produced their own leaders from within the group. They were not appointed or dismissed by the governments. And they did operate effectively as a constraint.³²

I think the following blog by Paul Cooley captures very well the spirit of convivial (mesria) as opposed to complex/non-convivial (canggih) technology:³³

Ivan Illich speaks of convivial technology as that which is easily maintained by an individual or community. Something that solves a need without undue complication or, I'm sure he would add, without driving a wedge between the wealthy, who can afford the technology, and the poor, who would have to depend upon the largesse of the wealthy. Mr. Illich was particularly fond of the bicycle as an example of appropriate technology, and so, us bicyclists are particularly fond of him. What follows is an account of how much time I've wasted these past two weeks with the iffy interface between computers and culture. It's a gruesome tale that's not for everyone.

One of the jobs I did for Charles Bell consisted of transferring his *Symbolic History* series of shows from slides and reel to reel tape to CD-ROM. Charles had obtained money to make the transfer to digital in order to preserve his master-work for posterity, to get it off "ephemeral plastic," as he likes to put it. Unfortunately, there has been no attempt to protect and preserve this digital archive beyond having my keep a set of CD-ROM's. I have been pushing for years to have the storage and production of the information be transferred to a publishing company, but no one has connections with any such firms, and now it looks as if my collection may be deteriorating.

Charles's daughter in Maine called me to request six CD's of various shows for a woman who is ordering them for her son for Christmas. After I sat down to make copies of the *Period Styles* show, I soon discovered that the CD burner on my iBook does not work. When it reached the end of the burning session and turned to verify the disc, a message saying "verification failed" popped up immediately. Ejecting the disc and putting it back in the computer, I found that the computer treated it as a blank disc. The same thing happened when I tried to burn a couple of text files to CD-R. So far, so good, at least as far as the master *Period Styles* CD is concerned, if not for my burner.

Now I do have an old desktop, with a CD burner. However, a few months ago, I decided to see how GnuCash was progressing as free accounting software, so I upgraded the Linux software to Fedora 5. When I did that, the computer no longer recognized my hardware. I tried to reinstall it on

³⁰ Vadillo, "The Return of the Guilds," at <http://www.islam.co.za/awqafsa/sorce/library/Article%2014.htm>.

³¹ My coinage.

³² Interview at http://www.sullivan-county.com/id4/blewis_islam.htm.

³³ <http://carfreefamily.blogspot.com/2006/12/non-convivial-technology.html>.

the first harddrive, overwriting my Windows partition. The problem persisted. I decided I should reinstall my old software, but I found that I had thrown it out in a fit of decluttering back at a point when I thought I would get rid of the old desktop and just use the laptop.

So, I ordered a copy of Ubuntu Linux. Ubuntu will send you a free CD. When it arrived, I saw that it needed 256 megabytes of RAM to run. My computer has 144. I tried it anyway, and the computer hungup during the opening of the installation screen.

So I downloaded Damn Small Linux, (DSL), which works great, though it did take me some time to get the configuration files set, and I am still not certain how the whole Live CD thing works in terms of saving files, but I have it working. It took me a while — because I've been ignoring computers for a long time — to find the SCSI address of my CD burner and get all the burner application settings correct, but when everything was ready, it worked like a charm. Except that the newly burned *Symbolic History* CD was not recognizable by any computer. It wouldn't mount on DSL, and it was treated as a blank disc by the iBook. When I tried to make an image rather than a copy of *Period Styles*, DSL would get 98% finished and then stick. The iBook would make the image, but the "verification failed" message would pop up when I tried to burn the image. I rebooted into Mac 9, tried to make an image, and received a message that there was an unexpected end of file. If I tried to copy the files to the hard drive, make an image from that, and then burn it, it would still not work. I can only conclude that there is some problem with the disc.

The printed word, oral tradition, paintings, musical traditions, all seem to circumvent such problems of storage and retrieval. I have medical books on my bookshelf dating back to 1798. (They belonged to Amariah Preston, who was a doctor in Lexington Mass around the turn of that century. He must be tied into my wife's family tree, because they came from the estate of her grandmother). Those books are still readable, though the information in them has been a little superceded.

I'm not sure if the question is whether *any* of the digital information currently being produced will survive, though I have my worries for the *Symbolic History* project. In addition to the set of CD's I have, there is a set at St. John's College and a set at the Lily library, where Charles's archives are being stored. I think the question is whether the information being created today is worth the incredible amount of infrastructure and time required to make sure it is preserved. A printed book, or even the written word, can persist for centuries sitting on a shelf or secreted away in some cave. If we had the good sense to preserve our oral traditions — do we even still have them, beyond "Twinkle, twinkle little star"? — then they would be passed directly from person to person.

Of course we live in a lazy age. I set out to memorize "Song of Myself" a few years ago and never made it past the first stanza. I once memorized quite a bit of Dylan Thomas, but I can't remember much of it now. "Time held me green and dying/ Though I sang in my chains like the sea." That's about it.

What is it about technology that drives someone like me, who is a fence-sitting Luddite, to spend seven hours trying to get a CD to burn in a variety of operating systems instead of doing creative work? Why can't I even give fifteen minutes a day to memorizing poems? Why do I download something like DSL and then spend much of an evening opening every single program that comes with it to see how each one works? It's probably been three years since I used an FTP program for anything, and there I am, trying to FTP a file that says "test" up to my website space. Every couple of years I have to telnet into my ISP to see if it is still impossible to send an email message via Pine to a person outside of the ISP's network. And whaddya know! I can now run my beloved WordPerfect 5.1 for DOS on "DOS in a Box" in Linux. Last time I tried, it didn't work. Thank goodness Damn Small Linux only occupies fifty megabytes of disc space, or it would keep me busy for a long time.

It's easy to see how non Luddites would end up with every single electronic device available hooked into their computers, but just because you can do something doesn't mean you should. The only items from most of our personal computers that will last more than a generation are what gets printed out and stored in physical space.

We would probably save a lot of time and money if we stuck to journals and pens. Maybe we just don't know what to do with our time anymore, so we are primed for the advertisers: "Now you can remove redeye even before you think of taking a picture." Hell yes, give me one of those!

7. Technology as Art & Craft³⁴

The most important thing about technology is not whether it is high or low, but whether it is appropriate and fitting, that is, appropriate and fitting to the both the cultural and natural contexts in which it is to be used and hence adjust instead of imposing itself on them. In short, whether it *truly* cares for nature and culture.

Another thing to consider is that true technology concerns itself with human creativity, and human creativity is something very personal and individual, and hence it is also an art and a craft involving both the labor of the hand and of the soul, both functionality and beauty, both the discipline and moulding of matter and of the spirit, both efficiency and wisdom, both essence and ambience. These are some of the characteristics that impresses on us whenever we look and ponder on Islamic technology and the way it organizes labor³⁵ with any degree of seriousness and insight, that its beauty captures our notice before its function, that it is sensitive to what it means to be human and to be creative, and hence it involves the total humanity of the craftsman or the artisan, and hence the total and yet individual human personality is imprinted on the resultant artifact, or tool, or instrument, or machine, and hence each product possesses uniqueness and character, or "soul" and is somehow alive and living and breathing. In short, Islamic Technology focusses on the LIVELIHOOD of the creative human NOT on the narrow efficiency of the robotic machine.

Hence it is for this reason, as pointed out by Ekmeleddin Ihsanoglu, that the printing press was initially rejected by the Ottoman government and ulama, not because they were anti-technology per se, but because they took into serious consideration the larger interest to society of the preservation of the work of thousands of professional scribes and book copyists who would stand to lose their livelihood and hence their human dignity if the newly invented printing press was introduced without restraint into the Empire.³⁶

In contrast modern western technology is not only soulless, it alienate and destroy the creative human personality of the worker or employee or labourer or operator, or supervisor, now no longer called the artisan, the craftsman, but merely the factory worker/operator³⁷; it is very, very impersonal and distant, and hence exploitative of both the human and the natural resource, resulting in the peculiar modern separation between what is the product of technology and the product of art and of craftsmanship. In one the machine rules, in the other the human. So it is no wonder that in the midst of high tech gadgets we yearn for things of true craftsmanship, of art and the artistic, for "handicraft", for what is "crafted" rather than merely "produced." In Islamic technology, what is produced and what is crafted is the one and the same thing.

The way forward to bring the soul and its beauty back into technology is to revive the Islamic mode of production or rather of creation that is based on a network of cooperative small and medium scale craft and artisan industries which are autonomous manufacturers of the final product in their own right and not merely "suppliers" or "outsourcers" for the big, impersonal, soulless multinationals and national monopolies.³⁸ Our motto will be, "People over Profits" and "Localization before Globalization" and "Mesra

³⁴ For further discussion, see Seyyed Hossein Nasr and Muzaffar Iqbal, *Islam, Science, Muslims and Technology* (Kuala Lumpur: IBT, 2007).

³⁵ A critical study is Maya Shatzmiller, *Labor in the Medieval Islamic World* (Leiden: Brill, 1994).

³⁶ See his "Some remarks on Ottoman science and its relation with European science & technology up to the end of the 18th century," in his *Science, Technology and Learning in the Ottoman Empire: Western Influence, Local Institutions, and the Transfer of Knowledge* (Ashgate, 2004).

³⁷ For a critique, see Michael Adas, *Machines as the Measure of Man: Science, Technology and the Ideology of Western Dominance* (Ithaca: Cornell U. Press, 1989).

³⁸ Thus we have to restudy the history of the Islamic professional and manufacturing guilds in order to revive them in our contemporary age. Even in the West, this is already done within a Christian context as in the case of the famous Scott Bader Company mentioned and discussed by Schumacher in *Small is Beautiful*. For more on this

Insan & Alam” or *MESRIA*, and “Caring for Nature & Culture” In fact we can call Islamic Technology in the modern age as Teknologi Mesria = Mesria Technology = Convivial Technology. I think ASASI in collaboration with HAKIM, WIA and Ta’dib International should copyright that name as soon as possible, and design and implement a detailed professional course on Teknologi Mesria or Convivial Technology based on the concept of MESRIA and CONVIVIALITY, and teach it to students, lecturers, engineers and corporations!

8. Natural Medicine³⁹

Just as modern western secular agriculture grows toxic foodstuffs by poisoning the earth, so similarly we find that modern western medicine manufactures dangerous synthetic drugs by torturing animals (e.g., vivisection) in order to poison the human body (e.g., chemotherapy) and still it is called medicine! ⁴⁰ In many ways, the modern age is the age of Violent Agriculture⁴¹ and Violent Medicine. In many ways Modernity is Violent. As a matter of fact, the dangerous drugs industry is closely intertwined with the toxic chemical industry. Take the infamous drug thalidomide for instance which was chemically synthesized and then tested on life mice (and systematically torturing them in the process of course), and then pronounced safe for human consumption as sleeping pill for pregnant women which then resulted in very many THOUSAND of foetal deformities. For Muslim doctors and medical researchers who care about the Islamic Medicine and Islamization of Medicine, it should be pertinent here for them to note that the great Ibn Sina a thousand years ago has already proscribed the practice of experimenting drugs meant for humans on animals. He says, “The experimentation must be done with the human body, for testing a drug on a lion or a horse might not prove anything about its effect on man.”⁴²

Both the scientific and ethical crisis of modern medicine is well captured by Stephen Fulder when he notes that:

The drugs we now use have been found to be generally harmful and in many cases of questionable benefit. They are tens of thousands of different drugs on the market now, such a confusing plethora that the World Health Organization recently prepared a model list of essential drugs for Third World countries, and found that only 2 per cent of the total of drugs sold were really necessary...A recent Wall Street survey showed that less than 1 per cent of the drugs which were currently on trial promised important therapeutic gains...The doctors seem befuddled by ever more pressure. ‘Doctors are pushed around and bullied and bribed by the drug industry. They have undoubtedly lost control of their own profession and must consequently be held responsible for all the disasters and errors which bad prescribing produces.’⁴³

If a medical remedy is taken according to the doctor’s instruction and yet cause debilitating even life threatening side-effects, then can it truly be of real therapeutic value? Can it even be called medicine? To quote Fulder again:

company see its website, www.scottbader.com.

³⁹ For an Islamic, Sufi point of view and some practical remedies, see Shaykh Nazim al-Haqqani, *Natural Medicines* (London: TaHa, 1992).

⁴⁰ For some critiques, see Pietro Croce, *Vivisection or Science: An Investigation into Testing Drugs and Safeguarding Health* (London: Zed Books); Ray Greek, *Golden Goose and Sacred Cows*; Stephen Fulder, *The Tao of Medicine: Oriental Remedies and the Pharmacology of Harmony* (Rochester, Vermont: Destiny Books, 1987).

⁴¹ Vandana Shiva, *Violence of the Green Revolution*; Manu L. Kothari and Lopa A. Metha, “Violence in Modern Medicine,” in Ashis Nandy, ed., *Science, Hegemony and Violence: A Requiem for Modernity* (Delhi: Oxford U. Press, 1990), 167—210.

⁴² See the detailed Wikipedia article on him (“Avicenna”) with detailed documentation.

⁴³ Fulder, *Tao of Medicine*, 35—36.

The extent to which the health of man is compromised by drugs is never fully appreciated. The care of patients suffering from the harmful effects of drugs is now put at around 3000 million dollars annually in the United States alone. One study calculated that some 15 per cent of old people are admitted to hospital as a direct result of the consumption of drugs. We hear of the most dramatic cases such as thalidomide, the sleeping pill which caused foetal deformities....Depression, for example, is a form of drug side-effect produced by almost every kind of drug known....Salicylic acid was one of the first pure chemicals to be isolated and taken medicinally. Now acetyl salicylic acid, or aspirin, is the most widely used drug in the world. Fifteen thousand million tablets were consumed in 1976 in the United States. Yet evidence is only now emerging of gastric damage and possible infertility as a result of aspirin use. Pregnant women taking aspirin may have smaller babies, more complications and stillbirths, and their babies' health may be affected. In many cases, drug side-effects only appear after years of use and what was once an ultra-safe drug turns into a gradually damaging one.⁴⁴

As a result of these and other acute problems with modern medicine (e.g., prohibitive expense due to over commercialization), there is a robust movement in the West back to various forms of traditional and contemporary natural medical and pharmacological systems such as herbalism,⁴⁵ homeopathy, naturopathy, ayurvedic, acupuncture, Islamic Yunani medicine (Avicennan medicine),⁴⁶ traditional Malay-Islamic medicine⁴⁷ and so on and so forth, many of which can be systematically integrated into a contemporary revival of Islamic Medicine. This would be Islamization of Medicine in practice, and to achieve this we need to formulate in detail a comprehensive IMRP (Islamic Medicine Research Program) and to found medical research institutes to IMPLEMENT it.

...natural medicines made out of herbs and plants will always be the best and slowly, very slowly, Europeans and Western societies are coming back to the wisdom of using natural medicines."⁴⁸

9. Malay-Islamic Technology

ASASI and Khazanah Fathaniah have done a lot of work researching and documenting the Malay-Islamic contributions to science and technology to this region of the world. Maybe at another opportunity I can touch on this in some detail. But our very own President of ASASI is here, Professor Wan Ramli Wan Daud, and he shall be able to answer your queries on this important topic since he himself has done some significant amount of research on it.

9. Conclusion: Science & Technology in the Service of Islam

⁴⁴ Fulder, *Tao of Medicine*, 36—37.

⁴⁵ Eg., Ross Trattler, *Better Health through Natural Healing: How to Get Well without Drugs or Surgery* (Hinkler, 2001);

⁴⁶ Mohd. Hilmi b. Abdullah, *Teori-Teori Asas Perubatan Ibnu Sina* (Kota Baru: Pustaka Hilmi, 2005); idem, *Rawatan Umum dalam Perubatan Ibnu Sina* (Kota Baru: Pustaka Hilmi, 2007);

⁴⁷ Roland Werner, *Royal Healer: The Legacy of Nik Abdul Rahman bin Hj. Nik Dir of Kelantan* (Kuala Lumpur: University of Malaya Press, 2002); idem, *Medicines in Malay Villages* (Kuala Lumpur: University of Malaya Press, 2002); Musa Nordin, *The Forgotten Jungle Medicine of Taman Negara Pahang* (Penang: Malaysian Pharmaceutical Society, 2007); Anisah Barakbah, *Ensiklopedia Perbidanan Melayu* (Kuala Lumpur: Utusan, 2007); Harun Mat Piah, *Kitab Tib, Ilmu Perubatan Melayu* (Kuala Lumpur: Perpustakaan Negara Malaysia, 2006); Ab. Razak Ab. Karim, *Analisis Bahasa dalam Kitab Tib Potianak* (Kuala Lumpur: DBP, 2006); Noraida Arifin, *Penyembuhan Semula Jadi dengan Herba* (Kuala Lumpur: PTS, 2007).

⁴⁸ Shaykh Nazim al-Haqqani, *Natural Medicines* (London: TaHa, 1992), page facing inside front cover.

In conclusion, based on what we have learnt from the history and philosophy of Islamic Science & Technology, I earnestly encourage all Muslim scientists and technologists today to go full speed into the following areas of research:

- A. Biomimicry & Biomimetics (definitely **NOT** biotechnology!).
- B. Permaculture, Biointensive and Organic Agriculture in General.
- C. Green Chemistry & Green Manufacturing in General.
- D. Wind, Water and Solar Energy.
- E. *Hima* System of Nature and Culture Conservation.
- F. MESRIA Technology.
- G. Sufi Metaphysical Ontology & *Kalam* Physical Theories.
- H. Herbal & Natural Medicines in General within the Framework of Islamic Medicine.
- I. Islamic Psychology, especially Islamic Cognitive, Spiritual, Educational and Animal Psychology
- J. Gold Dinar & Silver Dirham Monetary System.
- K. *Waqf* System.
- L. Islamic Guild System of Professional, Industrial, Business and Labor Organization.
- M. The Islamic Gift Economy.
- N. Islamic Mathematics & The Islamization of Mathematics.⁴⁹
- O. Islamic Engineering.

Our associates in ISRU, ASASI, HAKIM, WIA, INSISTS, CIS, Ta'dib International and Muamalah Council, among others, shall be very happy to work with anyone and any institutes and organizations, including NGOs and corporations, who seriously and sincerely wish to consult us for a detailed no-nonsense implementation of the principles of MESRIA⁵⁰ outlined briefly in this article.

Thank you very much.
Wassalaamu 'ala man ittaba'a al-huda.

⁴⁹ As elaborated in Adi Setia, "Some Upstream Research Programs for Muslim Mathematicians: Operationalizing Islamic Values in the Sciences through Mathematical Creativity," in *Islam & Science* (Winter 2008).

⁵⁰ These ideas on MESRIA will be fleshed out in further detail under the rubric of ITRP (Islamic Technology Research Program), God willing.