Nidhal Guessoum's Reconciliation of Islam and Science

with John Hedley Brooke, "Reconciling Religious Tradition and Modern Science"; Salman Hameed, "Walking the Tightrope of the Science and Religion Boundary"; Rana Dajani, "Evolution and Islam's Quantum Question"; Zainal Abidin Bagir, "Practice and the Agenda of 'Islam and Science' "; and Nidhal Guessoum, "Issues and Agendas of Islam and Science"

ISSUES AND AGENDAS OF ISLAM AND SCIENCE

by Nidhal Guessoum

Abstract. The publication of *Islam's Quantum Question* coincided with a burst of interest in the subject of Islam and science. This article first places the book in context (academic and cultural); in particular, an update is given on the two strong current trends of *I'jaz*, the "miraculous scientific content in the Qur'an" and Muslim creationism, and a note is made of the "Arab Spring" and its potential effect on science in the Arab-Muslim world. The second part is devoted to a discussion of the views presented by the four reviewers (Brooke, Hameed, Dajani, and Bagir): my "theistic science" approach, the similarities and contrasts between Christian and Islamic approaches to the scientific exploration of the world, the importance of relating religion and science in practice, not just in theory, the need for a theology of nature versus natural theology in Islam, and so on. The article concludes with an outlook on the issues that still need to be addressed in the field of Islam and Science.

Keywords: cosmology and Islam; creationism; environment and Islam; evolution and Islam; Islam; Islamic science; Islamization of science; modern science; natural theology; Qur'an; theology of nature

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Islam's Quantum Question in Context

In the past few years, both while I was writing my book and after its publication, the field of "Islam and Science" saw a series of interesting developments, mostly in the West but some in the Muslim world also. The field of "Islam and Science" is a large space of discourse in three dimensions: (1) the historical developments of science during the Islamic civilization; (2) the issues of practical application of science in the Islamic

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life (ranging from the astronomy of the Islamic calendar to gene therapy and euthanasia); and (3) the conceptual discussions of conflict, harmony, or separation between Islam and modern science.

The interest in the history of science in Islam (often referred to as "Islamic science") has enjoyed significant interest and scholarship from many academics (Ahmad Dallal, Ahmed Djebbar, Toby E. Huff, David King, Roshdi Rashed, and George Saliba, to name just a few), and they have continued to publish books and journal articles and sometimes appear in documentaries on the subject. The history of science in Islam has now become a topic of public interest, with superbly written recent books (Freely 2009; 2011; Lyons 2009; Al-Khalili 2011), elaborate exhibitions,[1] and media programs.[2]

On the practical applications of science in the Islamic life, one may cite the following recent activity: (1) two conferences[3] were organized in Abu Dhabi (United Arab Emirates) to address the way in which modern astronomy impacts the construction of the Islamic calendar (especially the determination of the holy Ramadan and Hajj) and prayer times in high-latitude regions, one in December 2006 and one in May–June 2010; and (2) a training course on human pluripotent stem cells was conducted[4] in Amman (Jordan) in April 2011.

But it is the third dimension of "Islam and Science" that is of primary interest to us here—namely that of the conceptual discussions of conflict, harmony, or separation between Islam and modern science. For while the "practical" dimension brings up fascinating issues pertaining to the extent to which Islam, as understood and practiced in our times, can constructively interact with some fields of science (biotechnology, modern astronomy, etc.), it is in the "conceptual" dimension that the tug-of-war really occurs, challenging the traditional religious principles and worldviews with naturalistic methodologies and theories, as well as new results that force us to review our conception of nature, humans, history, creation, and God's relation to all that.

And in this area, too, both academics and the media have noticed the importance of examining the contemporary relations between Islam (or Muslims) and modern science. In 2007, Taner Edis published *An Illusion of Harmony: Science and Religion*, a critical examination of the ways in which Muslims have been trying to relate their religious principles to modern science. From an opposing angle, Mehdi Golshani has continued to promote his theistic approach to science, publishing new editions of *The Holy Quran and the Sciences of Nature* (2003) and *Can Science Dispense with Religion?* (2004).

But the debate is moving into the public sphere as well, as can be seen through the publication of a number of feature-length articles in important journals and magazines such as *Discover* (Pitock 2007), *Physics Today*

(Hoodbhoy 2007), *Science & Education* (Edis 2009), and *The Chronicle of Higher Education* (Paulson 2011).

And, limiting myself again to the last five years or so, I should mention that *Zygon* has published about ten papers on issues of "Islam and Science,"[5] half of them in the field of bioethics (cloning, genetic modification, and stem cells).

On a larger sphere of influence, The Royal Society (London, UK) held two important lectures on "Islam and Science" in recent years: one in December 2006, given by Ziauddin Sardar and titled "Islam and Science," and the other in January 2008, given by Jim Al-Khalili and titled "The House of Wisdom and the Legacy of Arabic Science." And mediawise, in February 2009, Ehsan Masood presented a three-part BBC Radio series on the conceptual issues of Islam and science today.

Why this renewed and wide-ranging interest in the subject? There are, in my view, several reasons for this phenomenon: (1) a new general interest in Islam, to a large extent stemming from recent political events; (2) a large increase in the number of Muslims living or having grown up in the West, who find that the great Islamic civilization is largely unknown there; and (3) significant developments in the scholarship of both the history of Islamic science, particularly in astronomy, and in the relevance of the Islamic cultural context to the relation(s) between science and religion.

The serious discourse on Islam and science actually started a few decades ago, when the idea of an "Islamic science" (here meant as a conceptually different construction of science) surfaced almost simultaneously from several thinkers: Seyyed Hossein Nasr (who claims precedence with it[6]), Muhammad Naguib al-Attas, and Ziauddin Sardar. In the eighties, the "Islamization of knowledge" program was presented by Ismail Raja al-Faruqi, later carried on and extended to the "Islamization of science" by al-Faruqi's disciple Taha Jabir Al-'Alwani and other followers. And then, in an altogether separate category (of low academic standards, faulty methodology, but high sociological importance), there is *I'jaz*, the theory of the "miraculous scientific content" of the Qur'an (and now of the Sunna, the Prophet's statements and deeds). I should note in passing that although Maurice Bucaille almost inadvertently launched the hugely popular interest in this *I'jaz* theory (mainly for being French and non-Muslim, while categorically stating that the Qur'an, unlike the Bible, contains no factually wrong scientific statements), he was far from the first writer to advocate such a theory. Indeed, technically speaking he was only rarely making the claim of a "miraculous scientific content" of the Holy Book. For the most part, he was only insisting that it did not contain any scientific errors.

The serious discourse (Nasr, al-Attas, Sardar, Faruqi/Al-'Alwani) largely subsided in the past two decades or so, for mainly two reasons: (1) Sardar's school of thought, known then as the Ijmalis, which provided a very important oppositional standpoint and intellectual production against

both Nasr's "sacred science" perennial philosophy and the Islamization of knowledge program, mostly disappeared from the scene, and its prominent members (Sardar, Pervez Manzoor, and Munawar A. Anees, most prominently) turned to other issues (Islamic culture, future, etc.); and (2) the Islamization of knowledge/science program essentially stalled from the start (as I explained in my book) and did not produce any works of substance that would have carried the debate forward.

This brief review serves to put my book in context. Indeed, the book seems to have come at the right time, both considering the aforementioned renewed interest among scholars and media people and the serious need for works that can try to redirect the currently flawed Islam-science culture that one witnesses in the Arab-Muslim world.

Indeed, the Arab-Muslim cultural landscape is largely oblivious to the above debates, most of the works being published in English by the protagonists (most of whom are Muslim). Moreover, today's plethora of books and media production on Islam and science tend to be almost totally dominated by the *I'jaz* discourse, which now enjoys an unprecedented and alarming popularity, even more so than even five years ago when I started writing my book, in which I devoted a whole chapter to critiquing that theory in detail.

Examples abound of the huge momentum of *I'jaz* today, in the Arab-Muslim world but also quite substantially among Muslim immigrants in the West. First, there is the continued organization of international conferences on *I'jaz*, led by the World Authority on Scientific *I'jaz* in the Qur'an and the Sunna. After the eighth one in Kuwait, which I critiqued and decried in my book, came the ninth one in Algeria in October 2009; the tenth one in Istanbul, Turkey, in March 2011; and even regional ones as far away as South America (in Brazil in March 2010, in Egypt in April 2010, etc). Leaders of that World Authority now claim that the evidence of "miraculous scientific content in the Qur'an and the Sunna" that is presented in these conferences is so impressive that many (Western) scholars convert during those meetings (Ben Mahfoudh 2011).

Second, the media is now saturated with this discourse: stalls in libraries and book fairs are full of lavishly produced and illustrated, hardcover books by such popular figures as Zaghloul R. El-Naggar and many others who are following in his footsteps, including university professors and deans; curricula at the high school and university levels now routinely contain at least a chapter on *I'jaz*; and newspapers and TVs are full of articles and shows on the subject. In fact, the aforementioned *Discover* article ("Science and Islam in Conflict"), which was published in July 2007, featured El-Naggar quite prominently, where he was quoted as stating, "The Messenger of Allah . . . talked about all these cosmic facts in such accurate scientific style at a period of time when people thought that Earth was flat and stationary. This is definitely one of the signs, which testifies

to the truthfulness of the message of Muhammad." The article also gave examples of the kinds of claims that El-Naggar makes—for example, that geologists recently discovered that Earth's crust consists of seven zones and that biologists now say that the body contains 360 joints, "facts" that were stated by Prophet Muhammad fourteen centuries ago. But unlike countless uncritical articles and shows where such claims are made, *Discover* made sure that the errors therein are exposed to the readers. And a strong indication of the momentum that *I'jaz* has acquired in recent years is the fact that El-Naggar's website lists a dozen books that he has published on the subject since 2006!

Finally, the same standpoint was presented by a representative of the Muslim Brotherhood in London, who, in a feature-article in *Nature*, told Ehsan Masood (2006), "I urge all scientists to read the Koran, from which they will learn much about so many scientific topics."

Another phenomenon that has seen substantial worsening in the past five years is the Muslim creationist movement of Harun Yahya, which has now gone global in its campaign, setting up local chapters in a number of countries in the Middle East and Europe; selling books and videos at fairs at largely subsidized prices; mailing expensive literature to high schools in many countries, including in Europe; and organizing large lectures (in Paris, London, and other places) to present the "falsehood" of Darwin's evolution.

The *Discover* article also gave a stunning example of the creationist mindset that now prevails even among university professors in the Arab-Muslim world: When asked about Darwin's theory, a chemistry professor at Cairo University replied, "If you are asking if Adam came from a monkey, no.. . . Man did not come from a monkey. If I am religious, if I agree with Islam, then I have to respect all of the ideas of Islam. And one of these ideas is the creation of the human from Adam and Eve. If I am a scientist, I have to believe that." When challenged by the reporter to justify his rejection of human evolution, he replied, "It's written in the Koran."

I analyzed and decried this (growing) literalist mindset and its effect on Muslims' understanding of science-related issues in a recent *Zygon* article (Guessoum 2010).

But a very important development of the past 18 months, one that coincided almost exactly with the publication of my book but that, on the surface, seems unrelated to it, is the "Arab Spring." In his review of my book, Salman Hameed (2012, 337) is correct to point to this general revolution as a significant event in relation to the discourse on Islam and Science. Noting that the "Arab Spring" was ignited and led by the young and educated segment of the population, he hears them asking themselves, "What does it mean to be a Muslim in the modern age? What does Islam have to say about the discoveries of modern cosmology and evolutionary biology?" I am not sure that many are asking themselves the second question

or that it matters to them enough to have a transformative effect on their worldview, especially when science education is mediocre in most countries of the Muslim world (see the results of the Trends in International Math and Science Study 2007[7]), and there is almost no philosophy of science component in the curricula; the first question, however, is certainly at the core of the crisis that all classes in the Muslim world (politicians, educators, religious scholars, media personalities, etc.) are contending with.

Now the "Arab Spring" has ushered in an era of Islamist governments and parliaments (in Tunisia, Morocco, Egypt, and, most likely, Libya and others to come), and fear of new constraints on freedoms of speech and debate are being voiced everywhere. In her review of my book, Rana Dajani (2012, 343) is correct in pointing to the "lack of freedom of thought and misinterpretation of the Qur'an" as the two main reasons behind the current conflicts between Islam and science. Such conflicts are rarely acknowledged—most Muslims mechanically repeating that there is no conflict between science and Islam, as the latter (particularly through the Qur'an) has always held knowledge to the highest esteem and encouraged its pursuit.

In the aforementioned *Nature* article, titled "An Islamist Revolution," Masood, without foreseeing the "Arab Spring," stunningly anticipated the current resurgence and dominance of Islamist parties and discussed the potential effects on science in this region's society. He asks, "What can Muslim scientists expect from new Islamist parties that are seeking power? Will there be more support for science and for research infrastructure . . . but an environment where basic freedoms continue to be denied?" He finds trends suggesting that "Islamist governments are likely to restrict academic freedoms as much (if not more) than the secular regimes they want to replace." He refers to Saudi Arabia, Sudan, Iran, and Pakistan, and notes that social scientists are most at risk. Masood goes on to diagnose the source of the problem: "How literally they interpret the Koran will clearly influence how the new Islamist governments regulate science and technology." He finds agreement from the most influential Islamic scholar of the past several decades, Sheikh Yusuf Al-Qaradawi, who considers the Islamist movements as literalists who do not encourage independent thinking enough: "My worst fear for the Islamic movement is that it opposes free thinking for its followers and closes the door to *ijtihad* [intellectual effort to come up with new ideas and solutions]."

We are living that experiment right now, and the future of Muslim generations is in the balance. So much hope has been invested in this "Arab Spring" after so much suffering and wasted time; which direction these countries and societies go will be absolutely critical.

There are some positive signs, however, with regard to the place of science in Muslim societies. I am more interested in the cultural and educational trends in society, but I realize that the financial aspects are crucial, so I will

start with this factor. A number of Muslim-majority countries have greatly increased their spending on scientific research; Pakistan, in spectacular fashion, increased funding to higher education institutions by 5,000% over a seven-year period in this past decade (Osama et al. 2009) and similarly jump-started scientific research; other countries such as Algeria and Egypt have doubled their research budgets; Qatar is steadily increasing its funding of science toward 2.8% of the gross domestic product (GDP), the average in the Arab world being still around 0.2%, compared to 1.2% worldwide and more than 2% in the developed world.

Equally as important, as far as the financial aspect of the problem goes, is the emergence in the past five years or so of new, well-endowed research funding agencies in the Gulf, such as the Emirates Foundation, the National Research Foundation (also in the UAE), the Qatar National Research Fund, the Arab Science and Technology Foundation, and others, not to mention the creation of new research parks and research-intensive institutions (the Qatar Science and Technology Park, the Masdar Institute in Abu Dhabi, and the King Abdallah Science and Technology University, to name only the most prominent). It is too early to assess the impact of these foundations on scientific research in the region and the socioeconomic and cultural impact of such a push.

There has also been a large increase in university enrollments across the whole Muslim world.[8] Most interestingly, the percentages of females enrolled in science fields have steadily increased in Arab universities, now reaching as much as 80% of students in the Gulf States.

In the social arena, science is making a slow comeback, with the clear appearance of science-related media activity in several forms, with the Internet playing a significant role in many ways. First, there are a number of new science magazines, several of them online. Second, there has been an increase in the number of science shows on TV, helped by the exponential increase in satellite TV stations, some of them entirely devoted to documentaries and thus running an abundance of science programs, either dubbed or subtitled. Many of the homemade science shows tend to be of the *I'jaz* type, but the foreign-made documentaries are genuine, well-made, and up-to-date science programs. And last but not least, an Arab Science Journalists Association (ASJA) was established in 2006, though it is still struggling with the funding; still it has created and executed science journalism awards and held its first conference in Fez, Morocco, in October 2008. And in June 2011, the Seventh World Conference of Science Journalists was held in Doha, Qatar, hosted by both the ASJA and the (American) National Association of Science Writers (NASW) organizations, with 760 participants from 90 countries, including more than 120 Arab science journalists (Kintisch 2011).

Finally, the issue of Islam's position and relation to the environment has attracted much interest lately. A number of conferences have taken place

on the subject: in Turkey in 2009, in Indonesia and Jordan in 2010, and in Algeria in 2011. Furthermore, several books have been published, in various languages, including *The Holy Qur'an and the Environment* (2010) by Ghazi bin Muhammad, Reza Shah-Kazemi, and Aftab Ahmed, *Islam & Climate Change—a call to heal* (2010), a booklet produced by the *Wisdom In Nature* team, and *Green Deen: what Islam teaches about protecting the planet* (2011) by Ibrahim Abdul-Matin.

These surely are signs of progress regarding the state of science in today's Muslim culture. However, on the conceptual and intellectual levels, in particular, this progress seems rather slow. More students are studying science, more research is being done, and more publications are coming out of this part of the world, but the understanding of the real nature of science, the critical thinking that it requires and entails, and the habits of mind that it produces in people are still largely lost on the Muslim public, including much of the educated segment. And how science, as an approach to understanding the world, can be seamlessly meshed with the Islamic worldview is certainly far from achieved; indeed, the debate on this crucial subject has barely (re)started.[9]

Response to the Reviewers' Comments

The reviews of my book that were written by John Hedley Brooke, Salman Hameed, Rana Dajani, and Zainal Abidin Bagir present an excellent spectrum of viewpoints and positions with regard to my work and thesis and raise a number of very useful points that can only help push the debate further. I am flattered to see my modest effort elicit such reactions and help reignite the Islam-science discussions at the highest scholarly levels.

I would like to present a number of responses to ideas that the reviewers expressed, in some cases because they were indeed questions posed by the authors in the hope of deepening the explorations and pushing the investigation further, and in other cases because some statements or viewpoints represented a misunderstanding of my own thesis or position on some issues.

In his masterly piece, Brooke, while largely agreeing with my propositions, added substantially to the discourse by connecting and intersecting with recent works from historians, philosophers, and theologians. He raised three main points to take the discussion on Islam and Science further: (1) "who controls the meanings?" in Islam, and if it's the *ulamas*, then how could scientists (like me) have any impact?; (2) could there really be a natural theology in Islam, if one keeps in mind the Scripture's "unquestionable primacy" there?; and (3) along with the similarities, can we not see important "contrasts" between Christianity and Islam with regard to their potential attitudes on modern science?

"Who controls the meanings in Islam?" is certainly an important and pertinent question today more than at any other time. Muslims always repeat the fact that there is no formal clergy in Islam, no church institution, no spokesperson for the religion, no pope, and no infallibility, but only scholars (the famous *ulamas*) who can express mere "opinions," which may be—and have often been—contradicted by other *ulamas*. Even a "fatwa" (edict) is, technically speaking, only one scholar's "reply" to a question or issue posed by someone (e.g., "am I allowed to take a loan with interest to buy a house in France, where there are no Islamic banks, since interest is forbidden in Islam?"). It is also true, however, that because of the high status of knowledge (*'ilm*) in the Muslim culture, scholars (religious ones in particular) have acquired such a privileged stature, and religious institutions of various kinds (Islamic universities, ministries of Islamic affairs, Islamic foundations, etc.) have indeed become highly prominent, so that there now exists a quasi-formal clerical body of Muslim scholars. Furthermore, the nature of the educational process by which religious scholars are trained is a closed circle, whereby one is not "recognized" as a scholar until one has received *ijazas* ("certificates" or, in effect, "authorizations") from grand sheikhs on this or that subject (Qur'anic exegesis, Islamic jurisprudence, etc.), and this then perpetuates the status quo. In other words, if a person receives a doctorate in Islamic studies from, say, Oxford University, he (and even more so she) would not be presented to the public (and thus listened to) as an Islamic scholar, until and unless he has gone out and received *ijazas* from traditional *ulamas*, in which case he will have adopted their positions and written a number of texts showing a traditional standpoint. In such a system, obviously, there is a monopoly of the theological discourse, and scientists, or even academics who are well trained in Islamic studies, cannot hope to make any impact, much less steer the general understanding of one issue or another to a new direction.

But there is hope, and things have been changing, albeit very slowly, as is often the case in traditional societies. First, general education, up to and including the university level, have opened up the possibility for many to acquire knowledge and challenge the *ulamas* on their own fields. Indeed, this is now possible because the public sphere and discourse have been opened by the media, especially the new media of satellite communications and internet contacts, including mailing lists, discussion groups, and social networks.[10] Young people now watch ten YouTube videos for every one sermon or TV talk given by a traditional scholar. And books can now cross borders at the speed of the electric signal (online), avoiding censorships and monopolies altogether. Last but not least, this age of science and technology has given higher stature to natural scientists like me, and we can thus exploit this opening and interest from the public to pass on a new message. To summarize, the meanings are still largely controlled by

the orthodoxy, but various factors are helping shift this situation into new directions.

Regarding natural theology, Brooke, having so carefully read my book, has noted the existence of a similar tradition in Islam as in Christianity; in fact, I had noted that on several essential ideas of natural theology, we not only find very close resemblance in the two traditions, we sometimes find precedence in the Islamic history of scholarship (Al-Ghazzali centuries before John Ray, Averroes centuries before William Paley). Brooke, however, is astutely asking about the role and place that natural theology could have in Islam, considering the Scripture's "unquestionable primacy."

Actually, I think the more pressing issue is not the Scripture's primacy in Islam (that, of course, is true), but rather what role natural theology could be expected to play in Islam. What I mean by this crucial distinction is the fact that the Qur'an, as I tried to show at length in my book, does use the argument from design repeatedly, and indeed I used the word "ubiquitous" to describe the place of the argument from design in the Islamic tradition. Abraham himself, the father of the three big traditions, is described in the Qur'an (as in the Bible) as looking for God in nature. Also, one of the most beautiful and most often quoted verses from the Qur'an is "*Those who reflect on the creation of the heavens and the earth (and say): Our Lord! Thou hast not created this in vain! Glory be to Thee*" (Q 3:191). And in this verse already we begin to see the place of natural theology as presented in the Holy Book: it is an approach for confirming—not establishing—God's existence. Indeed, the Qur'an takes the belief in the Creator as rather self-evident, and the concept of atheism is hardly mentioned there.[11]

But this is not the end of the argument. Indeed, the Qur'an was then addressing a people whose acceptance of God was quite unanimous and unquestioned; it was rather the nature and attributes of God that needed clarification, and the purpose for humans' lives and the importance of asserting a final judgment (i.e., accountability) that required firm insistence. Thus, natural theology played a kind of confirmatory role when atheism essentially did not exist. But now that the debate among humans, especially among the (growing) educated segments of society, is more about God, His place, and the purpose behind existence itself, Islam brings its arguments (design, fine-tuning, or other ideas) richly to the debates. As far as I see it, the problem is more one of Muslims making the necessary efforts to updating their tradition of natural theology and making it relevant. Indeed, the question of God, which today is taboo in the Islamic culture,[12] will soon become an open one.

Now to the similarities and "contrasts" that may exist between the Christian and the Islamic positions and outlooks with regard to modern science. First, referring to Bacon's view of science as a way of mastering or even dominating nature, an approach he described as "interventionist

empiricism," Brooke sees "a contrast between active and contemplative attitudes towards nature" (and cites Gruner 1975). He asks whether "such a vision of changing the world was more easily reconciled with Protestant Christian spiritualities than might have been possible in cultures where submission to the divine will was and has been paramount."

I do not believe that science needs to be understood in that way ("changing the world"); indeed, Newton himself, and before him Ibn Al-Haytham, sometimes described with a bit of exaggeration as "the father of the scientific method" for his insistence on empiricism, and his contemporary Al-Biruni, an "inductivist" in his understanding of science, and others in the fields of astronomy and medicine in particular, all believed that nature needed to be fully explored and experimented upon—though not "tortured."

Furthermore, the insistence on science having to benefit humanity, thus not just being contemplative, is in fact a bit too strongly expressed in the Islamic tradition. Indeed, I find difficulties countering interlocutors when they bring up the *hadith* (Prophet Muhammad's statement) asking God to "protect/divert him/us from knowledge which has no benefit to humans." The utilitarian approach to knowledge and science is all too strong in Islam, and here too we need Muslims to reassess the situation and reinterpret *hadiths* on the basis of what was needed then and what is needed now.

Second, Brooke, while noting that "models of divine activity were clearly not absent from the work of the great Muslim philosophers," asks "to what extent were they used to legitimate actual scientific investigation?" Two points can be mentioned in this regard. The Qur'an itself, the core and the "prime mover" of the Islamic culture, encourages people to explore in order to discover *how* God created the world (which is precisely the goal of science): "*Say: Travel in the land and observe how He originated creation*" (Q 29:20). Moreover, as I mentioned in my book, some of the most prominent Muslim scientists of the golden age explicitly stated that their scientific work was a direct result of Allah's call: Al-Biruni pointed to the aforementioned verse 3:191, and Al-Battani, one of the most illustrious astronomers of that era, wrote, "By focusing attention, observation, and extensive thought on astronomical phenomena, one is able to prove the unicity of God and to recognize the extent of the Creator's might as well as His wide wisdom and delicate design" (Mujahed 2004).

Finally, Professor Brooke asks whether in contrast to Europe, there were in the Islamic civilization any opportunities for scientists to act as "lay theologians" or whether "the more common pattern [was] an exclusive ownership of religious discourse by those specially trained as religious teachers." Here the limitedness of my knowledge of the history of thought, particularly theology, in the Islamic civilization prevents me from giving a complete and authoritative answer to this interesting question; however,

as I've mentioned above, I do believe that for too long there has been a monopoly on the whole religious discourse, including theology (Kalam) on the part of the mutually supporting and reaffirming *ulamas*. But this can change, and indeed, in *Kalam's Necessary Engagement with Modern Science* (Guessoum 2011), I called upon Muslim theologians to benefit from the crucial knowledge that scientists bring to bear on many topics that are central to theology, such as creation and evolution, God's relation/action in the world, and so on.

Salman Hameed's and Rana Dajani's views, interestingly, can be symmetrically positioned with respect to my own philosophy of science and Islam, the first being secular and humanistic, the second being theistic. Both praise my work on various grounds, but each finds points of departure from it, and Hameed, while he acknowledges "shar[ing] many of the same positions," diverges from mine on the central way of relating Islam and science; in fact, he faults me for some of my main positions. I would like to address the points of disagreements here.

Scholarly disagreements are nothing to frown upon, except that they must occur with full mutual understanding of the different ideas being expressed and positions being adopted. I believe Hameed has misunderstood one of my main points, and on another he has mischaracterized my position by latching onto one awkward word or expression.

Hameed's central disagreement with me is on my adoption of "theistic science." First, it should have been clear from various passages in my book that I did not invent this concept; I adopted it from Golshani and from the Western scholars (Robert J. Russell, Holmes Rolston, III, John Haught, and others) who have described their view on evolution as "theistic evolution"; moreover, many recent surveys have adopted the latter expression to describe the views of a significant fraction of the public. Second, throughout my text, I took pains to insist that "theistic science" is simply an *interpretation* of modern science, one that is "rigorous in every way, but enveloped in a theistic worldview" (14). Bagir not only understood my philosophy with crystal clarity but summarized it perfectly in two lines: "The heart of the proposal consists of two steps: first of all, accept the methodology and theories of modern science in general and, second, one may add a theistic interpretation of the theories."

Hameed in fact agrees to this "if the goal of *theistic science* was to interpret findings of modern science from a theistic framework (just like such findings can be interpreted from an atheistic perspective)." So it seems mainly a matter of understanding the nature of this "theistic science," which I hope this clears up.

But Hameed sees some risks in this proposition, namely the possible resurgence of variations of the Islamic science proposals (Nasr's "sacred science," Faruqi's "Islamization of knowledge/science," etc.). But then the interpretation from an atheistic perspective, which he allows, carries similar

risks of running amuck, as in the overgeneralizations of Richard Dawkins and other "new atheists."

And in being overly sensitive, Hameed stretches my own views to the point of deformation—for instance, regarding my (brief) discussions of the research on the effectiveness of prayers (or lack thereof), over miracles, divine-action in the world, God-guided evolution, and "a cosmological framework that includes God in its complete outlook." I am surprised at the confusion of topics and the misunderstanding of my position on each. To be brief, I do not see why research on the effectiveness of prayer should a priori be rejected; in my view, it is a claimed phenomenon, and it thus deserves to be investigated, just like UFOs, paranormal activity, or anything that we may be very skeptical about. The investigation of any claim or phenomenon is not "at least at the outskirts of current science," as an investigation of a claim does not automatic imply its acceptance; on the contrary, science has taught us to be very open minded but rigorous and highly demanding in our standards for any confirmation. Concerning miracles and divine action in the world, Hameed should simply reread the relevant section in my book; he did not cite anything specific that can be viewed as objectionable from a scientific point of view; on the contrary, my stand on miracles (rejection of any claim of violation of the physical laws) has already brought me the ire of many orthodox Muslims. As to theistic evolution and cosmology, these fall precisely in the "interpretative" domains, and Hameed knows that I have kept all the scientific aspects absolutely rigorous; thus I should be free to adopt any interpretative framework I find most appropriate for my worldview.

Hameed does not see the need for any interpretation of our discovery and knowledge of the cosmos. He says, "After all, the expansion or scale of the universe is a matter of observational science, and has as much meaning attached to it as laws of orbital mechanics." Actually, it is the mind-boggling scale of the universe (in space and time) relative to us and it being so out of proportion with anything we know or can imagine that calls for meaning. The laws of mechanics, because they apply exactly the same way here on earth, don't jolt us almost at all, though the realization of the sizes of various celestial objects does bring awe, as do the tiny sizes of insects and microbes. Hameed actually realizes this call for meaning and accepts the fact that "the universe can inspire meaning in a nontheist framework as well" as "in the writings of the late Carl Sagan." So Sagan is allowed to find nontheistic meaning in the universe, but I and others are not allowed to find theistic meaning in it? Supporting my position, Bagir argues for "the notion of metaphysical/theological ambiguity of scientific theories which opens up the possibility of such interpretation activities."

Hameed adds, "On the other hand, one can see wonders of creation (and God) not only in the awe-inspiring scale of the universe, but also in the minutia of a flower or in the formation of an igneous rock." First, one

can—if one wishes to—see wonders of creation (and God) in anything, including the human mind and spirit and other aspects of our lives and environments. But again, because a flower or a rock is not disproportionate in size or intricacy compared to the human body, for example, one is not overly struck by it. The quantum world, on the other hand, does boggle one's mind, and many thinkers have tried to interpret its nature.

Now I come to the theory of evolution, where I find myself squeezed by Hameed and Dajani. Hameed erroneously claims that "Guessoum spends most of his time on non-Darwinian evolution," adding that "it" (as if "non-Darwinian" evolution is one agreed-upon theory) "downplays natural selection and has Neo-Lamarckian ideas," thereby denigrating any non-Darwinian approach.

First, I spent five pages on Darwinian evolution, not counting the eight and a half pages on the section titled "The Evidence for (the Fact of) Evolution," then four pages on non-Darwinian evolution, then three pages on "theistic evolution." Second, there was a definite didactic need to present some non-Darwinian ideas that have surface lately, because although Darwinian evolution can be found well explained in dozens of books, non-Darwinian ideas are difficult to find, and I owed it to readers to present all views, even those that the mainstream biologists (and I did point out that they are the overwhelming majority) don't uphold and, apparently, don't want to hear about. Most importantly, non-Darwinian ideas, which have been defended by scientists of all philosophical inclinations (including atheists such as Stuart Kauffman and Christian de Duve, a Nobel Prize winner), bring in concepts of self-organization, convergence, and sometimes neo-Lamarckism. I concluded that section by insisting that even an avowed non-Darwinian evolutionist like Jean Staune, who calls for a new "Einsteinian" theory of evolution (as Einstein's general relativity is to Newton's gravity), agrees that "the main elements of Neo-Darwinism . . . will remain the reference . . . for explaining most aspects of microevolution." To take such an objective, balanced, and very fine-grained presentation of evolution and its various aspects and to describe it as if it were laden with a hidden agenda is neither fair nor rigorous.

What seems to have irritated Hameed is a phrase at the end of that long chapter, a few words he misinterprets and faults me for. He says (about me): "He encourages Muslim scientists and thinkers to follow the path of the 'theologically acceptable version of evolution.'" The whole statement, however, reads: "It is incumbent upon enlightened Muslim scientists and thinkers to step up and on the one hand oppose this [creationist] movement, which as I have shown does not even adopt serious methodology and arguments, and on the other hand show that a theologically acceptable version of Evolution exists, one which can be adopted and further developed on the basis of the rich Islamic tradition." I thought it was clear, from the structure of the chapter and from the

immediately preceding discussion, that I was there referring to "theistic evolution" (not any non-Darwinian theory, which again is yet to appear in any full shape), and the Islamic reference there recalls the long section where I showed that many Muslim thinkers from the classical era and from more modern times have accepted evolution with a theistic interpretation. Hameed seems to have missed the whole point of the chapter and has here allowed his hypersensitivity to theistic interpretations to get the best of him.

Dajani, on the other hand, wants to go further than me and propose an "Einsteinian" theory of evolution, one "which involves the dimension of time and human cognition." The "dimension of time," it later appears, refers to her attempt at reconciling evolution's timescales with God's statement that when He wills something to be created, He only says to it "be," and it is (Q 36:82). However, all she proposes is that just like the universe was created with "be" but took billions of years to come to what it is, the creation of living organisms was also willed with "be" but took millions or billions of years to produce the present forms. I don't see how this can be an "Einsteinian" theory of evolution, and how human cognition factors into this.

And I will leave aside her exegetical attempts at finding natural selection in the Qur'an (at one point translating "*Ahsan*" as "best" and at another point stating that it should not be understood as "best" but rather as "most fit"), but in any case, one can see the urge found by many Muslim scientists to reconcile scripture with science, something that Hameed wants Muslims to avoid.

Before I comment on the possibility of reconciling modern science with Islam's tradition and Hameed's insistence on sticking to NOMA, I wish to briefly discuss one proposition made by Dajani with regard to how Muslim scientists and theologians can bring about the harmony that everyone is seeking.

Dajani "call[s] for the formation of committees to deal with controversial issues in science and Islam." This approach is certainly adequate and advisable when the "controversial issues" are jurisprudential, in which case a multidisciplinary approach will guarantee that all aspects of the problem are fully taken into consideration, so that a proper ruling (a *fatwa* in the Islamic case) can be issued most appropriately. Her experience, with a committee addressing issues of stem cell research and bioethics, clearly falls within that category. My experience with "Islamic astronomy" issues is somewhat similar,[13] though reaching a consensus when some members of the committee are literalists is a difficult proposition.

But it seems to me a very different matter when one is to address conceptual issues. Indeed, how can a committee come up with a philosophy for reconciling methodological naturalism with divine creation and action, or for interpreting supernatural stories in the scriptures or the possible

existence of extraterrestrials next to whom we might be as primitive as lizards are to us?

Now to the NOMA question, which Hameed upholds as an "ideal [principle] for young scientists growing up in religious societies." Actually, I was perplexed by the apparent contradiction in Hameed's views, as he initially endorsed my Averroesian harmonizing approach, stating that "this book can serve as a guide for those Muslims seeking reconciliation between Islam and science with Guessoum as the inspiring role model."

In any case, my experience of more than 20 years teaching at universities in the Arab-Muslim world has shown me (and I am sure Dajani's experience has been similar, if not identical) that Muslims find it near-impossible to put aside their religious education and mindset when dealing with scientific ideas, facts, models, or theories. When I teach astronomy, my students regularly say "but the Qur'an says . . ." (about the sun, the moon, or celestial phenomena) or ask "but how does this compare with the Qur'an's description of, for example, meteors"? Telling students to just separate the two magisteria would not be an educationally satisfactory approach; in fact, it would just leave those preconceptions unchallenged—to be happily taken up by the preachers and the *I'jazists*. The need for reconciliation and harmony is constant and pressing.

Second, Muslims find it difficult to digest any "separation" of domains, widely believing (quite erroneously) that Islam is a complete system, which covers every aspect of life. That is why Muslim societies are the only ones to continue to resist "secularism," and as I mentioned in the first section of this article, Islamists are now making such a strong showing at the polls.

NOMA is not completely inapplicable in the Islamic context. It is good in that it requires careful understanding of the domains of application—and the nature of—both religion and science. But more crucially, there will always be some areas of human cognition and behavior where both seem to apply, such as ethics, philosophy, and worldviews. To coin an acronym, I think a SOMA (Softly Overlapping Magisteria) program could be developed for the Muslim context and perhaps even beyond, where my Averroesian approach could help bridge the two domains. It is agreed, of course, that certain areas will remain the sole province of "jurisdiction" of either science or religion.

Zainal Bagir, by comparing my work to Ian Barbour's, indeed seeing both as "an attempt to set the agenda of the discourse," has both given me too much credit and projected too much expectation in what I was presenting in my book. I am flattered by the comparison, and while Bagir has understood my approach perfectly well and stated that he "agree[s] very much with many of [my] viewpoints," his thesis that my book constitutes my agenda for science and religion in the Islamic context is not accurate. I will explain this here, and I hope Bagir will be glad to note my clarification.

Bagir wants to break the "mold" in which Barbour has fashioned the field of science and religion, one in which science is a set of theories, religion is a set of doctrines, and thinkers present their views on how the two are to relate (the famous four-fold typology). Bagir reminds us that other, less famous and less impactful thinkers have shown the limitedness and inadequacies of this program, and he adds his own experience, stressing the importance of seeing both science and religion as two "messy" on-ground fields of practice, not theoretical constructs.

I agree with Bagir, though I do not see it as an either-or proposition; indeed, as I stated at the very start of this article, the field of Islam and Science, is not just those two domains (theory and practice), but a third one as well, the history of the relation between the two, where one can search for ways by which past illustrious scholars combined or separated the two. Indeed, I mentioned that one important component of the Islam-Science discourse is the issues of practical application of science in the Islamic life (ranging from the astronomy of the Islamic calendar to stem cells and euthanasia). And, though it seems Bagir is not aware of this, I have for the past two decades been doing substantial work in the domain of "Islamic astronomy," at both the theoretical and the practical levels, proposing new models, and attempting to find solutions with religious scholars and governmental officials (Guessoum, El-Atbi, and Meziane, 1993, 1997; Meziane and Guessoum 2009; Cartlidge 2011, to give a few references).

The one other place where Bagir finds my "program" too limiting and sets out to broaden "the agenda" is in my discussion of "natural theology." Instead, he insists on the need of constructing a "theology of nature," one which takes disasters as a rich domain of study, where religion, science, and local culture all play important roles, and a field which can allow us "to see expressions of divine action in the world." Moreover, he stresses, such a "theology of nature" program would be the perfect place where ethics are formulated as the other side of theology. He sees the environmental crises and the biomedical issues as perfect domains of application of such a program.

I have no quarrel with this whatsoever; indeed, I fully support this view. My only remark is that, as I am sure Bagir fully realizes, there is a significant difference between "natural theology," which is an attempt to build a theology (God's existence, His attributes derived from His creation; His relation to the world seen through phenomena and laws of nature, etc.), and a "theology of nature," which is a religious view of nature. I showed in my book that Muslims have been doing "natural theology" for centuries, being especially fond of the argument from design, but I fully concur that very little has been done in the realm of an Islamic "theology of nature," and this is sorely needed to deal with the environmental crises, with the understanding of disasters, and so on.

The Road Ahead

It is extremely pleasing to me to see that the field of "Islam and Science" is seeing such strong interest and that my work is at the center of it. This multireviews and discussion exercise that *Zygon* has conducted is certainly a hugely productive process, and from this debate a number of issues have surfaced for further exploration. It is also highly encouraging to see new, young voices appearing on this scene, a newer "new generation" in Islam and Science. I here wish to mention some of the ideas and avenues that I see as fruitful paths that those interested in this theme can pursue in the future.

From the points made by Bagir and Dajani, as well as from other works I had contributed, one comes out with a renewed conviction that a fruitful and important exploration of the harmonious way in which science and Islam can relate today for the benefit of Muslims is in the practical issues of biomedicine, the environment, and astronomical applications. One is not surprised to note that Islamic bioethics is still in its infancy (similar to the situation in other religious traditions), considering the challenges that new biotechnologies (genetic modification, cloning, stem cells, gene therapies, etc.) are posing; indeed, more complicated cases are on the horizon with the emergence of nanotechnology as a new field of transformative applications and even more so with "synthetic life," and so forth. More surprising, however, is the fact that astronomical calculations have yet to be fully adopted by the Islamic jurisprudence. Also, to a large extent, environmental issues (pollution, global warming, aggressive fishing, transformation of entire landscapes, etc.) have yet to receive an insightful treatment on the part of Muslim thinkers, who largely have contented themselves with Qur'anic admonishment of corruption on earth (e.g., Qur'an 30:41) and principles of preservation. A full-fledged Islamic theology of nature, as advocated by Bagir, is in urgent need of development, where one would find a proper treatment of the Islamic principles of stewardship (*khilafah*) and subservience (*taskheer*).

Conceptual issues also still deserve more treatment, particularly those of scriptural interpretation (as opposed to literalism) and of "meaning," with what can be developed on the basis of theistic worldviews, compared to what the nontheists can propose. A common denominator between all well-meaning humans, including Muslims (and other religious people, of course) and atheists, is an important objective to seek, and science can help rally people around, as long as agreements and disagreements are recognized and accepted and properly seen as falling in the area of interpretation. For this to happen, all sides still have some work to do.

Finally, there is the socioeducational arena, where a huge amount of progress still needs to be made. First, we need more sociological fieldwork to understand the place of science in the minds of Muslims today. Hameed

is conducting an international survey among Muslim physicians and medical students about their attitudes with regard to biological and human evolution. Other, similar and more general work is needed to gauge the science literacy of Muslims and to probe their understanding of the nature of modern science. Such diagnostics are important for remedies to be devised and administered for the betterment of the Muslim society.

Indeed, for me, the interface of Islam and Science is not a question of getting more Muslims to do science, to publish papers, produce more patents, or participate in greater numbers in international frontline research; all that would be good, and it would automatically come if we improve the whole Muslim mindset with regard to science and modernity in general.

The question of individual freedom, especially academic freedom, and before that the question of critical thinking, are central issues for Muslims to enter more properly into modernity and avoid internal or external clashes. Universities need to be given much more autonomy, and academics need to be encouraged and feel safe to explore all topics they might get interested in, no matter how unpopular they may be. Without these freedoms, social principles, and habits of mind, science will not take root, much less flourish in Muslim lands.

With a few colleagues, I have embarked on an educational project on Islam and science, whereby we will train dozens of promising students and young researchers to explore any of the above topics rigorously and fruitfully. Our hope lies in educating and encouraging the next generation to carry on the work that we have started. As always in the Muslim world, and in all educational endeavors, it will take time, but things look promising.

Notes

1. For example, the exposition (1) " L'Age d'or des sciences arabes" (the golden age of Arab sciences), which ran at the Institut du Monde Arabe in Paris, from October 25, 2005 to March 19, 2006, drawing 170,000 visitors; (2) the "1001 Inventions: Discover the Muslim Heritage in Our World," which was created by the British-based Foundation for Science, Technology and Civilisation, started running in March 2006 at the Museum of Science and Industry in Manchester, then went on to major world cities, including Istanbul, London, and New York.
2. In particular, Jim Al-Khalili presented a three-part TV series on the history of science in Islam on BBC 4 in January 2009.
3. Both conferences were organized by the Islamic Crescents Observation Project (ICOP) and the Emirates Astronomical Society, in cooperation with the Center for Documentation and Research. Proceedings have been published for both conferences: Guessoum & Odeh (2007, 2011).
4. The training course on human pluripotent stem cells was organized under the auspices of the Jordanian Society for Fertility and Genetics and the Farah hospital, in collaboration with the International Cell Research Organization.
5. Al-Hayani 2007, 2008; Farimani 2007; Ghaly 2010; Guessoum 2010; Sekaleshfar 2010; Bigliardi 2011; Elshakry 2011.
6. *SeyyedHossein Nasr*, "Islam and Modern Science" (lecture given at MIT, no date), transcript available at: http://msa.mit.edu/archives/nasrspeech1.html; accessed February 7, 2012.

7. See http://timss.bc.edu/timss2007/index.html.
8. http://data.worldbank.org/indicator/SE.TER.ENRR.
9. Particularly noteworthy is Salman Hameed's Science & Religion News blog *Irtiqa*, which is in large part devoted to discussing issues of science in the Muslim world and culture, and the Muslim-Science.org portal (created and run by Athar Osama), which is largely devoted to science policy analyses pertaining to the Muslim world.
10. See, for instance, my Huffington Post article titled "How Will Facebook and Twitter Impact Islam?" at http://www.huffingtonpost.com/nidhal-guessoum/facebook-twitter-impact-islam_b_1105006.html.
11. The verse that is usually quoted as referring to unbelief is 45:24: "*And they say: There is nothing but our life in this world; we live and die and nothing destroys us but time, but they have no knowledge of that; they merely conjecture,*" though what kind of unbelief is expressed here remains open to interpretation.
12. Dajani herself has stated that "In Islam there is no limit to your questioning unless you question the existence of a God."
13. At the aforementioned Abu Dhabi Islamic astronomy conferences, a large group of Islamic scholars were invited for the first time, representing Saudi Arabia (at least four Sunni and one Shia scholars), Oman, UAE, Egypt, Libya, Turkey, UK, USA, Belgium, the Netherlands, Germany, and Sweden.

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