

# Chapter 2

## Pedagogical Implications of American Muslims' Views on Evolution



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**Abstract** American Muslims' rates of acceptance of evolution and those of the population as a whole are similar, because they form three groups: those who accept both macroevolution and microevolution for all species, those who accept macroevolution for all species except humans, and those who reject macroevolution for all species, and because people who have one way of negotiating the relationship between science and religion may be resistant to adopting another method of negotiating this relationship. A difference is that American Muslims generally accept an old age for the Earth, whether or not they accept evolution. Pedagogical implications of these views for Muslims are that curricula could be sequenced to teach microevolution before macroevolution, and that a robust treatment of both the science supporting evolutionary theory and important NOS concepts could help students avoid common misconceptions promoted by American creationists. Introducing students to different methods of negotiating the relationship between religion and science, and to practicing Muslim evolutionary biologists and Muslims from the past who developed proto-evolutionary theories, might help them to view acceptance of evolution in a more favorable light.

## 2.1 Introduction

### 2.1.1 *The American Context for Islam*

American Muslims constitute a small minority in the United States of about 1%. Muslims have been a part of the United States since its inception, mainly coming involuntarily due to the slave trade, but also some voluntarily even from early on (GhaneaBassiri, 2010). There have been successive waves of Muslim immigration to the U.S., with 40% of the current American Muslim population having arrived after 1960 due to changes in immigration laws (GhaneaBassiri, 2010; Pew, 2007).

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Converts to Islam and their children constitute more than a third of American Muslims, a feature that is unique to the United States compared to Muslim populations in other countries (Gallup, 2009).

American Muslims include groups seen elsewhere in the world, such as Sunni, Shia, Sufi, and Ahmadi Muslims (GhaneaBassiri, 2010; Pew, 2007). In addition, there are many American Muslims who self-identify simply as Muslim. That is, when they are asked about their affiliation, they will reply that they are “just Muslim” (Pew, 2007). There are some from indigenous, uniquely American forms of Islam, such as the Nation of Islam, as well. Half of American Muslims identify as Sunni, 16% as Shi’a, 22% as “just Muslim,” with the remaining 12% containing Muslims from other groups, such as the Nation of Islam and the Ahmadiyya Movement in Islam.

**Brief history of Islam.** The religion of Islam was founded in the seventh century in Mecca in present-day Saudi Arabia when Muhammad ibn Abdullah began having experiences that he interpreted as divine revelations starting around 610 CE and continuing until his death in 632 (Aslan, 2006). These revelations were collected to form the Quran, or the Recitation, the scripture of the Muslims. The main teaching of Islam is that God is One and that He alone is worthy of worship. Muslims engage in various practices to attain nearness to God, such as prayer, charity, fasting, and performing the pilgrimage to Mecca.

The early Muslim community faced severe persecution in Mecca, including ridicule, torture, boycott, and death (Aslan, 2006). In response to this harsh treatment, Muhammad and some of his followers migrated to present-day Medina in 622 CE. In Medina, Muhammad became a political as well as a spiritual leader. After his death, his followers passed on many of his sayings and actions by oral tradition. These were collected in later centuries and written down to become known as the hadith collections.

**The formation of groups in Islam.** After Muhammad’s death in 632 CE, there was disagreement among his companions as to who should succeed him (Aslan, 2006). One party supported his longtime friend and father-in-law Abu Bakr, while others supported his cousin and son-in-law, ‘Ali ibn abu Talib. These two groups gave rise to the Sunni and Shi’a Muslims, respectively. Sunni Muslims hold that leadership of the Muslim community could rest in any pious, knowledgeable man. Shi’a Muslims hold that leadership of the Muslims should be by divine appointment only, and that this divine office of leadership in Islam was bestowed on descendants of Prophet Muhammad through his daughter, Fatimah, and ‘Ali, because they believe these people to be wiser and more pious than others (Tabataba’i, 1971). Currently in the United States Sunnis have a diffuse, decentralized leadership, although umbrella organizations, such as the Islamic Society of North America, provide cohesion and structure for Islamic activities (GhaneaBassiri, 2010). Shi’a Muslims in the United States have religious scholars who provide them with guidance and leadership, as well as umbrella organizations, such as the Muslim Students’ Association—Persian Speaking Group.

The Ahmadiyya Movement in Islam was founded in 1889 by Mirza Ghulam Ahmad of Qadian, India, who maintained that he was the long-awaited reformer of

Islam, the Imam Mahdi, as well as the Promised Messiah and metaphorical second coming of Jesus anticipated by Christians and Muslims alike, and the reincarnation of Krishna that the Hindus expected (GhaneaBassiri, 2010). The Ahmadiyya Movement sent missionaries to the United States in the 1920s and 1930s, successfully winning a number of converts. For this reason, they claim to be the oldest Muslim organization in the United States. Currently Ahmadi leaders are chosen on a local level under regional and national leadership, with separate organizations for women and men. These report directly to the Khalifah, the spiritual head of the community, headquartered in London, UK (Saliha Malik, personal communication, 2010).

The Nation of Islam (NOI) is a distinctly American form of Islam that originated in the early part of the 20th century (GhaneaBassiri, 2010). It was brought into national prominence under the leadership of Elijah Muhammad, who began leadership of the community in 1934. When he died in 1976, his son Warith Deen Muhammad took over leadership of the organization and later renamed it the Muslim American Society. He led his followers to an American version of Islam rooted in the Quran and mainstream Islamic practices. A couple of years after Warith Deen Muhammad took over the leadership of the NOI, Louis Farrakhan formed a splinter group that broke off from the main body of the organization and retained the original name. He resisted Warith Deen Muhammad's guidance toward a more mainstream version of Islam and instead retained the beliefs and practices promulgated by Elijah Muhammad.

Those American Muslims who say they are "just Muslim" without claiming membership in any specific group are a diverse group, and have different approaches to Islam. Some rely on the Quran alone for religious guidance, while others may rely on the hadith traditions as well. Among the reasons that they identify as just a Muslim are that they do not identify with ancient animosities or foreign cultural traditions that they view as intrinsic parts of Muslim groups, or they may have a desire to avoid sectarian arguments. In practice, many of these Muslims attend Sunni, Shi'a, or other mosques.

## **2.2 Public Acceptance of Evolutionary Theory Within the Social, Political, and Cultural Context of the United States**

### ***2.2.1 American Muslims' Views on Evolution***

American Muslims' acceptance rate for evolution is 45%, similar to the acceptance rate for American Christians, but lower than the 53% acceptance rate for Muslims worldwide (Pew, 2013).

Everhart and Hameed (2013) conducted a mixed methods study of the views of 23 Pakistani-American medical doctors on evolution. They found four positions on

evolution when they asked the physicians to choose a statement that was closest to their beliefs, theistic evolution, “all species, including humans, have evolved over millions of years, but Allah guided the process,” naturalistic evolution, “all species, including humans, have evolved over millions of years, and Allah played no part,” the special creation of humans, “Allah created humans, but all other species have evolved over millions of years,” and the special creation of all species, “Allah created humans and all other species in the form they exist today.” A qualitative study was conducted to examine the relationship between 60 American Muslim undergraduates’ views on evolution, their understandings of nature of science, their understanding of natural selection, and the manner in which they negotiate the relationship between science and religion (Fouad, 2016a). Respondents in this study all believed that God was responsible for creation, whether or not they believed He used evolution as a mechanism for these changes. They generally accepted the idea that natural selection is responsible for microevolutionary changes in all organisms, including humans, but differed over whether all organisms, all organisms except humans, or no organisms are the product of macroevolutionary changes. These positions corresponded to theistic evolution, belief in the special creation of humans, and belief in the special creation of all species, respectively. None of the undergraduates chose the naturalistic evolution position. These positions are not unique to American Muslims, and similar positions can be found among American Christians (Legare, Evans, Rosengren, & Harris, 2012). Table 2.1 lists examples of people articulating these positions taken from an unpublished data set consisting of qualitative research interviews of 63 American Muslim undergraduates (Fouad, 2016b).

**Factors affecting American Muslims’ views on evolution.** Although the evolution acceptance rate among American Muslims is similar to the country as a whole, there are some distinctive features about the manner in which American Muslims view evolutionary theory. We will examine these features in more detail.

***The relationship between science and religion.*** Most U.S. Muslims do not believe there is any conflict between science and religion. The manner in which people negotiate the relationship between science and religion can be classified as conflict, independence, dialog, and integration (Barbour, 2000). Those with a conflict view see science and religion as competing methods of making sense of the world. Those who take an independence view see science and religion as having different, independent functions so that both can be used to make sense of the world, although each explains different aspects. Those who take a dialog view use metaphors from one to explain the other, or view religion as providing answers to questions that science cannot answer. Those who view the relationship between religion and science as being integrated use both together to formulate their understandings of natural phenomena. These categories can generally be a useful way to think about American Muslims’ views on the relationship between science and religion, although some do not fit into these categories, either because they are disengaged from this question or because they are in the process of sorting out this relationship for themselves (Fouad, 2016a). Examples of American Muslims articulating each of these positions are presented in Table 2.2.

**Table 2.1** Examples of American Muslims' views on evolution

Stance	Example
Theistic Evolution (Both macroevolution and microevolution for all species)	<p>Abbas: There's a lot of evidence scientifically that proves evolution, but being Muslim, we believe that the source of all life or all matter in the universe comes from a Supreme Being, Allah, and it just makes sense this way without conflicting with my religious beliefs</p> <p>Angela: I feel the evolution debate is null and void, considering the scientific evidence we have. As Muslims we are required to read and understand science, and be exemplary in learning. So, for me it's like the judgment of how basing Allah's creation on human understanding is a little faulty, so I really just don't see how evolution can't co-exist with a belief in Allah and His creation of Earth, because we don't, we can't even have any understanding of Allah's mercifulness. How can we have understanding of something as complex as how He decided to create the world?</p> <p>Habib: If as a Muslim you take it that Allah, along with His 99 names, if He's capable of anything, then He would be capable of implementing such a system as evolution</p>
Special Creation of Humans (Microevolution for humans and both microevolution and macroevolution for all other species)	<p>Rafiq: I believe that we did evolve from previous ancestors, but when you tell me actually that when we first evolved from the very first human being, that's kind of, you know, that they're come from another species, we're not, we didn't come from monkeys.... Because religiously, obviously Adam and Eve were the first human beings on earth, correct? ...So, that's why I'm telling you that we, the very first human beings did not evolve from previous species, but we did evolve from our ancestors, such as Adam and Eve. That's my view on it. I do agree that we did evolve, but not from other animals, from our own species</p> <p>Salahuddin: It makes sense to me, because if you look at the Quran and also the Bible, God says that He blew His soul into Adam, but it also says that the heavens and the Earth were as one unit of creation, and also, "We created from water every living thing." So, I don't see them as being apart. The fact that God blew His spirit into Adam can be taken symbolically, but I think that might be stretching it, although I wouldn't be surprised if we did evolve with the other species....I mean, I wouldn't be surprised</p>

(continued)

**Table 2.1** (continued)

Stance	Example
	if it is more evolution, but just from the way the verse is, it sounds to me like that Adam and the jinn and the angels were all created separately from that process, but at the same time, one of God’s names is al-Bari, which has been translated as the Evolver
Special Creation of All Species (Microevolution for all species with macroevolution for no species)	<p>Akilah: I believe that Allah created everything, and nothing evolved by itself. Everything’s from Allah so you know how people say, oh, from evolution, the dinosaurs and all this kind of stuff? But I believe like Allah created everything on the planet. He created the world and everything</p> <p>Hadiyah: Well, I know that I’ve seen different types of animals: birds and reptiles and different things like crocodiles and alligators. I’m sure that over time that their environment changed, and they changed with their environment. So, to me, this is a just another thing to marvel at. When you think about Allah and His creation, everything changes over time, but how does it change? Well, of course, as a Muslim, I believe it changes with the will of Allah, with the power of Allah, so I do believe that even the land, not just the animals, every creation, the trees, the plants, everything has changed over time, so of course it’s only logical for the things that live in the environment to change with it, and I think that is something that, you know, it shows us the power of Allah, like how He can adapt the things over time, and things change with their environment</p>

*Note* All names are pseudonyms. Data taken from a sample of 63 American Muslim undergraduates (Fouad, 2016b)

American Muslims’ stances on evolution can be seen in the light of the manner in which they negotiate the relationships between science and religion. Hadiyah’s response given in Table 2.1 is an example. She uses integration to incorporate both the scientific evidence and her religious beliefs to form a coherent view of biological evolution. She can accommodate the strong scientific evidence she learned in her biology and anthropology classes by allowing for microevolution of all species, but her literal interpretation of the Quran precludes her from accepting the idea that evolution was responsible for their emergence.

**Religious texts.** American Muslims’ stances on evolution can also be seen as a response to both the scientific evidence and their religious scriptures as well as the

**Table 2.2** Examples of American Muslims' views on the relationship between science and religion

Stance	Example
Conflict	<p>Brittany: Either you believe what your religious book says, or you believe what this theory says</p> <p>Lubna: With religion it's, everything is written. With science, it's everything is to be proven....Very religious people, they don't necessarily think science is correct, because they think that everything has already been written, and that it doesn't have to be proved</p> <p>Nabila: I think the border is crossed when one decides to specifically focus on scientific points of view, one is trying to understand the world and completely disregard any religious aspects like forgetting to acknowledge the fact that, okay, these discoveries aren't human discoveries really. We have to acknowledge that apart from the scientific understanding and the scientific explanations for these phenomenas, at the end of the day, really everything can be explained by Allah, and everything was created by Allah</p>
Independence	<p>Haroon: Religion is different from science, because science is the study of how things work in the universe. Religion is the study of how you should live in this universe</p> <p>Carlene: Religion and philosophy, it seems that those fields, they function to tell us why things happen, and science and physics and all the rest, they tell us how things happened</p> <p>Nafisa: I think science tends to explain what's going on in the world whereas religion kind of gives it a purpose</p>
Dialog	<p>Adam: There is a big gap in science. How did something come from nothing? It's a gap they try to fill up with reason, but it's God, not science</p> <p>Nadira: General umbrella of science .... Some parts are incomplete without religion. There is not a conflict because one is a tool to explain the other. Science cannot stand alone, because it is a tool to explain what is written in the Quran, to gain an appreciation of what Allah says in the Quran, because Allah is al-Malik, King of Everything</p>
Integration	<p>Jason: Science and religion, they go hand in hand</p> <p>Latifa: I don't think you have to separate science and religion, because if we're talking about religion in terms of what God has a part in and we assume that God has a part in everything, it doesn't really make sense to separate them</p>
Disengagement	<p>Nusaybah: I really couldn't take a side, honestly, I really don't take sides</p>

*Note* All names are pseudonyms. Data taken from a sample of 63 American Muslim undergraduates (Fouad, 2016b)

weights and interpretations they give to each of these types of explanations. The two main textual sources used by Muslims are the Quran, which Muslims hold to be the word of God as revealed to the Prophet Muhammad, and the hadith, which are traditions attributed to Prophet Muhammad (Aslan, 2006). All Muslims consider the Quran as authoritative, but there are disagreements over which hadith are considered authentic among the different groups of Muslims (Aslan, 2006). For example, Sunni Muslims use traditions that were collected from the Prophet's companions and retold by later generations. Shi'a Muslims use traditions

transmitted by the imams, descendants of Prophet Muhammad whom they believe to be his pious successors. Some scriptures used by American Muslims in formulating their stances on evolution are considered in detail here.

Muslims consider God to be the Creator of the universe and to be responsible for its care and maintenance in response to verses such as the following. “And We have not created the heavens and the earth and whatever is between both of them as one who indulges in idle play”<sup>1</sup> (21:16). Here, creation is described as teleological in its essence, as everything has been created for a set purpose determined by God.

Not only did God create the universe, but He is responsible for maintaining it, and encompasses it with His knowledge, as described in the following verse:

God – there is nothing worthy of worship but He, the Living, the Self-subsisting, Eternal. Neither drowsiness nor sleep can seize Him. For Him is whatever is in the heavens and whatever is in the earth. Who is there who can intercede with Him except with His permission? He knows whatever is in front of them and whatever is behind them, and they will not encompass anything from His knowledge except what He wills. His authority extends over the heavens and the earth, and He does not weary of guarding and preserving them both, for He is the Most High, the Always Most Magnificent. (2:255)

Here God is depicted as being continually necessary for the perpetuation of the creation. If He were to shift His attention from it for only a moment, it would cease to exist. However, He is constantly awake and alert, preserving the universe and everything in it.

Most Muslims do not have any problem accepting an old age for the Earth. Although creation is described in the Quran as taking place in six days (سِتَّةَ أَيَّامٍ), “days” is generally understood to mean periods of time, and not necessarily 24-hour “days.” For example, “God is He Who created the heavens and the Earth and whatever is between both of them in six eons” (32:4).

Noah’s flood is mentioned in the Quran, but it engulfs only Noah’s people, and not the entire Earth, for example, the following verse.

And We helped him against the nation who belied Our miraculous signs. Indeed they were an evil nation, so We drowned them all together (21:77).

This verse does not pose any problem to Muslims who wish to accept evolution, as verses in the Bible concerning the flood do for some Christians. Christians who believe in a literal interpretation of the Biblical version of the flood must somehow explain the evolutionary bottleneck that would have occurred on the ark. Muslims, on the other hand, believe that only Noah’s people were flooded, so plants and animals could have easily survived outside of the flood zone. Even a literal interpretation of the version in the Quran would not be incompatible with acceptance of evolution.

There are many verses in the Quran that could be interpreted as specifying how Adam was created, but it does not give a similar treatment to the creation of other

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<sup>1</sup>All translations of the Quran from the Arabic are my own unless otherwise noted.



organisms. Therefore Muslims consider the creation of Adam differently in formulating their stances on evolution than they do the creation of other organisms.

One example of a verse mentioning the creation of plants and animals is the following:

He created the heavens without any visible pillars and He cast in the Earth anchors (firm mountains) lest it shake with you, and He spread on it every living, crawling creature, and We sent down water from the sky and germinated on it every noble pair. (31:10)

Verses such as this one do not specify exactly how animals and plants were created, and therefore leave open the possibility that they could have evolved as part of the creative process.

Evolution of human beings is problematic for some Muslims because of verses that could be interpreted to specify how human beings were created. The following is one such verse.

Indeed the example of Jesus with God is like the example of Adam. He created him from dust, then He said to him, "Be!" so, he became. (3:59)

This verse is not problematic in itself, but traditional interpretations of the verse based on hadith can be seen as presenting a barrier to the idea that human beings were not specially created. According to the traditional exegesis, a delegation of Christians came to Prophet Muhammad in Medina and claimed divinity for Jesus because he was born without a father (Ibn Kathir, n.d.). This verse was revealed to counter this argument by claiming that, although Jesus was born without a father, Adam was born without a father or a mother, so if Adam has no claim to divinity because he was born without any parents, then Jesus would not have a claim to divinity by being born from only one parent. According to this interpretation, neither Adam nor Jesus came from normal births, but were instead specially created, and therefore Adam could not have come into being as the result of natural evolutionary processes.

Another verse that describes the creation of Adam is the following.

And when your Sustainer said to the angels, "Indeed, I am One Who creates a human being from clay dried from stinking dark mud. So, when I have proportioned him and I have breathed into him from My Spirit, then all of you fall down in prostration to him." 15:28–15:29.

Many Muslims interpret this verse to signify that God created Adam at a specific point in time and in a specific manner. From this, they infer that Adam was specially created, and that therefore he could not have evolved.

There are some Muslims who not only accept evolution, but claim that verses in the Quran are consistent with the idea that human beings evolved, such as the following verses.

And when your Sustainer said to the angels, "Indeed I am One Who Makes a *khalifah* (خَلِيفَةً) on the Earth." They said, "Will you make on it one who will cause corruption in it and shed blood, while we glorify with Your praise and purify for You?" He said, "Indeed I am the most knowledgeable of whatever you all do not know." And He taught Adam the names, all of them. Then, He presented him to the angels. So, He said, "Inform Me of these names if

you are truthful.” They said, “Your glory! We have no knowledge, except whatever You taught us. Indeed, You are the Always All-Knowing, the Always All-Wise.” (2:30–2:32)

The term “*khalifah*” in the preceding passage can be translated as “successor.” In this interpretation, Adam would be a successor to someone who came before him. Therefore, he would not be the first human being. In this passage, angels are depicted as saying that human beings will cause corruption and shed blood on Earth. However, the succeeding passages could be interpreted to suggest that their knowledge is limited. Therefore, their statements that people would shed blood and cause corruption would have to be based on prior observation. If they had an opportunity to observe human behavior before the creation of Adam, then he would not have been the first human being. From this, these Muslims conclude that there must have been people on Earth before Adam. If Adam were not the first human being, then these verses could be interpreted to argue against special creation of human beings, and could further be interpreted as not precluding the idea that human beings evolved.

In a more traditional exegesis of this passage the term *khalifah* is interpreted to mean “vicegerent” or “steward,” rather than “successor.” According to this interpretation, the angels had not observed humans before Adam, but instead had observed the jinn, or unseen beings, before the creation of Adam. According to this interpretation, the angels’ assessment of human beings was based on their observations of unseen beings and not on observations of humans who lived prior to Adam. When interpreted in this manner, this passage does not have any bearing on the evolution of humans.

The following hadith from Sunni sources describing the creation of Adam can be interpreted to support microevolution of human beings, because it seems to suggest that people have decreased in average height since the time of their creation.

Allah created Adam, making him 60 cubits tall. ...People have been decreasing in stature since Adam’s creation.<sup>2</sup>

The purported decrease in stature of people since the time of the creation of Adam could be considered a microevolutionary change if interpreted in biological terms. Some American Muslims use this hadith to justify the idea that humans are subject to microevolution, even though they do not accept the idea that humans evolved from non-human ancestors. By accepting microevolution for humans, they can incorporate both their interpretations of the special creation of Adam and scientific evidence supporting the idea of evolution of human beings into their schema.

***Islamic scholars and organizations.*** American Muslims’ views on evolution are influenced by popular scholars whose speeches they hear in person at a mosque or conference, or on online formats, such as You Tube. What follows is a brief examination of views on evolution expressed by scholars from the three main

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<sup>2</sup>From Sahih al Bukhari Vol. 4, Book #55, Hadith #543 retrieved from <http://sunnah.com/bukhari/60>.

groups of American Muslims, Sunni, Shi'a, and "just Muslim." The Ahmadiyya Movement in Islam and the Nation of Islam are included as representing two of the earliest American Islamic organizations, and to give a flavor of the diversity of the American Muslim community. In addition, the views of a Turkish creationist organization that has widespread influence among American Muslims are examined. These represent differing positions on evolution that are representative of those found among American Muslims by people who have widespread influence in their respective Muslim communities.

*Yusuf Estes.* One popular internet preacher is Yusuf Estes, a former evangelical Christian who holds a doctorate in theology. He identifies as "just a Muslim" because he interprets verses of the Quran that warn against dividing into sects as precluding him from joining any of the groups of Muslims that exist today. He has been listed as one of the 500 most influential Muslims, has traveled the world to lecture on Islam for popular audiences, and has a large internet presence, including a website that had accumulated more than 13 million unique hits as of 2011 (Schleifer, 2011).

Estes (2009) takes a strictly creationist stance, claiming that the theory of evolution "lacks any real, testable evidence. The most we can come up with is not even a possibility, more or less like a dream that they're trying to use evidences, mix them together, stack the deck, as we say, to come up with something" (Estes, 2009). He raises issues that he feels disprove the idea of evolution, such as, "If we evolved from monkeys, how come we still have monkeys?" (Estes, 2009). Such arguments are quite similar to those raised by Christian creationists. Perhaps Yusuf Estes finds them attractive in part because of his background as a former evangelical Christian. Estes sees evolution as part of a strategy used by atheistic scientists to turn believers away from God. Estes (2006) even goes on to suggest that since evolution is so nonsensical, scientists must have some sort of ulterior motive for promoting it. He suggests their desires to publish papers in academic journals and to obtain academic appointments as possible ulterior motives.

*Harun Yahya.* Yusuf Estes cites Harun Yahya as one source of his ideas on evolution. Harun Yahya is a pseudonym used for a popular form of Islamic creationism originating from Turkey and propagated worldwide using both print and electronic media (Edis, 2009). Harun Yahya's arguments are taken from American creationists and other sources to produce a form of old earth creationism. An example of a typical argument against evolution from the Harun Yahya corpus is, "A 450-million-year-old fossil horseshoe crab, no different from those crabs of our day" (Yahya, 2008, p. 32).

*Yasir Qadhi.* Yasir Qadhi, the son of parents who immigrated from Pakistan in the 1960s, is a popular Sunni theologian who teaches Islamic studies at Rhodes College in Memphis, TN, and is Dean of Academic Affairs and instructor for the Maghrib Institute. He has been named as one of the 500 most influential Muslims (Schleifer, 2017). He is well-known among Sunni Muslims in the U.S. and serves as a speaker at the Islamic Society of North America's conventions, which draw over 30,000 participants annually. The so-called Islamic State called for his assassination because he was one of 126 Muslim scholars who served as signatories

of a letter condemning their actions as contrary to Islam (Schleifer, 2017). The video referenced below where he discusses his views on evolution has nearly 25,000 views on You Tube (Qadhi, 2013).

Qadhi (2013) integrates his understandings of both the Islamic faith and the science behind the theory of evolution. In light of the scientific evidence for evolution he states the following.

So, what the theory of evolution does, it takes these facts – these are undeniable facts – and then proposes a system that takes into account all these facts.... To say that the theory of evolution is only a theory ignores the whole point.... The theory of evolution from a purely scientific standpoint, in my humble opinion, makes a lot of sense.

He adheres to scriptural literalism, which he claims is not a problem for Muslims because “the Quran is the divine, uncorrupted speech of Allah; it is the literal word of Allah” (Qadhi, 2013). He reconciles his understanding of the Quranic teachings with the theory of evolution by making an exception for human beings. He uses a metaphor to explain this exception.

Imagine if you like, a series of dominoes tumbling, and they’re all going, as we’ve seen on You Tube clips and what not, going in different directions, having been caused by one beginning domino, and eventually, if these dominoes continue, one line of that domino will lead to that domino which is a final domino known as man, because we know that nothing has been evolved *from* us. We are the final domino....All of these dominoes came about, all of these species came about, and right when it was our turn, right when the next domino should have been our domino, Allah, *subḥānahu wa ta’āla* [God, Glorified and Most High], inserted that domino directly, and that’s *Banu Adam* [Adam’s descendants]. And, of course, that domino, which is us, fits in perfectly with all the other dominoes, because, why would it not fit in perfectly? Allah is perfect in His creation, and all of the other species are evolving the way that they are supposed to, and when it was the right time at the right place, Allah, *subḥānahu wa ta’āla*, placed us where we were supposed to be such that a neutral observer, who doesn’t believe in Allah, quote unquote a *kāfir* [non-believing] observer, would automatically say, “Obviously, this domino comes from the one before it,” and he has every right to make that claim.

Qadhi (2013) argues that Muslims should not consider scientists as part of some conspiracy. Instead, they should understand that scientists are operating under a different paradigm.

In Qadhi’s view all of evolution can be accepted, except human evolution. In this manner, he can accept the scientific evidence for non-human species without reservation. By claiming that although human beings are an exception to evolution, they were created as if they evolved, he can accommodate scientific evidence for human evolution. He has sophisticated understandings of both nature of science and nature of religion, so he is able to formulate his position without compromising his beliefs in either sphere.

*Hassanain Rajabali*. Hassanain Rajabali is a popular speaker among Shi’a Muslims, who holds a master’s degree in molecular biology and a degree in psychology from the University of Colorado (Qul, 2014). He is well-known in American Shia circles, and has traveled the country to give lectures on Islam to both Shi’a and popular audiences. Videos of these lectures are widely available on Shi’a

websites. The video referenced below where he discusses his views on evolution has more than 25,000 views on You Tube (Rajabali, 2008).

He does not think that acceptance of evolution is necessarily contradictory to having a belief in God (Rajabali, 2008). He explains, "There is no verse in the Quran where Allah forbids it, and therefore, we have to be silent about it and say maybe it's possible." He reiterates that science and religion are indeed compatible, because science and religion take different approaches. According to him, science is basically a tool that people can use to advance knowledge, while religion presupposes belief in God, but there is no reason that a person who believes in God cannot use the tool of science.

From an Islamic perspective, and this is very important for us to understand, we must not think that science [is a bad thing]. No, science is one of the greatest gifts God has given us. It's one of the greatest tools we have been given, and in my opinion, thank God for science! (Rajabali, 2008).

According to Rajabali (2008), "Evolution is a process; it's a methodology; it's a system." He claims that although the Quran categorically states that God created everything, it does not explicitly state the method of creation. Therefore, it is possible that evolution was one of the methodologies He used.

For Rajabali (2008), the creation of Adam is a sticking point. "The Quran is very clear on this issue, that Adam was created and placed on Earth" (Rajabali, 2008). However, a scientist would argue that everything has to be within the system, and must have come from some branch of some tree, from some predecessor. "I said that is *a* system, but it is not the *only* system," counters Rajabali (2008). He claims that one cannot take evolution back to infinity, because it must have started at some point. Therefore if species were created at some point in the distant past, then it is not a stretch to say that God created Adam without a predecessor.

According to Rajabali (2008), to reject God outright is to be dogmatic. He argues that there is no evidence that God does not exist, so, at the most, one could be agnostic without going beyond the bounds of reason. On the other hand, he thinks that rejecting the scientific viewpoint outright without examining the arguments in its favor, on the basis of religion is also being too dogmatic. He believes both the religious and scientific arguments should be scrutinized to see if they stand up to the light of reason.

[A]ll these realities have to be met with a clear understanding of a holistic human being who lives within the spectrum of science, ethics, ideologies, etc., etc., which brings about the completion of who we are....[I]n reality, it's not us vs. them, or this vs. that. I think at the end of the day, they both have a position, and we need to reconcile them. (Rajabali, 2008)

*Mirza Tahir Ahmad.* Mirza Tahir Ahmad (1928–2003) was the fourth *khalifat ul-masih*, or successor to the founder of the Ahmadiyya Movement in Islam (AMI), Mirza Ghulam Ahmad (1835–1908). He served as a homeopathic physician prior to his election to the office of khalifa in 1982. Although his views on evolution are widely known within the AMI, most other Muslims would not be familiar with them. Ahmad (1998) wrote a book, *Revelation, Rationality, Knowledge, and Truth*,

which is widely read and referred to by scholars and speakers within the AMI. In it, he explains how his position in favor of evolution of all species is compatible with his interpretation of the Quran.

Ahmad (1998) believed that evolution, like all other aspects of the natural world, was under the control of God and that He purposefully directed it. He began his discussion with the following verses of the Quran:

Blessed is He in Whose hand is the kingdom, and He has power over all things;

*It is He* Who has created death and life that He might try you - which of you is best in deeds; and He is the Mighty, the Most Forgiving, *The Same* Who has created seven heavens in stages (Tibaqan). No incongruity can you see in the creation of the Gracious God. Then look again: Do you see any flaw? Aye, look again, and yet again, your sight will *only* return to you tired and fatigued. (67:2-4 of Mawlawi Sher Ali translation)

He claims these verses demonstrate that there is no contradiction in creation, because they describe it as not flawed, and also that God creates things via stage by stage development, as exemplified by the mention of His creation of the heavens in stages. He connects this to human evolution by stating that this stage by stage development applies to humans by linking the previous passage to the verse, "That you [human beings] shall assuredly pass on from one stage [Tibaqan] to another" (84:20). Ahmad (1998) interprets these and other verses of the Quran to mean that the selection processes that went into the creation of human beings were by the choice and design of the All-Knowing and All-Powerful Creator, and not by random chance or blind necessity.

According to Ahmad (1998), although the Quran was revealed more than 1400 years ago, it contains verses that could not be properly interpreted until the modern age. Among these are verses that describe the origins of life and the creation of human beings. It should be noted that although the idea that the Quran contains verses that somehow presage modern scientific discoveries is common among Muslims in the West, not all of them would include the theory of evolution under this umbrella (Guessom, 2011).

Human kind is described in the Quran as having been created from dust, clay, pottery clay, and dark, fermenting mud. Ahmad (1998) interprets these verses as referring to early stages in the creation of primordial organic molecules on Earth by inorganic processes. He contends that these verses refer to the creation of human beings, because they were the ultimate result of these processes. These processes would have been reversible in the oceans due to hydrolysis of the resulting molecules. Consequently, some scientists propose a wet beginning with dry intermediate stages and others propose that the initial stages must have been dry. Ahmad (1998) goes on to explain that clay has been proposed as a surface that would be amenable for

an initial or intermediary dry stage. This stage was reached when the oceanic prebiotic soup was concentrated and dried in the form of laminated micro-thin layers of clay. The Quran is evidently on the side of those who support a wet beginning with an intermediary stage of dryness where concentrated primordial soup was moulded into plates like dry ringed clay, such as broken pieces of earthenware. (Ahmad, 1998, p. 373)

Ahmad (1998) scoffs at the idea from literalist readings of the scripture that Adam's creation from clay signifies that God molded him out of clay and then suddenly created a human being from that as being as absurd as the idea scientists hold that human beings were created from a process that proceeds by blind chance. Rather, he believes it was a slow and deliberate process, under God's direction, guidance, and care.

The scenario of natural selection as against the scenario of purposeful design, would require hundreds of thousands of variant atmospheres, accidentally created by the interplay of billions of chances over millions of earths, of which only one could be rightly proportioned to support life on earth....There are many ... verses in the Quran to the ... effect that life has to be protected by God, every moment of its existence, or it will cease to be. (Ahmad, 1998, pp. 400–402)

According to Ahmad (1998), God is the Creator, but uses the process of evolution to bring living things into existence. He is involved in every step; nothing proceeds by blind chance. Ahmad (1998) claims that this is evident in the fine-tuning of such structures as transport proteins in cell membranes and also of the universe as a whole, configured precisely so that it could produce a planet that would support life.

*Nation of Islam.* Although the Nation of Islam is a minority group with only a few tens of thousands of the more than two million U.S. Muslims, their charismatic leader, Louis Farrakhan, has an influence that extends beyond his religious community to African-Americans in general. The video referenced below where Farrakhan discusses his views on evolution has well over a million views on YouTube.

The position of the NOI is that Darwin's theory of evolution was concocted to cover up the true origins of human beings. According to Farrakhan (2013), White people "would rather say that they are the descendants of apes rather than *admit* that the Black man and woman is their father and mother."

I understand by God's grace the teachings of the honorable Elijah Muhammad and why these teachings must be spoken to White people, to yellow and brown people, to every human being on the earth. Everyone must know the Black Man, because to know the Black Man is to know something of yourself. You cannot know the tree as well if you just study the fruit. You must also study the root. Now, we said ... historically speaking, anthropologically speaking, genetically and biologically speaking, there is no human being on the earth that predates the Black man and the Black woman. Now, you may wish to argue, but there is no argument. The honorable Elijah Muhammad asked us the question, who is the original man? And he gave us the answer. The original man is the Asiatic Black man, the owner, the maker, the cream of the planet earth, the God of the universe....

... Notice in the answer, the word "Africa" never is mentioned. The original man is not the African Black man. The original man is the Asiatic Black man.... In the lessons given to us by the Honorable Elijah Muhammad, I repeat, Africa is not mentioned....The question is asked, why does the devil call our people Africans? Now, he didn't say why do we call *ourselves* Africans. Um mm. He said why does the *devil* call our people Africans? Now, by devil we mean the Caucasian people, nobody under the ground, getting ready to burn you after you are dead, the White man on top of the ground burning you while you are alive.... Why does the devil call our people Africans?... To make our people of North America believe that the people on that continent are the only people that we have, and that they are all savage. Every time they show Africa, they attempt to show you our people in a savage

condition. They want you and me to focus our minds on that continent and that continent alone.... They do this to try to divide us. We have Black people that have been all over this Earth and have settled everywhere on the Earth. You may not know it, but there are Black people in China, Black people in Japan, Black people in Korea, Black people in India, ... in Fiji, in new Zealand, in Australia, Black people in Indonesia, ..., in the Hawaiian islands, Blacks there. When you come to North America, we came here before Columbus. There is a sign that Blacks were here in the Americas long before Christopher Columbus was even a thought in the mind of his father. ...

So to understand that it was a White man that named the continent of Africa Africa, and we predated the White man, then what was it called before the White man named it Africa? The honorable Elijah Muhammad said the original people called the *planet* Asia. The whole *planet* was once called Asia, not just that one part over there that is called Asia today, but all of it was Asia. The part that you call Europe was called Asia. Some of the old maps called it Eurasia. ...

So now if we are the original inhabitants of the earth, and we are, and our color as the first creatures of almighty God coming up out of darkness, the honorable Elijah Muhammad said we take our color from the darkness out of which we originated, so we are Black, symbolizing that we are the first human beings, and from us came all other human beings. That is the teaching of the honorable Elijah Muhammad, and you, Black man, and you, Black woman, if there were no people before you and you were the first of God's creation, then you are a direct descendant of the originator of the heavens and the earth. Therefore the nature of God is your nature, and if you are left alone and fed properly, spiritually, mentally, morally, you will grow up into God Himself. So, the Bible in the book of Psalms said, Ye [you] are all gods, children of the most high God. (Farrakhan, 2013)

According to Farrakhan (2013) the Asiatic Black man, a direct descendant of God, was the original human being. White people were descended from the Asiatic Black man.

Timothy Muhammad (2013), writing for the Nation of Islam Research Group, explains the origin of White people from “the Aboriginal People of the Earth; the Dark People of the Earth—The Black Man and Woman of the Earth from which every species of human being has come.” According to Muhammad (2013), it is these aboriginal people that are referred to as “Us” in the Bible when it says, “Let Us make man in our image and after our likeness.” That White people were derived from them is supported by recent scientific evidence that the White race was born when “a major genetic alteration occurred exactly 6,600 years ago.... [T]he White race is a young race—a ‘new man’ who, as the Honorable Elijah Muhammad has said, ‘came from us, but he is different from us.’” He continues that people had civilization and advanced scientific knowledge long before the White race came on the scene.

Muhammad claims that Darwin's theory of evolution was devised to cover up the fact that the White race was “selectively bred into existence” and to place “doubt in the minds of the Black professional class ... about the true reality of the Original Man, Who is God.” Muhammad (2013) concludes that, “the theory of evolution is not an empirical science, but a “false knowledge,” made up of racist doctrines whose aim and purpose is to deny and cover up the reality of the original people, who are God.” He then goes on to question the logic of believing “a people



who called 'Us' three fifths of a human being. We cannot and should not believe and follow the white supremacist model of education that our former slave masters and their children have foisted upon us.”

In NOI thought Darwin's theory of biological evolution is antithetical to belief in God and does not tell the true story of the history of human beings, but is instead being taught to cover it up. They contend that Black people were not descended from apes, but, rather, had noble origins. They claim that White people, on the other hand, had ignoble origins, as they were selectively bred into existence, and had to be taught and civilized by Black people before they could make any advancements or achievements or develop a civilization.

## 2.3 Suggestions to Improve Evolution Education in the United States

### 2.3.1 *Pedagogical Implications for Evolution Education of American Muslims*

In light of the foregoing discussion of American Muslims' views on evolution, some pedagogical implications of these views for both K-12 and post-secondary education are examined here. Research into specific pedagogical strategies for Muslim students in the American context is currently lacking, so the intent of this discussion is to start a conversation and to suggest areas for further research.

**Place of evolutionary theory in the curriculum.** In the U.S., K-12 state and national science curricula are typically spiraled, so that concepts are introduced in elementary school, and then successively elaborated on in middle and high school. An example of a widely-used set of standards on which to base curricula is the Next Generation Science Standards (NGSS) (NGSS Lead States, 2013). Although they were intended to serve as national standards, fewer than 20 states have adopted them so far. Even so, state standards on evolutionary biology generally follow a similar sequence. The NGSS recommend that on the elementary level, biodiversity is introduced in second grade and differential survival is introduced in third grade. In middle school, students learn about biological evolution by studying the fossil record and how this can be used to infer common ancestry. They also examine evidence for evolution from embryonic development and selective breeding. In high school, students infer common ancestry through macromolecular evidence, and study the mechanisms of natural selection and how it leads to adaptation of organisms to their respective environments.

**Treatment of microevolution and macroevolution.** Regardless of the position that American Muslims take on macroevolution, in the main they accept microevolution. For this reason, it might be beneficial to start with microevolution when teaching evolution. Once students have a grasp of the role of natural selection in producing microevolutionary changes, then macroevolution could be introduced.

This sequence might be difficult to implement for K-12 education in the United States, however. The sequence that is commonly taught, starting with evidence for macroevolution and then teaching microevolution, is the reverse of what I am suggesting here.

However, some have suggested that natural selection deals with abstract concepts, such as genes, while macroevolution can be deduced from the fossil record, which is more concrete. Therefore the sequence of dealing with macroevolutionary changes in middle school and microevolutionary changes in high school is perhaps best suited to students' cognitive abilities at these levels (Jackson, 2007). As this sequencing by grade level in national and state standards is unlikely to change, perhaps high school teachers, who would normally be tasked with teaching microevolutionary changes to their students, could begin their units on evolution with this material, and then move on to the macroevolutionary topics, which are harder for students to accept, after they have mastered microevolution.

At the post-secondary level where macroevolution and microevolution are taught together, it would be easier to sequence the course to start with microevolutionary changes before dealing with macroevolutionary ones. One of my colleagues has successfully used this approach with religious Christian students (S. W. Seagle, personal communication, March 1, 2017). He reported that in the past he frequently had some of his religious students express their concern to him in response to learning about evolution by coming to his office hours and offering to pray for him. He changed the sequencing of the evolution unit by introducing his students to the more easily accepted microevolutionary concepts before delving into macroevolution. He reported that after this change his students no longer feel the need to express their concerns to him in response to this unit. As this tactic has been successful with religious Christian students in the American context, it is a promising line of inquiry to pursue with Muslim undergraduates as well.

It would also be important to help students understand the distinction between microevolution and macroevolution, rather than simply using the more ambiguous term "evolution" as a catch-all. The terms "macroevolution" and "microevolution" are not generally introduced until high school in the U.S. For example, a popular middle school life sciences textbook, Prentice Hall's *Life Science*, deals with biological evolution without mentioning these terms (Padilla et al., 2009), while Holt Mc Dougal's high school textbook, *Biology*, uses the term "microevolution" in a discussion of natural selection (Nowicki, 2010). At the college level, the terms are used extensively. For example, Campbell's *Biology*, the most popular college level general biology textbook, uses the terms "macroevolution" and "microevolution" repeatedly in its treatment of evolution (Urry et al., 2017). Raven and Johnson's (2002) *Biology* uses these terms in its discussion of evolution as well, and Brooker and colleague's (2011) *Biology* uses them in section heads as well as in the text. Therefore, it is reasonable to expect that K-12 teachers would be familiar with these terms from their college biology courses. Since these terms are common in both high school and college level biology textbooks, making this distinction could be easily implemented at both levels.

From a pragmatic standpoint many of the important practical applications of evolution, such as preventing antibiotic resistance in human pathogens or formulating flu vaccines, rely on understanding of microevolutionary changes, so stressing microevolution would probably not have serious negative practical consequences for people who go on to study further in biology.

**Countering creationism.** Addressing evidence that directly refutes Christian creationist arguments and their old-Earth variants promulgated by Harun Yahya could prevent some students from being swayed by these types of arguments. For example, explaining how some ancestral forms, such as lemurs, co-exist with descendent forms, such as monkeys, in the present day could counteract arguments such as, “If humans are descended from apes, why are there still apes?” Teaching amendments to evolutionary theory, such as the idea of punctuated equilibrium, could counteract arguments that evolution does not happen because there are some extant species that do not appear to have changed appreciably in hundreds of millions of years when compared with their fossil counterparts. Helping students to understand theory-laden NOS could help counteract the idea the Charles Darwin had an “agenda” in a way that other scientists do not. Helping students understand other NOS concepts, such as the nature of scientific theories, the logic of testing scientific theories, the validity of observationally based theories and disciplines, and the use of inference and theoretical entities in science, might help counteract other creationist arguments on weaknesses in Darwin’s theory (Clough, 1994; Smith, 2010). Teaching the history of the development of evolutionary theory and the manner in which it has been critiqued from within the scientific community and how these criticisms have been dealt with based on scientific evidence could also be useful in countering these “holes in the theory” arguments. This need not entail even mentioning the creationist counterparts to these arguments, and I do not suggest bringing these into the science classroom. However, the teacher could have these in mind when designing lessons to arm students with information that could counteract these arguments when students encounter them outside of science class. The foregoing is intended as a brief suggestion of possible strategies that could be employed in the classroom, rather than as an exhaustive list of possible creationist arguments and methods to counter them. The intention here is to start a dialog on the usefulness of these strategies and to suggest avenues for future research.

**Modeling how to negotiate the relationship between science and religion for students.** U.S. textbooks at both secondary and post-secondary levels commonly recommend teaching an independence view of the relationship between science and religion, and this view is commonly expressed in the biology departments of American colleges and universities. This is due in part to the influence of Stephen J. Gould (1997) who espoused the independence view by claiming that science and religion have “non-overlapping magisteria.” He explains, “The lack of conflict between science and religion arises from a lack of overlap between their respective domains of professional expertise—science in the empirical constitution of the universe, and religion in the search for proper ethical values and the spiritual meaning of our lives.” This viewpoint is recommended to counteract the conflict view to help religious people to accept the theory of evolution.

However, there are some problems with this approach. Many Muslims think of science and religion as integrated rather than as independent, for example, the influential Muslim scholar Yasir Qadhi discussed above. The majority of the theistic evolutionists who took part in a qualitative study on American Muslim undergraduates had an integrated view of the relationship between religion and science, while only a small minority of all respondents used independence to negotiate this relationship (Fouad, 2016a). A couple of the respondents who used integration expressed their opposition to using independence instead, at the urging of a teacher or a parent, because this simply made no sense to them.

Similar difficulties exist for non-Muslim theistic evolutionists. For example the noted geneticist Francis Collins stated the following in response to Gould's position.

That doesn't work for me. To me, being a scientist who is also a believer is a wonderful, comforting, harmonious experience, so that as a scientific discovery looms into view (and we scientists have the chance to do that from time to time), it is both a remarkable moment of realizing that you've discovered something that no human knew before, but God knew it, and so you are both experiencing discovery, and also a chance to glimpse just a little bit of God's mind. For me, that is just a privilege and a wonderful experience not to be missed." (Flato, 2006)

For these reasons, it might be preferable to give students examples of different ways of thinking about the relationship between science and religion rather than insisting that everyone take the independence view. Presenting more than one way of negotiating this relationship would make it more likely that students would find a method that is suitable for them.

Smith (2010) advocates a related approach in his review of evolution pedagogy. He suggests explicitly introducing students to Barbour's (2000) typology and inviting them to reflect on how their personal positions relate to these categories. Smith (2010) states, "at least in classrooms with substantial numbers of students from religiously conservative backgrounds, it is my opinion that the largest barriers to studying and learning about evolution are the philosophical and religious issues involved." Therefore he advocates an explicit, reflective examination of nature of science as well as a discussion of the ways in which religious people can negotiate the relationship between science and religion.

**Muslim scientists as role models for accepting evolution.** Muslim scientists and anthropologists who are currently working to push the boundaries of our knowledge in the field of evolution could potentially serve as role models for Muslim students (Hameed, 2013). As people who have found successful strategies for negotiating the relationship between science and religion, they can serve as examples of how to accept evolution by natural selection as a mechanism for the production of biological diversity in general and of human beings in particular while still maintaining an active faith.

**Ehab Abouheif.** One such researcher is Ehab Abouheif who holds the Canada research chair in evolutionary biology at McGill University (Verdone-Smith, 2015). His collaborative research group focuses on the evolution of ants. He has authored numerous publications in prestigious journals, including *Science* (Abouheif &

Wray, 2002) and *Proceedings of the National Academy of Sciences* (Smith, et al., 2011). He discusses his position on the scientific evidence for evolution.

There's a lot at stake here, because it's well beyond evolution. If it's not about the evidence, if you reject science, if you reject evolution as a science and you're not willing to listen to evidence, then that means that for all of science, when it comes into contact with socio-logical, political conflicts, then you won't believe it either. (Farell, 2012, para 7)

He stressed the importance of Muslims studying evolution so that they could be innovators of science and technology and not just consumers.

**Fatimah Jackson.** Fatimah Jackson (2015) conducts research at Howard University on microevolutionary changes that lead to human diversity and on human-plant co-evolution. She has published in *Science* (Jackson, Lee, & Taylor, 2014), and other scientific journals. On accepting evolution she stated, "I studied evolution before I accepted Islam. It was no hindrance for me to become Muslim" (thedeeninstitute, 2013). She negotiates the relationship between science and religion by seeing them as independent.

Remember, science, especially evolutionary science, is designed to tell you how things change, not why. Why comes from our Islam. You know, when we want to know why something happened we go to the Islam. (thedeeninstitute, 2013)

She uses a metaphor to describe her position as a theistic evolutionist.

Look at the similarities, the genetic similarities among all of the life that has been created. That is a sign of the signature of a single artist... you would never confuse a Monet painting with a VanGough. You would never confuse it, because every artist has a signature, has a style of presenting their creativity, and the style that we see is in the unity of the genetic message across all living species on this planet. (thedeeninstitute, 2013)

Researchers such as Fatimah Jackson and Ehab Abouheif could serve as role models for Muslim students on how to successfully negotiate the relationship between religion and science to accept biological evolution. The role models for negotiating this relationship would not necessarily have to be Muslims themselves. People from other faith traditions who have successfully negotiated this relationship, such as Francis Collins as quoted above or Theodosius Dobzhansky in his seminal 1973 article "Nothing in biology makes sense except in the light of evolution" could also potentially serve as role models for Muslim students.

**Abu Uthman al-Jahiz.** Historical figures from the Golden Age of Islam, such as Abu Uthman al-Jahiz (781–869) are another possible source of role models for Muslim students. He was a prolific writer on many subjects, including animals adapting to their environments. His work was known to European scientists, including Lamarck. Such scientists who contributed their proto-evolutionary theories to the discourse on evolution are often overlooked in science textbooks. Since their ideas were foundational to modern Western science and some history of evolutionary thought is normally presented in lessons on evolution in textbooks and in the classroom in the U.S., it would be fairly easy to include them in discussions on evolution.

**Further justification.** In the United States, proponents of creationism attempt to undermine evolution education using three tactics (Berkman & Plutzer, 2015). One is to exploit common misconceptions in NOS understandings by suggesting that there is some controversy surrounding evolutionary theory in scientific circles. Another is to suggest that since a controversy exists, it is only “fair” to teach both sides. A third is to promote the idea that religion and science are incompatible.

Some American high school biology teachers have been susceptible to these tactics (Berkman & Plutzer, 2015). They may attempt to avoid controversy in their classrooms by concentrating on microevolution without mentioning macroevolution, by discussing evolution of microbes while avoiding that of humans, or by using terms such as “adaptation” or “change over time” in place of evolution. They may discuss creationist views in their classrooms in the interests of “fairness.” Some tell students that they must learn about evolutionary theory because it is included in standardized tests, but without advocating for it on the basis of the scientific evidence that supports it.

It is important to note here that the pedagogical strategies mentioned above could potentially counteract these three creationist tactics. Therefore, they should be implemented in the context of a scientifically robust evolution unit.

The suggestion to begin the evolution unit with microevolution and then follow that with macroevolution once students have mastered natural selection is *not* meant to suggest that macroevolution should be de-emphasized in the treatment of evolution in either the high school or university biology classroom. Rather, it is meant to suggest that since most American students, whether Muslim or not, are willing to accept microevolution, they may be more inclined to learn about evolution if this is used as the gateway to the unit. Beginning the unit with those aspects of evolution that they are more likely to reject may turn them off of the subject entirely and prevent them from learning even those aspects that they might otherwise accept. The suggestion to stress to students the distinction between microevolution and macroevolution is meant to introduce proper terminology to students.

In the United States the courts have ruled that it is unlawful for public schools to promote religious views or to teach creationism or its variants, such as intelligent design, in the classroom (NRC, 2008). This is one reason that it is important to avoid mentioning creationist arguments in the science classroom, even while teaching material that could serve to counter these arguments. Another is that mentioning creationist arguments in the classroom could confuse students by making it appear that there is indeed a controversy about the science behind evolutionary theory (Clough, 1994). These are reasons to include both the scientific evidence and informed NOS views that would help students to counter these arguments should they encounter them, but not to include the creationist arguments themselves in the science classroom.

Although advocating for a particular religious viewpoint is not allowed in American public schools, teaching students about religion is not prohibited. Introducing students to the views of people who have used varying strategies to negotiate the relationship between science and religion would be allowable as long as the teacher refrained from promoting or advocating for one of these positions. In

addition to the benefit mentioned above of giving students examples of these strategies to help them find one that may work for them, this serves to counteract the creationist strategy of promoting the false idea that religion and science are necessarily incompatible.

## 2.4 Conclusions

Regarding acceptance of evolution, there are some ways in which American Muslims are similar to other Americans and other ways in which they differ. Rates of acceptance are similar. Also similar is the way that American Muslims differ in their views on evolution, forming three groups: those who accept both macroevolution and microevolution for all species, those who accept macroevolution for all species except humans, and those who reject macroevolution for all species, but could accept microevolution for all species. Another similarity is that people who have one way of negotiating the relationship between science and religion may be resistant to adopting another method of negotiating this relationship.

American Muslims differ from their compatriots in some important ways. They are far more likely to accept an old age for the Earth, even if they do not accept evolution as the best explanation for the appearance of new species. A related concern, that Noah's ark would have served as a bottleneck for species, with their subsequent development from kinds, is mostly absent for American Muslims.

There are several pedagogical implications of these views for Muslims. One is that curricula at the secondary and post-secondary levels could be sequenced to teach microevolution before macroevolution in order to accommodate those students who accept the former, but not the latter. This would benefit non-Muslim students who reject macroevolution as well.

A robust treatment of important NOS concepts, including theory-laden NOS, the nature and logic of testing scientific theories, the validity of observationally based theories and disciplines, and the use of inference and theoretical entities in science, could help both Muslim and non-Muslim students avoid common misconceptions about evolutionary theory that are often exploited by creationists in formulating their arguments against it. Helping students understand how evolutionary theory has been modified over time to enhance its explanatory power, and providing more robust explanations of the nature of lineages could potentially counteract other common creationist arguments against evolution.

It could be useful for both Muslim and non-Muslim students to introduce them to different methods of negotiating the relationship between religion and science, rather than expecting that only one method will work for all students, since there are multiple ways that people have successfully negotiated this relationship in order to avoid conflict. Introducing Muslim students to practicing Muslim evolutionary biologists and to Muslims from the past who developed proto-evolutionary theories might help them to view acceptance of evolution in a more favorable light.

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