Green is Graceful:[1] Some Practical Lessons from the History of Islamic Science and Technology

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Abstract

This essay claims to be self-critical and introspective in exploring modern western science, technology and innovation in relations to the religion of Islam. The article proposes learning from the Islamic scientific tradition in dealing with the current technoscientific mode of doing things. The author hopes to present ideas that could be used to build contemporary green and graceful science and technology. The article laments the deliberate, systemic destruction of nature and culture as the price for technoscientific progress and recommends that humanity should begin listening to the wisdom of the ages in coping with the present day civilisational challenges.

Keywords:
green technology, Islamic science, graceful technology, Islamic technology

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Introduction: History, Philosophy & the Meaning of 'Science'

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" that was nurtured throughout 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 lessons[6] from it in order to bring culture and nature back into the centre of science and technology in the contemporary age. The current global concern about the manner in which modern Western (*kafir*[7]) science and technology (coupled with

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3 (New York: Harper, 1989).

4 My inspiration for this phrase is the hadith, "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 Meaning a science that essentially expresses *ingratitude* (Arabic, *kufr*) for the bounties of the natural world, hence it *exploitative* rather than *appreciative* approach to the study of nature, for among the meanings of *kafir* (adjectival noun of *kufr*) is "one who is ungrateful." For more on science as "appreciation of nature," see Adi Setia, "*Taskhir*, Fine-Tuning, Intelligent Design & the Scientific Appreciation of Nature," in *Islam & Science* (Summer, 2004).

the liberal capitalist political economic system supporting it[8]) have systematically wrought havoc on both the natural and cultural worlds over the past century or so,[9] 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 vision 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 recent history before the "Westernization of the World."[10]

Before we go further to look at what lessons Muslim scientists and technologists can draw from the history of Islamic science and technology, we all have to really sit back and do some really serious reflection about the meaning and practice of the much used and abused word, 'science'. For our limited purpose here, it is quite sufficient to take the current definition of science at face value, namely, *science as the systemic study of nature*, and then to sit back, relax and do a

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[8] 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 book *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. An accesible overview of Polanyi's thought is J. R. Stanfield, *The Economic Thought of Karl Polanyi: Lives and Livelihood* (London: MacMillan, 1986).

[9] 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 # 4, 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).

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

leisurely bit of conceptual analysis on it. And so we find that this definition only makes existential 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, for if that happens there will soon be nothing of nature left for science to study hence entailing the extinction of science. 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 curiousity of science and its resultant technological utility demand a concomitant moral responsibility toward nature as the object of study and toward people as both subjects and beneficiaries of this study. Thus the thinking scientist can go on reflecting on the meaning of science in this or similar ways and thereby come to self-critical 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 in science and technology *really* contributing to the preservation of nature and culture?" And "Am I pursuing a science that integrates intellectual curiousity, technological utility and moral responsibility toward nature and culture?" If your answer to these and similar questions is yes in all earnestness and sincerity, then you are doing Islamic Science which is appreciative of divine bounty, otherwise you are doing *KAFIR* science which is in denial of divine bounty, even if you pray five or ten times everyday before going into your laboratory or office or factory!

With that self-critical, introspective mode of thinking firmly in place (and which, of course, can be further attenuated and articulated), we may now look into our 1001 year technoscientific tradition to see what we can learn from it in order to revive it to build a contemporary green and graceful science and technology, and hence address in a constructive and programmatic manner one of the greatest civilizational challenges of our rather sorry age, we are witnessing the deliberate, systemic destruction of nature and culture as the price for technoscientific progress we would do well to listen to the wisdom of the ages for tradition is but the beacon of the present toward the future.

Green Energy

One striking aspect of Islamic civilization is the way in which much of its energy requirements were met by renewable, pollution-free wind

and water power,[11] as compared with, say, modern Western civilization. When we think of industries and factories and industrial-scale production in general, our minds usually go back to the so-called "industrial revolution"[12] 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 now call "green energy," namely wind and water power (even tidal power), producing output on a scale sufficiently large to provide for the needs of some of the largest cities of the world at the time, such as the city of Baghdad with its estimated population of between one to two million souls at the time of, say, the fabled Caliph Harun al-Rashid. Once we acquire sense enough to cast away the Eurocentric blinkers on world history[13] we may thereby come to realize that Britain did not originate the "industrial revolution" as such; 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. This industrial revolution was also revolutionary in another sense, in the way it was systematically exploitative of men, women and children in the interest of private, self-interested capital, a fact not lost on the discerning Charles Dickens, hence his satirical expose of it in his novel *Hard Times*. So the industrial revolution is also the *inhuman revolution* rendered excusable to the conscience of its elitist beneficiaries through the philosophy of utilitarianism of Jeremy Bentham which rationalizes away inhumanity and hence humanity in the higher interest of utility.

In contrast, we are not too way off the mark to say that the industrial revolution was started in the great cosmopolitan cities of Islamic civilization, and it was also a relatively "green" revolution to boot. There

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[11] For very many examples of these such as windmills and watermills, see the relevant articles at www.1001inventions.com and www.muslimheritage.com.

[12] As a matter of fact, the so-called Industrial Revolution of Britain was made possible by the British annihilition of Indian Muslim and Hindu manufactures, not to mention a very long series of Enclosure of the Commons Acts.

[13] Michael Hodgson, *Rethinking World History: Essays on Islam, Europe and World History* (Cambridge: Cambridge University Press, 1993); see also J. M. Blaut *et al.*, *1492: The Debate on Colonialism, Eurocentrism & History* (Africa World Press, March 1993).

was output on a large industrial scale, large even by modern standards,[14] minus the dust and the smog and the general sense of dissipating dreariness so vividly captured in some of the great novels of Charles Dickens, who in many ways became the voice of public conscience of his time.[15]

What can our tradition in the sciences and crafts tell us about the meaning of 'green energy'? The answer is this: *green energy is the* fine art of living only off the resources of the land where your feet stand on. Needless to say, it was and is at once a spiritual and technical art.

Waste Not Want Not

An aerospace engineering friend of mine by name of Naguib Muhammad Nor, now Chief Operating Officeer (COO) of Strand Aerospace Malaysia (SAM) first brought to my attention some years ago 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 systemically collected and recycled into ink, and 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. Reflections on this "waste not want not approach" brings to mind the new science of 'biomimicry' founded by Janine M. Benyus a decade or so ago.

Biomimicry, also called biomimetics,[16] literally means "imitation of life in nature." It is a relatively new approach in science and technology

[14] 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.

[15] Read, for instance, his novel *Hard Times* (London: Penguin Classics, 2003).

[16] 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* (New York: Springer, 2004).

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 and preserving both the natural and cultural environment), a clean, benign approach which dovetails rather well with the fast growing field of *green chemistry*. From the Islamic point of view, biomimicry can be conceptually re-grounded in the following underlying principle expressed as a question:

> *If* the way in which the Creator does things in the natural environment generates no waste or nothing that is in vain or superflous (*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 superflous by-products and effluents in our artificial environment?[17]

In the Qur'an we are always exhorted to look and ponder at the mutifarious signs (*ayat*) of divine wisdom and mercy so observationally self-evident in creation and to draw lessons from them, among of the most important of which are: do not generate waste *(kulu washrabu wa la tusrifu* = "eat and drink and do not waste"*)*; be merciful to the world (*rahmatan lil-'alamin* = "mercy to all the worlds"); respect for other, non-human communities on earth (*wal-arda wada'aha lil-anam* = "and the earth We have spread it out for all creatures"); and gentleness, peacefulness (*qalu salaman* = "they say peace," *marru kiraman* = "they pass by with dignity") and humility (*yamshuna 'ala al-ardi hawnan* = "they walk lightly on the earth"); 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, merely contented with lip-servicing those very precepts. *If* we are serious *then* we should be able to systemically translate our *ethics into technics* embodying, realizing and actualizing those very ethics.

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[17] My formulation.

As Kenneth L. Hausen puts it so eloquently in regard to the book *Biomimicry*:

> 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 books 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.[18]

One big advantage to Muslim scientists and technologists becomes clear. Being sensitive to their Islamic ethical precepts as something that should be systemically embedded in their work gives them a headstart over their counterparts in the west who are only now beginning the gradual cultivation of a more selective and discriminative attitude toward Western science and technology. Muslim scientists are well poised to recognize and appropriate the best of the West, even though it may be (as yet) marginal, and leave aside the rest, even though it may be (currently) mainstream. Biomimicry may be marginal science right now, but it is green science and it is largely in accord with Islamic ethical precepts, and so it should be appropriated by Muslim scientists. And by the way, biomimicry is certainly *not* (nature and culture destroying) biotechnology, and this is an excremely important distinction to keep in mind..

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[18] Book review at http://www.amazon.com/dp/0060533226#.

The *Original* Green Revolution[19]

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 yields over the very short term but impoverished both the land and the farming community over the medium to long term. Although it was not stated quite bluntly so, yet, in practice "chemo-agriculture" is motivated by the motto *profitting by poisoning*. Yes, instead of a "green" it was a rather "grey" revolution and a very violent one indeed, on both nature and culture.[20]

That the modern Western style of agriculture should be violent, poisonous, manipulative and exploitative on and of both nature and culture 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.[21] Once western and westernized nations (like Japan) were done with killing human beings in war time by the tens of millions, they simply had to redirect their murderous efficiency to the killing of nature in peace time in order to go on keeping their ammonia, nitrate and nitrite factories up and running. To do this they had to create a new style of capital and chemical intensive agriculture and market it agressively 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,[22] 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, simply because "for the earth He has laid out for all His creatures (*wa al-arda wada'aha lil-anam*)."

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[19] For a good comprehensive article on the "Muslim Agricultural Revolution" google it in Wikipedia or look up the article on it at www.muslimheritage.com.

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

[21] For the genesis of modern day chemo-intensive agriculture, see http://www.idrc.ca/en/ev-115017-201-1-DO_TOPIC.html.

[22] The classic book on this is Rachel Carson's *Silent Spring* (Boston: Houghton Mifflin, 1962).

To think and hence act outside of this stifling, self-destructive poison-and-profit box, Muslims can of course look into the various modern forms of organic agriculture such as permaculture and biointensive agriculture,[23] both of which are essentially based on the ecological principles of biomimicry, but they can also perhaps more profitably look into *the original green revolution*[24] of their forebears who transformed much of their arid landscapes into verdant edens of peace, prosperity and plenty. This way they may come to realise that the organic food movement is not an alien new-age fad of quasi-pagan, Gaian mother-earth worshippers, but rather something whose essential principle of harmony between culture and nature finds perfect reasonance with divine mercy as the stamp of creation[25] (*rahmatan lil-'alamin*) and with the best agricultural traditions and pratices of our more ecologically enlightened Muslim forebearers in Andalusia, India, Yemen[26] and the Malay-Islamic Archipelago.

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 more than a thousand years ago, 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.[27] Here, we give an

[23] For instance, Bill Mollison's *Permaculture;* see http://en.wikipedia.org/wiki/Permaculture.

[24] 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).

[25] Umar Faruq Abd-Allah,"Mercy: The Stamp of Creation," at www.nawawi.org.

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

[27] 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.erica.demon.co.uk/EH/EH1208.html; http://www.uwm.edu/Library/AGSL/cgp_toc/ap2a5958.pdf;

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...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. 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...."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 SPNI 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 SPNI's hima site manager Dalia al-Jawhary.[28]

In short, the traditonal Islamic nature conservation principle of *hima* not only preserve wildlife but also cultural life through a dynamic harmony of "soil, soul and society."[29] And I simply can see no reason why the Islamic concept and practice of *hima* cannot be implemented in Malaysia and in South-East Asia in general, nay, throughout the whole world even.

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[28] Tom Verde, "A Traditon of Conversation," in *Saudi Aramco World* (November/December, 2008).

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

Technology, Industry & Conviviality

The radical (going-to-the-root-of-the-problem) thinker and Catholic humanist-priest Ivan Illich wrote and published a book called *Tools for Conviviality*,[30] and though he was focussing more on social conviviality, I think we can and should 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 al-jamala*).

In Islamic civilization, industrial production is centered on the trade and craft guilds,[31] in which everyone is a craftman. In a system of master craftman-apprentice collaborative partnership relationships, each person is directly and thoroughly involved in the whole creative and production process from start to finish, and hence no one is a mere worker or labourer who is just another cog in the wheel of a larger impersonal factory. But the some token no one was merely the boss or the supervisor aloofly watching over his charges on behalf of absent, alien owners-investors-shareholders headquartered at Wall Street or Dubai. 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

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[30] (New York: Harper, 1973); see laso his *Energy and Equity*.

[31] 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=13ezC lP67BC3ORSEWvl_lsJwE0Y&hl=en&ei=iDdSeLNEZK-kAXeheWaBQ&sa=X&oi=book_result&resnum=1&ct=result#PPA31,M1.

> was invented in the 19th [*sic.*, 9th?] century by Ibn Firnas 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 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.[32]

In short, it was through the craft guilds of the Islamic Civilization that a mode of industrial production based on partnership (*musharakah*), mutuality (*taradin wa ta'awun*), reciprocity (*tabadul*) and conviviality (*mu'anasah*) was perfected, a mode of making and manufacturing that we may now call in Malay, *technologi mesria*,[33] or *convivial technology*. It was a mode of technology, industry and manufacturing that promoted political economic democracy by serving as an effective check against the despotic excesses of the central goverment, as pointed out, for instance, 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.[34]

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

[33] My coinage.

[34] Interview at http://www.sullivan-county.com/id4/blewis_islam.htm.

I think the following blog by Paul Cooley captures very well the spirit of convivial (*mesria*) as opposed to complex/non-convivial (*canggih*) technology:[35]

> 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.

Technology as Art & Craft[36]

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 both the particular cultural and natural contexts in which it is to be used. Hence it adjusts itself instead of imposing itself on them. In short, whether it *truly* cares for nature and culture is evidenced by virtue of the very fact that it is to be *embedded* in nature and culture.

Another thing to consider is that *true technology* concerns itself with human creativity. Human creativity is something very personal and individual while at the same time self-consciously adhering to some objective, existential norms. Hence it is an art and also a craft involving both the labor of the hand and the labor of the soul, functionality and beauty, the molding of matter and the discipline of the spirit, skill and wisdom, essence and ambience, life and livelihood, indeed culture and nature. These are some of the characteristics impressed on us whenever we look and ponder Islamic Technology and the way it organizes labor[37] with any degree of seriousness and insight. Its beauty captures our notice before its function, that it is sensitive to what it means to be human, to be communal and to be creative, to be in tune with nature (*fitrah*) and hence it involves the total humanity of the craftsman or

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[35] http://carfreefamily.blogspot.com/2006/12/non-convivial-technology.html.

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

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

the artisan. 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, responding to tradition as a timeless beacon. In short, Islamic Technology focuses on the *life and livelihood* of the creative human being and *not* on the narrow efficiency of the robotic machine serving the corporate bottom line to the exclusion of all else. It was and is always *people over profits*.

Hence it is for this reason of life and livelihood, as pointed out by Professor 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 the tens of thousands of professional scribes and book copyists and binders who would stand to lose their livelihood and their culture and hence their human dignity if the newly invented printing press was introduced without restraint into the Empire.[38] In short, the printing press was rejected at that time because it was tending to violently impose rather than peacefully embed itself into society. In other words, *the test of true technical progress is the very fact that it should obey the moral imperative of not stuffing itself down people's throats*.

In contrast modern Western technology is not only soulless, it alienates and destroys the creative human personality of the worker or employee or laborer or operator, or supervisor, now no longer called the artisan, the craftsman, the apprentice, but merely the factory worker/ operator.[39] Like the "satanic mill,"[40] it is very, very impersonal and distant, and hence exploitative of both human and natural "resources," resulting in the peculiar modern separation between what is the product of technology and what is the product of art and of craftsmanship. In

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[38] 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), 47.

[39] 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).

[40] For a political economic critique of the (British) Industrial Revolution symbolized by the phrase "satanic mill" see Karl Polanyi, *The Great Transformation: The Political and Economic Origins of Our Time*, 2nd ed. (Beacon Press, 2001), 35 ff.

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 by caring hands and hearts" rather than merely "produced by machines tended by workers enslaved to monotonous mechanical rythms." In Islamic technology, what is produced and what is crafted were and are always the one and the same thing, it is at once *hand-crafted and heart-crafted*.

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 or *craftation* that is based on collaborative networks 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.[41] Our motto will be, "People over Profits" and "Localization before Globalization" and "Mesra Insan & Alam" or *MESRIA*, and "Caring for Nature & Culture" In fact we can call Islamic Technology in the modern age as *Technologi Mesria* = *Mesria* Technology = *Convivial Technology*. I think ASASI in collaboration with HAKIM, WIA and Ta'dib International should copyright (or rather *copyleft*) that name in the public interest 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! seriously.

Natural Medicine[42]

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 (i.e.,

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[41] 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 company see its website, www.scottbader.com.

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

vivisection) in order to poison the human body (e.g., chemotherapy) and still it is called medicine![43] In many ways, the modern age can be defined as the age of Violent Agriculture[44] and Violent Medicine. In many ways *Modernity is Violenity*. 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 live mice (systematically torturing them in the process), and then pronounced safe for human consumption as a sleeping pill for pregnant women. This then resulted in thousands of foetal deformities. For Muslim doctors and medical researchers who *really care* about Islamic Medicine and Islamization of Medicine, it should be pertinent here for them to take note that the great Ibn Sina a thousand years ago had already proscribed the practice of experimenting with 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."[45]

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

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[43] 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 Pharmocology of Harmony* (Rochester, Vermont: Destiny Books, 1987).

[44] 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.

[45] See the detailed Wikipedia article on him ("Avicenna") with detailed documentation.

> 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.[46]

Anyone, especially doctors, should have enough sense to reason that: *If a medical drug is taken according to the doctor's instructions and yet causes debilitating even life threatening side-effects to be treated by yet other drugs, then can it truly be of real therapeutic value? Can it even be called medicine?* To quote Fulder again:

> 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.[47]

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 pharmachological system such as

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[46] Fulder, *Tao of Medicine*, 35-36.
[47] Fulder, *Tao of Medicine*, 36-37.

herbalism,[48] homeopathy, naturopathy, ayurvedic, acupuncture, Islamic Yunani medicine (Avicennan medicine),[49] and traditional Malay-Islamic medicine[50]. Many of these 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."[51]

Conclusion: Science & Technology in the Service of Islam

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, the details of which will have to be worked out at another opportunity:

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

[49] 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).

[50] 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 Phamarceutical 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).

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

A. Biomimicry & Biomimetics (definitely ***NOT*** biotechnology!).
B. Permaculture, Biointensive and Organic Agriculture in general.
C. Green Chemistry & Green Manufacturing in general.
D. Wind, Water, Tidal 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 for the Revival of the Islamic Gift Economy.
L. Islamic Guild System of Professional, Industrial, Business and Labor Organizations.
M. The Islamic Gift Economy based on Collaborative Partnerships *not* on Banks.
N. Islamic Mathematics & The Islamization of Mathematics.[52]
O. Islamic Engineering.

[52] 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).

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