



ISLAM & BIOLOGICAL EVOLUTION

Exploring Classical Sunni Sources and Methodologies



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ABSTRACT

This research investigates, within the framework of classical Sunni Islamic scholarship, what we might expect an Islamic opinion about evolution to be, bringing together an accurate and detailed understanding of evolutionary biology as the field stands today with a systematic consideration of the traditional Islamic sciences.

The scope of the study encompasses the scholarly traditions recognized, at least by their respective adherents, to be part of Muslim orthodoxy – referred to in Islamic discourse as *Ahl al-Sunnah wa al-Jamā‘ah* or more colloquially as “Sunni”. It covers the works of the scholars of the Ash‘arī, Māturīdī, and Salafī theological schools as well as the sources which they all draw upon – the Qur’ān, the Sunnah, and the opinions of the *Salaf*.

The reason for this choice is that these traditions represent for most Muslims the “mainstream” of Islamic thinking, and therefore have a greater relevance for determining what a general Islamic perspective on evolution could be.

The study first identifies and defines the methodological approaches of classical Sunni scholarship that have relevance to the question of an Islamic position on biological evolution. It also identifies and defines the issues within the field of Evolutionary Biology that need to be brought under scrutiny. The methods of classical Islamic Theology are then applied to the claims of Evolutionary Biology, drawing on traditional Islamic sources. The result of the study is an extrapolation of what an orthodox Islamic position towards biological evolution could be. Is Islam neutral towards the idea of biological evolution? Does it support it or categorically reject it? Can it accept certain aspects of Evolutionary Biology while rejecting others?

Finally, the extrapolated “classical” Islamic position on evolution is compared with the writings of some contemporary Muslim scholars whose views run contrary to that extrapolation. Possible reasons for the discrepancy are explored.


Such an interdisciplinary work should provide a valuable frame of reference for a more accurate analysis of the creation–evolution debate unfolding in the Muslim world today.

KEY WORDS

Islam, Classical Arabic, Evolution, Biology, Abiogenesis, Sunni Theology, Exegesis, Cosmogony, Aetiology, Creationism

DECLARATION

I declare that *Islam and Biological Evolution: Exploring Classical Sunni Sources and Methodologies* is my own work, that it has not been submitted for any other degree or examination at any other university, and that all the sources I have used or quoted from have been indicated and acknowledged as complete references.


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TRANSLITERATION AND WRITING CONVENTIONS

I have employed the Library of Congress Arabic transliteration standard (ALA-LC) for the transcription of Arabic words and proper names. The names of prophets are referred to by their English equivalents (*eg.* Moses instead of Mūsā). This includes the name of the Prophet Muhammad, which is rendered without the use of any special transliteration characters. By contrast, when a classical Arabic scholar is cited who shares this name, the name is rendered in transliteration as Muḥammad.

The word *ibn* (son of), found in many classical Arabic names, is rendered as “b.” if it occurs between the first and second name (*eg.* Aḥmad b. Ḥanbal) and is rendered as “Ibn” if it appears at the beginning of the name (*eg.* Ibn Khaldūn).

All Arabic terms mentioned in the text are italicised except for commonly used terms (*eg.* ḥadīth and Qur’ān) and Arabic words that have become an accepted part of the English vocabulary. The word ḥadīth is used to indicate both the singular and the plural form of the word.

In view of the fact that most of the references in this book are classical Arabic texts whose titles and authors are rendered in transliteration, and in consideration of the multi-volume nature of many of these works, a footnote style reminiscent of that found in modern Arabic writings is employed. The author of the reference is given in the footnote with the page number appearing next to it within brackets. Where an author has more than one work referenced, the title of the work is also given after the author’s name to avoid confusing one work with another. If it is a multi-volume work, the volume is given first, separated from the page number by a slash, as follows: al-‘Asqalānī, *Fath al-Bārī* (2/23). The same system is used to reference English sources for the sake of consistency.

If an online reference is used, the page number citation is given as follows: (– online); for instance: Alters *et al.* (– online). Full bibliographic citations for all works are to be found in the Bibliography.

If the reference is a ḥadīth, the name of the compilation in which it is to be found is given without being preceded by the author’s name, followed in brackets by the ḥadīth’s particular index number, as follows: *Mustadrak al-Ḥākim* (2234). If,

however, a statement of the compilation's author is what is being cited, a typical author reference will be given. For instance: al-Ḥākim, *al-Mustadrak* (2/45).

I have endeavoured to use the most widely referenced indexing system for each ḥadīth compilation. For *Musnad Aḥmad* and *Ṣaḥīḥ Ibn Ḥibbān*, I have relied on the critical editions that were produced by a team of specialists under the editorial supervision of Shu‘ayb al-Arna‘ūt, since these are the most complete and accurate editions available, and they are rapidly becoming the standard references for these two works in the field of ḥadīth research.

The index numbering systems that I have employed are as follows:

Ṣaḥīḥ al-Bukhārī, *Ṣaḥīḥ Muslim*, and *Sunan Ibn Mājah* – Muḥammad Fu‘ād ‘Abd al-Bāqī

Sunan al-Tirmidhī – Aḥmad Shākīr

Sunan Abī Dāwūd – ‘Izzat al-Da‘‘ās

Sunan al-Nasā‘ī – ‘Abd al-Fattāḥ Abū Ghuddah

Sunan al-Nasā‘ī al-Kubrā – Ḥasan ‘Abd al-Mun‘im Shalabī

Mustadrak al-Ḥākim – ‘Abd al-Salām ‘Allūsh

Ṣaḥīḥ Ibn Ḥibbān and *Musnad Aḥmad* – Shu‘ayb al-Arna‘ūt

All translations from the Arabic texts, including passages from the Qur‘ān and ḥadīth, are my own unless otherwise indicated.

A Final Note: A number of ḥadīth from Sunni sources are quoted and discussed in this research. Those ḥadīth which accord with the standards of authenticity set forth by classical Muslim scholars – including all ḥadīth cited from the two most widely accepted ḥadīth compilations *Ṣaḥīḥ al-Bukhārī* and *Ṣaḥīḥ Muslim* – are quoted in the body of the research. When the needs of the research necessitate discussing the text of a ḥadīth that is judged as weak according to those standards, or where the authenticity of the ḥadīth is widely disputed, both the text of the ḥadīth and the discussion of that text are relegated to the footnotes.

INTRODUCTION

The concept of biological evolution as it is understood today has only been part of human thought for a little over 150 years. Most of Islamic history preceded it, so the development of Islamic theology occurred in the absence of the evolutionary paradigms that now have such a marked effect on contemporary thinking in the West. As could be expected, Muslims today exhibit a wide spectrum of views concerning evolution. There is also a considerable degree of confusion among Muslims about what evolution actually is and what it means for them as believers in Islam.

Muslim scholars have explored the question of biological evolution, usually superficially, and have come up with various conclusions. Much of what has been written has come from intellectuals and thinkers who are not formally trained in Islamic disciplines and who interpret scripture according to their own understandings, often at variance with traditional views.

A good recent example of this kind of work that is pro-evolution is *Creationism and/or Evolution* by T.O. Shavnas. He delves into a number of pertinent issues, like the theological implications of chance and causation, but his methodology and theological ideas are very personal.

Another example, one which differentiates between human beings and other living things, is *al-Khalq bayna al- 'Ankabūṭiyyah al-Darwiniyyah wa al-Haqīqah al-Qur'aniyyah* by Dr. Karīm Ḥasnayn. It is based on a highly subjective and personal exploration of certain verses of the Qur'ān, specifically verse 19 of *Sūrah al- 'Ankabūt*.

Anti-evolution examples are numerous, including the ubiquitous books of the Harun Yahya Foundation. The works of al-Zindānī, most notably *Kitāb Tawhīd al-Khāliq*, also lean towards an anti-evolutionary stance. Another typical example is Ruqaiyyah Waris Maqsood's *The Sign of the Gnat*.

The anti-evolutionists in this group generally exhibit a poor understanding of the field of evolutionary biology. Their arguments centre less on scriptural and doctrinal issues within Islam, but rather on the assumption that evolution is scientifically dubious and that it is tantamount to atheism. Yahya and Maqsood also focus heavily on the notion that evolutionary theory encourages negative values and weak morality.

Traditionally trained contemporary Islamic scholars have also spoken about biological evolution and Islam. Some like Nadīm al-Jisr, in *Qissah al-Īmān*, approve of the idea of biological evolution. Others, like Noah HāMīm Keller are tentative. Al-Būtī in *Kubrā al-Yaqīniyyāt al-Kawniyyah* comes out against it. The Salafī-oriented scholar, Sulaymān al-Ashqar, also comes out strongly against evolution in his book *Belief in Allah (al-`Aqīdah fī Allāh)*.

What the traditionalist works generally have in common is a weak understanding of evolutionary theory. Again, those who come out against evolution argue that evolution is scientifically dubious and that it necessitates atheism. Those with a positive view are not much better off. For instance, Nadīm al-Jisr, who argues in favour of evolution, feels the need to assert that Darwin believed in God.¹

Academic scholarship on the question is not considerable. What exists usually amounts to a survey of contemporary Muslim opinion on the matter. For instance, after lamenting that: “Very little is known about the ways in which Muslim scholars and general public respond to evolutionary science,” Alters *et al.* discuss the very useful research that their McGill University-based Evolution Education Research Centre is undertaking, an exploratory study that “seeks to examine the ways in which evolution is understood by Muslim university faculty, high school biology teachers, and high school students and their families. What happens when evolution is perceived to conflict with their Islamic faith?”²

Though they identify various strains of thought that exist in the Muslim world regarding evolution, their research does not attempt to analyse these ideas in depth, but rather looks at how they bear upon the dynamics of evolution teaching.

Tanir Edis has written a number of articles analysing the Creationist movement in Turkey. His works are excellent in comparing Turkish creationism with its American counterparts and with identifying the political and social catalysts driving the spread of such thinking in that country. Edis touches upon some of the currents in contemporary Islamic thinking that promote it. For instance, he discusses the role played by the “Science-in-the-Qur’ān” movement, and he mentions that the notion of *fiṭrah* (the natural way) has been used to provide a link between biological facts and morality.³ However, his research does not delve very deeply into Islamic thought itself. In fact, he concludes that

¹ al-Jisr (193).

² Alters *et al.* (– online).

³ Edis (123).

Turkish creationism is a modernizing, “Islamist” phenomenon and that its fundamentalist adherents “are *not* religious traditionalists.”⁴

What is still lacking is in-depth interdisciplinary research that first brings an informed understanding of evolutionary biology as it is currently understood by the scientific community and then analyses it in the context of an equally in-depth understanding of traditional Islamic sources and methodologies. I believe that such research is needed to provide a frame of reference for the analysis of the unfolding creation-evolution debate in the contemporary Muslim world.

The aim of this present research, therefore, is to investigate, within the framework of classical Islamic scholarship, what an Islamic opinion about evolution might be, bringing together an accurate and detailed understanding of evolutionary biology as the field stands today with a systematic consideration of the traditional Islamic sciences.

This requires first identifying and defining the methodological approaches of classical Muslim scholarship that have relevance to the question. It also requires accurately identifying and defining the issues within the field of evolutionary biology that need to be brought under scrutiny. The methods of classical Islamic theology must then be applied to the claims of evolutionary biology, drawing on classical Islamic sources. The result of this study will be an extrapolation of what an orthodox Islamic position towards biological evolution could be. Is Islam neutral towards the idea of biological evolution? Does it support it or categorically reject it? Can it accept certain aspects of evolutionary biology while rejecting others?

The scope of this study encompasses the scholarly traditions recognized, at least by their respective adherents, to be part of Muslim orthodoxy – referred to in Islamic discourse as *Ahl al-Sunnah wa al-Jamā‘ah* or more colloquially as “Sunni”. It covers the works of the scholars of the Ash‘arī⁵, Māturīdī⁶, and Salafī⁷ theological schools as

⁴ Edis (123).

⁵ Sunni theological school attributed to Abū al-Ḥasan al-Ash‘arī (d. 322 AH/ 936 CE). This theological school has generally been embraced by scholars of the Shāfi‘ī and Mālikī legal schools and is regarded as a traditionalist reaction to the rationalism of the earlier Mu‘tazilī theological school. [Refer to Abrahamov (x) and Leaman (85).]

⁶ Sunni theological school attributed to Abū al-Manṣūr al-Māturīdī (d. 333 AH/944 CE). Scholars of the Ḥanafī legal school have generally embraced this theological school, and its adherents claim to follow the theological teachings of Abū Ḥanīfah. [Refer to Burrell (147) and Leaman (86-89).]

⁷ A broad term used to describe Sunni religious thought that decries the scholastic theology of the Ash‘arī and Māturīdī theological schools. This thought has generally been associated with the Ḥanbalī

well as the sources they all draw upon – the Qur’ān, the Sunnah, and the opinions of the earliest generations of Muslims (*Salaf*).

The reason for this choice is that these traditions represent, for most of the world’s Muslims, the “mainstream” of Islamic thinking, and therefore have a greater relevance for determining what a general Islamic perspective on evolution could be.

It may seem overly ambitious to tackle the question of an Islamic viewpoint towards biological evolution within such a broad spectrum of scholarship stretching back through the entirety of Islamic history. Typically, research centres around the views of a single scholar or a single historical movement or, at most, a single sect.

However, I feel it is both appropriate and possible to make this research inclusive of all orthodox Islamic scholarship. First of all, in order to provide the extrapolated outcome that this research aims to uncover, all ideas and methodological approaches that could affect that outcome need to be taken into account. Scholars of the three orthodox theological schools, in spite of their differences, are openly influenced by one another as well as by other early Sunni scholars like al-Ṭabarī, al-Ṭaḥāwī, and Ibn Ḥazm. When we look at the theological, legal and exegetical literature written by scholars of the various “Sunni” schools, we see that in spite of their differences, they quote each other and at times adopt each other’s opinions. On the other hand, they rarely cite the opinions of Shi’ite, Mu‘tazilī⁸, and Peripatetic scholars except by way of refutation.

At the same time, this research does not attempt to analyse the question of evolutionary biology according to the views and methodological approaches of other Islamic sects. Such research would certainly be both interesting and worthwhile. However, each broad sectarian viewpoint warrants a thesis of its own. For instance, if we consider only the various Shi’ite sects, we find that the differences among them

legal school, most importantly with al-Barbahārī (d. 330 AH/941 CE), a contemporary and critic of Abū al-Ḥasan al-Ash‘arī. However, a number of scholars from the other three canonical legal schools identify with it. The term Atharī is often used to refer to early scholars of this tendency, the word *athar* referring to textual traditions, as opposed to a reliance on scholasticism and reason. Its most famous proponents are two later Ḥanbalī theologians: Ibn Taymiyah (d. 728 AH/1326 CE) and his student Ibn Qayyim al-Jawziyyah (d. 751 AH/1350 CE). [Refer to Abrahamov (x, 23 and 76) and Leaman (85)]

⁸ Early theological school, extremely important in late Umayyad and early Abbasid times, generally regarded as having been established by Wāṣil b. ‘Atā’ (d. 131 AH/749 CE). The school is regarded as placing a higher premium on reason and is known for the doctrine that the Qur’ān is created. [Refer to Abrahamov (x) and El-Bizri (123).]

with respect to dogma, theological principles, and even scriptural sources, is far greater than the differences that exist between the various Sunni theological schools.

For example, if we look merely at the application of the Sunnah among Shi'ite sects, we see that they differ widely in their recognition of the Sunnah. Then, the sects that recognize the Sunnah in principle and possess a body of ḥadīth literature recognize entirely different ḥadīth books. With respect to a religion based upon revealed, scriptural knowledge, this is a major difference indeed, and any study seeking to extrapolate the stance of a particular Shi'ite sect to a new issue needs to engage with the scriptures recognized by that particular sect. Also, we find that among the Akhbārī and Uṣūlī sub-sects of Ithnā Asharī Shi'ism – which is itself only one of many Shi'ite sects – the methodological differences in their approaches to their ḥadīth literature is greater than the differences that exist among Sunni schools regarding the Sunni ḥadīth literature. This makes a single comprehensive and predictive study of all Shi'ite sects towards evolution impractical, let alone a study encompassing all Sunni and Shi'ite sects together.

Similar arguments can be given for the exclusion of the various Mu'tazilī, Peripatetic, and Gnostic sects of Islam. Added to these is the argument of their relevance to contemporary Islam. Many of these sects are no longer in existence and though some of their ideas have been influential on later Islamic thinkers of the orthodox schools, those aspects will necessarily be covered in a survey of the orthodox schools themselves.

What this means for the present study is that the views of classical sects that are regarded as heterodox by *Ahl al-Sunnah wa al-Jamā'ah*, including the various sects of the Mu'tazilah, the Khawārij, the Gnostics, and the Shi'ites, will not be explored. The perspectives of Islamic Modernism will not be addressed. Likewise, the research will not attempt a comprehensive survey of contemporary Muslim opinion about evolution.

Scriptural evidence will, therefore, be analysed according to the spectrum of methodological perspectives – those of the three orthodox schools mentioned above – that fall within the scope of the study. As a consequence, the conclusions reached by

this research about the meanings of the sacred texts may not necessarily hold true if other methodological approaches are applied.

With respect to biological evolution, the study will deal with evolution according to how contemporary biologists understand it. It will not explore obsolete and invalidated theories like those of Lamarck.

The body of the book is divided into three parts. Part One is a critical exposition of what Islam's sacred texts say about the origins of the universe, of life on Earth, and of humanity, drawing upon the principles set forth in the introduction and upon the commentaries of classical Islamic scholars. The purpose of Part One is to determine within the framework of classical Islamic thought what the texts say about these origins and equally what the texts do *not* say about them. Therefore, the discussions in this part of the book are restricted to the sacred texts and scholarly opinions about what the sacred texts indicate, without digressing into the other opinions and theological explorations made by various scholars.

The first chapter in Part One, entitled *The Seen and the Unseen*, is indispensable to the rest of the work. It gives a thorough presentation of methodological issues according to the three classical schools of theology represented by the study. When these schools differ on a point of methodology – for instance, the question of the validity of individual-narrator ḥadīth for establishing matters of creed – the nature and extent of their disagreement is explored with the purpose of determining the possible relevance that it might have to the topic of study. No attempt is made to sit in judgment of the various opinions presented, since our only concern is to determine the implications that those opinions might have for the theological acceptance or rejection of biological evolution.

Part Two is a survey of evolutionary biology as the field stands today. In a series of expository chapters, it seeks to provide an accurate assessment of how biologists understand evolution and evolutionary theories. Where it may be relevant to the study, and in some cases where there is a lot of public misunderstanding, certain matters of disagreement among biologists will be discussed, punctuated equilibrium being a case in point. As in the Introduction, no attempt is made to validate or invalidate any theoretical claim. What is intended is to clarify the matter and its implications.

The final chapter in Part Two, entitled “The Scope of Evolutionary Biology” explores topics that the field of evolutionary biology does not address but which are often confused with it. This chapter discusses how evolutionary biology is confused with matters such as the origin of life, ethics, and political economy.

Since Part Two aims chiefly at defining evolution and evolutionary theory, it relies on recent sources that are regarded as being accurate and representative of the field as it stands today. Much of this section draws upon three highly acclaimed university textbooks on evolution, those of Futuyma, Ridley, and Strickberger. Also used are references focusing on specific topics in the field. Included as well are reputable “popular” writings on evolution by recognized authorities like Ernst Mayr, Stephen Jay Gould, and Richard Dawkins. The primary literature is also cited.

In Part Three of the book, evolution as presented in Part Two is examined for its theological implications in light of what preceded in Part One. Each chapter of Part Three discusses a different topic and draws upon the theological writings of Islamic scholars of the various orthodox schools.

In the Conclusion, a summary of the extrapolated “classical” Islamic position on evolution arrived at in Part Three is given, followed by a brief discussion of views that some contemporary Muslim scholars have that run contrary to this conclusion. Possible reasons for these differences are explored.

PART 1:

**THE QUR'ĀN, THE SUNNAH & THE HISTORY OF
LIFE**



CHAPTER ONE

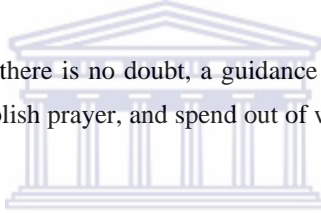
THE SEEN AND THE UNSEEN

Before exploring the question of what classical Islamic scholarship says about the creation of the universe and the origin of life, it is necessary to first understand the methodological approaches that classical Islamic scholars have employed in making determinations about Islamic beliefs and doctrines.

Much of this chapter will deal with how classical scholarship approaches Islam's sacred texts. Islam is a revealed religion. Muslims follow what God revealed to Muhammad, whom they accept as God's final Prophet and Messenger to humanity. This revelation is manifested in two textual sources, the Qur'ān and the Sunnah, both of which we will now define.

The Qur'ān, the revealed book of Islam, introduces itself with the following words:

This is the book in which there is no doubt, a guidance for those who fear God. Those who believe in the unseen, establish prayer, and spend out of what We provide for them. [*Sūrah al-Baqarah*: 2-3]



Al-Ṭaḥāwī sums up the orthodox Islamic position on the Qur'ān as follows:⁹

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The Qur'ān is the speech of God, emanating from Him in a manner that is incomprehensible to man, as a word, and sent down to His Messenger as revelation. The believers believe it to be the truth and they are certain that it is literally the speech of God.

The Qur'ān refers to itself as “the speech of God”¹⁰, and orthodox Muslims believe that the Qur'ān is God's word, not the word of any human being, nor yet the human expression of a divinely inspired meaning. Hence, Muslims do not speak about “the authors of the Qur'ān”, nor do they describe Prophet Muhammad as merely expressing divine inspiration in his own words as best he could.

The Qur'ān is unanimously regarded by orthodox Muslims as being of undisputed authenticity (*qaṭ'ī al-thubūt*).¹¹ The integrity of its text is considered a matter of absolute certainty. Not only has its text been confirmed by its transmission from the

⁹ al-Ṭaḥāwī, *al-'Aqīdah*, published with Ibn Abī al-'Izz (1/254)

¹⁰ *Sūrah al-Tawbah*: 6.

¹¹ Ibn Ḥazm (1/94).

Companions through numerous chains of transmission that support one another¹², it is also a matter of faith for Muslims that the Qur’ān is divinely protected from corruption, for the Qur’ān says:

Indeed, We have sent down the Reminder, and indeed We are its protectors. [*Sūrah al-Hijr*: 9]

Indeed it is a Mighty Book. Falsehood cannot approach it from before it or behind it; a revelation from One who is Wise and Praiseworthy. [*Sūrah Fuṣṣilat*: 41-42]

The other textual source of Islam is the Sunnah, which comprises everything that has been transmitted from the Prophet Muhammad of his statements, his actions, and those matters for which he gave his tacit approval.¹³ It is unanimously accepted by orthodox Muslims that the Sunnah is also revealed knowledge from God. The most important verse cited in this respect is:

He does not speak of his desire. It is but revelation that is revealed to him. [*Sūrah al-Najm*: 3-4]

Ibn Ḥazm, for instance, cites the above verse when he writes:¹⁴

Once we make it clear that the Qur’ān is the authority that we refer back to in Islamic Law, we then look within it and find that it obliges us to obey God’s Messenger. We also find within it that it says about the Messenger: “He does not speak of his desire. It is but revelation that is revealed to him.” From this we know that the revelation from God to His Messenger can be divided into two categories: the Qur’ān and the Sunnah.

Likewise, al-Ghazālī writes:¹⁵

God has made it so that the declaration of monotheism – *There is no god but God* – is not sufficient for complete faith if it is not complemented by the statement: *Muhammad is the Messenger of God*, and God obliges humanity to believe everything that the Messenger informed us about pertaining to this world and the Hereafter.

Therefore, according to orthodox Islam, a Muslim is expected to approach revelation with an attitude of submission and total acceptance, whether the source of that revelation is the Qur’ān or the Sunnah.

¹² al-Ghazālī, *al-Mustasfā* (81). Ibn Ḥazm (1/94). The Qur’ān is a narration of the general masses (*mutawātir*). For an elaboration of this concept, see page 20.

¹³ This is the definition of the Sunnah with respect to it being a source of Islamic beliefs and legal knowledge. Refer to al-Āmidī, *al-Iḥkām fī ‘Uṣūl al-Aḥkām* (1/145).

¹⁴ Ibn Ḥazm (1/95).

¹⁵ al-Ghazālī, *Iḥyā’ ‘Ulūm al-Dīn* (1/134)

Approaching the observable world:

If a Muslim is expected to accept revelation as an authoritative source of knowledge, it remains for us to explore how a Muslim considers the world and what can be learned from it through sensory experience. Subsequent chapters of this book will explore the Muslim belief that God directs the creation of everything in human experience – and indeed everything outside of human experience – along with the belief that everything in Creation is within God’s power and subject to His will, and that created things are understood to be the consequences of God’s actions.

Many of these consequences are manifest to sensory perception. They are the things that human beings experience in the world. Though Muslims regard these things as the creations of God, most of what is known about these created things is learned through observation and experience – through seeing, hearing, smelling, tasting, and touching. Human awareness of these things is, therefore, not directly dependent on revelation.

What, then, does Islam say about the value and validity of knowledge acquired through sensory experience? In other words, what is its position on empirical knowledge?

This question is of vital importance, since a Muslim, as a follower of a revealed religion, will first seek to determine the relationship between Islam and science by ascertaining how revelation defines that relationship for him. Since religion, for an orthodox Muslim, is not a man-made institution but a God-given one, it is not up to the human being to determine the scope and domain of religion. In the Qur’ān it reads: “Indeed God has chosen for you the religion.”¹⁶

It follows that Muslims will not seek to define the parameters of religious authority *a priori*, since God can, through revelation, define the parameters of His religion any way He wishes.¹⁷ Many possibilities can be conceived of regarding how the

¹⁶ From *Sūrah al-Baqarah*: 132.

¹⁷ Steven Jay Gould, in *Rocks of Ages*, asserts the Principle of Non-Overlapping Magesteria (NOMA), which he explains as follows (6): “(The) magesterium of science covers the empirical realm: what is the universe made of (fact) and why does it work this way (theory). The magesterium of religion extends over questions of ultimate meaning and moral value. The two magesteria do not overlap...” The problem with this idea is that when a religion claims to be founded upon revelation from God, it

relationship between revelation and empirical knowledge could be defined within the context of a revealed religion. For instance, the revelation could contain a list of specific scientific claims and, by simply mentioning those claims in the sacred texts, demand that believers accept them as tenets of faith. Alternatively, a religion's scriptures could claim that God "tests" His creatures by placing within nature indications that run contrary to what is stated in revelation, so that what people observe in the world around them would indicate meanings contrary to scriptural "truth". Such a possibility would not constitute a lie on God's part as long as God did not command His creatures to believe what they observe in nature or inform them that what they observe in the natural world is true. In such a situation, revelation would be the only source of truth and knowledge that a believer could rely upon. With these and other possibilities open to a revealed religion, the question remains: What actually is the relationship between the domain of religious authority and empirical knowledge in orthodox Islam?

In answer to this question, we find many verses in the Qur'ān that appear to encourage people to look into Creation and to learn from it. The clearest of these verses are the following:

Say: Observe what is in the heavens and the Earth. But of no avail will be signs or warners to a people who do not believe." [Sūrah Yūnus: 101]

Say (O Muhammad): Travel through the land and observe how He began Creation. [Sūrah al-'Ankabūt: 20]

Have they not observed the sky above them – how We structured it and adorned it and how it has no rifts?" [Sūrah Qāf: 6]

Do they not observe the camel, how it was created? And the sky how it was raised? And the mountains, how they were erected? And the Earth how it was spread out? [Sūrah al-Ghāshiyah: 17-20]

Orthodox scholars have cited these and other verses to assert a positive value for knowledge gained through empirical means. After discussing how God encourages

cannot be presupposed that the revealed scriptures will restrict the domain of religion to questions of "ultimate meaning and moral value." The principle of NOMA might or might not apply to a particular revealed religion. This will depend on how the scriptures of that particular revealed religion define its magisterium and the way in which the practitioners of that religion interpret their scriptures. Therefore, the magisterium of a particular revealed religion cannot simply be pre-supposed, as Gould would have it.

his creatures to look into creation and draw lessons from it, Ibn al-Qayyim says the following:¹⁸

The universe with all that it contains of signs, indications, and evidence, God created none of it as a deception, nor constituted anything in its midst frivolously, nor created it in vain. Causes, catalysts, and reasons are the province of reflection for thinkers, of consideration for investigators, and of facts for those who cite evidence. (God says): “Indeed in that are signs for those who carefully examine.”¹⁹

Therefore, verses like these are seen to clearly sanction the pursuit of empirical knowledge. More importantly, they endorse the validity of knowledge acquired through the observation of the physical world.²⁰ If the world around us were such that its observation and study led to falsehood and error in matters of religious relevance, the texts would warn against seeking knowledge in this way, not encourage it. God would definitely not have indicated it as a means for believers to strengthen their faith.

The Qur’ān’s endorsement of the observation of the natural world as a means of acquiring knowledge means a Muslim cannot accept the idea that the natural world has been set up to deceive humanity and lead them astray.

At the same time, Muslims believe that God can and has created things that cannot be seen with the eyes or perceived with the other senses. In Islamic thought, these issues are collectively referred to as the unseen (*ghayb*).²¹

¹⁸ Ibn al-Qayyim, *Ma‘ārij al-Sālikīn* (3/387).

¹⁹ From *Sūrah al-Hijr*: 75

²⁰ People have developed systematic methods of observing and manipulating the world around them in order to uncover its secrets. These methods collectively fall under the banner of science. Science is essentially a method to enhance our ability to learn from the things that we observe. As a consequence, science is limited to the investigation of those things that can either directly or indirectly be perceived by our senses. Though some Muslim thinkers have argued that verses like these are an endorsement of modern science, none of these verses actually set forth a fully detailed epistemological system. They merely assert that empirical knowledge has a positive epistemological value. They do not necessarily endorse the philosophical assumptions and methodologies that are associated with science as it is practiced today. The suitability to Islam of modern scientific methods is a point of contention among contemporary Muslim thinkers. Some, like Pervez Hoodbhoy (20), argue that contemporary scientific practices, as they stand, are compatible with the religion of Islam. Others, like Seyyed Hossein Nasr (179-180) and Mawdudi [Sajjad (60)], argue that there is a need for the development of an Islamic science based upon a new set of paradigms. This question is, however, outside the scope of the present study, which is confined to comparing the *extant* conclusions of a particular scientific theory with orthodox Islamic beliefs and theological teachings, and not with providing a detailed critique of the epistemological system within which the scientific theory developed.

²¹ al-Rāzī, *Maḥāṭib al-Ghayb* (2/26). He writes: “The majority of commentators define the unseen as what is not detectable through sensory perception.”

The Qur'ān and Sunnah discuss many things that people cannot not see, hear, touch, taste or smell, nor can people hope to observe them indirectly by way of inference or by relying on advanced instrumentation. There are many reasons for this. It may be that the topic referred to (like Heaven or Hell) lies outside the domain of human scrutiny. Alternatively, the text may be foretelling what will occur in the future. Yet again, the matter at hand may be something abstract or intangible, like the value and esteem in which God holds someone. People have no way of knowing about any of these things through empirical methods. Al-Qurṭubī elaborates on the unseen as follows:²²

The unseen includes everything the Messenger informs about which the intellect has no way of arriving at: like the signs of the last days, the punishment of the grave, the gathering and resurrection, the Bridge, the Balance, Heaven, and Hell.

God is described in the Qur'ān as “the Knower of the unseen and the seen”.²³ Al-Ṭabarī explains this attribute of God as follows:²⁴

He means by this statement that He is the knower of what you – O mankind – cast your eyes upon and therefore observe, as well as what is undetectable to your senses and your sight, so you neither sense it nor perceive it.

Since God alone possesses knowledge of the unseen, it follows that Muslims are required to believe in what God has revealed about it. The Qur'ān describes the God-fearing person as one who, among other things, believes in the unseen:

This is the book having no doubt in it, a guidance to the God-fearing; who believe in the unseen, establish prayer, and spend out of what We provide for them; who believe in what has been sent down to you (O Muhammad) and what has been sent down before you, and have certainty in the Hereafter. They are on true guidance from their Lord and they are the successful ones. [*Sūrah al-Baqarah*: 2-5]

The Qur'ān and Sunnah speak about many things that cannot be perceived by the human senses. Furthermore, the Qur'ān indicates that the only source of knowledge about these matters of the unseen is revelation from God to His select Messengers:

He is the Knower of the unseen, and He does not make manifest His unseen to anyone; except to whom He pleases of the Messengers. [*Sūrah al-Jinn*: 26-27]

²² al-Qurṭubī, *al-Jāmi'* (1/209).

²³ From *Sūrah al-An'ām*: 73.

²⁴ al-Ṭabarī (9/341).

Al-Qurṭubī writes:²⁵

Since God extols His knowledge of the unseen and reserves it to Himself to the exclusion of His creatures, this is proof that no one apart from Him knows the unseen. Then He makes an exception of those whom he pleases among the Messengers, for He bestows upon them whatever He pleases of the unseen by way of revelation to them and makes this an inimitable miracle for them and a sign of the genuineness of their prophethood.

From this, we can discern that Muslims are expected to believe in everything that has been revealed in the Qur'ān about many matters like the angels, the *Jinn*, Paradise, Hell, and the events that are going to take place in the future. As for what has not been mentioned about their details or characteristics, humanity will have no knowledge of these matters and no effective means to speculate about them. Al-Rāzī states:²⁶

The unseen is divided into what is indicated by evidence and what is not indicated by evidence. As for what is not indicated by evidence, Allah alone knows about it to the exclusion of others. With regard to what is indicated by evidence, it can be said that we know of the unseen what the evidence indicates.

Therefore, matters of the unseen that are not detailed to us by any evidentiary means remain the exclusive knowledge of Allah alone.

Matters of the past can be part of the unseen. The Qur'ān makes it clear that certain events of the past are unknown to humanity except by way of revelation and describes such events as being matters of the unseen.

For instance, when the Qur'ān relates the story of Zechariah and Mary, it addresses Muhammad, saying:

These are from the reports of the unseen that We reveal to you. And you were not with them when they cast their lots to decide who would receive guardianship over Mary and you were not with them when they disputed amongst themselves. [*Sūrah Āl 'Imrān*: 44]

It also says, after relating the story of Noah:

These are from the reports of the unseen that We reveal to you. Neither you nor your people knew about them before this. [*Sūrah Hūd*: 49]

²⁵ al-Qurṭubī, *al-Jāmi'* (19/28).

²⁶ al-Rāzī, *Mafātīḥ al-Ghayb* (2/27).

It says, after relating the story of Joseph and his brothers:

These are from the reports of the unseen that We reveal to you. And you were not with them when they agreed upon their course of action and conspired. [*Sūrah Yūsuf*: 102]

The events being referred to in these verses were matters of the unseen to Prophet Muhammad. His only way of coming to know of these matters was through direct revelation from God. Of course, they were not matters of the unseen to those who lived at that time and actually experienced the events being described.

Not all events that took place in the past are part of the unseen for those living at a later time. People can know about certain details of past happenings by the evidence that has been left behind. The Qur'ān attests to this and exhorts people to observe what the nations of the past left behind and to draw lessons from what befell them:

“Events had taken place before your time; so travel through the Earth and observe what was the end of those who denied.” [*Sūrah Āl ‘Imrān*: 137]

And already Messengers had been ridiculed before you, but those who mocked them were enveloped by that which they used to ridicule. Say: Travel through the Earth and observe what was the end of those who denied. [*Sūrah al-An‘ām*: 11]

Say (O Muhammad): Travel through the Earth and observe what was the end of those who came before. Most of them had been polytheists.” [*Sūrah al-Rūm*: 42]

Therefore, matters of the past are considered part of the unseen only if people must rely upon revelation for their knowledge about them. This means that knowledge of the past can be acquired in two ways:

1. From direct revelation from God to His prophets and messengers.
2. From studying the evidence left behind from the events of the past.

People can learn something about the past history of the Earth by looking at evidence in Creation. Astronomers, geologists, biologists, and palaeontologists are among the specialists who are occupied with such research. Likewise, something about the past history of humanity can be learned by looking at human artefacts and documents. Specialists like historians and archaeologists are among those who are concerned with investigating evidence of this kind.

As for matters that are indeed part of the unseen and are known only by way of revelation, Muslims are to accept what the sacred texts say about those matters. It is, therefore, important for a Muslim to know exactly what the sacred texts are saying. Equally important, however, would be to realize what those texts are *not* saying, so as not to misconstrue one's own assumptions or interpretations for revealed knowledge.

Approaching the sacred texts:

The Qur'ān warns against speaking without knowledge, saying:

And do not pursue that of which you have no knowledge. Indeed, the hearing, the sight, and the heart – for each of those, one will be held accountable. [*Sūrah al-Isrā'*: 36]

When it comes to speaking about matters of faith, the matter is most serious. We can appreciate the gravity of this sin when we consider that the Qur'ān mentions it in the same context as polytheism:

Say (O Muhammad): My Lord has only forbidden immoralities – both those made manifest and those that are concealed – and sin and wrongful transgression, and that you associate with God that for which He has not sent down authority, and that you say about God what you do not know.” [*Sūrah al-A'raf*: 33]

Therefore, the texts must be approached carefully and not in an arbitrary manner. In approaching the sacred texts, two things must be determined: the first being the authenticity of the text in question, and the second being the degree of certainty that can be had in understanding or interpreting the meanings indicated by the text.

The question of authenticity does not pose any problems with respect to the Qur'ān, since orthodox Muslims accept without question the integrity of its text in its entirety. However, the Sunnah is different in this regard. Even though the Sunnah is undisputed as a source or revealed knowledge among orthodox Muslims, the same cannot be said of the total body of ḥadīth²⁷ literature through which the Sunnah is known. The authenticity of individual ḥadīth can vary considerably, and this has engendered a whole body of Islamic sciences related to the criticism of ḥadīth.

²⁷ A ḥadīth is a report. In the context of the Prophet, it is a report conveying something of the Sunnah. [refer to: al-'Asqalānī, *Nuzḥah al-Nazar* (52-53)]

With respect to how a ḥadīth reaches us, it is classified either as a report of the general masses (*khābar mutawātir*) or a report of individual narrators (*khābar al-wāḥid* pl: *akhbār al-āḥād*).²⁸ For a narration to qualify as being a report of the general masses (*mutawātir*), it must be conveyed by such a large number of people that it is, according to the norms of nature, impossible for them to have conspired upon a falsehood. This number must be sustained in every level of the narration's chain of transmission from the beginning to the end, and the topic being reported about must stem from the direct sensory experience of those reporting it.²⁹ In other words, they must have seen or heard what they are reporting.

Mutawātir ḥadīth are accepted as being certain in their authenticity (*qaṭ'ī al-thubūt*), in the same way as the text of the Qur'ān is considered to be authentic. This is a matter of consensus among scholars.³⁰ Ibn Ḥazm writes:³¹

No two Muslims have ever disagreed regarding the obligation of accepting it, or in the fact that its veracity is absolutely certain.

Probably the most well-known *mutawātir* ḥadīth is the Prophet's statement: "Whoever invents a lie and attributes it to me intentionally, let him prepare his seat in the Fire."³² Other *mutawātir* narrations include the ḥadīth relating to the fountain of Kawthar in the Hereafter, the ḥadīth about the believers seeing God in the Hereafter, the ḥadīth about wiping over leather socks, and those relating to the prohibition of all intoxicants.

Unlike *mutawātir* ḥadīth, individual-narrator reports (*akhbār al-āḥād*) do not, on their own, provide certain knowledge of their authenticity. This is a matter of general agreement among scholars. Ibn Taymiyah writes:³³

No one possessing sense has ever claimed that the report of every individual bequeaths knowledge.

²⁸ See: al-Juwaynī, *al-Burhān* (1/368), al-Sam'ānī (1/324), and al-'Asqalānī, *Nuzḥah al-Nazar* (70).

²⁹ See: al-Sam'ānī (1/325), al-'Abbādī (3/272-273) and al-Kalbī (287).

³⁰ Al-Ḥarrānī (1/467).

³¹ Ibn Ḥazm (1/102).

³² *Ṣaḥīḥ al-Bukhārī* (110) and *Ṣaḥīḥ Muslim* (3).

³³ Quoted in al-Ḥarrānī (1/490).

Al-Khaṭīb al-Baghdādī writes:³⁴

An individual-narrator ḥadīth is not accepted until the integrity of its narrators and the continuity of its chain of transmission are verified.

Individual-narrator ḥadīth are not accepted as authentic until both their texts and their chains of transmission are subjected to a careful and rigorous scrutiny. It is in order to carry out such an assessment that the sciences of ḥadīth criticism were developed. Different types of evidence are used to evaluate a report and assess its degree of authenticity. Taken into consideration are factors like the reliability and honesty of the narrators, the ability to demonstrate that all the narrators met one another and that there is no break in the chain of transmission, and the absence of any inconsistency between the text and other texts that are comparable with it.³⁵

Equipped with these methods, scholars of ḥadīth criticism grade individual-narrator ḥadīth on the basis of how likely it is that those ḥadīth are true. These grades include authentic (*ṣaḥīḥ*), good (*ḥasan*) – which are generally accepted for establishing Islamic teachings – as well as weak (*ḍaʿīf*), rejected (*munkar*), and fabricated (*mawḍūʿ*), which are not accepted.

Any ḥadīth that do not fulfil the rigorous requirements are unacceptable as evidence for matters of faith.³⁶ Such ḥadīth cannot be used to deal with questions of belief or inform about matters of the unseen. There is some scholarly disagreement regarding the value of moderately weak (*ḍaʿīf*) ḥadīth, but this disagreement is restricted to the extent to which such narrations can be used as evidence in matters of Islamic Law and Ethics. It certainly does not extend to matters of faith.³⁷

Moreover, with respect to individual-narrator ḥadīth that fulfil the rigorous conditions to be graded as authentic, scholars disagree regarding whether they provide certain knowledge of their authenticity. Some scholars are of the opinion that the conditions

³⁴ al-Khaṭīb al-Baghdādī (1/291).

³⁵ Ibn al-Ṣalāḥ (15-16)

³⁶ al-Ghazālī, *al-Mustaṣfā* (81) and al-ʿAsqalānī, *Nuzḥah al-Naẓar* (71-73)

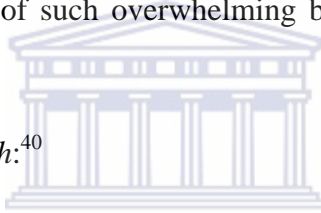
³⁷ For instance, legal scholars differ regarding the permissibility of resorting to moderately weak ḥadīth for establishing legal rulings in the absence of other textual evidence, when the only alternative would be for the jurist to exercise his or her personal judgment. Another point of juristic disagreement is the use of moderately weak ḥadīth for encouraging good acts that are already prescribed on the strength of authentic texts. For an excellent survey of scholarly opinion regarding the use of weak ḥadīth in matters of law, refer to al-Turkī (300-312).

of authenticity set forth by the science of ḥadīth criticism are sufficient to provide certain knowledge. Most notable among them is Ibn Ḥazm, who writes:³⁸

What is transmitted from one individual to another, if it comes as a continuous transmission of trustworthy narrators going back to God’s Messenger, then it is obligatory to act upon it and it is obligatory to have knowledge of its authenticity as well.

The majority of scholars are of the view that such ḥadīth never provide absolute knowledge, since no narrator, regardless of how trustworthy and reliable he or she might be, is infallible.³⁹

Such narrations, however, afford at least an overwhelming belief (*ghalabah al-zann*) in their genuineness. Consequently, though these ḥadīth may not provide absolute certainty, the overwhelming belief that is to be had in their reliability obliges a Muslim to accept them and act upon them without hesitation. A Muslim is expected to act according to the dictates of such overwhelming belief, even though it does not reach the level of certainty.



Al-Shāfi‘ī writes in his *Risālah*:⁴⁰

As for what is found in the Sunnah reported by individual narrators wherein it is possible for disagreement to exist and wherein interpretation is possible, when such reports come to us from individual narrators, then I would say that the evidence it contains has the force to make us abide by it, so they cannot reject what is stated therein any more than they can reject the testimony of a reliable witness. This is not because there is absolute certainty in the report like there is in the text of the Qur’ān or in a report of the general masses about God’s Messenger. If anyone is in doubt about this point, we would not tell him to repent. We would say to him: If you were a person of knowledge, you would have no right to doubt it, just as you would have no right if you were a judge to offer a judgment except in accordance with the testimony of reliable and trustworthy witnesses. Though a mistake is a possibility, you must pass judgment on the face value of their honesty, and God assumes responsibility over what you cannot perceive from them.

Authenticated individual-narrator ḥadīth, though they are to be accepted, do not on their own bequeath certainty regarding their authenticity. There is some scholarly disagreement regarding those authenticated individual-narrator ḥadīth that enjoy the general acceptance of the Muslim nation without reservation. (One might cite as an

³⁸ Ibn Ḥazm (1/115).

³⁹ See: al-Juwaynī, *al-Burhān* (1/388, 392) and al-Ghazālī, *al-Mankhūl* (341).

⁴⁰ al-Shāfi‘ī (461).

example for this the majority of the ḥadīth recorded in the two widely acclaimed “authentic” collections, *Ṣaḥīḥ al-Bukhārī and Ṣaḥīḥ Muslim*.⁴¹) Some scholars argue that such general acceptance strengthens these texts to the point of providing us with certainty regarding their authenticity.⁴² Al-Shāfi‘ī endorses this view in his *Risālah*.⁴³

As for what is a clear text of the Book or a Sunnah that is agreed upon, no excuse will be accepted about it. No doubt is to be entertained about either of these. Anyone who refuses to accept it will be obliged to repent.

Some scholars, likewise, are of the opinion that individual narrator ḥadīth can be strengthened to the point of certain authenticity by any number of contextual or circumstantial indicators.⁴⁴

There is a methodological principle, often seen in the practice of scholars of the Ash‘arī and Māturīdī theological schools, which derives from the idea that authentic individual-narrator ḥadīth do not provide certain knowledge. This is the principle that individual-narrator ḥadīth are not acceptable as evidence for establishing essential matters of creed (‘*aqīdah*).

This principle is stated explicitly by the Māturīdī scholar al-Nāsirī in *al-Nūr al-Lāmi*.⁴⁵

Matters of creed (‘*aqīdah*) are not established upon individual-narrator ḥadīth, because they do not provide absolute, certain knowledge.

Matters of creed in this context refer only to the essential theological doctrines that constitute what a Muslim must believe to be considered within the fold of Islam.⁴⁶

⁴¹ Refer to: Ibn al-Ṣalāḥ (30) and Ibn Taymiyah, *Majmū‘ al-Fatāwā* (13/350-351).

⁴² al-Khaṭīb al-Baghdādī (1/278). Abū Ya‘lā (3/743). Shihāb al-Dīn Ibn Taymiyah attributes this view to the majority of jurists [*al-Ḥarrānī* (1/483)]

⁴³ al-Shāfi‘ī (460).

⁴⁴ This is the view of a number of prominent scholars, including al-Juwaynī, *al-Burhān* (1/374) al-Rāzī, *al-Maḥṣūl* (4/284) and Ibn Taymiyah, *Majmū‘ al-Fatāwā* (18/40). This view was also expressed by al-Ghazālī in *al-Mankhūl* (326).

⁴⁵ al-Nāsirī, *al-Nūr al-Lāmi* (14) manuscript 2973 in the Suleimania Library, Istanbul, as quoted by al-Harbī (178).

⁴⁶ For an excellent discussion on this point by a contemporary scholar, refer to Hītū (304-306). He draws a comparison with the distinction made in Ḥanafī legal terminology between *farḍ* and *wājib* religious duties. Both Arabic words mean “obligatory”, and a person who deliberately neglects to fulfil either a *farḍ* or a *wājib* duty is sinful for neglecting that duty. The distinction is made regarding the evidence that establishes the religious obligation. When that evidence is certain in its authenticity and indications, then and only then is it classified as *farḍ*. When it is established only by uncertain evidence – like individual-narrator ḥadīth – it is classified as *wājib*. A person who denies the obligatory nature of a *farḍ* duty (like the five prayers, the pilgrimage, or the fast of Ramaḍān) is in danger of falling into

Such doctrines, these scholars argue, must be established with certainty, since they must be believed with absolute certainty and conviction. Abū Zayd al-Dābūsī writes:⁴⁷

Absolute certainty is only required for matters that refer back to creed (*'aqīdah*) and not to those that refer to action. [Certainty is required for] that which we are obligated to know about God, His attributes, the affairs of the Hereafter, and those of prophethood – the matters which constitutes the foundation of the religion without which its edifice collapses.

The argument here is that since individual-narrator ḥadīth cannot provide this certainty, they cannot be used as evidence to establish what requires it.⁴⁸

When it is said about Ash‘arī and Māturīdī theologians that they do not accept individual-narrator ḥadīth in establishing essential matters of creed, it means that they do not consider it to be an act of unbelief for a person to reject something that is established only by way of individual-narrator ḥadīth. It does not, however, imply that Muslims are supposed to summarily refrain from accepting the meaning of those ḥadīth.

Al-Juwaynī makes this clear in *al-Irshād*, while discussing the evidence that can be used to establish matters of the unseen:⁴⁹

If the textual evidence is not established by means that are certain and what it implies is not rationally impossible, having its basis in established certainty while being susceptible to interpretation, then there is no way that it can be accepted as certain. However, the person of religious faith will have a preponderance of belief that what the textual evidence indicates is established as true, although it is not absolutely certain.

He states this more strongly in *al-'Aqīdah al-Nizāmiyyah*:⁵⁰

If the transmission is *mutawātir*, then it is known with certainty to the extent that knowledge is to be had in matters established upon textual evidence. If the transmission is by way of individual narrators, then it is established with less than certain belief in what is related textually, and it is to be received with acceptance and not rejected as being unlikely, for viewing such matters as unlikely is a quality of those who have doubt in the principles of faith.

unbelief, whereas a person who denies the obligatory nature of a *wājib* obligation is, at worst, a sinner or a deviant, but still within the pale of Islam.

⁴⁷ al-Dābūsī (173).

⁴⁸ al-Kankuhay (180).

⁴⁹ al-Juwaynī, *al-Burhān* (359).

⁵⁰ al-Juwaynī, *al-'Aqīdah al-Nizāmiyyah* (243).

From these statements of a foremost Ash‘arī theologian⁵¹, it is clear that a Muslim is obliged to accept authentic individual-narrator ḥadīth and to believe what they tell us about matters of faith, including matters of the unseen, unless those ḥadīth contradict with other evidence that provides certain knowledge. Belief is an action of the heart and Muslims are held accountable for such actions just as they are for the actions of their limbs.

Al-Sarakhsī explains how such belief in the heart is akin to the actions of the limbs when he says:⁵²

As for the texts narrated regarding the punishment in the grave and similar matters, some of them are well-known⁵³ and some are individual-narrator reports. They obligate the heart to affirm them. Being held accountable that one’s heart affirms something is of the same degree as being held accountable to act according to it, if not of a greater degree.

‘Alā’ al-Dīn al-Bukhārī says:⁵⁴

It is acceptable for individual-narrator ḥadīth to obligate belief, which is the action of the heart, though it does not obligate certain knowledge. Abū al-Yusr says: “the reports related about the affairs of the Hereafter fall under action, since action is of two types: actions of the limbs and belief of the heart.”

According to these scholars, failure to believe what is authentically related from the Prophet Muhammad about matters of the unseen is sinful in the same way that failure to act according to an injunction of Islamic Law that is established by an individual-narrator ḥadīth is sinful. However, a person who rejects the meaning of an authentic individual-narrator ḥadīth regarding a matter of faith will not fall into unbelief for doing so, but at worst, will have fallen into innovation in his belief, which might be best understood as a “lesser heresy”.

⁵¹ He is also one who, on a number of occasions, clearly put into practice the principle that individual-narrator ḥadīth are not acceptable as evidence for establishing essential matters of creed. Refer to *al-Irshād* (161, 399, 421-422), where he dismisses certain evidence on the basis of it being taken from single-narrator ḥadīth.

⁵² al-Sarakhsī (1/341).

⁵³ In Ḥanafī legal terminology, a Prophetic ḥadīth is classified as well-known (*mashhūr*) if it is related from the Prophet by a single Companion or by a small number of Companions so that it is an individual narrator ḥadīth, but is then subsequently related from the Companions by far greater numbers, as if it were *mutawātir*. Such a ḥadīth is not *mutawātir*, but is recognized in Ḥanafī jurisprudence to be more strongly established than other single-narrator reports. It provides what they call “confident knowledge” (*‘ilm al-tu‘manīnah*) but not certain knowledge. Rejection of such a report does not constitute unbelief. Refer to: *Uṣūl al-Shāshī* (171).

⁵⁴ al-Bukhārī, ‘Alā’ al-Dīn (2/695-696).

What is important for our purposes is the clear point of consensus that exists among all scholars of *Ahl al-Sunnah wa al-Jamā‘ah*. They agree that authentic individual-narrator ḥadīth are to be accepted as evidence for information about matters of the unseen and that a Muslim is generally obligated to believe in what those ḥadīth say about those matters.

Statements of the Companions regarding matters of the unseen:

Ibn Ḥajar, in his biographical encyclopaedia of the Companions, defines a Companion as: “...anyone who met the Prophet believing in him and died as a Muslim.”⁵⁵

The Companions have a special status in Islam, since they are the ones who lived with the Prophet and learned the faith from him directly. They witnessed the revelation firsthand and had an intimate understanding of the context in which that revelation was sent down. They were also the ones who conveyed the religion of Islam to the rest of the world.

Orthodox scholars agree that the Companions are considered to be trustworthy and reliable in what they convey of the religion. Ibn Ḥajar writes:⁵⁶

Ahl al-Sunnah agree that all of the Companions are trustworthy. There is no disagreement on this point, except for some strange exceptions found among the heretical innovators... The trustworthiness of the Companions is established and well known, since Allah establishes their integrity, informs us of their purity, and tells us that He chose them.

He goes on to cite six verses of the Qur’ān by way of example. Therefore, according to Muslim orthodoxy, the Qur’ān itself attests to their good character, and it is considered a matter of faith to revere them and acknowledge their trustworthiness. Teachings to this effect can be found in nearly every Sunni statement on creed.⁵⁷

Because of these considerations, a statement made by a Companion in a matter where personal opinion does not come into play is implicitly understood by many scholars to be a narration from the Prophet, since there is no other way that the Companion could

⁵⁵ al-‘Asqalānī, *al-Iṣṣābah* (9). See also: *Nuzḥah al-Naẓar* (149).

⁵⁶ al-‘Asqalānī, *al-Iṣṣābah* (11).

⁵⁷ See: al-Ṭaḥawī, *al-‘Aqīdah*, published with Ibn Abī al-‘Izz (2/704). al-Ghazālī, *Iḥyā’ ‘Ulūm al-Dīn* (1/166) and *al-Iqtiṣād* (152).

know about it.⁵⁸ This would include matters of the unseen, as well as rulings pertaining to abstract matters of worship and similar matters of Islamic Law in which juristic discretion (*ijtihād*) and personal opinion do not play a role.

However, as the Egyptian ḥadīth scholar Aḥmad Muḥammad Shākir points out, when it comes to matters of Islamic Law, people can differ regarding which issues are closed to a jurist's opinion.⁵⁹ Understandably, there have been scholars who have rejected this principle outright, at least with regard to matters of Islamic Law.⁶⁰

An important application of this principle is where a Companion states that a certain verse of the Qur'ān was revealed for a particular reason or in response to a particular set of circumstances. This is taken as being equivalent to a ḥadīth of the Prophet. Al-Ḥākim says:⁶¹

The Companion who witnessed the revelation taking place and witnessed it being sent down, when he says that a certain verse came down for a particular reason, then this is a ḥadīth reaching back (to the Prophet).

There is, however, one equally important exception to this general rule. When it comes to detailed information pertaining to the nations of old, other matters of antiquity, and similar topics that were addressed by the Jewish and Christian scriptures, then there is a possibility that the Companion is relating something taken from Judeo-Christian sources. (Such narrations are collectively referred to as *Isrā'īliyyāt*). The reason for this possibility is that the Prophet permitted his Companions to quote from those sources, for he said:⁶²

Convey from me even a single verse. You may recite from the Children of Israel without harm. Anyone who deliberately tells a lie against me will have prepared his seat in the Hellfire.

⁵⁸ See: al-'Asqalānī, *al-Nukat 'alā Kitāb Ibn al-Ṣalāh* (192-193), al-Suyūṭī, *Tadrīb al-Rāwī* (1/212) and al-Rāzī, *al-Maḥṣūl* (4/449).

⁵⁹ Shākir (46).

⁶⁰ Most notable among these is Ibn Ḥazm (1/210-211).

⁶¹ al-Ḥākim, *Ma'rifaḥ 'Ulūm al-Ḥadīth* (20).

⁶² *Ṣaḥīḥ al-Bukhārī* (3461)

Here, the Prophet is giving his Companions permission to relate from the Jewish traditions. However, the Prophet also explains to them how a Muslim is supposed to approach those traditions, saying:⁶³

Whatever the People of the Scripture tell you, neither believe them nor deny what they say, but rather say: "I believe in God, His scriptures, and His Messengers." For if what they tell you is true, you will not be denying them, and if it is false, you will not be believing them.

This means that though the Prophet did not prevent his Companions from relating these traditions, he did prohibit them from believing or disbelieving those traditions on their own merits. If a story related from Jewish or Christian sources agrees with what is in the Qur'ān and Sunnah, then and only then it is known to be true. Likewise, if it contradicts what is said in the Qur'ān and Sunnah, a Muslim must know that it is false. Otherwise, a Muslim is obliged to have an agnostic attitude regarding its veracity.

Ibn Taymiyah discusses the nature of this third category of traditions that are neither confirmed nor denied by the sacred texts:⁶⁴

Most of this is of no benefit to it with respect to matters of religion. For this reason, the scholars of the People of the Scripture disagreed considerably about such matters. For this reason, there is disagreement coming from scholars of Qur'ān exegesis, like when they mention the names of the people of the cave or the colour of their dog, or their number, or the type of wood from which Moses' staff was made, or the names of the birds that God had brought to life for Abraham, or the part of the heifer which was used to strike the man who was slain, or the type of tree from which God spoke to Moses, or other matters that God did not detail in the Qur'ān. Such details that are of no benefit to legally accountable people, neither in their worldly lives nor in their religion. However, it is permissible to relate the disagreements on these matters from them.

Because of the possibility that what a Companion is narrating on such matters might come from the *Isrā'īliyyāt*, it cannot be assumed that the Companion is relating from the Prophet unless the Companion explicitly says so. This is especially true for Companions like Ibn 'Abbās and 'Abd Allah b. 'Amr⁶⁵, who are known to have related a considerable amount of material from Jewish and Christian traditions. Ibn

⁶³ *Musnad Ahmad* (17225, 17226) and *Sunan Abī Dāwūd* (3644). This ḥadīth is good (*ḥasan*), having a strong chain of transmission. Refer to: al-Arna'ūt, Shu'ayb *et al.*, *Musnad Ahmad* (28/460-462) and al-Albānī, *Silsilah al-Aḥādīth al-Sahīḥah* (6/712-714, ḥadīth #2800).

⁶⁴ Ibn Taymiyah, *Majmū' al-Fatāwā* (13/367).

⁶⁵ Ibn Taymiyah, *Majmū' al-Fatāwā* (13/366).

Taymiyah mentions that Ibn Mas‘ūd and Ibn ‘Abbās had related some of the traditions of the Jews and Christians, and that some of what al-Suddī al-Kabīr relates from them in his exegesis of the Qur’ān is of this nature.⁶⁶

Scholars exhibit different attitudes about the commentary of the Companions on the Qur’ān when matters of the unseen are involved. Some, like al-Ḥākim, take an extremely strict view. In spite of his claim that both al-Bukhārī and Muslim accept all the commentary of the Companions as being ḥadīth of the Prophet⁶⁷, he personally accepts it as such only in cases where the Companion is discussing the reason why a verse of the Qur’ān was revealed. Otherwise, he does not consider any commentary of the Companions as being equal to a statement of the Prophet.⁶⁸ Aḥmad Shākir’s view on the matter is equally as strict.⁶⁹

Many scholars, like Ibn al-Ṣalāḥ⁷⁰, al-Nawawī⁷¹, Ibn Kathīr⁷², and al-‘Irāqī⁷³ show a similar tendency, though their choice of expression indicates a greater degree of leniency. Ibn Ḥajar, by contrast, accepts all narrations of the Companions regarding matters of the unseen as being from the Prophet unless the Companion is specifically known to have related *Isrā’īliyyāt*. He goes on to cite ‘Abd Allah b. ‘Amr and ‘Abd Allah b. Salām as examples of such Companions.⁷⁴

Al-Sakhāwī discusses the opinions of both al-‘Irāqī and Ibn Ḥajar and then offers his view that regardless of whether or not the Companion is known to have related *Isrā’īliyyāt*, he would not relate such things in matters where there are legal implications, and that what really must be taken into consideration is the subject matter itself. After discussing at length his opinion that the Companions had a general dislike for relating things from Jewish and Christian traditions, he writes:⁷⁵

⁶⁶ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (13/366).

⁶⁷ al-Ḥākim, *al-Mustadrak* (1/183).

⁶⁸ al-Ḥākim, *Ma‘rifah ‘Ulūm al-Ḥadīth* (20).

⁶⁹ Shākir (46).

⁷⁰ Ibn al-Ṣalāḥ (47).

⁷¹ al-Nawawī, *al-Taqrīb*, published with *Tadrib al-Rāwī* (1/215-216).

⁷² Ibn Kathīr, *Ikhtisār ‘Ulūm al-Ḥadīth*, published with *al-Bāḥith al-Ḥathith* (46).

⁷³ al-‘Irāqī, *al-Taḥqīd wa al-‘Idāḥ* (62). Also: *Sharḥ al-Tabṣīrah wa al-Tadhkirah* (1/200) where he expresses sympathy for the stance of Ibn Ḥazm.

⁷⁴ al-‘Asqalānī, *al-Nukat ‘alā Kitāb Ibn al-Ṣalāḥ* (193). See also *Nuzḥah al-Nazar* (141) and *Fath al-Bārī* (6/395).

⁷⁵ al-Sakhāwī (1/165).

This is not contradicted by “*You may recite from the Children of Israel...*”, because that is specifically in reference to the events that befell them and the reports related about them, because of what (those reports) provide of lessons and moral exhortations.

Al-Sakhāwi’s view is that the possibility of a Companion’s statement being from the *Isrā’īliyyāt* is much higher when the topic of the statement pertains to the events of past nations.

In any case, the question remains one of likelihood, not certainty. It may be that the statements of Companions who are not known to have related from the traditions of the Jews and Christians may be accepted with a greater degree of confidence; nevertheless, the possibility cannot be entirely ruled out that they are quoting Jewish or Christian sources when the subject matter allows for such a possibility.⁷⁶

As for what is related on these matters by later generations, such statements can never be assumed to be attributable to the Prophet. Ibn Taymiyah addresses both of the points when he writes about the disagreements in Qur’ān exegesis that often results from such narrations:⁷⁷

This applies to what is related from some of the Successors⁷⁸, even if they do not mention that they took it from the People of the Scripture, for when the Successors disagree, their statements are not proof against each other. A person can receive what is authentically related about such matters from some of the Companions with more confidence than what is related from some of the Successors, since the possibility is stronger that they heard it from the Prophet or from someone who heard it from him, and the narrations of the Companions from the people of the Scripture are fewer than the narrations of the Successors from them. When a Companion is assertive in what he says, how can it be said that he related it from the People of the Scripture, when they had been prohibited from believing them? The point here is that disagreements of this nature, where what is authentic cannot be known, and where relating the opinions about it brings no benefit, is like having knowledge of what is related of ḥadīth that have no evidence for their authenticity.

⁷⁶ The contemporary Egyptian scholar, Muḥammad ‘Amr b. ‘Abd al-Laṭīf observes (54-55): “It is possible that Ibn Mas‘ūd, Abū Mūsā al-Ash‘arī, ‘Ā’ishah, and others also related some things from the People of the Scripture. This matter is not restricted to the likes of Salmān, ‘Abd Allah b. Salām, Ibn ‘Abbās, and Ibn ‘Umar, as some might assume. It is just that those people did so more frequently.”

⁷⁷ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (13/345-346).

⁷⁸ The Successors were the generation that came after the Companions and learned from them directly.

What this amounts to is that claims about the unseen found in such texts cannot be used as evidence for establishing matters related to a Muslim's belief.

Interpreting the texts:

The Qur'ān speaks about itself as follows:

“And indeed it is a revelation from the Lord of all the worlds, brought down by the Trustworthy Spirit upon your heart (O Muhammad) – that you may be of those who give warning – in a clear Arabic tongue.” [*Sūrah al-Shu'arā'*: 192-195]

“It is an Arabic Qur'ān without any crookedness, that perhaps they might fear God.” [*Sūrah al-Zumar*: 28]

The Qur'ān does not address humanity using arcane symbols or indecipherable metaphors. The language of the Qur'ān is clear, and the Qur'ān must be understood strictly in conformity with the dictates of the Arabic language in which it was revealed.

The same can be said about the Sunnah of the Prophet Muhammad. His role was to make matters clear to the people. The Qur'ān says:

“And We revealed to you the Reminder so that you may make clear to the people what was sent down to them, and that perhaps they might give thought.” [*Sūrah al-Nahl*: 44]

Does this mean that nothing of the Qur'ān or Sunnah is open to interpretation? Certainly not. The meanings conveyed by the sacred texts may or may not lend themselves to the possibility of more than one interpretation. However, in classical Islamic thought, the language is the decisive factor in determining the existence of such a possibility.

Al-Shāfi'ī writes:⁷⁹

God addresses the Arabs in His Book by none other than their own language according to what they understood of its meanings. And among what they understood of its meanings is how vast and flexible their language is.

Some words and phrases in Arabic convey meanings that are precise and that provide absolute certainty about what they indicate (*qaṭ'ī al-dilālah*). These texts are not open

⁷⁹ al-Shāfi'ī (51-52).

to discussion and interpretation.⁸⁰ Their meanings must be accepted without question. When the text in question is certain in its authenticity (*qaṭ'ī al-thubūt*) as well as in its meaning (*qaṭ'ī al-dilālah*), then, without a doubt, those meanings are to be taken by Muslims as tenets of faith.

Other words and phrases can indicate more than one possible meaning, in and of themselves or in consideration of the contexts in which they appear. There may be various degrees of ambiguity regarding certain meanings that a text might possibly be understood to convey. These texts, consequently, offer varying degrees of uncertainty regarding the meanings that can be understood from them. They are uncertain in their indications (*ẓannī al-dilālah*).

Since all knowledge regarding matters of the unseen is taken from the sacred texts, when the meaning of a text relating to some matter of the unseen is precise and unambiguous, then the matter must be accepted on faith. Al-Ghazālī writes:⁸¹

Whenever the textual evidence is certain in both its meaning and authenticity, without any chance of it being otherwise, then it must be believed with certainty. Where it is uncertain, then it must be believed to that extent.

Consequently, when the text is less than perfectly clear, then assessing the level of uncertainty becomes crucial. In many cases, one of the possible meanings of a word, phrase, or passage will be more apparent than others.⁸² The context may indicate that this apparent meaning is in fact what is intended or it may just be that there is no reason to assume something else. In either situation, it is wrong to reinterpret the text to understand from it something other than its apparent meaning.⁸³ The principle in operation here is that a text should always be understood on its apparent meaning as long as it is possible to do so.

In other cases, this more apparent meaning will either be less strongly apparent or there will be other factors and contextual indicators that indicate that an alternative

⁸⁰ See: al-Ghazālī, *al-Mankhūl* (243) and Ibn Qudāmah, *Rawḍah al-Nāzir* (2/560).

⁸¹ al-Ghazālī, *al-Iqtisād* (132).

⁸² al-Āmidī, *al-Iḥkām* (3/49).

⁸³ Ibn Qudāmah, *Rawḍah al-Nāzir* (2/563).

possible meaning is intended. In such a situation, it will be necessary to interpret the texts according to the dictates of the evidence.⁸⁴

In the same way, the dictates of the language and the context will determine whether a certain word or passage is meant to be taken literally or metaphorically. Most classical scholars acknowledge that the Qur'ān contains metaphor, but only in conformity with the constraints and conventions of the Arabic language.⁸⁵ Accordingly, any claim that a word or phrase is being employed metaphorically must be established with a clear linguistic precedent and proven with contextual evidence. Again, the principle is that a metaphorical meaning shall not be assumed unless the literal meaning proves to be untenable in the context.⁸⁶

Ibn Taymiyah and many scholars who follow his way of thinking are known to be highly critical of dividing speech into the literal and the metaphorical. However, this does not mean that Ibn Taymiyah denies that words have different meanings in different contexts. He simply denies that any of the various meanings of a particular word are distinct from any of its other meanings with respect to how the word indicates those meanings. For him, the meanings of all words are simply to be understood from their contexts according to the textual and extra-textual indicators that define how the word is being used in a particular instance. He writes:⁸⁷

There is no such thing as someone uttering a word that is completely devoid of any contextual qualifier. No one speaks except with speech that is composed and qualified, with each part of the utterance intrinsically tied to every other part. All of this qualifies the utterance and makes it impossible for anything to be totally devoid of contextual qualification. This makes it clear that those who distinguish between literal and metaphorical meanings have no reasonable standard upon which to make that distinction. Consequently, the distinction is a false one. Therefore, every word found in God's book and in what his Messenger said is contextually qualified with what clarifies its meaning, so none of it is metaphor; it is all literal.

It is through the context that the meaning of any word is to be understood and interpreted. Quite often, Ibn Taymiyah fully agrees with the interpretations of those who assert that a particular word is being used metaphorically; he just refrains from

⁸⁴ See: al-Ghazālī, *al-Mustasfā* (196) and al-Āmidī, *al-Ihkām* (3/50).

⁸⁵ al-Āmidī, *al-Ihkām* (1/40).

⁸⁶ See: al-Ghazālī, *al-Mustasfā* (190) and Ibn Qudāmah, *Rawḍah al-Nāzir* (2/557).

⁸⁷ Ibn Taymiyah, *Majmū' al-Fatāwā* (4/72).

calling that particular usage metaphorical. He gives the following example to clarify his point:⁸⁸

One of the examples cited by those who assert the existence of metaphor in the Qur'ān is: “So ask the town.”⁸⁹ They say: “The meaning here is ‘the people of the town’, with the first part of the genitive construct removed and the second part standing in its place.”

The answer to this is that words like “town”, “city”, “river”, and “fount” both contain things and are containers of things, and both of these aspects are part of the word’s meaning. The intended meaning can either be what is contained – in this case the population – or what contains them, which in this case would be the location.

He says elsewhere:⁹⁰

Levels of clarity and rhetorical eloquence vary. A word indicates nothing apart from its context. So whoever thinks the literal meaning of a statement like “So ask the town” is to ask the town walls, such is an ignorant person.

Therefore, the rejection of metaphor by the likes of Ibn Taymiyah does not imply a rejection of interpreting words differently according to the dictates of differing contexts. Sometimes, like in the example above, his interpretation is the same as it is for those who acknowledge metaphor. In other cases, as we shall see, Ibn Taymiyah approaches the interpretation of certain words in a slightly different manner.⁹¹ However, for all orthodox scholars, both those who acknowledge metaphor and those who deny it, the context and the norms of the Arabic language are the decisive factors in interpretation.

Finally, there are cases where some aspect of a text’s meaning is ambiguous. This means that no opinion may be asserted about it in the absence of other evidence.⁹² This evidence may be in the form of another verse of the Qur’ān or a ḥadīth of the Prophet. Otherwise, a Muslim must refrain from speculation about it.

⁸⁸ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (4/75). The example he gives here is, strictly speaking, one of metonym, but in debates about the existence of metaphor in Arabic, the distinction between the two is not made. Furthermore, the same Arabic word (*majāz*) is used for both metaphor and metonym.

⁸⁹ *Sūrah Yūsuf*: 82.

⁹⁰ Ibn Taymiyah, *al-Haqīqah wa al-Majāz* (69)

⁹¹ Refer to Chapter Two and Ibn Taymiyah’s interpretation of the verse: “And He sent down to you from the cattle eight mates.”

⁹² Ibn Qudāmah, *Rawḍah al-Nāzir* (2/572).

Summary:

Islam is understood by orthodox Muslims to be a revealed religion, with the Qur'ān and Sunnah as its two textual sources. The text of the Qur'ān is accepted as being unquestioningly authentic and accurate. The Sunnah – for our purposes, the collected sayings, actions and tacit approvals of Prophet Muhammad – is narrated in traditions (ḥadīth) which are accepted as unquestioningly authentic only when they are reports of the general masses (*mutawātir*) whereby it is deemed impossible for the narrators, due to their sheer number, to have agreed upon a lie or an error. Otherwise, ḥadīth texts are regarded as individual-narrator reports (*akhbār al-āḥād*), whose authenticity must be ascertained through a rigorous evaluation of their wording and chains of transmission.

Authenticated ḥadīth are valid as evidence for establishing Islamic teachings, both in matters of Islamic Law and matters of belief. Ash'arī and Māturīdī theologians, contrary to Salafī scholars⁹³, argue that authenticated individual-narrator ḥadīth cannot be used to establish essential points of creed. They still deem it obligatory for a Muslim to accept what an authenticated ḥadīth says, but they do not regard someone's failure to do so as constituting an act of unbelief.

Scholars differ regarding the authenticated statements of the Companions regarding matters of the unseen, but generally concur that those statements never reach the level of certain knowledge required to obligate belief in points of religious doctrine. This is due to the possibility that the source of those statements might be the *Isrā'iliyyāt*.

Orthodox Islamic scholars, based on their understanding of the sacred texts, assert a positive epistemological value to knowledge gained of the observable world through empirical means. Knowledge about matters of the unseen, by contrast, is derived from the sacred texts, and Muslims are obliged to believe what the sacred texts say about those matters. Past events are matters of the unseen when the sacred texts provide the only source of information about them. Other past events can be learned about by way of historical and physical evidence.

⁹³ Ibn Taymiyah asserts: “The position of our scholars is that individual-narrator ḥadīth, when they are determined to be acceptable, can be used to assert essential matters of creed.” [Quoted in al-Ḥarrānī (1/496).]

The Qur'ān and Sunnah are to be understood according to the dictates of the Arabic language. The clarity or ambiguity of each text is to be assessed according to both language and context, with preference given to the apparent or literal meaning of the text whenever possible. When the context determines that the literal or apparent meaning is untenable, interpretation is allowed according to the dictates of the context and in conformity with the constraints and conventions of the Arabic language. When the sacred texts do not give clear information about a matter of the unseen, speculation about that matter is not allowed. Therefore, awareness of what the texts are *not* saying is vitally important to an accurate understanding of what they are saying.



CHAPTER TWO

THE CREATION OF THE HEAVENS AND THE EARTH

The mere existence of the universe is certainly not from the realm of the “unseen”. It is readily visible to everyone. On the other hand, the idea that the creation of the heavens and the Earth took place in six days is very much part of the unseen, since the source for this idea is the Qur’ān, which contains verses such as the following:

Verily, your Lord is God who created the heavens and the Earth in six days then mounted the throne. [*Sūrah al-A‘rāf*, 54]

As for the duration and nature of these six days, the Qur’ān and authentic Sunnah do not provide us with any information. As a number of commentators have pointed out, it is not necessary for these days to be the same length as ours, because the Sun and the Earth had to first be created and set in their proper motions before day and night as we know them could exist.⁹⁴

Another reason it is not necessary to assume that the six days of creation were the same length as our present days is that the Qur’ān mentions days of different durations under different circumstances. For instance:

Verily, a day with your Lord is like a thousand years by your count. [*Sūrah al-Ḥajj*, 47]

Ibn Jarīr relates the following account that illustrates to us how one eminent Companion approached this question:⁹⁵

A man asked Ibn ‘Abbās about ‘a day the extent of which is a thousand years’⁹⁶. So Ibn ‘Abbās said to him: “So what is ‘a day the extent of which is fifty thousand years’⁹⁷?

The man said: “I only asked you so you could relate something to me.”

So Ibn ‘Abbās said: “They are two days that God mentioned in His Book. And God knows best about them. I hate to say something about God’s book that I do not know.”

Consequently, we find that classical scholars have disagreed about the duration of the six days of creation. Some have maintained that their duration is exactly like that of

⁹⁴ See: al-Bayḍawī (3/15), al-Shawkānī (1/1001), and al-Alūsī (8/518).

⁹⁵ al-Ṭabarī (23/254). See also: Ibn Kathīr (6/307).

⁹⁶ From *Sūrah al-Sajdah*: 5.

⁹⁷ From *Sūrah al-Ma‘ārij*: 4.

our own days.⁹⁸ Other scholars have said that each day is equivalent to a thousand years. This was the opinion of Mujāhid and Aḥmad b. Ḥanbal. This opinion was also related from Ibn ‘Abbās by Ibn Abī Ḥātim, Abū al-Shaykh, and Ibn Mardawayh.⁹⁹

Al-Qushayrī said: “The meaning of “in six days” are the days of the Hereafter, each day being a thousand years.”¹⁰⁰

Later commentators had a tendency not to commit themselves to a definite timeframe. Al-Bayḍāwī, for instance, allows the six days to be merely “six time periods”. He elaborates on his reasons, saying:¹⁰¹

It means six periods of time, like in God’s statement: “And whoever shall turn his back to them on that day”¹⁰² or it could mean the duration of six days. What is commonly known as a “day” is the period of time from sunrise to sunset, and this [sunrise and sunset] was not taking place back then.

The Qur’ān, by mentioning a day of a thousand years of our reckoning, indicates that a day does not necessarily have to be the duration of time that we are accustomed to. This leaves the matter open to possibilities. The disagreement of the scholars on this matter is indicative of this uncertainty.

The Qur’ān does not even indicate that the six days were equal to each other in duration. All that can be ascertained from the texts is that the creation of the heavens and the Earth took place in six stages over a period of time. Therefore, the exact duration and nature of these stages cannot be determined from scripture.

Regarding the chronology of the major events of Creation, there is no explicit statement on this matter in the Qur’ān. A number of scholars have held the view that the Earth was created before the sky. They base their argument on the following verses:

It is He who created for you all that is in the Earth and then turned to the heaven and made them seven heavens. And He has knowledge of all things. [*Sūrah al-Baqarah*: 29]

⁹⁸ Ibn Kathīr mentions this opinion (3/165) without attributing it to anyone by name.

⁹⁹ al-Shawkānī (1/738).

¹⁰⁰ al-Qurṭubī, *al-Jāmi’* (7/195).

¹⁰¹ al-Bayḍāwī (3/15).

¹⁰² From *Sūrah al-Anfāl*: 16.

Say: Do you indeed disbelieve in Him who created the Earth in two days and attribute to Him equals? That is the Lord of all the worlds. And He placed in it firmly set mountains upon its surface and blessed it and determined therein its sustenance within four days without distinction – for those who ask. Then he directed Himself to the heaven while it was smoke and said to it and to the Earth: “Come forth willingly or by compulsion.” They said: “We come forth willingly.” And He completed them as seven heavens in two days and inspired in each heaven its command. And We adorned the nearest heaven with lamps and as a protection. This is the determination of the Mighty, the All-Knowing. [*Sūrah Fuṣṣilat: 9-12*]

Ibn Kathīr writes:¹⁰³

These two texts indicate that the Earth was created before the sky, and this is something in which I know of no argument among scholars, except what Ibn Jaṣr related from Qatādah that the sky was created before the Earth.

Al-Qurṭubī, in his commentary on the verse in *Sūrah al-Baqarah*, cites another passage in the Qur’ān that speaks about the creation of the heavens. It is a passage that concludes with: “And after that He spread the Earth”.¹⁰⁴ In order to reconcile this passage with the aforementioned verses, al-Qurṭubī favours a more complex scenario:¹⁰⁵

The opinion of Qatādah (that the heaven was created first) is correct if we understand that God created the smoke of heaven first, then created the Earth, then turned to the heaven again while it was smoke and fashioned it, then spread the Earth after that.

Ibn ‘Aṭīyah, while discussing the verse in *Sūrah al-Baqarah*, states that chronology is not being indicated at all.¹⁰⁶ He is followed in this view by al-Rāzī, who explains:¹⁰⁷

The correct answer to this is that the word “then” (*thumma*) is not for chronological order here but it is merely to enumerate blessings. It is like when one man says to another: “Did I not give you great benefits, then raised your status, then repelled your opponents?” It may be that some of what he mentioned later actually took place first, and the same can be said here. And God knows best.

¹⁰³ Ibn Kathīr (1/197).

¹⁰⁴ *Sūrah al-Nāzi‘āt*:

¹⁰⁵ al-Qurṭubī, *al-Jāmi‘* (1/296).

¹⁰⁶ Ibn ‘Aṭīyah (70).

¹⁰⁷ al-Rāzī, *Mafātīḥ al-Ghayb* (2/143).

Al-Bayḍāwī concurs, saying:¹⁰⁸

Perhaps the word “then” here is to indicate the disparity between the two creations and the greater merit of the creation of the heavens over the creation of the Earth. This is like (the use of the word *thumma*) when God says: “Then he had been among those who believed”. It is not to indicate that it took place later chronologically.

What it comes down to is that the textual evidence is inconclusive on the matter. The Qur’ān does not describe in certain terms the order of the events of creation any more than it indicates a timeframe.

There is, however, a ḥadīth in *Ṣaḥīḥ Muslim* that seems to sketch a rough chronology of events. It reads as follows:¹⁰⁹

God created the dust on Saturday. He created the mountains on Sunday. He created the trees on Monday. He created the despised things on Tuesday. He created the light on Wednesday. He scattered the beasts throughout it on Thursday. He created Adam in the late afternoon on Friday as the last creation on the last hour of Friday, between the late afternoon and the night.

This ḥadīth is one of the few controversial ḥadīth related in *Ṣaḥīḥ Muslim*. Al-Bukhārī was among the ḥadīth scholars who criticized it. He writes in *al-Tārīkh al-Kabīr*:¹¹⁰

Some of them have said that it is from Abū Hurayrah who took it from Ka’b al-Aḥbār¹¹¹. This is the most correct view.

Ibn Kathīr, in his commentary of the Qur’ān writes:¹¹²

This ḥadīth is one of the unusual ḥadīth found in *Ṣaḥīḥ Muslim*. ‘Alī al-Madīnī, al-Bukhārī, and a number of other leading scholars of ḥadīth have criticized it, saying that it is the statement of Ka’b and that Abū Hurayrah merely heard it from Ka’b al-Aḥbār and some narrators simply got confused and attributed it to the Prophet. This has been thoroughly researched by al-Bayhaqī.

¹⁰⁸ al-Bayḍāwī (1/27).

¹⁰⁹ *Ṣaḥīḥ Muslim* (2789), *Sunan al-Nasā’ī al-Kubrā* (10943), *Ṣaḥīḥ Ibn Ḥibbān* (6161), *Musnad Aḥmad* (8341), and al-Bayhaqī in *al-Asmā’ wa al-Ṣifāt* (2/124-125).

¹¹⁰ al-Bukhārī, *al-Tārīkh al-Kabīr* (1/383) in the entry for Ayyūb b. Khālīd b. Abī Ayyūb al-Anṣārī.

¹¹¹ Ka’b b. Mātī’, better known as Ka’b al-Aḥbār, was a Jewish convert to Islam and a contemporary of the Companions. He had extensive knowledge of Jewish traditions and related a considerable number of them to the Companions. [Refer to: al-Dhahabī, *Siyar A’lām al-Nubalā’* (2/3118; Mu’assasah al-Risālah 3/489) and al-‘Asqalānī, *al-Iṣābah* (1127)]

¹¹² Ibn Kathīr (1/199).

Ibn Taymiyah comments:¹¹³

It is a defective ḥadīth. It has been declared defective by quite a few scholars.

One of the main criticisms levied against the ḥadīth – apart from the allegation that it is a statement of Ka‘b – is its apparent contradiction to the verses of the Qur’ān that describe the creation of the heavens and the Earth to have taken place in six days. This ḥadīth seems to mention seven.

However, other scholars, like Ibn al-Jawzī¹¹⁴ and al-Shawkānī¹¹⁵, consider the ḥadīth to be authentic. It can be argued that the only creative activity mentioned in the ḥadīth for Friday is the creation of Adam. The ḥadīth says nothing about the creation of the heavens and the Earth on that day. Likewise, the verses in the Qur’ān that discuss the creation of the heavens and the Earth in six days make no reference to the creation of Adam. This, therefore, resolves the apparent contradiction between this ḥadīth and the verses of the Qur’ān.

In any event – and in deference to the fact that the ḥadīth is narrated in *Ṣaḥīḥ Muslim* – it warrants being analysed to determine what the text is saying and what it is not saying about the creation of the heavens and the Earth.

First of all, as has already been discussed, there is no reason to assume that the days mentioned in the ḥadīth correspond in duration to days as we know them now, even though these days are named. However, the fact that they are named is a clear indication both of chronology and of the idea that each day follows directly after the one before it. We are, therefore, apparently dealing with seven intervals of time that follow one another in chronological succession.

It is important to point out, as al-Qurṭubī does,¹¹⁶ that no direct reference is made in the ḥadīth about the creation of the heavens. It mentions that “the light” was created on Wednesday, but it would be an assumption to say that this refers to the Sun. Al-Qurṭubī assumes the light to refer to all luminescent heavenly bodies, and concludes that this might mean that the creation of the heavens took place during this period of time. However, he makes this suggestion only tentatively.

¹¹³ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (17/236).

¹¹⁴ Ibn al-Jawzī (1253).

¹¹⁵ al-Shawkānī (1/61).

¹¹⁶ al-Qurṭubī, *al-Mufḥim* (7/343).

It mentions that dust was created during the first interval. It would be again an assumption to interpret this as the Earth's crust or as the rocky substance of the Earth. Both of these interpretations, and possibly quite a few others, would be equally valid.

It clearly places the creation of the mountains in the second interval of time. However, since we cannot possibly determine in scientific terms what is meant by the creation of dust that occurred before it, the processes being referred to here cannot be determined from the texts with any accuracy.

Al-Qurṭubī explains what is apparent to us from the language, saying:

It is as if He created the dust on Saturday unassembled and unsolidified, then on Sunday, He solidified it and made from it the mountains that stabilized the Earth. He created the Earth with its mountains in two days.¹¹⁷

It mentions that “trees” were created in the third interval of time. Though the word *shajar* is used here, which is commonly used to refer to trees, its meaning is broad enough to encompass most types of plants. It is quite likely, and quite acceptable linguistically, that the word is being used here to refer to plants in general. Our modern minds might find it tempting to presume that the word is being used in this context not only to signify all plant life, but possibly all photosynthesising life forms including algae and cyanobacteria. However, it would be presumptuous to do so. Indeed, the possibility remains that the ḥadīth is referring to trees and is simply not saying anything about other plant life or about the interval of time in which those other plants first appeared on the scene. This is something impossible to determine from the wording of the text.

As for the “despised things” that were created during the fourth interval of time, there is no direct textual evidence to explain it. Al-Qurṭubī ventures the idea that it refers to things that cause harm like poisons and harmful insects.¹¹⁸ However, he presents this merely a suggestion.

The ḥadīth is related in *Sunan al-Nasā'ī al-Kubrā*¹¹⁹ and by Thābit b. Qāsim differently. Instead of the word “*makrūh*” that means “despised things”, the word

¹¹⁷ al-Qurṭubī, *al-Mufhim* (7/342).

¹¹⁸ al-Qurṭubī, *al-Mufhim* (7/342).

¹¹⁹ *Sunan al-Nasā'ī al-Kubrā* (11328).

“*tiqn*” is given. The word *tiqn* refers to the natural world.¹²⁰ Scholars have interpreted it in this context to mean natural resources like iron and precious stones.¹²¹ Again, this is not an indisputable interpretation.

Al-Nawawī does not consider these two variations of the ḥadīth to be problematic, since both the despised things and the *tiqn* could have been created on the same day.¹²²

The ḥadīth mentions that the beasts were scattered throughout the Earth during the sixth interval of time. This raises two questions: What is being referred to by the word “beasts”? And what is meant by their being “spread throughout” the Earth?

The word we are translating as “beasts” is the word “*dābbah*”. It literally means any animal that treads upon the Earth. This includes all terrestrial animals that walk on the ground. However, it could very possibly refer in this context to all animal life, since the word can be found in this broader context in the Qur’ān:

And there is no beast on the Earth except that upon God is its sustenance. [Sūrah Hūd: 9]

The phrase “scatter throughout” the Earth (*baththa fihā*) might simply be implying the creation of these creatures. Yet, this is not what the words mean. The language of the ḥadīth indicates something else like their distribution, variation, or dispersal over the globe, since the words “*baththā fihā*” do not convey the meaning of “to create” and the context in which it is used does not limit the interpretative possibilities. It implies that the creation of these beasts must have occurred by the sixth interval of time. However, it does not rule out the possibility that their initial creation may have already occurred during one of the previous intervals.

The ḥadīth does mention plainly that Adam was created near the very end of the seventh and final interval of time. This is worded in terms allowing for no other interpretation. The ḥadīth is clearly saying that Adam came on the scene quite late and that all major acts of creation were completed well before his arrival.

¹²⁰ al-Fayrūzabadī (1183).

¹²¹ al-Qādī ‘Iyād (8/321). al-Qurṭubī, *al-Mufhim* (7/342) and al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (1957).

¹²² al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (1957). The version of the ḥadīth related by Thābit b. Qāsim also contains the word *nūn* (whale) in the place of *nūr* (light). Al-Nawawī offers the same suggestion that both of these things could have been created on the same day. Al-Qurṭubī, however, dismisses the narration of Thābit as unauthentic.

Unfortunately, this is almost the only concrete conclusion that can be taken from the ḥadīth – barring the idea that the physical creation of the Earth took place in the first two periods of time. The fact remains that even if this ḥadīth is accepted as authentic, it remains that the textual evidence from the Qur’ān and Sunnah regarding the chronology of the events of creation is inconclusive at best.

Al-Qurtūbī observes:

This ḥadīth has been related in other sources besides *Ṣaḥīḥ Muslim* with various conflicting narrations. In some of them, the Earth is created on Sunday and Monday, while the mountains are created on Tuesday, the trees, rivers, and inhabitants are created on Wednesday, the Sun, Moon, stars, and angels created on Thursday, and Adam on Friday. These are individual-narrator ḥadīth that conflict with one another and do not provide any practical instruction. We must not rely upon them in determining the order of appearance of created things during those days.¹²³

The same can be said for how long ago the creation of the heavens and the Earth took place. Al-Alūsī points out this lack of textual evidence regarding this matter when discussing the advent of Adam.¹²⁴

Many of our scholars have gone and said that from his time up to (Prophet Muhammad’s) advent was a period of six thousand years and that the Earth is seven thousand years old. Many reports have been narrated to that effect. The truth as I see it is that he came into existence after having not been and then ceased to exist after having been. As for the timing of each of these events, it is something known to none but God. The reports on the matter are contradictory and can scarcely be relied upon.

¹²³ al-Qurtūbī, *al-Mufḥim*.

¹²⁴ al-Alūsī (4/532), commentary of *Sūrah al-Nisā’*: 1

CHAPTER THREE

THE CREATION OF LIVING THINGS

Since a Muslim believes that God is the creator of all things, it follows that God is the creator of all life. God created life initially and He is the creator of every living creature in existence. However, we find that very little is said in the Qur'ān and Sunnah about the origin and development of life on Earth. Of course, it is frequently emphasized in the Qur'ān and Sunnah that God created all living things, but in spite of that frequency, very few details are given about it.

One of the places where all life forms are discussed together is the where the Qur'ān says:

...And We made from water all living things." [Sūrah al-Anbiyā': 30]

The Qur'ān also discusses life in general when it says:

You enter the night upon the day and enter the day upon the night, and You bring forth the living from the dead and bring forth the dead from the living. And You provide sustenance to whom You will without measure. [Sūrah Āl 'Imrān: 27]

The Qur'ān mentions this "bringing forth the living from the dead" and *vice-versa* in the context of God's power and Lordship:

Say: "Who provides sustenance for you from the sky and the Earth? And who controls the hearing and the sight? And who brings forth the living from the dead and brings forth the dead from the living? And who arranges affairs?" They will say: "It is God." So say: "Then will you not fear Him?" [Sūrah Yūnus: 31]

This statement of "bringing forth the living from the dead" is mentioned repeatedly in the Qur'ān. From the contexts in which it is mentioned, it does not seem to be referring to the initial origin of life, but rather to the life cycle of living things. This meaning is apparent, since "bringing forth the living from the dead" is followed by "bringing forth the dead from the living." Indeed, the Qur'ān specifically mentions this matter in the context of the seeds of plants where it says:

Indeed God is the one who splits open the grain and the date stone. He brings forth the living from the dead and brings forth the dead from the living. That is God. How then can you be deluded? [Sūrah al-An'ām: 95]

This statement is also cited as a parable of the Resurrection:

He brings forth the living from the dead and brings forth the dead from the living and brings to life the Earth after it is dead. And thus will you be brought forth. [*Sūrah al-Rūm*: 19]

Elsewhere, the Qur’ān discusses the creation of animal life in particular:

“And He created every beast from water: of them there are some that creep on their bellies; some that walk on two legs; and some that walk on four. God creates what He wills, for verily God has power over all things.” [*Sūrah al-Nūr*: 45]

The Qur’ān makes specific mention of the creation of cattle:

Do they not see that We have created for them – from among the things our hands have wrought – cattle, which are in their possession? [*Sūrah Yāsīn*: 71]

It also mentions the creation of cattle while discussing human creation, after speaking about the initial creation of humanity and before speaking about their continual creation in the wombs:

He created you from a single soul then made from it its mate. And He sent down to you from the cattle eight mates. He creates you in the wombs of your mothers, creation after creation, within three levels of darkness. That is God your Lord; to Him belongs the dominion. There is no god but Him, so how are you averted?” [*Sūrah al-Zumar*: 6]

The “eight mates” of cattle being discussed here are detailed elsewhere in the Qur’ān.¹²⁵ They are the male and the female of the sheep, the goat, the camel, and the oxen.

Sa’īd b. Jubayr understood the term “He sent down” (*anzala*) in this context to simply mean “create”, and indeed considering what is being discussed in the verse, the term clearly lends itself to be understood as “He created”. This is the opinion that has been adopted by the vast majority of the commentators of the Qur’ān, many of whom are content simply to briefly mention that the word means “to create” when they discuss this verse¹²⁶. Some do not even bother to discuss the word at all.¹²⁷

¹²⁵ *Sūrah al-An‘ām*: 143-144

¹²⁶ Ibn al-Jawzī (1224).

¹²⁷ al-Ṭabarī (20/162).

Other commentators of the Qur’ān have chosen to explore the reason why the term “sent down” is specifically used in connection with the creation of these animals. They provide numerous suggestions based on various linguistic conventions, but none of their suggestions are definitive. Some of their suggestions imply that the creation being referred to is the initial creation of these cattle. Other interpretations point instead to their continual creation and sustenance.

Ibn Kathīr elaborates on this matter slightly, saying that God “...created from the loins of the cattle eight mates.”¹²⁸ In this way, the verse can be understood to refer to the continuous creation of these animals and not specifically to their initial creation.

Ibn Taymiyah – who holds the view that the word “*anzala*” must always imply its literal meaning of downward motion and therefore cannot merely mean “to create” – elaborates on this idea and defends it. He says:¹²⁹

There is no reason to take this word off of its well-known linguistic meaning. For indeed, cattle come down from the wombs of their mothers, and from the loins of their fathers. It is said: “A man ejaculates (*anzala*) semen and if he ejaculates, he is obliged to take a bath.” This is said in spite of the fact that a man is often lying on his side when he ejaculates, either engaged in sex or during a wet dream. So how should it be for cattle who usually ejaculate while standing on their feet above the backs of the females?

This is clarified by the fact that the word “sent down” is not used for what he created of lower life forms. It is not said of the plants or the pasture grass. It is only used for what is created from a higher position.

Al-Baghawī takes a more metaphorical approach and writes:¹³⁰

The meaning of “*sent down*” here is “to bring into existence, to create”, as in “*We have sent down upon you clothing to conceal...*”. It has been said that it refers to the rainwater that is the reason for the cotton to grow from which clothes are made and the plants that sustain the cattle. It is also said that “*And He sent down to you from the livestock...*” means that He made them for you a provision and a sustenance.

¹²⁸ Ibn Kathīr (5/398).

¹²⁹ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (12/254).

¹³⁰ al-Baghawī (4/72).

Al-Qurṭubī explores this approach in detail and provides a number of possibilities, preferring the following:¹³¹

He refers to these mates by using the term ‘sent down’, because they are sustained from the plants and those plants are in turn sustained by the rainwater that is sent down.

He then invokes the literary device known as *tadrīj*¹³² and gives as another example of this in the verse:

O children of Adam, We have sent down upon you clothing to conceal your shame and as an adornment.” [Sūrah al-A‘rāf: 26]

Al-Bayḍāwī writes:¹³³

It means He decreed and apportioned them for you, since His decree and His apportionment is described as “sending down” from the sky since there they are recorded in the Preserved Tablet. Or it means that He brought them into existence for you by way of causes that are sent down, like luminous heavenly bodies and rain.

Abū Ḥayyān writes:¹³⁴

The cattle are described as being sent down allegorically, either because His decrees are described as being sent down from the heavens since everything in existence is recorded in the Tablet, or because they live on plants that are nourished by rainwater sent down from the sky.

However, when discussing other verses containing the verb “anzala”, Abū Ḥayyān uses this verse as an example of how this verb can come with the meaning of “create”.¹³⁵

Notwithstanding these interpretations, the idea has been suggested that these eight pairs were created in Paradise and then sent down to Earth. This has been mentioned in passing by some commentators of the Qur’ān¹³⁶ without their attributing it to

¹³¹ al-Qurṭubī, *al-Jāmi‘* (15/207).

¹³² Literally “gradualisation”. Most scholars refer to it simply as a case of metaphor (*majāz*). Al-Alūsī writes: “It is possible that the metaphorical usage is in the attribution of “sending down” to the cattle, while what is literally being sent down are the causes of sustaining the cattle’s life, like the rains. The justification for this usage is how closely these matters are interconnected. [al-Alūsī (23/317)]

¹³³ al-Bayḍāwī (5/37).

¹³⁴ Abū Ḥayyān (7/554).

¹³⁵ Abū Ḥayyān (4/363) and (8/319). See also Ibn al-Jawzī (1401) in his commentary on verse 25 of *Sūrah al-Ḥadīd*.

¹³⁶ See: Ibn ‘Aṭṭiyah (1610), al-Zamakhsharī (934), al-Qurṭubī, *al-Jāmi‘* (15/207), Abū Ḥayyān (7/554), al-Nasafī (4/77), and al-Rāzī, *Mafātīḥ al-Ghayb* (26/213).

anyone in particular and without their advocating it or discussing it at any length.¹³⁷ Though al-Qurṭubī also mentions it in passing, he does go a little further than other commentators by suggesting that some people may have compared it to the verse about iron, where there are narrations from Ibn ‘Abbās to the effect that the verse “*And we sent down iron...*”¹³⁸ refers to iron being sent down from the sky.

There is no clear basis for drawing this conclusion from how Ibn ‘Abbās understood the verse on iron. Nothing in the language of the verse on cattle supports the idea that those cattle were created in Paradise. It is something that would require direct textual evidence to support it. Al-Alūsī expresses this sentiment. After embarking upon a painstaking account of almost all the possible literal and metaphorical interpretations of this phrase on the basis of linguistic considerations, he writes:¹³⁹

It has been said that these words purport their apparent meaning, and that God created the cattle in Paradise and then sent down from there. However, I do not ascertain any authenticity for this report.

Though the phrase “sent down” may not yield to us any clues about the details of the origin of animal life, there is a very important and eloquent statement being made in this verse where it says: “He creates you in the wombs of your mothers, creation after creation”. This is a most eloquent testimony that a life form brought forth in the womb, with all of its natural causes subject to direct human observation, is still to be understood as being completely and totally the creation of God alone.

¹³⁷ It seems that al-Shawkānī (2/672) favors this interpretation, although he merely says: “...it has been related that He created them in Paradise then sent them down...”. He then mentions in passing a few of the interpretations based on linguistic usage and concedes their possibility.

¹³⁸ From *Sūrah al-Ḥadīd*: 25.

¹³⁹ al-Alūsī (23/317).

CHAPTER FOUR

THE CREATION OF ADAM

This issue falls under the category of belief in the unseen, because no one in recorded history was around to witness the creation of Adam. The only sources for this information are the sacred texts. The Qur’ān says that the human being was created from earth:

He created man from a dried mud like fired clay and created the *jinn* from a pure flame of fire. [Sūrah al-Raḥmān, 14-15]

We had created man from a dried, black mud. [Sūrah al-Ḥajar, 26]

And among his signs is that He created you from earth, then suddenly you were human beings dispersing. [Sūrah Rūm: 20]

These texts indicate that the human being was created from a type of earth. As for the nature, quality, and composition of this earth, there is no recourse to knowledge of it beyond the brief descriptions of it given in the Qur’ān.

The Qur’ān identifies Adam as being an individual created from earth:

Verily, the likeness of Jesus with God is the likeness of Adam. He created him from earth and then said to him: “Be!” and he was. [Sūrah Āl ‘Imrān, 59]

The Qur’ān also indicates that human beings are descended from a single father:

O mankind, fear your Lord who created you from one soul and created from it its mate, and from the two of them brought fourth many men and women. [Sūrah al-Nisā’, 1]

O mankind! We have created you from a male and a female, and made you into nations and tribes, that you may know one another. Verily, the most honourable of you with God is the one who is the most God-fearing.” [Sūrah al-Ḥujurāt:13]

The Prophet identifies Adam as being the first father referred to in the verse when he says:¹⁴⁰

Human beings are the children of Adam and Adam was created from Earth. God says: “Indeed We created you from a male and a female and made you into nations and tribes so you may

¹⁴⁰ Sunan al-Tirmidhī (3270).

come to know one another. Indeed the most honoured of you with God are those of you who are the most pious.”

These texts, taken together, convey the idea that Adam is the direct ancestor of all human beings living on the Earth today. God first created Adam, then created from him his wife Eve, and from the two of them descended all of mankind. This meaning is reinforced by the fact that the Qur’ān refers to humanity as the Children of Adam (*Banū Ādam*); for instance, where it says:

O Children of Adam! Do not let Satan tempt you as he removed your two parents out from Paradise. [*Sūrah al-A ‘rāf*: 27]

The Sunnah also attests to this idea. Prophet Muhammad mentions that Adam will be addressed as the father of humanity by the believers on the Day of Resurrection when they come to him requesting him to intercede on their behalf with God:¹⁴¹

The believers will gather together on the Day of Resurrection and say: “If we could seek intercession with our Lord.” They will approach Adam and say: “You are the father of humanity. God created you with His hand and made the angels prostrate to you and taught you the names of all things, so intercede for us with your Lord so that He may relieve us of this place of ours.”

The Prophet also mentions that Moses addressed Adam as the father of humanity:¹⁴²

Adam won an argument with Moses. Moses had said to him: “O Adam, you are our father. You disappointed us and got us expelled from Paradise...”

The following is apparent from the textual evidence: Adam was created by God directly from earth. Both Adam and his wife were created by God without the agency of parents, and all human beings living on the Earth today are the direct descendents of these two people.

These are the conclusions that have been reached by all orthodox commentators on these texts. For, instance, al-Ṭabarī says, commenting on the verse: “O mankind, fear your Lord who created you from one soul”:¹⁴³

¹⁴¹ *Ṣaḥīḥ al-Bukhārī* (4476, 6565). *Ṣaḥīḥ Muslim* (193-195).

¹⁴² *Ṣaḥīḥ al-Bukhārī* (6614). *Ṣaḥīḥ Muslim* (2652).

¹⁴³ al-Ṭabarī (6/339).

Here God is saying about Himself that He alone created all humanity from a single individual. He informs His servants how He originated their creation from a single soul, thereby making them aware that they are all the children of one father and mother and that they are all from one another, and that their rights upon one another are the obligatory rights of siblings, since they all descended from a single set of parents... however remote the point of hereditary conjunction to their common forefather might be.

Ibn Kathīr says, discussing the same verse:¹⁴⁴

He brought forth from Adam and Eve numerous men and women, and spread them through the regions of the world with their various races, features, colours, and languages.

It is safe to say that the idea that Adam and Eve were the progenitors of all human beings living on the Earth in later times is something that has never been called into question by classical Sunni scholarship.

Adam's physical appearance

The Qur'ān does not give any physical description of Adam. However, in an authentic ḥadīth, the Prophet mentions that Adam was sixty cubits tall.¹⁴⁵

God created Adam to be sixty cubits in height then said: "Go forth and greet those angels with peace and listen to how they greet you – your greeting and the greeting of your descendants."

So he said: "Peace be upon you!"

They replied: "And upon you be peace and the mercy of God." Adding to it "...and the mercy of God."

Everyone who enters Paradise will be in the image of Adam. Creation has kept getting smaller until now."

In some narrations of the ḥadīth, it begins: "God created Adam in his image, his height being sixty cubits."¹⁴⁶

¹⁴⁴ Ibn Kathīr (2/185).

¹⁴⁵ *Ṣaḥīḥ al-Bukhārī* (3326).

¹⁴⁶ *Ṣaḥīḥ al-Bukhārī* (6227) and *Ṣaḥīḥ Muslim* (2841).

Al-Nawawī observes: ¹⁴⁷

This apparent meaning of narration is that the pronoun “his” in the phrase “his image” refers to Adam. It means that he was created from the initial moment to be in the image that he was to have on Earth and upon which he died, as being sixty cubits tall. He did not go through stages of growth like his descendants.

The ḥadīth states that creation – in this context, clearly referring to Adam’s descendants – has been getting smaller over the course of time and that this process has been going on up to the present day. Ibn Ḥajar discusses this matter and a problem that he perceives as arising from it: ¹⁴⁸

This means that the creation of every generation was shorter in stature than the generation that preceded it. This diminution of stature continued until it comes to this present era wherein the situation stabilizes.

Ibn al-Tīn says: “ His statement ‘*Created beings have still been getting smaller...*’ means that just as a person grows up little by little and this is imperceptible from hour to hour or from day to day and only becomes evident with the passage of many days, likewise is the situation with this diminution.”

This poses a problem with respect to the artefacts that exist today from the nations of old, like the cities of Thamūd. Their buildings indicate that their stature was not exceptionally tall so as to coincide with the process discussed above. There can be no doubt that they lived in ancient times and that the time interval between them and Adam was shorter than that which existed between them and the advent of this nation. Up to now, I have not come upon a solution to this problem.

In fact, the problem that troubles him is not serious at all. It is based on certain assumptions that are not mentioned in the texts themselves. The first of these assumptions is that the time period between Adam and the people of Thamūd was less than the time period between Thamūd and the advent of Islam. There is neither scriptural nor empirical evidence to determine when Adam came to Earth. Therefore, such a determination is impossible to make. This alone is enough to resolve the problem.

More importantly, there seems to be an assumption implicit in Ibn Ḥajar’s thinking that the gradual diminution of stature had been taking place at a constant rate. There is

¹⁴⁷ al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (1978).

¹⁴⁸ al-‘Asqalānī, *Fath al-Bārī* (6/410).

absolutely nothing in the texts to indicate this. In fact, Ibn al-Tīn’s comparison between this diminution and the growth of a human being belies such an assumption, since a person does not grow at a constant rate. Even if we were to insist that the language of the ḥadīth implies some steadiness of process, it is completely compatible with a situation where the diminution in stature occurred at a rapid pace during the first few generations and slowed down steadily from generation to generation until the rate of decrease became exceedingly slow. In such a situation, people of a few thousand years before would not necessarily have been observably taller than people today. Such possibilities mean that the ḥadīth does not present the problem that Ibn Ḥajar is concerned about.

A third unnecessary assumption – which, though it really has little bearing on Ibn Ḥajar’s problem, it behoves us to point it out – is that this process had come to an end with the advent of Islam. The language of the ḥadīth does not require this to be the case. The preposition *hattā* (until) in the phrase “...*have still been getting smaller until now...*” does convey the meaning of something arriving. However, in this context where it precedes the word *al-ān* (now), it merely indicates that the process had continued up to and until the present time. It does not negate the possibility of the process continuing in the future, though it also does not imply that it will continue.¹⁴⁹

What is most important to note in all of this is how Ibn Ḥajar handles what appears to him as a contradiction between an authentic ḥadīth and clear empirical evidence from the remains of the past. This reveals something important about his methodological approach to such a situation. He does not dismiss the ḥadīth or the empirical evidence as false, nor does he try to come up with far-fetched theories or interpretations. He simply admits that he had no explanation for it.

¹⁴⁹ Contextually, this is obvious. There is no contrary implication (*mafḥūm mukhālafah*) to be inferred from this phrase, since every continuous process necessarily comes to an arriving point when it reaches the present time, regardless of whether or not it will go on in the future. On a purely grammatical note, the Arabic preposition *hattā* (until) is generally understood to be inclusive of what comes after it, which in this case would mean the inclusion of the time the Prophet was living in. The grammarian Ibn Hishām writes about *hattā*: “If there is no contextual indicator requiring that what comes after it is included in its meaning...or excluded from it... then it should be assumed to be inclusive...as this is what is most common.” [*Mughnī al-Labīb*: (1/284)]

CHAPTER FIVE

THE FLOOD

One of the significant events that can be discerned in the sacred texts with respect to the experiences of Adam's descendants is the Flood. Since the event is set in prehistory, Muslims believe in the Flood as a part of the unseen, and accept what is related about it in the Qur'ān and the authentic Sunnah.

Though it is not directly related to the question of the origins of life on Earth and the issue of evolution, the story of the Flood invokes ideas of potentially far-reaching implications for the past ecology of the Earth and its natural history. Therefore, it behooves us to investigate exactly what the Qur'ān and authentic Sunnah say about this event.

The story of Noah and the Flood is related in the Qur'ān in detail in *Sūrah al-A'raf*: 59-64, *Sūrah Yūnus*: 71-74, *Sūrah Hūd*: 25-48, *Sūrah al-Mu'minūn*: 23-30, *Sūrah al-Shu'arā'*: 105-120, *Sūrah al-Qamar*: 9-15, and *Sūrah Nūḥ*: 1-28.

It is chiefly from these and a few other verses of the Qur'ān that all of the authentic scriptural information about the events surrounding the flood is to be found, since there is a paucity of authentic ḥadīth evidence on the subject. The descriptions that we have of it in various books of Qur'ānic commentary are taken chiefly from Jewish and Christian accounts.¹⁵⁰

Moreover, the account of the story that is attributed to Ibn 'Abbās, which is a major source for details about the ark and the events of the flood, is inauthentic. Ibn Kathīr goes so far as to call it "a strange account".¹⁵¹

For this reason, there is no way of determining from Islam's sacred texts many details of the story. For instance, though the Ark is mentioned in the Qur'ān as being "made

¹⁵⁰ Refer to Ibn Kathīr (3/533) in his commentary on *Sūrah Hūd*: 37, where he quotes a narration from the Torah, indirectly from Ibn Ishāq, to augment the information given in the Qur'ān about the Flood.

¹⁵¹ Ibn Kathīr (3/533). The narration is related by al-Ṭabarī (18151 and 18152) and contains 'Alī b. Zayd who is a weak narrator. Therefore, it cannot be authentically attributed to Ibn 'Abbās. Moreover, Ibn 'Abbās attributes the story to the disciples of Jesus, so it is something taken from unverifiable Jewish and Christian traditions.

of broad planks and caulked with palm fibre”¹⁵², there is no further description of the Ark given anywhere in the Qur’ān or the authentic Sunnah.

Noah’s place in human history

There is no scriptural evidence of indisputable authenticity from which it can be determined precisely how long ago Noah lived, any more than it can be determined when Adam lived.¹⁵³ However, it is substantiated in the Sunnah that Noah was the first Messenger to be sent by God after Adam. The Prophet Muhammad relates that the people will approach Noah on the Day of Resurrection seeking his intercession and mentioning his distinctive qualities:¹⁵⁴

They will go to Noah and say: “You are the first of the Messengers to the people of the Earth and God named you a thankful servant...”

In another narration, it is Adam who refers to him in this way:¹⁵⁵

(He will say): “Go to Noah, the first Messenger sent by God.”

¹⁵² *Sūrah al-Qamar*: 13.

¹⁵³ There is evidence from the Sunnah to indicate that Noah was not very many generations removed from Adam. Ibn Ḥibbān, in his compilation of what he deems to be authentic narrations, relates that a man asked: “O Messenger of God! Was Adam a prophet?” He replied: “Yes.” He asked: “How long was the time between him and Noah?” He replied: “Ten centuries.” [*Ṣaḥīḥ Ibn Ḥibbān* as arranged by Ibn Bulbān (6190)].

A number of scholars regard this ḥadīth to be authentic. Shu‘ayb al-Arna‘ūt says: “Its chain of transmission is authentic.” [Marginal notes to *Ṣaḥīḥ Ibn Ḥibbān* (14/69)] Al-Ḥākim, who also relates this ḥadīth [*al-Mustadrak* (3093)] says: “This ḥadīth is authentic according to the conditions set forth by Muslim.”

With respect to what the ḥadīth tells us, the word *qurūn*, translated here as “centuries”, can also mean “generations”. We cannot be sure which is meant here. It is interesting to note that traditional accounts of Noah’s genealogy, like that given by Ibn Ishāq, do in fact give ten generations going back from Noah to Adam. [Ibn Hishām (27)] However, such genealogical claims cannot be substantiated. There is also a ḥadīth related by al-Ṭabarānī in *al-Mu‘jam al-Awsaṭ* that Abū Dharr asked: “O Messenger of God! Who is the first of the Prophets?” He replied: “Adam” Abū Dharr asked: “Then who?” He replied: “Noah, and between them were ten fathers.” However, this ḥadīth is weak, being narrated only by way Ibn Lahī‘ah. [*al-Mu‘jam al-Awsaṭ* (4721)]

Both readings of *qurūn* are possible, and since the lifespans of the early Prophets could be of considerable length, ten generations might possibly indicate many times more than one thousand years. For instance, we read in the Qur’ān: “We sent Noah to his people and he tarried among them a thousand years save fifty.” [*Sūrah al-Ankabūt*: 14]

The ḥadīth is also related in *Mu‘jam al-Ṭabarānī al-Kabīr* (8/188-119 #7545), *Mu‘jam al-Ṭabarānī al-Awsaṭ* (4721) and *Mustadrak al-Ḥākim* (3093) with the additional phrase that there were ten centuries (or generations) between Noah and Abraham. This addition still does not help much in determining the time period, since the same ambiguities discussed above about the length of generations apply to this time span as apply to the other.

¹⁵⁴ *Ṣaḥīḥ al-Bukhārī* (3340) and *Ṣaḥīḥ Muslim* (194).

¹⁵⁵ *Ṣaḥīḥ Muslim* (193).

The scope of the story

The Qur'ān refers to the story as an event that took place between Noah and his people. No other people are referred to. For instance, it says:

And we had sent Noah to his people (saying): “I am to you a clear warner.” [*Sūrah Hūd*: 25]

Noah addresses only his own people, saying in every instance: “O my people!”¹⁵⁶

Noah's people, moreover, are the only ones referred to in the context of rejecting – or accepting – the Message:

So the eminent among those who disbelieved from his people said: “We do not see you but as a man like ourselves and we do not see you followed except by those who are the lowliest of us and with no forethought. [*Sūrah Hūd*: 27]

And it was revealed to Noah that: “No one will believe from among your people save those who have already believed, so do not be distressed by what they have been doing.” [*Sūrah Hūd*: 36]

But they rejected him and We delivered him and those with him in the ark, and we drowned those who rejected Our signs. They were indeed a people who were blind. [*Sūrah al-A'raf*: 64]

The people of Noah rejected the messengers. [*Sūrah al-Shu'arā'*: 105]

It is therefore in this context that what comes a few verses later on must be understood, when the Qur'ān refers to the fate of those who did not board the Ark:

So We delivered him and those who were with him in the Ark and then drowned thereafter those who remained behind. [*Sūrah al-Shu'arā'*: 119-120]

Though Noah was sent only to his own people, this does not rule out the existence of other people living elsewhere on Earth at that time. Ibn 'Aṭṭiyah points out that it would be wrong for us to assume that Noah's people were the only ones living on the Earth back then. He writes:¹⁵⁷

It is not possible for us to say that there was no one on Earth at that time besides Noah's people, because this would necessarily mean that Noah had been sent to all of humanity. It has been authentically related that such an honour is exclusively for Muhammad, by his saying:

¹⁵⁶ cf. *Sūrah Yūnus*: 71 and *Sūrah Hūd*: 28-30.

¹⁵⁷ Ibn 'Aṭṭiyah (943) commentary of *Sūrah Hūd*: 36.

“I have been given five things that no one has been given before me...”¹⁵⁸ The situation being thus, we can postulate that there were many nations in existence at that time.”

Ibn Ḥajar, however, explains how it is possible for Noah’s people to have been the only people on the Earth at that time without Prophet Muhammad losing the distinction of being the only Prophet sent to all humanity. He writes:¹⁵⁹

It is possible that there were no one else on the Earth besides Noah’s people at the time when Noah was sent. His mission, therefore, would have been specific, since it would only have been for his people. It would have had the appearance of being universal simply because there was no one else around. Nevertheless, had there been others, his mission would not have encompassed them.

In truth, the textual evidence does not provide sufficient information to come to any conclusions one way or another about the distribution of Earth’s human population at the time of Noah.

Before the Flood, Noah supplicates against the unbelievers, beseeching their destruction from God. The Qur’ān conveys this supplication as follows:

And Noah said: “O my Lord! Do not leave upon the Earth from among the unbelievers anyone going to and fro. Indeed, if you leave them, they will lead your servants astray and beget none but wicked unbelievers.” [Sūrah Nūḥ: 26-27]

At first glance, the absolute generality of this supplication’s wording seems to lend the idea of universality of scope to the story. Ibn Kathīr draws this conclusion, saying:¹⁶⁰

So God answered his supplication and destroyed everyone on the face of the Earth from among the unbelievers, even Noah’s own son.

Al-Ṭabarī, on the other hand, describes this supplication as being a supplication “against his people”.¹⁶¹ Al-Qurṭubī mentions that there are two opinions on the matter, favouring the one that the supplication applied to all unbelievers. He writes:¹⁶²

¹⁵⁸ *Ṣaḥīḥ al-Bukhārī* (335 and 438) and *Ṣaḥīḥ Muslim* (521). It reads: “I have been given five things that no one has been given before me. I have been assisted with fear the distance of a month’s journey. The Earth has been made for me a mosque and a purification, so any man from my nation who finds that it is time to pray can pray. War spoils have been made lawful for me and they were not made lawful for anyone before me. I have been granted the right to intercession. And every Prophet was sent specifically to his own people while I have been sent to all humanity.”

¹⁵⁹ al-‘Asqalānī, *Fath al-Bārī* (1/515).

¹⁶⁰ Ibn Kathīr (6/317).

It is general for every unbeliever and polytheist, and it has been said that he intended the polytheists from his own people.

Ibn al-‘Arabī derives from the general wording of the supplication evidence for the permissibility of offering general invocations against the unbelievers. However, he also gives the contextual scope of this general supplication, referring to it as a “supplication against his people” and saying:¹⁶³

So God answered his supplication and drowned his nation.

Al-Alūsī points out:¹⁶⁴

What is meant by “unbelievers” are his people whom he called to faith and obedience and did not respond.

Al-Alūsī then goes on to mention that some scholars use these verses as an indication of the universal scope of the story. Then he comments on the veracity of drawing such a conclusion, saying:¹⁶⁵

This is rebuffed by the fact that the word “Earth” is quite often used to refer to a portion thereof, and it is possible that this is how it is being used here. Likewise, if we were to concede that the intended meaning was all of the Earth, nonetheless the supplication was invoked against the “unbelievers” and these were the ones to whom he was sent and who did not respond.

Al-Alūsī is making a pertinent point. Since nothing is known about the existence or non-existence of other nations on the Earth at Noah’s time, we cannot entertain any assumptions about what their beliefs might have been. In any event, there is no evidence that those other nations, if they existed, would have heard Noah’s message and therefore had a chance to disbelieve in it. If they were ignorant of Noah’s existence and his message, they would not be described as being unbelievers. Therefore, Noah’s supplication would not include them.

¹⁶¹ al-Ṭabarī (23/307).

¹⁶² al-Qurṭubī, *al-Jāmi‘* (18/270).

¹⁶³ Ibn al-‘Arabī (4/283-284). Ibn al-‘Arabī explains here that a supplication against the unbelievers should be general in wording. He says: “The basic rule for a supplication against the unbelievers is that it should be universal. As for a specific unbeliever, his final outcome is not known so that he can be supplicated against, since destiny is unknown to us, and it is possible that God knows that his final outcome will be salvation.”

¹⁶⁴ al-Alūsī (29/126).

¹⁶⁵ al-Alūsī (29/126).

When the Qur'ān describes the subsiding of the waters and the aftermath of the flood, it refers only to the destruction of those same people:

And it was said: "O earth, swallow your water and O sky withhold your rain. And the water subsided and it came to rest on al-Jūdiyy. And it was said: "Away with the wrongdoing people." [Sūrah Hūd: 44]

The Qur'ān states that those who were on the Ark were successors for those who denied God's signs. Again, the wording does not convey a universality of scope:

And they denied him, so We saved him and those who were with him in the ark and made them successors, and We drowned those who denied Our signs. Then see how was the end of those who were warned. Then We sent after him Messengers to their people and they came to them clear proofs. [Sūrah Yūnus: 73-74]

Due to the lack of clear textual information regarding the people on the Earth who were subjected to the flood, classical scholars are only agreed on the point that the flood certainly struck Noah's people. The existence of other people at the time and the possibility of their experiencing the Flood are matters of pure conjecture, about which there is no scholarly consensus.

The description and duration of the flood

The Qur'ān does not talk about the geographical extent of the flood. It does describe the floodwaters to be substantial and violent, describing waves like mountains. This is merely a comparison and cannot be taken to imply that they were similar in size to actual mountains.

So the Ark floated with them on waves like mountains. And Noah called out to his son, who had separated himself, saying: "My son! Embark with us and be not with the unbelievers." [Sūrah Hūd: 42]

The Qur'ān describes how the flood began as follows:

Then we opened the gates of heaven with water pouring down and caused the earth to burst with springs so that the waters met for a matter already decreed." [Sūrah al-Qamar: 11-12]

This shows that the flood was something major and extraordinary in its scope and its violence. Moreover, its nature seems to have been unusual and incomparable to the natural flooding that we are accustomed to, since the Earth is described as having

“burst with springs”. Still, the Qur’ān and the authentic Sunnah do not define for us the geographic extent of the flood. Commentators of the Qur’ān have differed whether the flood covered the entire Earth or only a part of it. A great number of scholars hold the view that the flood covered the entire Earth, basing their understanding on the traditions handed down by the Jews and Christians. Others, including Ibn ‘Aṭīyah, favour the view that the flood was a local event.¹⁶⁶ Among later commentators, al-Alūsī favours a regional flood.¹⁶⁷ In the absence of decisive and authentic textual evidence, the matter remains inconclusive from a scriptural standpoint.

The animals brought on board the ark

The Qur’ān mentions that living creatures were brought on board the ark in pairs, but does not define what these creatures were. There is no authentic account of this in the Sunnah.¹⁶⁸

The Qur’ān says:

We said: “Load up within it of every set of mates a pair, and take your family, except those about whom the word has preceded, and whoever believes.” But none had believed with him except for a few. [*Sūrah Hūd*: 40]¹⁶⁹

Some commentators hold the view that since the word *kull* “each, every” is used in the context of the set of mates, the verse is general for all animal life. This view is derived mainly from the mode of reading transmitted to us by Ḥafs that could be translated “...of each, a mated pair...” The word *kull* in this reading is understood by commentators to mean “each kind of animal”.¹⁷⁰ Actually, this wording is quite vague, since the word *kull* is not described in any way whatsoever and therefore could

¹⁶⁶ Ibn ‘Aṭīyah (918-919). He makes it clear that he prefers this opinion in his commentary on verse 72 of *Sūrah Yūnus*, because it is the easiest way to reconcile the punishment with the idea that Noah was sent only to his own people. Elsewhere, while discussing verse 37 of *Sūrah Hūd* (943), he suggests a rather lengthy – and rather unconvincing – set of interpretations in an attempt to reconcile Moses’ specific mission with the possibility of a global flood.

¹⁶⁷ al-Alūsī (12/353) commentary of *Sūrah Hūd*: 40.

¹⁶⁸ It is related by Ibn Kathīr [*Tafsīr Ibn Kathīr* (3/534)] and Suyūfī [*al-Durr al-Manthūr* (8/58)] – their source being Ibn Abī Ḥātim – that the Prophet said: “When Noah loaded up the ship with every set of mates a pair, his companions said: ‘How can the grazing animals be secure while the lion is among them?’ So God descended a fever upon it and it was the first fever to be sent down to the Earth...” This statement is not attributed to the Prophet in any of the ḥadīth collections. The chain of transmission related by Ibn Abī Ḥātim for this ḥadīth is extremely weak. ‘Abd al-Razzāq al-Mahdī, in his editorial notes on *Tafsīr Ibn Kathīr* (3/534) identifies three defects: it contains a narrator known to have narrated a lot of false statements, another narrator with a weak memory, and a gap in the narration between the Prophet and the narrator who attributes the statement to him.

¹⁶⁹ See also: *Sūrah al-Mu’minūn*: 27.

¹⁷⁰ Abū Ḥayyān (5/290).

easily imply a meaning that is either more or less general in scope than that of “animal life”.

All other modes of reading for this verse have the word *kull* “every” annexed grammatically to the word *zawjayn* that comes after it, so that we would translate the verse as: “...of every set of mates a pair...” However, the problem in this case lies not with the generality of the word *kull*, but with the scope of the word *zawjayn* “set of mates” that it refers to. Many commentators, like Abū ‘Alī¹⁷¹, have seen the significance of this choice of words to be in its ability to convey a more general meaning than that of animals – namely everything that has two sexes – and took the idea further to claim that mated pairs representing all animal and plant life were brought aboard.

Yet there is no reason to insist upon either of these interpretations. Other possibilities are equally tenable, like the possibility that the verse is referring to the mates mentioned in verses 143-144 of *Sūrah al-An‘ām*, specifically the sheep, the goat, the camel, and the oxen.

Al-Qurtubī relates that al-Ḥasan said:¹⁷²

Noah did not carry on board the ship except what gives birth to live young or lays eggs. As for bugs, flies, and worms, he carried along nothing of them. They but came forth from the mud.

Al-Alūsī is of the opinion that the verse is talking about “...every kind of animal from which those who were saved and those who came after them would derive benefit.”¹⁷³

After mentioning a number of the often strange and mutually conflicting accounts given about the non-human occupants of the Ark, al-Alūsī explains his point of view:¹⁷⁴

What the heart tends to accept is that the flood – as some have opined – was not universal in scope and that Noah was not commanded to carry with him what generally subsists on unclean substances on the Earth, like mice and insects. Instead, he was commanded to carry with him what he would need when he and those with him were saved from drowning. This was in order that they would not be distressed by being deprived of them and burdened with trouble

¹⁷¹ Abū Ḥayyān (5/290).

¹⁷² al-Qurtubī, *al-Jāmi‘* (12/110)

¹⁷³ al-Alūsī (12/351).

¹⁷⁴ al-Alūsī (12/353).

of reintroducing them from the regions untouched by the flood. It is as if it were: “*We said: ‘Load up within it of everything you will need when you are saved a set of mates’...*”

In truth, as stated by Ibn ‘Atīyyah,¹⁷⁵ there is no way to arrive at any firm conclusion on the matter in the absence of authentic textual evidence describing in detail what actually took place.

The human inhabitants of the ark and their descendants

The Qur’ān does not mention the number or the relatedness of the people who accompanied Noah on the ark. The Qur’ān simply states that those who went with him were spared:

God saved him and the companions of the ship, and We made it a sign for all the worlds.”
[*Sūrah al-‘Ankabūt*: 15]

This has led to considerable disagreement among the commentators who draw from biblical traditions, both with regards to the members of his family who boarded the Ark and to the number of other people who may have accompanied them. Numbers run the gamut from seven to eight to ten to eighty to one hundred-sixty in various combinations of relatives and non-relatives. After mentioning all of these claims, al-Ṭabarī writes:¹⁷⁶

The correct stance is to say what God says: “...*none had believed with him except for a few.*” He describes them as being few in number without defining what that number is. There are no authentic statements from God’s Messenger on the matter. Therefore, it is not appropriate to delve into this matter beyond the limits set by God, since this number is not defined for us by either God’s Book or a report from God’s Messenger.

Abū Ḥayyān, likewise, observes:¹⁷⁷

These statements are mutually contradictory. What God tells us is that “...*none had believed with him except for a few.*” It is not possible to give a specific number to this small group whose number God has kept indeterminate without us having a statement from God’s Messenger.

¹⁷⁵ Ibn ‘Atīyyah (946).

¹⁷⁶ al-Ṭabarī (12/412-413) commentary on *Sūrah Hūd*: 41.

¹⁷⁷ Abū Ḥayyān (5/290).

With respect to the descendants of the Ark's survivors, the Qur'ān says:

And We made his descendants those who remained. [*Sūrah al-Şāffār*: 75-79]

On the basis of this verse, some scholars have claimed that no other human beings were left on the Earth.¹⁷⁸ It is related from Qatādah that he said: "Humanity, all of them, are from the descendants of Noah."¹⁷⁹

However, this verse is making no such claim, since no reference is made to humanity as a whole or to the world as a whole. Therefore, all that can be taken from the verse with certainty is that Noah's descendants survived as opposed to the unbelievers from among his people.¹⁸⁰

What we see in the Qur'ān is that the Children of Israel are specifically referred to as the descendants of the Ark's inhabitants:

O descendants of those whom We carried along with Noah! Truly, he was a grateful servant.
[*Sūrah al-Isrā'*: 3]

Moreover, this is followed by mention that such destruction was not unique to Noah's time in history, but occurred repeatedly thereafter to later generations:

¹⁷⁸ Among these is Ibn Taymiyah. *Majmū' al-Fatāwā* (4/63).

¹⁷⁹ Ibn Kathīr (5/347). Also, 'Alī b. Abī Ṭalḥah relates from Ibn 'Abbās that he said: "No one remained except for the descendants of Noah." None of these statements are substantiated any more than the many contradictory statements regarding the number of other people who accompanied Noah and his family on the Ark.

¹⁸⁰ There are two ḥadīth attributed to the Prophet in this regard. In the first, the Prophet is reported to have said, explaining verse 79 of *Sūrah al-Şāffār*: "They are Ham, Sam, and Japheth." [*Sunan al-Tirmidhī* (3230)] Al-Tirmidhī says: "This ḥadīth is good but strange (*ḥasan gharīb*). We do not know of it except by way of the ḥadīth of Sa'īd b. Bashīr."

In the other, without any reference being made to the verse, the Prophet is reported to have said: "The sons of Noah were three: Sam the father of the Arabs, Ham, the father of the Ethiopians, and Japheth, the father of the Romans." [*Sunan al-Tirmidhī* (3231 and 3931). *Musnad Aḥmad* (20099, 20100, and 20114). *Mu'jam al-Ṭabarānī* (18/145-146). *Mustadrak al-Ḥākim* (4060)]. Al-Ḥākim declared it authentic.

However, both of these ḥadīth are weak and cannot be relied upon as evidence. Al-Albānī declares them to be weak in *Da'īf Sunan al-Tirmidhī*.

The editorial council for the scholarly edition of *Musnad Aḥmad* led by Shu'ayb al-Arna'ūt discusses the second ḥadīth and declares all of its narrations to be weak. [Refer to: *Musnad Aḥmad* (33/292) for a detailed discussion of this ḥadīth and its weakness.]

Had these ḥadīth been authentic, they would have provided us with an indication of the magnitude of the flood's impact on the descendant's of Adam. Though these ḥadīth do not provide an indication that all humanity was wiped out in the flood besides those who were with Noah, they would at least have indicated quite clearly that the flood spelled devastation for a wide geographical area, at least to the extent that it resulted in all the Semitic peoples and those of southern Europe being in some way descended from Noah. Since this authenticity is lacking, we cannot even come to this conclusion.

How many generations have we destroyed after Noah? And sufficient is your Lord to note and see the sins of His servants. [*Sūrah al-Isrā'*: 17]

Though the Qur'ān is quite clear in identifying the Children of Israel as being among the descendants of the Ark's inhabitants, there is no indication that they were all direct descendants of Noah himself.

The Qur'ān includes the posterity of the Ark's inhabitants as part of the prophetic lineage:

These are they unto whom God showed favour from among the prophets, of the seed of Adam and of those whom We carried with Noah, and of the seed of Abraham and Israel, and from among those whom We guided and chose. When the revelations of the Beneficent were recited unto them, they fell down, adoring and weeping. [*Sūrah Maryam*: 58]

Conclusion

The story of Noah and the flood is clearly established by the Qur'ān as being an event that took place early in the prophetic history of Adam's descendants. There is no conclusive evidence in the Qur'ān or the Sunnah regarding the geographical extent of the flood or how much of the total human population were affected. What is clear from the texts is that all of Noah's people who remained behind perished in the flood and that the Children of Israel and all of the prophets whose names are mentioned in the Qur'ān are from the descendants of those who boarded the Ark.

CHAPTER SIX

THE SIMIAN TRANSFORMATION

There is one more event mentioned in the sacred texts that needs to be looked into for the possible implications that it might have for the origin of certain forms of animal life. This is the event mentioned in the Qur'ān where certain people underwent a transformation into simians¹⁸¹:

And you knew those among you who transgressed concerning the Sabbath, so We said to them: “Be simians, despised and rejected.” [*Sūrah al-Baqarah*: 65]

So when they were insolent about that which had been forbidden, We said to them: “Be simians, despised and rejected.” [*Sūrah al-A'rāf*: 166]

These verses come in the context of discussing the Children of Israel. They were the ones who witnessed this event, and those who were affected were from among their number who violated the Sabbath.

No one would argue that the imperative verb “*be*” is meant here as a command. It is obvious from the context that the people concerned are not being ordered to turn themselves into simians. The verb is clearly existential in meaning, indicating a change from one state of being into another.

How this change comes about is not discussed. The overwhelming majority of commentators support the idea of a physical change. Mujāhid, for his part, considers it to indicate an internal change, the term simian being used allegorically. He says:¹⁸²

Their hearts were transformed. They were not transformed into simians. It is merely a parable that God is offering about them, like “the parable of a donkey carrying volumes of scripture.”¹⁸³

¹⁸¹ The Arabic word used here is *qiradah*, the plural of *qird*. This word is problematic for translators, since its meaning embraces both apes and monkeys, so it is not equivalent to either of these English words. Indeed, there is no classical Arabic word that specifically means apes to the exclusion of monkeys. At the same time, the word *qird* is more specific than the English word primate, since we would most likely not wish to apply the word *qird* to animals such as lemurs and bush babies. Also, no strictly taxonomical meaning can be applied to the word in the context of the Qur'ān; it cannot be understood to apply to modern humans in any way. The English word that most closely reflects the meaning of *qird*, therefore, is the word “simian”.

¹⁸² al-Ṭabarī (2/65), commentary of *Sūrah al-Baqarah*: 65.

¹⁸³ He is quoting *Sūrah al-Jumu'ah*: 5: “The parable of those who were entrusted with the Torah and then did not take it up is like the parable of a donkey carrying volumes of scripture.”

However, he is severely criticized for holding this view by al-Ṭabarī, who says:¹⁸⁴

This statement that is made by Mujāhid contradicts the apparent meaning of what God’s Book is indicating.

Al-Ṭabarī then argues that this report about the Children of Israel is no different than anything else that is related about them, so rejecting the apparent meaning of some of what is reported while accepting the apparent meaning of others requires evidence. He also maintains that Mujāhid is going against the unanimous consensus of the scholars on the matter.

Al-Ṭabarī is perfectly right for saying that Mujāhid cannot make this claim without evidence. However, it has been acknowledged that the language of the verse – taken on its own – does not rule out such an interpretation. Al-Rāzī asserts that Mujāhid’s interpretation is in conformity with common Arabic metaphorical usage and “is not all that far-fetched.”¹⁸⁵ Also, a claim of consensus on such a matter of interpretation is a difficult claim to substantiate, especially since we indeed have Mujāhid’s differing opinion.

In the following verse, the Qur’ān refers to a transformation into simians and swine:

Say: Shall I inform you of worse than that as penalty from God? Those whom God has cursed and with whom he became angry and made of them the simians and the swine and the slaves of false worship; these are worse in position and farther astray from the right way. [*Sūrah al-Mā'idah*: 60]

This verse is clearer in indicating a change, using the phrase *ja'ala minhum* “made of them” to describe the event.

The language of this verse – specifically the use of the definite article in the phrase “the simians and the swine” – has led some commentators to the conclusion that the simians and swine living today are the result of that event.¹⁸⁶

¹⁸⁴ al-Ṭabarī (2/65) commentary of *Sūrah al-Baqarah*: 65.

¹⁸⁵ al-Rāzī, *Mafātiḥ al-Ghayb* (3/103).

¹⁸⁶ Refer to Ibn al-Jawzī (394) who attributes this interpretation to Ibn Qutaybah.

There is, however, an authentic ḥadīth that belies this assumption.¹⁸⁷

A man asked: “O Messenger of God! The simians and swine, are they from those who were transformed?”

The Prophet said: “God did not leave for those who were transformed any descendants or progeny. Simians and swine existed before that time.”

This ḥadīth tells us a great deal about the transformation mentioned in the Qur’ān. First of all, the Prophet explicitly states that a transformation (*maskh*) took place. Since he mentions physical simians and swine and the fact that the transformed beings left no descendants, this lends considerable weight to the idea that the transformation was not something allegorical – as alleged by Mujāhid – but was something physical.

The most important point made by this ḥadīth is that the transformed people left no descendants and that apes and swine were both in existence before this event took place.

This is contrary to the view held by Ibn Qutaybah, al-Zajjāj, and Ibn al-‘Arabī that the simians and swine in existence today are a consequence of the transformation. Their argument that transformed beings can leave behind descendants is drawn from the following two ḥadīth:

In one instance, when a *dabb*¹⁸⁸ was served to the Prophet, he said:¹⁸⁹

Perhaps this is from the generations who were transformed.

The second is where the Prophet said about mice:¹⁹⁰

There is a nation from the Children of Israel that is lost. It is not known what they did. I do not see them as being anything other than the mice. If camel milk is placed for them, they do not drink it, and if sheep milk is placed for them, they drink it.

¹⁸⁷ *Ṣaḥīḥ Muslim* (2663).

¹⁸⁸ A spiny-tailed lizard of the genus *Uromastyx*. The species found in Western Arabia that is commonly eaten is *Uromastyx aegyptius*.

¹⁸⁹ *Ṣaḥīḥ Muslim* (1949).

¹⁹⁰ *Ṣaḥīḥ al-Bukhārī* (3305) and *Ṣaḥīḥ Muslim* (2997).

In another narration of this ḥadīth, it reads:¹⁹¹

The mice are from a transformation. The indication for that is that if sheep milk is placed before them, they drink; if camel milk is placed before them, they do not drink it.¹⁹²

In truth, however, these are both tentative statements being ventured by the Prophet. Ibn Ḥajar comments on these ḥadīth, saying:¹⁹³

The majority of scholars have responded that the Prophet said these things before the truth of the situation was revealed to him. This is why he did not say these things conclusively. This is different from his negation, which he states conclusively.

Elsewhere, while discussing the ḥadīth about the mice, Ibn Ḥajar mentions the Prophet's statement "God did not leave for those who were transformed any descendants or progeny", then writes:¹⁹⁴

On this basis, we must assume his statement "I do not see them as being anything other than the mice" to be as if he had initially supposed that, then later came to know that they were not of those.

With respect to the *dabb*, it is clear from other narrations of the ḥadīth that it was merely an inference he had been making and not a statement based on revelation or on certain knowledge. The Prophet said, when asked about the *dabb*:¹⁹⁵

It has been mentioned to me that a nation from the Children of Israel had been transformed.

Another narration reads:¹⁹⁶

O desert dweller! God had cursed or became wrathful upon a tribe of the Children of Israel and transformed them into creatures that crawl upon the Earth. I do not know whether these are from among them. Therefore, I neither eat them nor forbid their being eaten.

Therefore, none of this evidence can be used to make the claim that the transformed simians left any descendants. Moreover, even if, for argument's sake, it were accepted

¹⁹¹ *Ṣaḥīḥ Muslim* (2997).

¹⁹² The significance of this is explained by al-Nawawī, who writes: "The flesh and milk of camels was forbidden to the children of Israel unlike the flesh and milk of sheep. Therefore, the refusal of the mice to drink camel milk but not sheep milk gave an indication that they were transformed from the Children of Israel." [al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (2048)]

¹⁹³ al-'Asqalānī, *Fath al-Bārī* (7/184).

¹⁹⁴ al-'Asqalānī, *Fath al-Bārī* (6/395).

¹⁹⁵ *Ṣaḥīḥ Muslim* (1951).

¹⁹⁶ *Ṣaḥīḥ Muslim* (1951).

that they might have left behind descendants, this in no way implies that all simians – or even all individuals of one species of simian – would have been their descendants.

Ibn al-‘Arabī cites one further piece of evidence to support his view that the simians living today are the descendants of the people who were transformed. He mentions the following event that was witnessed by ‘Amr b. Maymūn and related in *Ṣaḥīḥ al-Bukhārī*:¹⁹⁷

I had seen in the times of ignorance some simians surround a female simian who had committed fornication and stone her, so I stoned her along with them.

There is another narration that relates this event from ‘Amr b. Maymūn in far greater detail:¹⁹⁸

I was in Yemen tending my family’s sheep up upon an elevation. A male simian came with a female and laid his head on her hand. Then a smaller simian came and beckoned towards her, so she gently slipped her hand out from under the cheek of the first simian and followed him. He mated with her while I was watching. Then she returned and gently tried to slip her hand back under the cheek of the first simian, but he woke up suddenly, smelled her, and shrieked. Then the simians gathered round and he began shrieking while pointing towards her with his hand. The simians went to and fro and came back with that simian that I recognized. They dug a pit for the two of them and stoned them both. So I had witnessed stoning being practiced by other than the descendants of Adam.

Ibn al-‘Arabī draws the following surprising conclusions from this event:¹⁹⁹

The Jews had changed the ruling of stoning, so God wanted to establish it with those from among them who had been transformed so that it would be an even more poignant proof against what they had rejected and altered. In this way, their scriptures, their traditions, and their transformed brethren would all testify against them, and they would know that God knows what they conceal and what they make manifest and that He keeps account of the substitutions and alterations they have made. He establishes the proof against them from whence they do not realize.

However, these conclusions do not stand up to scrutiny. First of all, these are just some behaviours that were witnessed by ‘Amr b. Maymūn being exhibited by a group of animals. It is merely his interpretation that the animals were being stoned on account of having committed fornication. There is no way that he could have been

¹⁹⁷ *Ṣaḥīḥ al-Bukhārī* (3849).

¹⁹⁸ al-‘Asqalānī, *Fath al-Bārī* (7/184).

¹⁹⁹ Ibn al-‘Arabī (2/281).

able to ascertain their true motives. Moreover, regardless of what the impetus for their behaviour might have been, it is just wishful thinking to extrapolate from it that these creatures were descended from transformed human beings.

Ibn Ḥajar writes:²⁰⁰

It is not necessary from an event resembling adultery and stoning in its appearance that it was really a case of adultery and the administration of a prescribed punishment. He merely described it in this way since it resembled these things. Hence, it does not mean that legal accountability was being applied to animals.

It remains that the definitive word on the fate of transformed beings is the Prophet's statement: "God did not leave for those who were transformed any descendants or progeny." This tells us clearly that the transformation of people into simians has nothing to do with the origins of those animals, nor can it be invoked to explain the similarities between apes and human beings.

In addition, there is nothing authentically related that describes the exact nature of what the people were like after the transformation or how exactly the transformation took place, though the textual evidence strongly indicates that some sort of physical transformation did indeed take place. Assuming that the people suffered a purely physical transformation, there is no basis upon which to speculate on which species of simian, living or extinct, they were transformed into. Neither can the possibility be ruled out that they might have been turned into a form of simian that was completely unique unto themselves.

²⁰⁰ al-‘Asqalānī, *Fath al-Bārī* (7/185).

PART 2:

**BIOLOGICAL EVOLUTION & EVOLUTIONARY
THEORY**



CHAPTER SEVEN

DEFINING EVOLUTION AND THE THEORY OF EVOLUTION

Evolution, simply put, is descent with modification.²⁰¹ Evolution does not occur as changes within individual living organisms. It occurs as changes within populations of living organisms over long stretches of time.

Futuyma defines evolution as: change in the properties of populations of organisms, or groups of such populations, over the course of generations.²⁰²

Ridley defines it as: change in the form and behaviour of organisms between generations.²⁰³

Strickberger says: “Biological evolution entails inherited changes in populations of organisms over time, that lead to differences among them.”²⁰⁴

Scientists who prefer to look at evolution from a genetic perspective usually define it as changes in the frequency of various genes within a population. Coming from this angle, Curtis and Barnes write: “In fact, evolution can be precisely defined as any change in the frequency of alleles within a gene pool from one generation to the next.”²⁰⁵

A population of a given species of animal, plant, or other form of life will contain within it a certain degree of variation. Its individual members will not be exactly identical, neither in their genetic makeup nor in their outward appearance. The set of all genes in a population is known as that population’s gene pool.

Over time, as generation after generation passes by, a population of living organisms undergoes changes in the genetic variation that exists within its gene pool. This may also be reflected in the physical characteristics of the organisms within the population. Changes can accumulate until the population becomes a new species. The rate of change is not constant. Some populations may remain virtually unchanged for tens or even hundreds of millions of years. Other populations may undergo rapid and

²⁰¹ Futuyma (4).

²⁰² Futuyma (4).

²⁰³ Ridley, *Evolution* (4).

²⁰⁴ Strickberger (3).

²⁰⁵ Curtis & Barnes (974).

considerable change, even to the extent of becoming new species within relatively brief periods of tens of thousands of years or even shorter periods of time.

Moreover, the occurrence of substantial changes within one population of a species does not mean that the same rate of change has to occur concurrently in other populations of the same species.²⁰⁶

Evolutionary theory

So far, we have been discussing the phenomenon of evolution that scientists claim to observe either directly in the field and the laboratory or indirectly through such means as the fossil record, genetic evidence, and comparative anatomy. We have yet to talk about evolution as a theory.

A theory in science does not mean the same thing that it means in everyday speech. People tend to use the word theory to mean some idea that is less certain than a fact. In science, however, this is not the way the word theory is used. In science, a theory is a model explaining the facts. It is, therefore, not less than a fact, but rather something altogether different.

Futuyma defines a theory as: a mature, coherent body of interconnected statements, based on reasoning and evidence, that explains a variety of observations.²⁰⁷

A theory is not described as true or false. Rather it is either valid or invalid. If a theory consistently explains all of the facts and provides predictions that are correct when tested, then the theory is said to be valid. If the theory proves to be inconsistent with the facts, then its validity is called into question.

The theory of evolution states that all the species on Earth today came about from other species that came before them, through a gradual process in which genetic mutation, natural selection, and other mechanisms play important roles. As new traits are introduced into a population of a given species by way of genetic mutation and other mechanisms, some of these traits prove more beneficial than others. Individuals that have these superior traits enjoy a greater chance of reproductive success than those that do not and are more likely to multiply and perpetuate their traits within the

²⁰⁶ Futuyma (26).

²⁰⁷ Futuyma (11).

population. This is the process known as natural selection. By way of these mechanisms, populations change and adapt to their environments. Ultimately, in this way all the diversity of life found on the Earth today came about through a gradual divergence from common ancestors.²⁰⁸

Evolutionary change takes place by way of modification of what already exists – acting upon the variation that is present within a population of organisms – and not by way of transmutation or transformation.²⁰⁹ This means that, according to the theory of evolution, living things do not evolve from what they are into something else that they are not. Rather, various populations of living things accumulate a number of different changes over time, so that those populations gradually become more and more distinct from one another.

A word about genetics²¹⁰

Biological evolution is the change in the properties of living populations over time. These changes take place within the gene pool of the population and will either entail some increase or decrease in the genetic variation that exists within that gene pool.

Evolution requires genetic variation. Genes exist on chromosomes in the cells of living organisms. The place of a specific gene on a chromosome is called a locus. Different versions of a certain gene can exist at a certain locus in different organisms within a population. Each variant of a given gene is called an allele. In most sexually reproducing organisms, the offspring receives a set of chromosomes from each of its parents, so it has two alleles for a gene at a given locus, one inherited from its mother and another inherited from its father. A single animal, therefore, can carry in its genetic makeup up to two alleles for the same gene. A population of organisms will have distributed throughout its various individuals many more alleles than that. The total number of alleles that exist within the gene pool of the population is the level of genetic variation that exists within that population for that particular gene.

How are these genes coded? Genes are coded on molecules of DNA that exist within the cell. A DNA molecule is a long chain of smaller molecules called nucleotides. There are only four of these nucleotide bases: adenine, guanine, cytosine and thymine,

²⁰⁸ Futuyma (21) and Ridley, *Evolution* (345).

²⁰⁹ Futuyma (21) and Mayr (91).

²¹⁰ For a good overview of this topic, refer to Mayr (99-103) and Ridley, *Evolution* (21-26).

often represented by the letters A, G, C, and T. Indeed, these four nucleotides are the “letters” by which genetic information is coded. All of the instructions on how to build a living organism are written in this four-letter alphabet.

These nucleotide bases are strewn out on long chains of sugar and phosphate. The sugar molecule used is called deoxyribose, and DNA stands for deoxyribonucleic acid. DNA molecules exist as complementary pairs that are linked to each other at their nucleotide bases and that intertwine in the shape of a double helix. A chromosome is one extremely long double-stranded molecule of DNA.²¹¹

What do the genes on these long strands of DNA code for specifically? They code for the construction of proteins, and almost everything in a living organism is either made of proteins or made by proteins. The total set of genes carried by an organism is called its genotype.

From the time an organism starts developing, interactions between its genotype and its environment result in all of its observable features. The full set of an organism’s features during development and when it is fully developed is referred to as its phenotype. These genes, and not the phenotype, are what get passed on in a population from one generation to the next.

²¹¹ Futuyama (43).

CHAPTER EIGHT

THE MECHANISMS OF BIOLOGICAL EVOLUTION

The mechanisms of biological evolution are of one of two kinds: mechanisms that increase the overall genetic variation within a population's gene pool and mechanisms that decrease this genetic variation.²¹²

Among the most important mechanisms that decrease genetic variation within the gene pool of a population are natural selection, sexual selection, and genetic drift. Among the most important mechanisms that increase genetic variation within the gene pool of a population are mutation, recombination, and gene flow.

1. Natural selection:

Natural selection can be defined as differential reproductive success.²¹³ Simply put, some organisms within a population contribute more offspring than do other organisms. Organisms possessing certain traits will reproduce more successfully than those who do not possess those traits, thereby perpetuating those traits within the population at the expense of others.²¹⁴

Natural selection does not have any foresight. It does not have conscious motives. It merely favours beneficial genetic traits that already exist within a population. Natural selection requires that genetic variation already exists within a population so it has something to act upon. It either maintains the present level of genetic variation by weeding out detrimental mutations as they appear or decreases the level of genetic variation by favouring certain traits over others.

Organisms possessing a certain genetic trait that increases their reproductive success will become more abundant within the population. The proportion of this genetic trait in the population may increase until it ultimately replaces other competing variants of that genetic trait within the population, thus reducing genetic variation, in other words, reducing the number of alleles that exist for a certain gene in the population's gene pool.

²¹² I am indebted to Chris Colby's "Introduction to Evolutionary Biology" for this approach to presenting the mechanisms of evolution.

²¹³ Strickberger (648) defines natural selection as: "Differential reproduction or survival of replicating organisms caused by agencies that are not directed by humans." When humans cause differential reproductive success, it is called artificial selection.

²¹⁴ Ridley, *Evolution* (6).

The notion of “survival of the fittest”²¹⁵ is at best a misleading description of natural selection. Mere survival is not important. What actually matters is how many healthy offspring an organism leaves behind. Reproductive success is the real issue. “Fitness” is only relevant in evolutionary theory if we mean by it reproductive fitness and “survival” only matters in as much as it is conducive to bringing about an increased number of equally successful descendants.²¹⁶ An organism that lives a long, healthy and happy life but leaves behind fewer descendants is not, in evolutionary terms, as “fit” as an organism that lives fast, dies young, and leaves behind a lot of offspring.

This is not exactly “nature red in tooth and claw”.²¹⁷ The less successful organism in evolutionary terms is not necessarily one that suffers more during its life or one that dies prematurely. It may very well thrive throughout its lifetime and even leave behind offspring. However, if other individuals within the same population possess traits that result in their leaving behind a greater number of descendants, then ultimately those traits will become prevalent within that population.

Natural selection is the only mechanism of adaptive evolution, meaning that it brings about and maintains adaptiveness, optimising the average reproductive fitness of a population of organisms within its environment. Adaptation does not imply progress. It does not mean that living populations become better in an absolute sense over time. What might be “better” in a given environment at a given time will not be “better” if that environment changes. Natural selection does not have the purpose of bringing about adaptiveness. It is merely a process of elimination with adaptation resulting as its by-product.²¹⁸

Natural selection and altruistic behaviour in animals

Natural selection does not always favour behavioural traits that are overtly selfish. It can lead to apparently altruistic behaviours as well. What matters is that those

²¹⁵ A phrase coined by Herbert Spencer to describe his understanding of the mechanism of natural selection. Spencer was the founder of a political and economic theory that is misleadingly referred to as Social Darwinism. Darwin reluctantly adopted the phrase “survival of the fittest” as an alternate term for natural selection in later editions of his *Origins* at the prompting of his colleague Alfred Russell Wallace, who suggested that he adopt Spencer’s phrase to avoid the misunderstanding some people might have that nature actively “selects” in an anthropomorphic sense. [Young (100-101)]

²¹⁶ Ridley, *Evolution* (684) defines fitness as: “The average number of offspring produced by individuals with a certain *genotype*, relative to the number produced by individuals with other *genotypes*.”

²¹⁷ Tennyson, “In Memoriam A.H.H.” (315). In the poem, Tennyson laments what he sees as the apparent cruelty of natural selection.

²¹⁸ Mayr (167).

behaviours bring about an increased reproductive fitness for the organisms that possess them.

There are different types of altruistic behaviour.²¹⁹ One type is referred to as reciprocal altruism. An example often cited for this type of behaviour is blood sharing among vampire bats. Not all bats succeed in finding a meal during their nightly excursions. These bats, however, form partnerships. When they return to their cave, successful bats often share their gains with their unsuccessful partners by regurgitating some blood into their mouths. However, if a bat is found to cheat by accepting blood when he is starving but not donating to others when he is successful in finding a meal, that bat will be abandoned.

Another type of apparently altruistic behaviour has to do with a concept known as inclusive fitness. This is the concept that an organism's reproductive fitness has two components: direct fitness and indirect fitness. Direct fitness is the measure of how successful an organism is at producing viable descendents that pass on its genes. Indirect fitness is how successful it is in helping other closely related individuals, like siblings – which share many of its genes – pass those shared genes on to the next generation.

To understand this, we must keep in mind that an animal's full siblings share fifty percent of its own genes. An animal's cousins share one-eighth of its genes. Therefore, any behaviour that an animal exhibits that helps its close relatives in their reproductive success indirectly helps in the perpetuation of its own genes. This means that natural selection can often favour behaviours where an animal acts to the detriment of its own reproduction in favour of that of its relatives. To illustrate this point, J. B.S. Haldane remarked that he would gladly lay down his life if by doing so he saved two siblings or eight cousins.²²⁰

2. Sexual selection:

As already discussed, “survival of the fittest” is a very poor description of natural selection. This can be seen quite clearly in one particular form of natural selection,

²¹⁹ See Futuyma (594-595) and Strickberger (499).

²²⁰ Smith (195).

known as sexual selection, which is, in truth, a subset of the mechanism of natural selection dealing with sexual attractiveness.²²¹

In many species, males exhibit prominent secondary sexual characteristics that are often a liability as far as survival is concerned. The peacock's tail is a classic example. Others are the bright colours of many birds and the loud mating calls and various displays of many animals.

These traits decrease the overall chance of survival for the male animals that possess them, since they draw the attention of predators, can hinder an animal's speed, and are costly to maintain in terms of energy expenditure. However, if such a trait causes the individual male who possesses it to be more attractive to females than its competitors and consequently allows it the chance to mate more often, this can more than compensate for its possibly shorter lifespan.

3. Genetic drift:

Genetic drift can be defined as a change in allele frequencies in a gene pool due to chance alone. Parents pass on their genes to their offspring in a random manner. A parent possessing two alleles of a given gene will pass either one of those alleles to any one of its children. In the long run, the expected overall change in allele frequency within a population due to chance is zero, since it is equally probable for an allele's frequency to increase in a single generation as it is for it to decrease.²²²

However, occasionally, a small percentage of alleles may continue to change frequency in the same direction for several generations, just like flipping coins can sometimes result in a long string of heads or tails. This can lead to the loss of a small percentage of the total number of alleles in a population's gene pool.²²³

This mechanism has a more significant effect when a sharp drop in the size of a population occurs. A population can crash due to many reasons, like plague, climate change, or the introduction of new predators. Today, human activity has brought many populations to the brink or extinction. Another important reason for a drop in

²²¹ Futuyma (586).

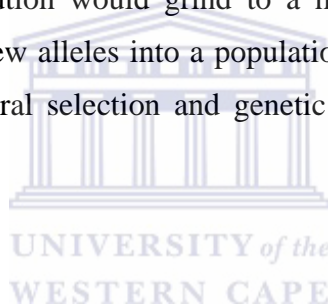
²²² Ridley, *Evolution* (142).

²²³ Futuyma (300) and Ridley, *Evolution* (139).

population size occurs when a few individuals from one population invade a new territory. This is known as the “founder effect”.²²⁴

Whatever the reason for the drop in numbers, the founders of the next generation will most likely not be genetically representative of the total genetic diversity of the much larger population that spawned them. The alleles possessed by these few individuals may not be in the same proportion as they were in the pre-crash gene pool. In fact, many alleles may not be represented at all. It is just like when an opinion poll is conducted where too few individuals are surveyed. The results of the poll are rarely representative of the opinions of the general population.

Natural selection and genetic drift are only capable of decreasing genetic diversity. If they were the only mechanisms of evolution, all populations would ultimately become devoid of diversity, variation among individual members of a population would cease to exist altogether and evolution would grind to a halt. However, there are other mechanisms that introduce new alleles into a population’s gene pool, and restore the variation that is lost by natural selection and genetic drift. We shall now turn our attention to these.



1. Mutation:

Genes are usually copied faithfully and passed on as they are from generation to generation. If this were not the case, there would be no such thing as heredity. Occasionally, however, a mistake is made in the copying of a gene or a chromosome. This mistake – this copying error – is known as a mutation.²²⁵

When genes replicate themselves during cell division, copying errors are introduced. There are different ways in which mutations can occur. One way is for a nucleotide at one site to be replaced by another. This is known as a point mutation. Another way is for a segment of DNA to be inserted or deleted. Another is for a gene to be duplicated.

²²⁴ Futuyma (304) and Strickberger (548). Futuyma (767) defines the founder effect as “the principle that the founders of a new colony carry only a fraction of the genetic variation in the source population.”

²²⁵ Futuyma (267), who points out that the word “mutation” refers “both to the process of alteration of a gene or chromosome and to the product, the altered state of the gene or chromosome. It is usually clear from the context which is meant.”

These errors are kept to an impressive minimum by a suite of proofreading and repair enzymes that work actively during the copying process. Such enzymes are unnecessary for the simplest of organism with very small genomes – RNA viruses do not have them. However, they are a must for anything possessing a genome as large and complex as that of a bacterium.²²⁶

Mutations may be neutral, harmful, or beneficial. Most mutations turn out to be neutral. This is a good thing since, although mutations are rare, because of the vast number of genes within an organism's DNA, almost every complex organism possesses some original mutations in its genetic makeup.

About one mutation takes place every time one of the cells in our bodies divides.²²⁷ These are the copying errors that occur in the genes and are not caught by the proofreading and repair enzymes. Considering that the human genome contains about 66 billion nucleotides, this is an extraordinarily small margin of error. Of course, mutations only have consequences for evolution if they can be inherited, that is, passed on to the next generation.²²⁸ If a mutation occurs in a person's skin cell, it may have consequences for that person – for instance, skin cancer – but that person will not pass the mutation on to his or her children.

However, when these mutations occur in reproductive cells, they are passed on from the parents to their offspring. Based on extrapolations from sampled sections of the human genome, it is estimated that each human zygote has on average 64 mutations, most of which occur in DNA that does not translate into anything.²²⁹ Estimates based on comparing the differences between the genes of different species posit a mutation rate that gives an average of around 200 copying mistakes per human child – meaning 200 genes that are not possessed by either of its parents.²³⁰

Most, but not all, of these mutations take place in stretches of the genome that neither translate directly into proteins nor have an obvious regulatory function. These mutations are usually more or less neutral. Some non-coding DNA, however, has been shown to affect the degree and frequency in which other DNA is activated and translated into protein. Mutations in such DNA can therefore sometimes bring about

²²⁶ Strickberger (224).

²²⁷ Caporale (25).

²²⁸ Futuyma (267).

²²⁹ Drake, John W *et al*; quoted in Harter, Richard "Are Mutations Harmful".

²³⁰ Ridley, *Mendel's Demon* (103).

very subtle affects on the phenotype, producing minute degrees of variation among organisms within a population.²³¹

Many mutations that do have a noticeable affect on an organism's physical characteristics are indeed deleterious. Others are neutral, and a few can prove to be advantageous. Moreover, advantageousness is often dependent on the environment. What may be advantageous in one environment could prove neutral or detrimental in another. It all depends on what effect the mutation has on the reproductive success of the organism possessing it.

The more substantial the effect a mutation has on an organism's physical characteristics, the more likely the mutation is to be deleterious and the more likely it is to be noticed. This is why, when we actually notice a mutation expressed in an organism's physical appearance, it is almost inevitably something bad. By contrast, a mutation that, for example, makes a roughly meter-long organism grow on average one millimetre longer than it otherwise would is a mutation that would quite likely be neutral and be equally likely to go unnoticed. However, it definitely contributes to the overall diversity of the population and, along with numerous other mutations over the course of time, contributes to the variation that natural selection has to act upon.

Mutations introduce new alleles into the gene pool. These new alleles are very likely to be lost, even if they may be beneficial, simply because they are faced with a huge number of other alleles in the gene pool at the same locus on the chromosome.

Beneficial mutations can sometimes sweep through a population quickly, if the circumstances are right for it. In the mosquito *Culex pipiens*, a gene that was involved with breaking down organophosphates became duplicated. Organophosphates are common ingredients in insecticides. This mutation increased insecticide resistance for the organisms that possessed it. The progeny of the organism with the mutations quickly swept through the worldwide mosquito population.²³²

This phenomenon can also be seen under controlled conditions in a laboratory, usually with bacteria, since they multiply and evolve very quickly. Bacteria have the added advantage of reproducing asexually so that all descendants of a single bacterium that starts off an experiment will be genetically identical "clones" of the

²³¹ Caporale (69).

²³² Colby, "Introduction to Evolutionary Biology" (– online).

initial bacterium, barring any mutations that are introduced along the way as “copying errors” when the bacteria reproduce. An experimenter can determine, therefore, that a certain mutation was not present from the onset and can determine when the mutation occurred.

Bacteria have been placed in different controlled environments where different viruses or predators were introduced. Mutations that confer resistance to infection or predation have repeatedly been seen to spread through such populations.²³³

Mutations and randomness

Mutations – changes in the gene – occur strictly according to causal processes that are permitted by molecular biology.²³⁴ These physical causes are well understood. When it is said that mutations are “random” what is meant is that mutations do not occur in response to the organism’s environment. In other words, at the moment when a mutation occurs, it is not, in and of itself, directed towards new adaptation.

Each instance of a mutation is a copying error. Its outcome is not something predetermined. There is no foresight involved at the moment a particular mutation takes place regarding the eventual needs of the organism that will carry the mutation. Specific mutations introduced in a sex cell during cell division do not occur in anticipation of the environment in which the organism inheriting it will have to live and wherein it will be subjected to natural selection.

This means that mutations, though they are not random in every sense, are random relative to natural selection.²³⁵ As we have already mentioned, natural selection is the only mechanism of adaptive evolution. A particular mutation will be random with respect to the direction of improved adaptation. It will have no tendency towards improved adaptation, but simply contribute raw material for selection to act upon.

²³³ Boxhorn, “Mutation Studies” (– online).

²³⁴ Wilkins, “Evolution and Chance” (– online).

²³⁵ Wilkins, “Evolution and Chance” (– online).

This is the way in which mutations are understood as process of chance. In scientific terms, chance simply means that the final state of a system cannot be completely specified in terms of its initial conditions.²³⁶

So long as we define the randomness of mutations strictly in the context of improved adaptation, mutations are inarguably random. However, even in this context, there is more to consider. For one thing, mutation rates may be to a considerable extent genetically determined. We have already mentioned that mutation rates are kept under control by way of an array of proofreading and repair enzymes. It is imperative that there is high fidelity in gene copying for heredity to be possible and for populations of organisms to remain viable over the course of generations. If mutation rates were too high, things would literally fall apart.

On the other hand, if mutation rates were too low – or if the proofreading mechanisms were so “perfect” in their effectiveness that mutations never occurred – then there would not be sufficient diversity in the gene pool of a population and the population would ultimately cease to be able to respond to the changing demands of its environment. As molecular biologist Lynn Caporale astutely observes: “We call mutations ‘errors,’ but from the perspective of evolution, the most serious error for a genome is to make no mutations.”²³⁷

Mutation rates may very well be subject to natural selection. Keeping in mind that the suite of proofreading and repair enzymes are themselves inherited, there may be an

²³⁶ Haarsma, in “Chance from a Theistic Perspective” explains how chance is understood in science and particularly in evolutionary biology as follows: “When physicists use the term ‘chance’ in a scientific theory, they mean simply this: The final state of a system cannot be completely specified in terms of its initial conditions, either in principle (e.g. the results of a ‘quantum measurement’), or in practice. In quantum mechanics, the element of chance is formally built into the theory; the outcomes of quantum measurements can only be specified probabilistically. In classical mechanics, the final state of ‘chaotic’ systems depend so sensitively upon the initial conditions that, in practice, it is impossible to specify all the variables precisely enough to predict the final state. In these systems, based upon experience and certain general considerations, ensembles of final states can be assigned certain probabilities of occurring.

“Biologists and medical professionals use ‘chance’ and probabilities in this second, classical sense. (For example, the chance that a disease will recur in a patient.) In evolutionary biology, a ‘chance’ event is simply an event which is not caused by the organism itself, and which we could not have predicted given our limited knowledge of the initial conditions, which affects the organism’s survival (e.g. a natural disaster) or its genetic information (e.g. a mutation). ‘Chance’ in evolution, or any other scientific theory, is a semi-quantitative statement about our ignorance --- our lack of precise knowledge of the initial conditions, or our lack of understanding of how a particular final state is selected.”

²³⁷ Caporale (11).

ideal rate of mutation that introduces the right amount of new material for other mechanisms of evolution to act upon.

There is also evidence to show that the fidelity of copying may vary depending on the gene in question. Some genes of a genome are copied, so to speak, more carefully than others. Lynn Caporale goes even further to posit mechanisms operating within the genome that generate genetic variation, mechanisms that are themselves subject to natural selection.²³⁸ In essence, natural selection favours organisms that bequeath to the next generation the right amount of new genetic diversity in the right places to give their descendents a better overall chance of survival in an ever-changing world.

In any case, regardless of how much “random chance” there is in mutation, evolution is not a random process. Evolution is not based solely on mutation, random or otherwise. Mutation is just one part of the broader evolutionary process. It is merely one of the mechanisms by which diversity is introduced into a population. This diversity is then acted upon by other mechanisms, like natural selection, that are far from random.

The traits that are passed on to future generations are not a random sample of those found in the previous one. They are the traits that helped the organisms that possessed them to be more reproductively successful in their environment. The more conducive a trait is to reproductive success, the more frequently it will be passed on. Therefore, a very non-random environmental sorting of genetic traits is constantly going on.

2. Recombination:

Genes are shuffled by way of sexual reproduction. A sexually reproducing organism has genes contributed from both its parents. Usually, it will have two sets of chromosomes, one set contributed by each of its parents. When this organism, in turn, produces its own sex cells through a process called meiosis, each of these cells will have only one set of chromosomes, but each chromosome will be a mixture of alleles from what the organism had inherited from both of its parents. This is because during meiosis, an organism’s paternal and maternal chromosomes exchange information in a manner that might be described graphically as “copying, cutting, and pasting.”²³⁹

²³⁸ Caporale, *Darwin in the Genome* (4).

²³⁹ Caporale, *Darwin in the Genome* (170).

This recombination of genes creates new combinations of alleles. This recombination not only shuffles genes around, it can occur within genes, creating new alleles that did not exist before. Recombination is an extremely important source of genetic variation. Mayr observes:²⁴⁰

Mutations continually replenish the variability of the gene pool. However, the variation of phenotypes that provide the material for selection is produced by recombination in meiosis, a process of restructuring and reassorting the chromosomes.

3. Gene flow:

Organisms from one population of a species may migrate to another population of the same species, introducing new genes to that second population's gene pool. Sometimes, closely related species can interbreed, forming fertile hybrids, transferring genes from one species to another.

Though gene flow between populations of a single species increases the genetic variation within a given population, it is an extremely conservative mechanism in evolution. This is because it prevents various populations of a species that are only partially isolated from one another from becoming genetically distinct.²⁴¹

Infrequently, genes can flow from distantly related species. Sometimes this happens by way of vectors like parasites or viruses. This is known as horizontal gene transfer.²⁴²

²⁴⁰ Mayr, *What Evolution Is* (126).

²⁴¹ Mayr, *What Evolution Is* (108).

²⁴² Futuyma (293) describes one interesting case of a virogene shared by baboons and six closely related species of cats. Virogenes are genes that are introduced into an organism's genome by retroviruses. Retroviruses can incorporate a host's DNA into their own genomes, and through cross-infection, introduce the DNA of one species into the genome of another.

CHAPTER NINE

SPECIES AND SPECIATION

There are many ways of defining a species. Which definition is best depends on what kind of organism is being defined, what aspect of biology is being focused upon, and whether the definition is referring to species at a fixed moment in time or to a species as a lineage over a stretch of time.

For the sake of simplicity, we will define a species according to the biological species concept, since it is the most widely accepted definition of a species when discussing sexually reproducing organisms, especially among zoologists.²⁴³ The biological species concept defines species in terms of interbreeding. Mayr defines the biological species concept as follows: “Species are groups of interbreeding natural populations that are reproductively isolated from other such groups.”²⁴⁴

The term “reproductively isolated” means that members of one species do not successfully interbreed with members of another. In the simplest terms, then, a species is a group of populations of similar, related, organisms that can successfully breed with one another but not with members of other populations.

A species is basically the largest possible gene pool in which the mechanisms of evolution that we have discussed can play themselves out. It is the common gene pool that gives a species its identity.²⁴⁵ As members of a species breed with one another, genes are shuffled and gene frequencies change.

Where one species ends and another begins is basically determined by whether members of the two populations can successfully produce viable and fertile offspring together. If they do, then they are a single species. If they do not, then they are separate species.

A horse is a horse. A donkey is a donkey. Though they can be coaxed into producing healthy offspring together, those offspring are usually sterile. Thus, they are two separate species.

²⁴³ Ridley, *Evolution* (351).

²⁴⁴ Mayr, *What Evolution Is* (183).

²⁴⁵ Ridley, *Evolution* (352).

Speciation

Speciation is the process by which a single species branches off into two or more species.²⁴⁶ Based on our definition of a species, speciation occurs when two populations that had not previously been reproductively isolated from one another become reproductively isolated.²⁴⁷

Reproductive isolation falls into two broad categories. The first is where members of two populations simply do not mate with one another, even though they may be interfertile. This could be on account of different courtship rituals, mate preferences, or breeding seasons.

The other is where two species cannot produce viable offspring even when they physically interbreed. If hybrid offspring do result from interbreeding, those offspring will have either low viability or fertility. Familiar cases of this are the horse and the donkey, which can interbreed and produce offspring; however those offspring are usually sterile.

In an evolving world, a species is not something fixed or immutable. Within any living population, there will be variation, and that population will be changing over time. When these changes, for whatever reason, get to the point where one population can no longer interbreed with members of another population with whom its ancestors were able to interbreed, it has become a new species.

Speciation is difficult to study in nature on account of the timescale in which it usually takes place. It is easy to observe mechanisms like mutation and natural selection in action within a species, both in the field and in the laboratory. And as we shall be discussing, it is also easy to observe large-scale evolutionary changes by looking at the fossil record.

Speciation – the point where one species branches off into two – lies in between. The timescale for speciation can be much longer than a human lifespan, but still usually far too quick to be recorded in the fossil record.

²⁴⁶ Futuyma (27 and 447).

²⁴⁷ Ridley, *Evolution* (381-382).

Geographic isolation and speciation

Speciation usually takes place when populations of one species become geographically isolated from one another, restricting the gene flow that would otherwise occur between them. As long as there is sufficient gene flow between populations, reproductive isolation is unlikely to occur, since the populations will not be able to become genetically distinct from one another.

However, when two populations become geographically isolated, each population can evolve in its own direction. Over time, the disparity between the two populations can reach a point that they become unlikely or unable to reproduce with one another, even if they were to again become geographically reunited.

Reproductive isolation seems to be a common bi-product of genetic divergence between geographically separate populations. This has been repeatedly demonstrated in the laboratory. One experiment involving fruit flies was conducted by Dodd at Yale University.²⁴⁸

An initial sample of flies was taken and divided into eight populations. Four of the populations were placed on a starch-based food medium and the other four were placed on a maltose-based food medium. These populations were reared on these different foods for many generations until they evolved detectable differences in the digestive enzymes that they produced as an adaptation to their different diets.

Then, the individuals were marked to distinguish which populations they came from and males and females from the various populations were placed together. Dodd then measured which flies mated with which, and found that the flies that had adapted to a starch-based diet preferred to mate with other flies that were adapted to starch. Likewise, the flies that were adapted to maltose preferred to breed with other flies that were adapted to maltose.

It is significant that these flies did not undergo adaptive change for their mating preferences. Selection occurred solely on account of diet. Nevertheless, mating preferences developed seemingly as a bi-product of this adaptive change.

²⁴⁸ Ridley, *Evolution* (384).

Many other experiments using experimentally isolated populations have yielded similar results. Rice and Hostert list fourteen such experiments, eleven of which showed the emergence of reproductive isolation.²⁴⁹

The same pattern can be seen when geographically isolated populations in nature are brought together in a lab. One notable study of this nature involves *Stephanthus glandulosus*, a species of flower that lives in California.²⁵⁰ The flower exists in nature as isolated populations with a discontinuous distribution. Specimens from various populations were collected and then crossed in the lab. It was found that crosses between flowers of nearby populations usually produce fertile offspring, while fertility decreases for crosses between more distant populations.

Since species evolve over time, we would expect that the lines between species to be a blurry one and that we should see examples in nature where it is hard to define where one species begins and another ends.

These blurred lines are observed in nature. They can be clearly seen in what is referred to as ring species. A ring species can be defined as: “a situation in which two reproductively isolated populations living in the same region are connected by a geographic ring of populations that can interbreed.”²⁵¹

A ring species is a case where there is a group of organisms among which there is a wide spectrum of variation that form a ring of populations. The extremes of this variation meet the definition of two separate species. They are distinctive in appearance and are reproductively isolated. At the same time there are intermediaries that link them. If these intermediaries were to disappear, the split into two distinct species would be complete.

Ring species provide a unique opportunity to observe distant populations meeting up together in nature. Usually, members of distant populations never meet and have to be brought together in a lab in order to measure the amount of reproductive isolation that

²⁴⁹ Ridley, *Evolution* (384).

²⁵⁰ Ridley, *Evolution* (387).

²⁵¹ Ridley, *Evolution* (668).

there is between them. In ring species, however, the distant, reproductively isolated populations have geographically reunited.²⁵²

One of these ring species is that of the herring gull (*Larus argentatus*) and the lesser black-backed gull (*Larus fuscus*). Both of these species live in the polar latitudes of Northern Europe. They are distinctive in appearance and never interbreed. The range of the herring gull extends into the polar latitudes of North America. As we travel west, to Alaska, then to Siberia, then back to Northern Europe, the herring gull gets progressively darker and its appearance gradually changes. The more geographically remote the population is from the original Northern European population, the more genetically different it is. Somewhere around central Siberia, it becomes dark enough and different enough to be classified as the lesser black-beaked gull.²⁵³

All of these populations located around the North Pole can breed with their immediate neighbours. However, the extremes of these populations, which are geographically reunited in Northern Europe, are completely distinct species. This is what a speciation event in progress should look like.

Another example is that of the salamander populations that form a ring surrounding the central valley of California. There are around seven distinct varieties that comprise the ring, each with its own striking coloration. They are a chain of interbreeding populations that start with *Ensatina eschscholtzii* in Oregon to the north with populations spreading southward around the central valley of California. One chain of gradually changing, interbreeding populations spreads down the western coast while another spreads down inland east of the central valley. The two lines of populations meet up again at the southern end of the valley, where they have become two distinct species.²⁵⁴

Other examples of ring species are a ring of warbler populations that encircle the Tibetan Plateau and a group of now extinct snail populations that formed ring species around small mountains on the Pacific island of Moorea.²⁵⁵

²⁵² The phrase “circular overlap” is used to describe the phenomenon of ring species in geographical terms. [Futuyma (445) and Mayr (202)]

²⁵³ Smith (228).

²⁵⁴ Ridley, *Evolution* (388). See also: Futuyma (456).

²⁵⁵ Ridley, *Evolution* (389).

When dealing with ring species, it is impossible to clearly define where one species ends and another begins. There is a continuum of gradual change. Only where the two extremes on the ring meet one another are two distinct species clearly discernable.

Hybridisation and speciation in plants

Some speciation events can occur more rapidly. This is especially true for new species that arise as a result of hybridisation. The natural evolution of four new plant species in this way has been recorded in the past century, two in Great Britain and two in North America.²⁵⁶

Two of these are species of goatsbeard that have arisen in North America within the past 50 to 60 years.²⁵⁷

Three European species of goatsbeard of the genus *Tragopogon* were introduced into North America, *Tragopogon dubious*, *Tragopogon pratensis*, and *Tragopogon porrifolius*. All three of these species are found together in the Pacific Northwest of the United States, having been established there in the early twentieth century. In 1950, Marion Ownbey discovered that two new species of goatsbeard had appeared in this region, *Tragopogon mirus* and *Tragopogon miscellus*. These two new species had to have arisen within the previous decade, since they had never been found earlier.²⁵⁸

Tragopogon mirus is a hybrid of *Tragopogon dubious* and *Tragopogon porrifolius* while *Tragopogon miscellus* is a hybrid of *Tragopogon dubious* and *Tragopogon pratensis*.

Each of these hybrids is reproductively isolated. Neither species can interbreed with either of its parent species. Both are still thriving in Washington State after 40 years.

The first artificially produced hybrid species was the kew primrose (*Primula kewensis*), which was formed in 1912 when Digby crossed two other primrose species.²⁵⁹ The kew primrose is a distinct species that will breed only with another kew primrose. Numerous other hybrid species have since been produced in this way.

²⁵⁶ Ridley, *Evolution* (405).

²⁵⁷ Ridley, *Evolution* (406).

²⁵⁸ Futuyma (506).

²⁵⁹ Ridley, *Evolution* (53). Boxhorn, "Observed Instances of Speciation".

One interesting case of hybridisation involved the introduction of a whole new plant genus.²⁶⁰ Between 1927 and 1928, the Russian cytologist Karpchenko crossed the radish *Raphanus sativus* with the cabbage *Brassica oleracea*, which resulted in a sterile hybrid. Some unreduced gametes were formed in the hybrids, which allowed for the production of seed. Plants grown from the seeds were interfertile with each other, but not with either parental species. This new plant genus, *Raphanobrassica*, had the foliage of a radish and the root of a cabbage.

It used to be assumed that hybridisation is unimportant in speciation among animals. This assumption is possibly mistaken. For instance, recent genetic evidence shows that hybridisation may be a significant factor in speciation among a number of insect species, including walking sticks, grasshoppers, blackflies and cucurionid beetles.²⁶¹



²⁶⁰ Boxhorn, "Observed Instances of Speciation".

²⁶¹ Boxhorn, "Observed Instances of Speciation".

CHAPTER TEN

EVOLUTION ON A LARGE SCALE

When biologists ask questions like: “How and when did birds or mammals evolve and what were their ancestors like?” or when they ask: “How did the first simple multicellular plants and animals evolve from single-celled ancestors?” they are dealing with large-scale evolutionary events. Evolution within a species can be readily observed both in the field and in the laboratory. The evolution of new species can sometimes be observed within the course of a human lifetime. However, because of the immense timescales involved, these large-scale evolutionary events cannot be observed directly.

These processes must be studied indirectly. Among the numerous methods employed by biologists in researching large-scale evolutionary trends are comparative anatomy, the study of the fossil record, and comparative genetics.

According to evolutionary theory, all species living today descended from a common ancestor. As different populations of organisms adapted to their environments, they branched off into different species. These species, in turn, continued to form populations that branched off from one another and diversified. This is depicted as a “tree of life” stretching through time. The tips of the branches represent the species that are living today. The branches going back in time represent the ancestors of these species. All living species, therefore, from the simplest bacteria to the most complex mammals, are all equally modern organisms. Indeed, most of the species living on Earth today are bacteria. There is no notion of “progress” in evolution.²⁶²

Nested hierarchies and the classification of living things

Living organisms fall naturally into a hierarchical system of groups within groups. Lions and tigers are clearly different, but they share a lot more in common with each other than either do with a chimpanzee. Lions, tigers, and horses, in turn share with each other a lot of features – like hair, lungs, limbs, and a warm-blooded metabolism, that separate them from other animals, like sharks and fish. All of these animals,

²⁶² Smith and Szathmári (4). “The notion of progress has a bad name among evolutionary biologists... Empirically, the history of life is better visualized as a branching tree than as a single ascending line. The fossil record shows that many organisms – horseshoe crabs, the coelacanth, crocodiles, for example – have undergone little change, progressive or otherwise, for hundreds of millions of years.

however, share possession of an internal skeleton with a backbone that they do not share with a wide array of other animals, like insects and earthworms. This pattern of nested similarity is obvious simply by comparing the anatomy of different species, and it is something that has been observed for centuries. This pattern has been further confirmed by comparing the genetic sequences of these different species.

This nested hierarchy, as it is called, conforms to the idea that organisms have undergone a historical process of branching and divergence – that a long series of consecutive speciation events has taken place.

A biological group is called a taxon (plural: taxa). A species is a taxon. It can be placed within a higher taxon, then in a higher one. Traditionally, these taxa had been given the following designations: Domain, kingdom, phylum, class, order, family, genus, and species.²⁶³

Looking again at our example of the lion (*Panthera leo*), we can see that it falls neatly into a larger taxon along with other very similar animals, namely the tiger (*Panthera tigris*), the jaguar (*Panthera onca*), and the leopard (*Panthera pardus*). This taxon is the known as the genus *Panthera*.²⁶⁴

Panthera, in turn, fits neatly into the family Felidae – the “cat” family – along with other genera of cats, which are made up of various other cat species. The family of Felidae is nested snugly within the order Carnivora along with other carnivores like bears and dogs. Carnivora is nested within the subclass Eutheria with all other mammals that give birth to fully formed, live young. These mammals are also known as placental mammals. They in turn fit neatly into class Mammalia along with the marsupials and egg-laying mammals like the platypus.²⁶⁵

The class of mammals then fits into the subphylum Vertebrata along with all other animals that possess a backbone. Vertebrates in turn fit into the phylum Chordata with

²⁶³ This classification system is known as Linnaean classification, since it was devised by the eighteenth century Swedish naturalist Carolus Linnaeus. This system, though it is familiar to most people, is outdated. For most evolutionary biologists, another classification system known as cladistics has gained in popularity during the past few decades and has more or less supplanted other classification systems. [Ridley, *Evolution* (489)]

²⁶⁴ A genus is the group of very similar species within a larger family. The scientific name of all species consists of two parts. The first, always capitalized, is the name of its genus. The second, always beginning with a lowercase letter, is its particular species epithet.

²⁶⁵ See Mayr (25-26) for a similar discussion, starting with the housecat instead of the lion.

all other chordates. Chordates are one of the many phyla of the animal kingdom. Other animal phyla include the arthropods and the molluscs.

The animal kingdom fits squarely into the domain of all living things that contain nucleated cells – the domain of Eucarya. The cells of all animals possess nuclei. There are many other kingdoms that share with animals this quality of possessing nucleated cells. There is the plant kingdom and the kingdom of fungi. There are also a huge and bewilderingly diverse number of kingdoms comprised of single-celled, nucleated life forms.

The domain of Eucarya is in turn one of the three main branches of living things, the other two being that of Bacteria and Archaea. Each of these other two domains consists of single-celled organisms that do not possess nuclei, and each of these domains is extremely rich in the diversity of life that it represents. We should also consider that, when living organisms are compared on the genetic level, the diversity expressed among the microbial life of these three domains far exceeds the diversity represented by plants and animals. Knoll illustrates this beautifully when he says:²⁶⁶

In the Tree of Life, built from comparisons of nucleotide sequences in genes from diverse organisms, plants and animals form only small twigs near the top of one branch. Life's greater diversity, and, by implication, its deeper history, is microbial.

This, then, is a description of the lion's place in the nested hierarchy of all living things.²⁶⁷ When all other living things are placed in this hierarchy, the relationships between them can be depicted as a single, branching tree.²⁶⁸ At the base of the tree are its three main branches: bacteria, archaeans, and eukariotes. Each of these then branches off into numerous kingdoms. Each of these kingdoms in turn branches off into phyla, which then branch off into classes, orders, families, genera, and ultimately into all of the species that are found on the Earth.

According to evolutionary theory, this branching tree represents lines of descent and divergence.²⁶⁹ Multicellular animals, plants, and fungi evolved from single-celled, eukariotic ancestors. Vertebrates evolved from non-vertebrate animals. Mammals

²⁶⁶ Knoll (16).

²⁶⁷ Yuan and Chan (– online).

²⁶⁸ For an excellent resource on the phylogenic relationships between taxa, refer online to the *Tree of Life Web Project*.

²⁶⁹ Mayr (20-21).

evolved from earlier vertebrates. Mammals that could bear fully-formed live young evolved from earlier mammals that could not do so. Early carnivores then evolved from these early live-bearing mammals. Cats evolved from these early carnivores. Lions then evolved from an ancestral cat species.

It is important to understand that when it is said that lions evolved from another cat species, it does not imply that they evolved from a cat species that still exists in the world today. What it means is that lions, along with the other members of its genus – tigers, jaguars, and leopards – all evolved from a common ancestor. The ancestral cat species from which these animals all descended is, in this case, long extinct.

Likewise, when it is said that all cats evolved from early carnivores, it does not imply that cats evolved from dogs or from bears. What it implies is that cats, dogs, and bears all share a common ancestor in the remote past from which they all descended. This means that various populations of an ancestral carnivore species – which was neither a cat, a dog, nor a bear – evolved in different directions. One lineage evolved into the cats, which further diversified into the many cat species that we have today. Other lineages evolved in the direction of canine or bear-like species. In turn, the lineage that evolved into an early canine-like species branched out into various populations which then continued to diversify to produce the coyotes, foxes, wolves, and dogs that we have today.

These conclusions are reinforced by comparative genetics. The further apart species are from each other, the greater the genetic difference is.²⁷⁰ Closely related species – those belonging to the same phylum – have similar gene sequences. In fact, tigers and lions are so similar genetically that they can actually produce hybrid offspring, though the hybrids have limited fertility and numerous health problems.²⁷¹

The fossil record

The fossil record shows a sequence of changing life forms over time. It allows for the study of evolutionary change on the broadest of possible timescales. The first of these timescales is that of the general succession of life over the entire stretch of geological

²⁷⁰ Mayr (37-38).

²⁷¹ Annabell (– online). These hybrids are called ligers and tigons. Only female ligers and tigons have been known to be fertile.

time. The second is that of the growing number of transitional sequences being discovered that present a picture of how different types of organisms evolved.

Before discussing the fossil record, it is necessary to define what fossils are. A fossil is any remnant or trace of a living organism found in the crust of the Earth.²⁷² There are many types of fossils.²⁷³ These can be summarised as follows:

1. Chemical and molecular fossils
2. Impressions left by organisms
3. Moulds and casts
4. Calcified hard parts
5. Petrified skeletal parts
6. Actual bone
7. Complete remains

1. The general succession of life over the entire stretch of geological time:

The fossil record reveals that life on Earth has undergone massive changes over time. What follows is a brief overview of some of the major changes:

2+ billion years ago – fossil bacteria: Bacteria consist of single cells that possess no nuclei. In over a dozen widely distributed sedimentary rock deposits over two billion years old, mainly iron-rich cherts, copious amounts of fossil bacteria, including photosynthetic cyanobacteria, are to be found. The most notable of these deposits is the Gunflint Formation of northern Ontario.²⁷⁴ There is some equivocal fossil evidence of bacteria in much older rock.²⁷⁵

1.5 billion years ago – fossil eukaryotes: The oldest unmistakable fossil eukaryotes are found in the shales of the Australian Roper Group and date back almost 1.5 billion

²⁷² Strickberger (641) defines a fossil as: “(t)he geological remains, impressions, or traces of organisms that existed in the past.”

²⁷³ Ridley, *Evolution* (524).

²⁷⁴ Knoll (90).

²⁷⁵ The oldest structures that might be bacteria fossils comes from the Apex Chert that dates back 3.5 billion years. [Schopf (76)] This claim, however, has come under some heavy criticism. [Knoll (63)]

years.²⁷⁶ The oldest eukaryotes that can be compared with living eukaryotes come from Somerset Island in Canada and date back to 1.2 billion years.²⁷⁷

There is fossil evidence that eukaryote evolution was well underway as far back as 2.7 billion years ago. Eukaryote cell membranes are stiffened with a family of fatty acids known as sterols. Sterols have been found in traces of oil in shale in northwest Australia that is 2.7 billion years old.²⁷⁸ Though this is not conclusive evidence that the organisms that produced these sterols were full-fledged eukaryotes; nevertheless, these chemical fossils indicate that a progression in this direction – a very important branching in the tree of life – was already taking place at that time.

950 million years ago – sexually reproducing protozoans: The oldest known fossils of clearly sexual protozoans are fossils of thick-walled acritarchs possessing wall openings for the release of reproductive cells. An important source for these fossils is the 850 million year old Kwagunt Formation in Arizona.²⁷⁹

640 million years ago – macroscopic fauna: First found in the Ediacara Hills in Australia, a diversity of fascinating, soft-bodied organisms represent the earliest known macroscopic fauna, often referred to as the Ediacarian biota. Some are disklike fossils, representing anatomically simple, bottom-dwelling organisms. Most palaeontologists agree that they are related to modern Cnidaria (the animal phylum that includes jellyfish and sea anemones).²⁸⁰ A second group of Ediacaran fossils, called vendiobonts, are complex, often leaf-like forms, some of which resemble sea pens and others which seem to have no modern equivalents, but which also appear to be related to cnidarians.²⁸¹ Other palaeontologists contend that much of the Ediacaran fauna is wholly unique and represents an extinct branch of macroscopic life.²⁸²

Cnidarians – modern representatives of which include jellyfish and sea anemones – are diploblasts, meaning they have only two body layers, an endoderm where the gut resides and an ectoderm, which forms the outer layer of the animal.

²⁷⁶ Knoll (154).

²⁷⁷ Knoll (149).

²⁷⁸ Knoll (94).

²⁷⁹ Schopf (254).

²⁸⁰ Knoll (166).

²⁸¹ Knoll (169).

²⁸² Gould, *Wonderful Life* (312).

Other Ediacaran fossils vaguely resemble arthropods or molluscs, and seem to have discernable front and back ends and seem to possess a more complex structure than that found in diploblasts, but the evidence for this is inconclusive.²⁸³

570 million years ago – triploblasts: Well-preserved specimens of a minute, triploblastic animal, *Vernanimalcula guizhouena*, were discovered in China's 570-million-year-old Doushantuo Formation.²⁸⁴ The animal is only between one-tenth and two-tenths of a millimetre across and in life would have barely been visible to the naked eye.

Triploblasts are animals that possess three body layers, an ectoderm (where skin and nervous system develops) and endoderm (gut), and mesoderm (muscle and connective tissue) which is sandwiched in between. All animal groups besides animals like sponges, cnidarians, and comb jellies are triploblasts.

Vernanimalcula guizhouena has bilateral symmetry. This means that its right half mirrors its left half and it has a distinct front and back. The mouth of *Vernanimalcula guizhouena* is clearly discernable at its front end. Bilateral symmetry was a milestone in the development of the animal body plan, since this form of symmetry is the most efficient design for active animals engaged in directional movement.²⁸⁵

Vernanimalcula guizhouena shows another significant development; it possesses a body cavity called a coelom. Animals with a coelom have a tube within a tube internal organization. Possession of a coelom is a major distinguishing characteristic of complex animals, allowing for a more stable arrangement of organs and a more complex internal arrangement.²⁸⁶

There are also fossils in the 570-million-year-old Doushantuo Formation of exquisitely preserved animal embryos in different stages of cell division. The pattern of this division clearly shows that these animals were triploblasts. The egg case and cell cleavage patterns evidenced in these embryos resemble that of arthropods or other

²⁸³ Knoll (172-173).

²⁸⁴ Chen *et al* (– online).

²⁸⁵ Hickman *et al* (189).

²⁸⁶ Hickman *et al* (190, 325).

similar invertebrates.²⁸⁷ However, what the fully developed animals looked like is something that cannot even be guessed at.

By the time we reach late Ediacaran rock of 550 million years old and younger, trace fossils of tracks and burrows dug by what were clearly much larger, muscular, bilateral animals become plentiful.

This is a brief overview of the fossil record during the great geological age referred to as the Proterozoic Era “the age of earlier life”. The fossil record during this age shows a succession of change in the forms and diversity of living organisms to be found, starting from a time when only bacteria flourished on the Earth to the proliferation of complex, bilateral, soft-bodied coelomate animals.

543 million years ago – animals with hard parts: Nearing the beginning of a geological period known as the Cambrian (543 mya to 505 mya), the first fossils appear of animals possessing mineralised hard parts.²⁸⁸ These animals are collectively referred to as the “small shelly fauna”. Among the earliest of these fossils that predate the Cambrian are those of *Cloudinia* and *Namacalathus*, though they probably belonged to cnidarians.²⁸⁹ Fossils of small shelly fauna rapidly increase in size and diversity into the early Cambrian. The earliest known fossils of mollusc shells appear at the very start of the Cambrian.

530 million years ago – the Cambrian explosion: Later on in the early Cambrian period, the fossil record of animal life, which had already been established on Earth for at least many tens of millions of years, begins to show a wide diversity of forms. Almost all of the animal phyla in existence today, and possibly a number of extinct phyla, are represented in the Cambrian fossils.²⁹⁰

The “explosion” took place in two stages.²⁹¹ The first of these is known as the Tommotian stage (from 531 mya to 522 mya), during which large body fossils (primarily reef forming archaeocyathids) appeared. The second is the Atdabanian stage (from 522 mya to 519 mya), the real height of the explosion in the fossil record,

²⁸⁷ Knoll (148).

²⁸⁸ Strickberger (323).

²⁸⁹ Knoll (174-176).

²⁹⁰ Futuyma (172).

²⁹¹ Gould, *Wonderful Life* (59-61, 226, 315).

a period of roughly four million years over which time the rest of the Cambrian fauna makes its appearance.

One of the phyla that makes its debut in the Cambrian fossil record is Chordata, the phylum to which all backboned animals belong, represented by a creature called *Pikaia*. The most famous source for Cambrian fossils is the Burgess Shale of British Columbia.

It is possible that much of the diversity among bilateral animals had already come about before the Cambrian. However, the fossil record does not reveal this diversity because the extremely small size of many of those animals coupled with the fact that they were soft-bodied made fossilization quite difficult.²⁹² How much of the Cambrian explosion is a genuine rapid diversification of forms and how much is merely an artefact of a greater availability of fossils due to increased body size and the evolution of hard parts is a subject of considerable debate and research.²⁹³

The fossil record up to the Cambrian period clearly shows the sequence of major hurdles that life passed through up to the time when all modern animal phyla appeared on Earth. The succession of life continues in the fossil record in the same way for every phylum that exists or has ever existed. We shall now look at a few highlights of what appears in the fossil record after the Cambrian explosion. For the sake of brevity, we will focus on the fossil appearances of terrestrial vertebrates.

360 million years ago – tetrapods: The first four-legged vertebrates bearing digits on their feet – known as tetrapods – appear in the fossil record around 360 million years ago.²⁹⁴

320 million years ago – amniotes: The next great hallmark in the vertebrate fossil record takes place 40 million years later with the appearance of amniotes. Amniotes are four-legged vertebrates that possess an egg membrane called an amnion, which allows them to lay their eggs on dry land. This means that, unlike amphibians, they do not have to return to the water to lay their eggs. All reptiles, birds, and mammals are amniotes. Most mammals and some other amniotes have the ability to bear live young, the amnion being with the foetus in the mother's womb.

²⁹² Mayr (65) and Ridley, *Evolution* (536-537).

²⁹³ Futuyma (174).

²⁹⁴ Strickberger (410).

One of the first true amniotes known is *Hylonomus*, fossils of which are found in Nova Scotia and date back to 320 million years ago.²⁹⁵

The amniote fossil record then progresses in three distinct main lines, each distinguished by the structure of the skull. There are the synapsids – the group to which the mammals belong – typified by a single hole in the back of the skull. There are the diapsids – to which lizards, snakes, crocodiles, and birds belong – typified by two holes in the back of the skull. Then there are the anapsids – to which the turtles belong – possessing no hole at the back of the skull.

300 million years ago – diapsids and synapsids: About 300 million years ago, not long after the first appearance of amniotes, the fossil record reveals the earliest known synapsid and diapsid fossils. They are the synapsid *Archaeothyris* found in Nova Scotia and the diapsid *Petrolacosaurus*. Both of these animals are superficially similar in skull and body form to that earliest known amniote *Hylonomus*, with the exception that *Archaeothyris* has a single hole at the back of its skull, showing it to be a synapsid, while *Petrolacosaurus* has two, distinguishing it as a diapsid.²⁹⁶

Moving forward in time, the fossil record reveals progressive changes in both of these lineages, with fossils of synapsids and diapsids become successively more and more different from early amniotes and from one another.

An important appearance in the diapsid fossil line was that of the archosaurs, the “ruling reptiles”. The first well-known archosaur, *Proterosuchus*, found in the Karoo Basin of South Africa, dates back 250 million years.²⁹⁷ Like earlier diapsids, it had a splayed posture like that of modern lizards, its legs extending outward from its body. Later archosaurs, like *Euparkarea*, displayed a more erect gait.²⁹⁸ This allowed for much faster locomotion. One important archosaur group that exhibits a semi-erect gait and survives until today is that of the crocodiles. Fully erect archosaurs with their four legs held vertically below their bodies, appear in the fossil record a little later on.

The next significant milestone in the archosaur fossil record is that of bipedalism – walking on two legs – with the front legs being smaller than the hind legs. Actually,

²⁹⁵ Clack, *Gaining Ground* (265).

²⁹⁶ Clack, *Gaining Ground* (265).

²⁹⁷ Benton, “Four Feet on the Ground” (114).

²⁹⁸ Benton, “Four Feet on the Ground” (117).

the first hints at bipedalism are seen in *Euparkarea*, which represents the first tetrapod known to be able to pull off the feat of moving about on two legs, though probably only in order to peer around or to sprint really fast.²⁹⁹ Full-fledged bipedalism is seen in some later archosaurs like *Ornithosuchus*.³⁰⁰ Bipedalism was an important milestone in the archosaur fossil line, leading to the first dinosaur appearance in the fossil record, *Staurikosaurus*, around 230 million years ago. These first dinosaurs were fully bipedal, had erect hind limbs, and forelimbs less than half the length of their hind limbs.³⁰¹ Probably the most modified bipedal archosaurs in the fossil record are the birds, which make their debut in the fossil record with *Archaeopteryx* 150 million years ago.³⁰²

The synapsid fossil record is equally intriguing. Over the course of 100 million years, it presents a succession of forms going from the more reptilian features of early synapsids to the suite of features that are unique to mammals.

Early synapsid groups exhibit the same lizard-like sprawling gait of other early amniotes. Synapsid fossils show a progression to upright posture similar to that which is seen among the archosaurs. Another significant set of successive changes is seen in the jawbones and middle ear bones of the synapsids. The jaws of early synapsids hinged at the back, in the same way that the jaws of earlier amniotes did and modern reptiles still do, in contrast with the jaws of mammals. Early synapsids show little or no tooth differentiation.³⁰³ This means that their teeth were very unlike the teeth of mammals, which are multicusped and highly differentiated down the jaw into incisors, canines, molars, and the like.

A major landmark in the synapsid fossil record is the appearance of therapsids. The teeth of some therapsids are more differentiated and later forms possess a secondary palate. This is the feature that allows mammals to eat and breathe at the same time.³⁰⁴

One group of therapsids, the cynodonts, are extremely interesting. Early amniotes, as well as reptiles, have a very different jaw structure than mammals. The jaws of mammals are hinged at a different place. This is why mammals have more precise

²⁹⁹ Benton, "Four Feet on the Ground" (116).

³⁰⁰ Benton, "Four Feet on the Ground" (117).

³⁰¹ Benton, "Four Feet on the Ground" (121).

³⁰² Benton, "Dinosaur Summer" (144).

³⁰³ Ridley, *Evolution* (544).

³⁰⁴ Ridley, *Evolution* (545).

chewing and hearing apparatus than reptiles. Not only did cynodonts have even more highly differentiated and multicusped teeth closer to those of mammals, some cynodonts had jaws that hinged in two places, both in the mammalian and reptilian positions. This means that they had functional jaws that were intermediate between those of early synapsids and those of mammals.³⁰⁵

This double hinge is important for another reason. Mammals have three bones in the middle ear, two of which, the hammer and anvil, are absent from the ears of early synapsids. By contrast, early synapsids, like reptiles, had four jawbones – as opposed to the single mammalian jawbone. Two of these other jawbones, the quadrate and the articular, are in contact with the single bone of the reptilian middle ear, the stapes. In mammals, the hammer and anvil are in contact with the stapes.

As therapsid species in the fossil record become progressively more recent, these two jawbones – the quadrate and the articular – become progressively more and more like the hammer and anvil of mammalian ears, all the while maintaining contact with the stapes. In therapsids like *Morganucodon*, the double-hinged jawbone allows the quadrate (anvil) and the articular (hammer) to serve as mammalian-style ear bones and “reptilian” jawbones at the same time.³⁰⁶

The first true mammals appear in the fossil record around 200 million years ago, not long after the appearance of the first dinosaurs.³⁰⁷

2. Transitional forms in the fossil record:

There are quite a significant number of transitional sequences found in the fossil record. Most of these are general, showing sequences of genera or families, though some sequences actually show species-to-species transitions. Two important general transitional sequences will be discussed.

Before doing so, however, it is important to point out that when discussing general sequences, it is not being claimed that the earlier fossil species are directly ancestral to the later ones. According to evolutionary theory, species are always branching off and diverging. A species from an early period is not necessarily the one that is the

³⁰⁵ Ridley, *Evolution* (545).

³⁰⁶ Futuyma (149-151) cf: Theobald, “29+ Evidences for macroevolution: Part 1” (– online).

³⁰⁷ Ridley, *Evolution* (542).

direct ancestor of a species found later on. The older species may very well be on a diverging branch, merely a close relative of the direct ancestor of the later species.

Tetrapod evolution

The term tetrapod refers to all four-legged vertebrates. Much of the evolution of tetrapods took place during the later part of the geological period known as the Devonian, which lasted from 408 million years ago to 360 million years ago. Contrary to what used to be assumed before the transitional forms were discovered, the transition from fins to feet took place entirely underwater.

The story of tetrapod evolution begins with a group of fishes called the Sarcopterygii, also known as lobe-finned fishes. These fish are typified by having fleshy, paired fins. Lobe-finned fishes include the lungfishes and the coelacanth that survive today, as well as a large number of other fossil groups. It is one of these fossil groups, the Osteolepiformes, which is the branch from which four-legged animals evolved. The transition of lobe-finned osteolepiform fish to tetrapods is well documented in the fossil record. Some of the more important of these transitional forms are discussed below:

Eusthenopteron: This fish could walk about underwater on its fins, just like a number of fish do today, for instance, the epaulette shark of the Australian reef. *Eusthenopteron* has muscular, paired fins that resemble tetrapod limbs in many ways. Its front fins even possess a recognizable humerus, radius, and ulna, just like the limbs of four-legged animals. These fins are reinforced with dermal fin rays. At the same time, they are still fins and not feet. It could only swing its forelimb back and forward through 20 to 25 degrees.³⁰⁸ Its eyes were spaced nearer the front of the skull and were far apart. With its streamlined torpedo shape, and its pelvic fins near the back of its body, its overall body plan is that of a fully aquatic, lurking predator, like a pike.³⁰⁹

Panderichthys: This fish was found in the late Devonian site of Lode in Latvia that is 378 million years old. It has paired fins at the front and back of its body that fit the tetrapod limb pattern. Its front fins have a humerus, ulna and radius. Its back fins have a femur, tibia and fibula. It has a flat skull with closely spaced eyes placed higher up on the head, a large mouth, and external nasal openings that makes the skull much

³⁰⁸ Benton, "Four Feet on the Ground" (114).

³⁰⁹ Clack, *Gaining Ground* (63).

more like the skulls of the early tetrapods which appear a little later in the fossil record. In fact, its skull proportions are almost exactly midway between those of *Eusthenopteron* and those of the earliest tetrapods.³¹⁰ Its ribs are joined to the backbone in the same way that those of tetrapods are. It would have been a far better underwater walker.

Tiktaalik: A number of well-preserved specimens of this creature were found in the Canadian Arctic. The animal dates back to 375 million years ago, has a flat-body, a longer snout, raised and dorsally placed eyes and a mobile neck, which more closely resembles the neck of later land animals, and which would have allowed the creature a wider range of head movements than other fish are capable of.³¹¹ It possesses a pectoral girdle and forefins capable of complex movements and support for walking upon a surface like a lakebed. It would have been able to flex its shoulders and elbows.³¹² Its ribs are larger and provide it with rigidity and support that would be unnecessary in a deep aquatic setting. From this suite of features, scientists surmise that it probably lived in a very shallow or even subaerial environment.³¹³ *Tiktaalik* is intermediate between earlier finned fish and those animals which are regarded as the earliest but still fully aquatic tetrapods. For this reason, Neil Shubin, one of its discoverers, nicknamed it a “fishapod”.³¹⁴

Acanthostega: This early tetrapod of 363 million years ago has legs with fingers, though its feet are still very finlike. Eight fingers appear on the front limbs and seven on its hind limbs.³¹⁵ These legs are not fully evolved. Its arm bones are fishlike and its arms could not support it on land. *Acanthostega*'s front foot could not bend forward at the elbow, meaning it still functioned like a horizontal flipper.³¹⁶ It has a caudal fin and an elongated tail fin like that of *Panderichthys*. It possesses both gills and lungs. The stapes, a bone which forms part of the hearing apparatus for later tetrapods, is still being used by this animal to ventilate its gills.³¹⁷ *Acanthostega* is the quintessential “fish with legs”.

³¹⁰ Clack, *Gaining Ground* (142).

³¹¹ Daeschler *et al.*, (762).

³¹² Shubin *et al.*, (764).

³¹³ Daeschler *et al.*, (762).

³¹⁴ Quoted in Daeschler's press release: “This animal is both fish and tetrapod; we jokingly call it a fishapod.” (– online).

³¹⁵ Clack, *Gaining Ground* (125, 127).

³¹⁶ Clack, *Gaining Ground* (126).

³¹⁷ Clack, *Gaining Ground* (294).

Ichthyostega: This is another tetrapod of around 363 million years ago. Its legs are still not structured for walking on land. It does, however, possess fully developed shoulder and hip girdles, a stronger backbone, bulky limb bones, accommodating well-developed muscles. It had an elbow that was a hinge, though it is possible that it may have been locked into a right angle bend.³¹⁸ Like *Acanthostega*, its ankles have no obvious lines of flexibility that would allow it to place its feet flat on the ground and help support its weight.³¹⁹ It is disputable how well it could have moved about on land, though it would clearly have been a very poor walker at best, its feet still operating largely as fins. It still has an elongated tail like *Acanthostega* and *Panderichthys*.

Acanthostega and *Ichthyostega* are among the earliest fossil vertebrates known to have feet. The feet of these tetrapods, though possessing digits, could only bend slightly. They could not flex their toes, because they lacked a notch on the flexor surface of the phalanges.

Tulerpeton: This tetrapod appears at the very end of the Devonian and has legs that are more elongated and slender than those of *Acanthostega* and *Ichthyostega*, which might have made them more adapted to terrestrial locomotion, and it has six digits on each of its feet.³²⁰ Though its leg structure is still more that of a paddle-like swimming appendage than one for walking proficiently on land, its shoulder bones are more robust and more like that of later tetrapods.³²¹ The fossil evidence indicates that it had lost the use of internal gills.

Although the tetrapods of the Devonian were largely aquatic, their means of walking can be seen in trackways that they left behind as they walked about on the bottoms of their aquatic habitats. Some of the tracks show a sinuous body or tail trace as well as footprints, meaning that these animals were dragging their bellies on the bottom. The tracks of others are of footprints appearing without tail or belly drag, meaning that at least when they were walking about underwater, the animals that made them kept their tails and bellies off the bottom.³²²

³¹⁸ Clack, *Gaining Ground* (330).

³¹⁹ Clack, *Gaining Ground* (330).

³²⁰ Clack, *Gaining Ground* (129-130).

³²¹ Clack, *Gaining Ground* (158).

³²² Clack, *Gaining Ground* (92-93).

Pederpes: This tetrapod dates back to about 350 million years ago, in the early Carboniferous period. Unlike the paddle-like feet of Devonian tetrapods that pointed back or to the side, the feet of *Pederpes* have been reoriented to point forward – perfect for locomotion on land. The middle toe on each foot points straight ahead just as it does in modern tetrapods. It was probably a sluggish crawler.³²³

By 340 million years ago, land-dwelling tetrapods, which we would commonly refer to as “amphibians”, were proliferating. The first amniotes, as we have already discussed, appear in the fossil record about 20 million years later.

Whale evolution

The story of whale evolution starts with a group of mammals known as ungulates. These are hooved mammals, represented today by animals like horses, sheep, and cows. The fossil record provides a chronological sequence of fossils showing a gradual transition from terrestrial hooved mammals to fully aquatic whales.

The transition from terrestrial hooved mammals to cetaceans is well documented in the fossil record. Some of the more important of these transitional forms are discussed below:

Pakicetus: This is a fully terrestrial, 52-million-year-old, wolf-sized cetacean. The skull of *Pakicetus* is what shows this animal to be a cetacean, because it has a narrow braincase, a high, narrow sagittal crest, and prominent lambdoidal crests. Some of its teeth, its premolars, have lost their cusps and have become simple serrated triangles.³²⁴ (The teeth of later whales will all be serrated triangles). *Pakicetus* has specialized inner ear bones unique to cetaceans; however, its hearing apparatus is very terrestrial.³²⁵ It would not have been able to hear directionally underwater. There is no vascularisation of the middle ear to regulate the pressure of the inner ear, so *Pakicetus* would not have been able to dive to great depths.³²⁶ Like other terrestrial mammals, its nasal openings are at the tip of its snout.³²⁷ Skeletal remains show *Pakicetus* to have been closely related to – but not descended from – the earliest artiodactyls, the

³²³ Clack, “An Early Tetrapod from ‘Romer’s Gap’ ” (72-76).

³²⁴ Sutura, “The Origin of Whales and the Power of Independent Evidence” (– online).

³²⁵ Thewissen *et al* (278).

³²⁶ Sutura, “The Origin of Whales and the Power of Independent Evidence” (– online).

³²⁷ Thewissen *et al* (278).

group off even-toed hoofed animals that include hippos. *Pakicetus* was a fully terrestrial cetacean and quite an efficient runner.³²⁸

Ambulocetus: Like *Pakicetus*, this cetacean was discovered in Pakistan, but in slightly younger rock, about 49 million years old.³²⁹ Its fossils are found in what were near-shore environments. It is clearly a cetacean, with a very cetacean skull lacking only a blowhole, but it has functional legs and a skeleton with hips attached firmly to the spine that allows it to walk on land.³³⁰ The femur, though stout, does not have the large attachment points for walking muscles, so *Ambulocetus* was not an efficient walker. Its limbs are short, though its feet are long.³³¹ It would probably have waddled around on land in the manner that sea lions do today.³³² Its spine has the flexibility to swim by way of dorsoventral undulations, the up-and-down back-to-belly swimming motion of whales. Modern whales use the up-and-down motion of their horizontal tail flukes to propel them through the water, but *Ambulocetus* has no tail fluke. Instead, it has extremely large back feet to propel it through the water. It basically swam like an otter. This is clearly a transitional state.

Kutchicetus: This creature belongs to a cetacean group known as the Remingtonocetids, which first appear in the fossil record around 49 million years ago. It has reduced limbs, short though still capable of bearing weight. Like, *Ambulocetus*, it has long back feet.³³³ It has a large and powerful tail. Unlike *Ambulocetus*, it has a very long slender snout, and long crocodile-like lower jaw.³³⁴ It also differs from *Ambulocetus* in having smaller eyes and widely separated ears, which may have been an adaptation for enhanced emphasis on hearing to locate prey.³³⁵

Rodhocetus: This cetacean lived around 46 million years ago. It is more aquatically adapted than *Ambulocetus*, but still retains many terrestrial features. The four large sacral vertebrae on its spine are unfused, allowing for greater flexibility for swimming. It had a much more robust tail and its spine shows many features associated with having a tail fluke, so *Rodhocetus* probably had one. It was definitely a good tail swimmer. The pelvis is smaller than that found in earlier cetaceans, but it

³²⁸ Thewissen *et al* (278).

³²⁹ Thewissen, “Ambulocetidae” (– online).

³³⁰ Sutura, “The Origin of Whales and the Power of Independent Evidence” (– online).

³³¹ Thewissen, “Whale Origins as a Poster Child for Macroevolution” (1038).

³³² Sutura, “The Origin of Whales and the Power of Independent Evidence” (– online).

³³³ Thewissen, “Remingtonocetidae” (– online).

³³⁴ Thewissen, “Whale Origins as a Poster Child for Macroevolution” (1039).

³³⁵ Thewissen, “Remingtonocetidae” (– online).

is still attached to the sacral vertebrae. It could not achieve a powerful muscular thrust from the hips. Its femur is 1/3 shorter than *Ambulocetus*.³³⁶ It could move on land, but its movements would have been slow and cumbersome. This means that it probably had a lifestyle more like that of a seal. Its head is longer. The teeth are more simplified. The eyes, like those of later whales, are oriented to the side of its head.³³⁷ The nostrils are located further back, above the canine teeth, indicating blowhole evolution.³³⁸

Basilosaurus: This is a 40-million-year-old, fully aquatic, streamlined whale with a long snakelike body. It still possesses a complete set of hind limbs that included a mobile knee and several toes.³³⁹ These limbs, however, at 3% of the total body length, are too small to aid in propulsion.³⁴⁰ The pelvic girdle, moreover, is completely detached from the spine. Its forelimbs are shaped like flippers.³⁴¹ It has a large, single nostril near the top of its head, about halfway to the position of blowholes in modern whales.³⁴²

Dorudon: This animal is a fully aquatic contemporary of *Basilosaurus*. Unlike the long body of the former, *Dorudon* are proportionally more like dolphins.³⁴³ Its skeleton also has a complete set of hind limbs that protrude from its body wall. Its skull is more vaulted than *Basilosaurus* and earlier whales.³⁴⁴

Species-to-species transitions in the fossil record

There are a number of reasons why it would be expected that speciation events would not be easily preserved in the fossil record and why we should not expect to find many detailed species-to-species transitional sequences. One of these is the timescale. From the perspective of geological time, species evolve very rapidly. Fossilization is a rare and chancy thing; it only occurs under certain conditions. Therefore, it is unlikely for transitions taking place in such a short span of time to be “captured” in the fossil record.

³³⁶ Sutera, “The Origin of Whales and the Power of Independent Evidence” (– online).

³³⁷ Thewissen, “Whale Origins as a Poster Child for Macroevolution” (1038).

³³⁸ Sutera, “The Origin of Whales and the Power of Independent Evidence” (– online).

³³⁹ Thewissen, “Basilosaurids and Dorudontids” (– online).

³⁴⁰ Sutera, “The Origin of Whales and the Power of Independent Evidence” (– online).

³⁴¹ Thewissen, “Whale Origins as a Poster Child for Macroevolution” (1039).

³⁴² Sutera, “The Origin of Whales and the Power of Independent Evidence” (– online).

³⁴³ Thewissen, “Whale Origins as a Poster Child for Macroevolution” (1039).

³⁴⁴ Sutera, “The Origin of Whales and the Power of Independent Evidence” (– online).

For something as detailed as species-to-species transitions, you need ideal fossilization conditions at the place and time where the speciation event took place. Kathlene Hunt, a zoologist at the University of Wales, explains how exceptional the geological conditions have to be in order for the fossil record to show species-to-species transitions:³⁴⁵

To demonstrate *anything* about how a species arose, whether it arose gradually or suddenly, you need exceptionally complete strata, with many dead animals buried under constant, rapid sedimentation. This is rare for terrestrial animals.

She further observes:³⁴⁶

In general, in order to document transitions between species, you [need] specimens separated by only tens of thousands of years (e.g. every 20,000-80,000 years). If you have only one specimen for hundreds of thousands of years (e.g. every 500,000 years), you can usually determine the order of species, but not the transitions between species. If you have a specimen every million years, you can get the order of genera, but not which species were involved. And so on. These are rough estimates (from Gingerich, 1976, 1980) but should give an idea of the completeness required.

The need for fossil specimens at intervals of tens of thousands of years in order to study speciation is a stiff demand to place upon the fossil record. The frequency of a sequence of fossils over time is called its temporal resolution. Most fossil sequences have a temporal resolution of no better than 100,000 years.³⁴⁷ Also, as has already been discussed, speciation often occurs within a single population of a species that is isolated from other populations. This means that the geographic distribution of a population undergoing speciation is going to be relatively small. The geological conditions in the area that it took place in might not have been conducive for fossilization. Moreover, even if fossils were left behind, it would be less likely that they would be discovered, since a very small portion of the Earth has been explored adequately for fossils.

Another reason why discerning a speciation event from the fossil record is difficult is that fossils do not provide us with all of the information that there is about an organism. Generally, only the hard parts of an organism are preserved. A fossil of a bird skeleton, for instance, cannot tell us about its coloration, its possible plumage or

³⁴⁵ Hunt, "Transitional Vertebrate Fossils FAQ; Part 1A" (– online).

³⁴⁶ Hunt, "Transitional Vertebrate Fossils FAQ; Part 1A" (– online).

³⁴⁷ Futuyma (690) citing Turner.

fleshy parts, what kind of mating song it sang, what its mating habits were like, or whether it could produce fertile offspring with all other fossil specimens with a similar skeletal structure.

In spite of all this, a number of good species-to-species transitional sequences have been found in the fossil record. Hunt provides a clear, general description of what a species-to-species transitional sequence looks like:³⁴⁸

(A species-to-species transition) is a set of *numerous individual fossils that show a change between one species and another*. It's a very fine-grained sequence documenting the actual speciation event, usually covering less than a million years. These species-to-species transitions are unmistakable when they are found. Throughout successive strata you see the population averages of teeth, feet, vertebrae, etc., changing from what is typical of the first species to what is typical of the next species. Sometimes, these sequences occur only in a limited geographic area (the place where the speciation actually occurred), with analyses from any other area showing an apparently “sudden” change. Other times, though, the transition can be seen over a very wide geological area. Many “species-to-species transitions” are known, mostly for marine invertebrates and recent mammals (both those groups tend to have good fossil records), though they are not as abundant as the general lineages.

A considerable number of smooth species-to-species transitions have been found for mammals.³⁴⁹ Phillip Gingerich found a number of smooth transitions in the fossil record for various primates, the animal taxon that includes apes, monkeys, and lemurs. He found species-to-species transitions linking together four genera belonging to the primate taxon Plesiadapida. Also, in a fossil site in Wyoming, he found that two lemur-like primates could be traced back smoothly to a common ancestral species. In a separate study at that site, he found detailed, step-by-step sequences covering a period of six million years that started from one ancestral species and ultimately branched into three or four different genera. In yet another study, he found gradual species-to-species transitions in a lineage of early monkey-like primates.

Other detailed primate sequences showing smooth transitions have been found by Rose and Bown and by Kurten. A number of species-to-species transitions in the fossil record have been observed for certain cat and bear lineages as well as for hyenas. A few of the many transitions found among marine invertebrates will be discussed in the following section.

³⁴⁸ Hunt, “Transitional Vertebrate Fossils FAQ; Part 1A” (– online).

³⁴⁹ Refer to Hunt, “Transitional Vertebrate Fossils FAQ; Part 2A” (– online) for a detailed explanation of all of these.

Punctuated equilibrium – an inference about the pattern of evolution

Punctuated equilibrium is a theory proposed by Niles Eldredge and Stephen Jay Gould that seeks to describe and explain large-scale patterns in evolution as the interactions between related species. It is a controversial theory in that it focuses on a concept known as species selection. This is the idea that different related species compete with one another in the same environment with some species eventually driving others into extinction. According to this idea, related species are subject to natural selection as they compete with one another in the environment much in the same way that individual organisms do within a population.

Punctuated equilibrium is an inference about the pattern of evolution derived from observing modern species as well as by studying transitional sequences in the fossil record. Some of the most important evidence for this theory comes from the study of transitional sequences, including species-to-species transitions.³⁵⁰

Ironically, punctuated equilibrium has been misunderstood by much of the general public to be an attempt to explain away a supposed absence of transitional fossil forms.

The theory of punctuated equilibrium does not predict that species-to-species transitions cannot be found. What it does predict, since it presupposes that physical changes generally only occur in conjunction with speciation in small, isolated populations,³⁵¹ is that fossils of species-to-species transitions, when they are found, will usually be in small, localized areas in a very narrow layer of sediment representing a short geological time span, by Gould's estimation a period of perhaps tens of thousands of years. After speciation takes place, the isolated populations may then migrate into other territories and then compete with and displace other related species. In the fossil record everywhere but the place where the speciation event took place, it will appear that one species has abruptly replaced another.

Cases like this have been seen in the fossil record and provide much of the evidence upon which the theory of punctuated equilibrium is based. A good example of this

³⁵⁰ Futuyma, (135-136). A study conducted in North America by Niles Eldredge of the highly detailed transitional sequences of the trilobite *Phacops rana* was one of the chief examples used by Eldredge and Gould to develop and support their theory of punctuated equilibrium.

³⁵¹ Futuyma, (690).

pattern is found in the fossils of *Kutchithyris*, a genus of Jurassic brachiopods – an important group of clam-like animals.³⁵² The species *Kutchithyris acutiplicata* typically appears in layers of Jurassic sediment below another, later species, *Kutchithyris euryptycha*, always with an abrupt transition from one to the other. Both species are quite common and can be found over a wide geographical area. They are different enough from one another that it has been argued that they could even be put in different genera. In all but one of the localities where fossils of these two species are found, there is an abrupt transition from where the older species stops appearing and the newer one starts.

However, there is a single small 1.25-meter thick locality where the two species appear, as usual, one on top of the other with the exception that there is a narrow, 10-centimeter thick layer in the middle where both species appear along with transitional specimens. This is the location where the speciation events took place. The narrowness of the layer wherein the transitional forms appear compared to the thickness of the layers below it and above where only one or the other species is found, indicates how rapidly the speciation events occurred compared to the much longer periods of time before and afterwards where no appreciable evolutionary change in these brachiopods took place.

A common misconception about the theory of punctuated equilibrium is that it proposes rapid, almost instantaneous speciation. This is not the case. What the theory does propose is the far more modest idea that speciation, though a gradual process, is short in comparison with the total duration of time that a species exists in a distinct form, a situation that Gould calls stasis. The opposing view would be that speciation is not only a gradual process, but that it plods along with various populations of a species diverging from one another at a rather steady, even pace. This view is often referred to as phyletic gradualism. The fossil evidence of species-to-species transitions gives an indication that both of these patterns occur in nature.³⁵³

³⁵² Colby, *Introduction to Evolutionary Biology* (– online).

³⁵³ Refer to Hunt “Transitional Vertebrate Fossils FAQ; Part 1A” (– online). where she says: “As a starting point, check out Gingerich, 1980, who found 24 gradual speciations and 14 sudden appearances in early Eocene mammals; MacFadden, 1985, who found 5 cases of gradual anagenesis, 5 cases of probable cladogenesis, and 6 sudden appearances in fossil horses; and the numerous papers in Chaline, 1983. Most studies that I've read find between 1/4-2/3 of the speciations occurring fairly gradually.”

For instance, a detailed study conducted by Cheetham of fossil Bryozoa³⁵⁴ from the Dominican Republic showed a clear pattern of punctuated change.³⁵⁵ The main samples of fossils in the study, numbering about 1000 specimens, were from 8.5 to three million years old. He measured 46 physical characteristics per specimen. Most of the species studied were found not to change in form over long periods of several million years. The majority of new species appeared suddenly in the fossil record without any specimens of intermediate forms. Often, the ancestral species would persist in the fossil record along with the new species for a period of time. When intermediate forms between other species did appear in the fossil record, they persisted on average of less than 160,000 years.³⁵⁶ This is exactly the fossil pattern that is predicted by the theory of punctuated equilibrium.

On the other hand, a rigorous study conducted by Sheldon of fossil trilobites³⁵⁷ from a single site in Wales showed gradual evolutionary change.³⁵⁸ He studied 3,458 fossil specimens spanning a time of three million years. The specimens represented eight different genera of trilobites. He measured a number of physical features of the specimens, such as the number of ribs in the tail region. In all eight genera, evolutionary change was gradual. A population at any one time was generally intermediate between the samples immediately before it or after it.³⁵⁹ In seven of these lineages, the final specimens in the series were designated with species names different than those of the earliest ones. In the eighth, the final specimens were designated as a different genus.³⁶⁰ This pattern of consecutive, steadily changing, intermediate forms is contrary to what would be predicted by the theory of punctuated equilibrium

As Ridley points out: “The question is not simply whether ‘either’ punctuated equilibrium ‘or’ phyletic gradualism is right.”³⁶¹ What is being hotly argued among biologists today is not whether either of these two patterns is evident in nature, but rather which of them is more common.

³⁵⁴ A group of aquatic invertebrates that live their life fixed in one position.

³⁵⁵ Ridley, *Evolution* (604).

³⁵⁶ Ridley, *Evolution* (604).

³⁵⁷ An extinct group of arthropods.

³⁵⁸ Ridley, *Evolution* (605).

³⁵⁹ Ridley, *Evolution* (605).

³⁶⁰ Futuyma (134).

³⁶¹ Ridley, *Evolution* (602).

CHAPTER ELEVEN

THE SCOPE OF EVOLUTIONARY BIOLOGY

Evolutionary theory does not apply to the origin of life

Evolution is a phenomenon that applies to living populations. For evolution to take place, certain factors must be present. The first of these is the existence of something that can make copies of itself. The second is that these copies have to be faithful to the original so that they can inherit their traits from the original. The third factor is that the replication cannot be absolutely faithful all of the time. Otherwise, no variation will be introduced and no change in the population can take place.³⁶²

Mayr makes it a point to exclude the origin of life from his definition of evolution by describing it as: the gradual process by which the living world has been developing following the origin of life.³⁶³

The theory of evolution, as we have seen, seeks to explain patterns of change within populations of living organisms that exist, reproduce, pass on traits, and undergo modification. It is taken as a given that self-replicating entities exist and that they have existed in the past.

It does not matter how rudimentary those earliest replicators may have been or how alike or different they were in molecular structure to what we know as living organisms. What matters is that once molecules came into existence that could make faithful – but not *too* faithful – copies of themselves, there was something for the mechanisms of evolution to act upon, and the course of evolutionary development could go on from there. Before the appearance of something of that nature, biological evolution could not take place.

Should these first replicating molecules be considered living things? This point is highly contentious. It really depends on how one wishes to define life. In consideration of what we have already said, the bare minimum requirements for living

³⁶² Smith and Szathmári (35): “For evolution...we require more than autocatalysis. We require that, occasionally, a new variant chemical compound – a mutation – should arise, and, once arisen, should be replicated.

³⁶³ Mayr (314).

organisms would inarguably be as Muller defines them: “any entities that have the properties of multiplication, variation, and heredity.”³⁶⁴

Mark Ridley states the same idea more simply by defining life as: “anything that can evolve by natural selection”.³⁶⁵

Evolutionary theory is, consequently, incapable of addressing the question of how the earliest self-replicating entities came into existence. The question is simply outside of its scope of enquiry. Futuyma says that: “whether or not we understand how living things first came into existence is irrelevant to questions about how living things subsequently evolved.”³⁶⁶ The question of the origin of life is the topic of another field of research in biology known as abiogenesis research.

Abiogenesis research is concerned with the chemical processes behind the initial formation of the simplest forms of life. It is a young field, and the questions of life’s origins are far from being answered. However, considerable progress has been made in this field in the past few decades.

Though there are many hypotheses and theoretical models about what the first replicators might have been and how they might have come about, biologists agree that these first replicators were nowhere near as complicated as the simplest of living cells. The road to the first bacterium must have taken a considerable number of steps.

Another point of consensus is that the processes that brought about the first replicators could not have been random. They were, rather, chemical processes that took place under the conditions that existed on the early Earth. Abiogenesis research, therefore, focuses heavily on what these conditions and chemical processes might have been.

It is highly unlikely that any direct evidence will be found to answer such questions. The first replicating molecules are not going to turn up as fossils. The problem, therefore, cannot be approached historically. Instead, scientists try to determine experimentally what is chemically feasible and what could have occurred on the prebiotic Earth. Research of this nature takes place in the laboratory and consists of

³⁶⁴ Smith and Szathmári (17).

³⁶⁵ Ridley, *Mendel’s Demon* (6).

³⁶⁶ Futuyma (166).

exploring the kinds of chemical reactions that may have taken place on Earth four billion years ago.

One possible candidate for the early replicating molecule is RNA. Research on the origins of life has suggested the notion of an ancient RNA world. The RNA world hypothesis is not the only one being investigated. For instance, there is some intriguing research being conducted investigating the possibility suggested by Cains-Smith that clay crystals could have been the earliest replicators.³⁶⁷ However, since our purpose is merely to get an idea of what the field of abiogenesis research is like and to contrast it with the field of evolutionary biology, we will just briefly look into the RNA hypothesis and some of the research that is going on to develop it.

RNA, like DNA, is made up of nucleotides. However it has uracil instead of thymine as one of its four nucleotide bases and its sugar “backbone” is a ribose molecule. RNA is simpler than DNA. It is single-stranded unlike DNA’s two-stranded double helix. RNA, therefore, does not have to be unzipped to interact with its environment and can interact with its environment directly.

Today, all living organisms, from the simplest bacteria on up, are based upon DNA. RNA is used by these living organisms as intermediaries to translate their DNA into proteins. There are, however, some viruses that are based on RNA. HIV, for instance, is an RNA virus.

One thing that is important about RNA is that some forms of this molecule can, on their own, catalyse the replication of other RNA molecules. However, up to now, no RNA molecule has been found that can auto-catalyse its own replication. According to the RNA world hypothesis, such a self-replicating RNA molecule would have been at one time been the dominant “life form” on the early Earth and would have been the ancestor to all DNA based life.

But how would that RNA world have come about? Research into this question is being conducted in a number of different ways.

Research into the synthesis of organic compounds under various conditions:
Numerous experiments have shown that many of the building blocks of life, like

³⁶⁷ Smith and Szathmári (72).

amino acids, sugars, and nucleotides, can be synthesized from simpler molecules. Experiments of this nature seek to simulate the possible conditions of the prebiotic Earth. The first of these was the famous Urey-Miller experiment, which resulted in the formation of several amino acids and other organic compounds.³⁶⁸

In the Urey-Miller experiment, methane, ammonia, and hydrogen gases were placed in a flask along with water and a continuous electrical discharge. Numerous other experiments have since been conducted testing a wide range of initial conditions. Besides, electricity, gamma rays, y-rays, x-rays, thermal heating, and ultraviolet light produce amino acids, nucleotides and other organic chemicals from gases.³⁶⁹ In support of the idea of an RNA world, many experiments of this nature have more readily yielded the RNA nucleotide uracil than the DNA nucleotide thymine.³⁷⁰

Amino acids and other simple organic molecules are easy to make. In fact, they are even found in interstellar clouds and in meteorites.³⁷¹ This evidence is encouraging in suggesting that these experiments at least somewhat reflect the early chemistry of our solar system.

Research into the synthesis of polymers: The next crucial question is once amino acids, sugars, and other organic molecules are available, how can they be brought together? These more complex chains of organic molecules are called polymers. A number of experiments have produced peptides – from which proteins are made – nucleic acids, and other complex molecules.³⁷²

Recently, scientists demonstrated that carbonyl sulphide gas, which is present in volcanic gasses and deep-sea vent emissions today, can bring about a vigorous chemical reaction that forms peptides under mild aqueous conditions.³⁷³ Within a few minutes of simply introducing the gas to a reaction vessel containing amino acids, they observed high yields of di-, tri-, and tetra-peptides. The beauty of this experiment lies in its simplicity. They carried out the reaction in the presence of air, without air, and with and without other ingredients like metal ions, and they found peptides formed readily under all these conditions.

³⁶⁸ Smith and Szathmári (28).

³⁶⁹ Strickberger (122).

³⁷⁰ Ridley, *Evolution* (530).

³⁷¹ Strickberger (121).

³⁷² Strickberger (126-130).

³⁷³ Leman *et al.* (283-286).

Research into self-replicating molecules: Peptides have been observed to replicate themselves under experimental conditions. Lee and others produced a 32-amino-acid peptide that could auto-catalyse its own synthesis.³⁷⁴ This research lends support to the idea that proteins and not RNA may have been the first self-replicating molecules.

Other examples of replicating molecules are groups of molecules that regenerate themselves in a cyclical fashion, like the hexanucleotide self-replicator, the SunY self-replicator and the RNA polymerase described by the Eckland group.³⁷⁵

These molecules can only replicate themselves under controlled and admittedly contrived experimental conditions. None of these molecules are suggested to be truly representative of the precursors of living organisms on Earth. They are rather experiments that form part of the ongoing research in a nascent field.

In summary, abiogenesis research is a very different field from that of evolutionary biology. It is also a very young field. Research is still in its early stages, and much of it is hypothetical. Even so, progress in the field is being made at a considerable pace and a number of plausible models for the origin of life are being developed.

Evolutionary theory posits no position about God

A biologist might say: “The present variety and diversity of living species came about as a result of gradual changes in the gene pools of the various reproducing living populations from which they descended, whereby genetic variety was introduced to these populations by mutation and by other means and then acted upon by various factors such as natural selection.”

Any biologist, regardless of his faith, might make this statement with conviction. Both a devout believer in God and an atheist can make this statement without any reservations, and moreover, they will both mean precisely the same thing by it.

The reason for this is that they are both speaking as scientists about the observable world around them. They are, in essence, describing what they see. Science is limited to the domain of the seen. Anything beyond that is outside of its scope and is something that science cannot comment upon.

³⁷⁴ Lee *et al.* (525-528).

³⁷⁵ Musgrave, “Lies, Damned Lies, and Statistics” (– online).

This is why, when it comes to these scientists' metaphysical understandings, they will disagree. A biologist who believes in God will say the above statement, but he will do so with the certainty of faith that he is, to the best of his ability, describing God's creative process as he sees it taking place in the world around him. An atheist, on the other hand, will be convinced within himself that the processes he sees have no metaphysical dimension to them, no Intelligent Creator behind them.

These two positions are ideological, metaphysical ones; neither of which is supported nor denied by the theory of evolution. They are matters that the theory of evolution – and indeed science in general – is utterly unfit and unequipped to address.

Evolutionary theory posits no moral or ethical claims

The theory of evolution is a scientific theory that purports to explain natural phenomena. Like relativity, plate tectonics, gravitation, and the atomic theory of matter, it is a purely descriptive theory. Specifically, the theory of evolution seeks to describe how living populations behave over time and how the diversity of life came about.

Scientists working in the field of evolutionary biology freely concede the purely descriptive nature of evolution and its inability to tackle moral questions. Richard Dawkins, in *The Selfish Gene*, states quite clearly:³⁷⁶

I am not advocating a morality based on evolution. I am saying how things have evolved. I am not saying how we humans morally ought to behave. I stress this, because I know I am in danger of being misunderstood by those people, all too numerous, who cannot distinguish a statement of belief in what is the case from an advocacy of what ought to be the case.

What Dawkins is saying when he distinguishes between what *is* the case and what *ought* to be the case is that moral systems are prescriptive and not descriptive.³⁷⁷ Unlike scientific theories that purport to describe what is actually going on in the world, moral values instruct people as to what they should be doing in it. In other words, making an observation about what is going on in the natural world is not the same as saying how people ought to behave.

³⁷⁶ Dawkins, *The Selfish Gene*, pp. 2-3.

³⁷⁷ Attempting to derive what ought to be directly from what is, in the discourse of philosophy, is known as the “naturalistic fallacy”. [Dennett (467). See also: Gould, *Rock of Ages*, 55n-56n where he argues that some subtleties and exceptions that can be advanced with regard to the naturalistic fallacy do not detract from its relevance in the broadest sense.]

Evolutionary theory addresses how differential reproductive success is important to the survival of certain genes and to adaptive evolution and explains what this means for the origin and development of species. However, it does not draw conclusions about the morality or immorality of birth control, homosexuality, or abortion.

Likewise, it tells us that extinctions have been going on throughout the history of life and that they are a necessary aspect of evolution. However, it does not place a moral value on conservation efforts or determine for us the question of whether or not we as humans have the right – deliberately or by our inadvertent conduct – to drive certain other species into extinction.

Ethical considerations are certainly of paramount importance when we are dealing with the application of science, when we are confronting with difficult questions of how we as human beings should use the scientific knowledge that we acquire. For instance, our scientific knowledge can give us the ability to clone a human being. This knowledge itself is morally neutral. It cannot tell us whether or not it is morally right for us to do so. That is undoubtedly an ethical question.

Ethical considerations are also extremely important to questions relating to the professional conduct of scientists. However, defining what is ethical and unethical conduct is something quite distinct from the factual conclusions arrived at by the pursuit of scientific enquiry. As Gould points out:³⁷⁸

Similarly, while scientists must operate with ethical principles, some specific to their practice, the validity of these principles can never be inferred from the factual discoveries of science.

Of course, there is nothing to stop some people from believing that what *is* should be the basis for determining what *ought* to be. However, this is itself a value judgment and not a scientific proposition. Indeed, evolution has been used – and misused – as a basis for determining moral values and ethical systems. This can be seen no more clearly than in the eugenics movement, which Stephen Jay Gould describes as “the early twentieth century’s most influential social crusade with an allegedly scientific foundation.”³⁷⁹

³⁷⁸ Gould, *Rock of Ages* (5).

³⁷⁹ Gould, *The Lying Stones of Marrakech* (272).

Eugenics was the idea that improving the human hereditary stock was a moral imperative and that this could be achieved through the regulation of procreative activity. It had two manifestations – negative eugenics, which was the policy of preventing procreation among the supposedly unfit, and positive eugenics, which was the encouragement of procreation among those considered to be genetically superior. Eugenics sought to turn natural selection into a moral principle.

The most benign form of eugenics was simply an encouragement of marriage between those deemed to have the most sought after genetic traits. The eugenics that became part of American policy was much harsher, including forced sterilization of prison inmates and others deemed less fit. The worst and most tragic application of eugenics was of course, witnessed in the mass extermination campaigns of Nazi Germany.

It must be accepted as historical fact that a number of evolutionary biologists were ardent supporters of one or another version of eugenics. Their diverse views on this subject, although drawn from evolution, were not the science of evolution; they were something else entirely.³⁸⁰ For even if it were true that only the “fittest” survive in biological terms, it does not follow that only the fit *should* be allowed to survive in society. If someone were to say that it does, then that person is making a statement of ethics and not one of science itself.

For better or for worse, people will continue to seek moral insights from nature and from how they understand the natural world. However, all of this goes beyond the realm of science and outside the scope of scientific enquiry. Moral conclusions, even when they are inspired by science, remain the fruits of the non-scientific intellectual endeavours – or of the equally non-scientific emotional dispensations – of those who hold them. This can be seen ever so clearly in the following lesson in patience and responsibility that one person found in evolution:³⁸¹

On the grandest of scales I have at last begun to grasp my life within the context of all life on this planet and recognize that in a very real sense each of us is truly related, man and “beast” alike. With that comes the profound revelation that each of us is the delicate product of 4.5

³⁸⁰ It warrants saying that much of the science advanced to support eugenics was flawed. Indeed, the underlying principle of the eugenics movement and of its most tragic policies was the idea that complex human behaviors could be explained as the effects of single genes – a proposition that is patently false.

³⁸¹ Gledhill (– online).

billion years of natural patience. Whew! If nothing else, evolution should demand of us mutual respect and responsibility towards this pale blue dot.

An important corollary of the moral neutrality of scientific facts and descriptive theories is that the moral conclusions that people might draw from scientific claims in no way reflect upon the veracity of those claims either positively or negatively. In other words, the truth of scientific claims cannot be assessed on the basis of the moral utility they might possibly have for some people. How people use or misuse science to further their moral values, ideologies, bigotries, and vested interests has no bearing on what is actually going on in the natural world.

Taking the example of human cloning, if we arrive at the conclusion that it is inherently unethical, this does not make the procedure any more or less scientifically plausible.

That someone might use the “survival of the fittest” as a justification for eugenics does not make it any more or less apt a description of what is going on in nature. (Its inaptness is something that we have already discussed.) No matter how morally distasteful a biologist might find eugenics to be, that person’s concern as a biologist is whether or not the concept of the “survival of the fittest” accurately describes the processes of nature that drive biological diversity and adaptation.

Likewise, that someone can draw lessons of patience and respect for the environment from the idea that evolutionary processes have been unfolding for over four billion years does not make the time frame of four billion years any more or less accurate, no matter how much we might empathize with those moral sentiments.

The theory of evolution is not a political or economic ideology

The theory of evolution is no more suited to applications in the unrelated fields of politics and economics than it is to the field of ethics. Nonetheless, a number of misguided attempts in this area have been made.

Herbert Spencer, a contemporary of Charles Darwin, carried out one of the most glaring attempts to apply biological concepts to politics and economics. His was a worldview in which social and political units were assumed to be comparable to living organisms. He developed a doctrine that human progress is the outcome of

competition and struggle among individuals, races, and nations. He coined the phrase “survival of the fittest” to embody this idea. Spenser writes:³⁸²

This survival of the fittest, which I have here sought to express in mechanical terms, is that which Mr. Darwin has called “natural selection”, or the preservation of favoured races in the struggle for life.

This was his understanding of natural selection, what he saw as the driving force behind the evolutionary progress of human civilization. Spenser went even further and developed the political ideology known by the misleading term Social Darwinism.³⁸³ As Dennett describes it: “Survival of the fittest, Spenser proclaimed, is not just Mother Nature’s way, but *ought* to be *our* way.”³⁸⁴

Unsurprisingly, Spenser was opposed to state sponsored welfare, public education, and corporate regulation, since all such things were barriers to competition and consequently to progress. Social Darwinism was used to justify cutthroat economic competition and imperialism, making it immensely popular with the industrial elite of the early twentieth century, and endearing Spenser to the hearts of the likes of John D. Rockefeller and Andrew Carnegie.³⁸⁵

Though Herbert Spenser was about as outspoken an opponent of Socialism as one could find, ironically Marx was also an admirer of Darwin. Illustrating just how treacherous it is to take a biological theory out of context and apply it to the totally unrelated fields of politics and economics, Socialists saw in the self-same concept of natural selection a justification for their ideas of class struggle. Indeed, there might be no better testament to the ludicrous nature of trying to mix biology with political economy than what Friedrich Engels said, in complete earnest, while speaking at Marx’s funeral: “Just as Darwin discovered the law of development of organic nature, so Marx discovered the law of development of human history.”³⁸⁶

³⁸² Spenser (1/444).

³⁸³ Spenser’s idea of “survival of the fittest” is actually not derived from Darwin’s understanding of evolution, but rather from the opposing and discredited evolutionary views of Lamarck who understood evolution as meaning relentless progress stemming from the heritability of character traits acquired during life. [Refer to: Roarck (7-14)]

³⁸⁴ Dennett (461).

³⁸⁵ Gould, *The Lying Stones of Marrakech* (263-264). He quotes Rockefeller as saying: “The growth of a large business is merely a survival of the fittest...” and Carnegie as using “survival of the fittest” to justify “the concentration of wealth, business, industrial and commercial, in the hands of a few...”

³⁸⁶ Quoted from Miller (175).

PART THREE:

**BIOLOGICAL EVOLUTION IN THE CONTEXT OF
ISLAMIC BELIEFS**



As has been explored in Part One of this book, the Qur'ān and Sunnah make no direct references to evolution one way or another. The task now is to try and establish the degree of compatibility or incompatibility that exists between Islamic teachings and the claims put forth by evolutionary theory. In the various chapters of Part Three, theological questions will be explored.

CHAPTER TWELVE

NATURAL LAWS AND CAUSATION

Muslim scholars have differed on the nature of the cause and effect relationships that exist in Creation. Most Ash'arī scholars maintain that natural causes are the result of God consistently creating one set of circumstances after another so that to us a pattern of causation appears.³⁸⁷ God, by His will, consistently creates what we see as the effect in connection with His creating something else that we see as the cause. This cause has no actual effective power of its own.

According to the Ash'arī theological view, natural laws are merely patterns in God's actions. Everything we observe is God's direct action. The laws of nature that we see are none other than consistency in His actions. It is only by virtue of His will that such actions are consistent. They do not have to be. It is not just that God knows whenever a leaf falls from a tree; God is the direct creator of the event of the leaf falling. He creates the fall and it occurs exactly according to His will.

Al-Ghazālī illustrates this concept with the example of exposing cotton to fire, saying that it is rationally possible for cotton to be exposed to fire without burning and for it to turn to ashes without ever being exposed to fire, and explains the reason for this as follows:³⁸⁸

The one who brings about the burning – by way of creating the blackening of the cotton and the desiccation of its fibres and by making it into cinders or ashes – is God the Most High, either through His angels or without any intermediary. As for the fire, it is an inert substance without any activity.

³⁸⁷ al-Bāqillānī, *Tamhīd al-Awā'il* (335). al-Ghazālī, *Tahāfut al-Falāsafah* (176).

³⁸⁸ al-Ghazālī, *Tahāfut al-Falāsafah* (176).

Al-Bayjūrī, in *Sharḥ Jawharah al-Tawḥīd*, discusses the principle that God is the only one who can bring anything into existence, including causes and effects. At the same time, he summarizes and criticizes – from an Ash‘arī point of view – the basic spectrum of opinion held by people regarding causation.³⁸⁹

From this, the falsehood of the claim that anything can bring about an effect on its own is known. Therefore, whoever believes that natural causes like fire, a knife, the eating of food, or the taking of drink bring about their effects like burning, cutting, nourishment, or the quenching of thirst by their very nature and on their own, then such a person is an unbeliever by consensus.

There are two opinions regarding the unbelief of a person who believes that these causes do so by an inherent power created within them by God. The most correct opinion is that such a person is not an unbeliever but rather a sinner and an innovator. Among those who hold such views are the Mu‘tazilah who claim that the servant creates his own voluntary actions by way of an ability that God creates within him.

Those who believe that the effective agent is God, but that He makes between causes and their effects a rational interrelatedness that cannot be contravened, such people are ignorant. It is possible that such a belief can lead a person to unbelief, because he could deny the miracles of the Prophets on account of those miracles being contrary to the natural order.

Those who believe that the causative agent is God and that there exists between causes and effects a customary interrelatedness that can be contravened, such people are believers who, by God’s grace, will be successful.

We can see in this exposition the harsh regard that al-Bayjūrī has for those who hold the view that cause and effect are inherent qualities of created things. We also observe that even though natural causation is directly ascribed to God, natural causes and effects are interconnected in the world through the consistency of their relationship with each other, and any deviation from that norm must be regarded as a miracle.

Indeed, al-Ghazālī asserts that there are cause-and-effect relationships that we must, as observers, deem to be “certain” (*qaṭ‘ī*), these being “causes whose effects are connected with them with absolute certainty, insofar that it is Allah’s decree and wish that the consistency between them never varies.”³⁹⁰ Al-Ghazālī goes further and criticises those who wait for miracles to happen, including those who claim to rely upon God and assume that natural causation will be suspended for them. He mentions

³⁸⁹ Al-Bayjūrī (98).

³⁹⁰ al-Ghazālī, *Iḥyā’ ‘Ulūm al-Dīn* (4/379).

many examples – including the expectation of nourishment without consuming food and the expectation of having offspring without engaging in sex – and describes these assumptions as being madness.³⁹¹

If you wait for God to create satiation within you without your taking bread, or create movement within the bread so that it moves towards you, or subject an angel to chew if for you and bring it into your stomach, then you are ignorant of God's norms. It is the same if you refrain from ploughing the field and instead hope that God will create crops for you without seed, or hope that your wife will bear you a child without your having intercourse with her in the way that Mary gave birth. All of that is madness. There are countless examples like these.

It should be clear that though it is the Ash'arī position that natural causation is not inherent in created things, it is wrong to assume that a miracle has or will take place. Denying the presence of natural causation in the world or expecting its contravention is a form of madness.

The other opinion on this matter, held by Ibn Taymiyah and others, is that God acts through causes and that He has created the causes and their effects³⁹² and placed within natural causes an innate effectiveness that manifests itself whenever God gives it leave to do so, while God's eternal knowledge comprises both the cause and its effect.³⁹³ The reason why no single cause can bring about its effect on its own is that its effectiveness is dependent upon a myriad of other contingent factors that can either facilitate it or stymie it, all of which can only occur in the right combination by God's express permission.³⁹⁴ Ibn Taymiyah explains:³⁹⁵

Mere causes do not necessitate the occurrence of their effects. It is not enough that the rain falls and the seed is sown for the plants to grow. On the contrary, cultivating winds are needed – by God's permission – and negating factors must be kept away. The conditions must be fully realized and the preventative factors must be removed. All of this is by God's pre-ordinance and decree.

The phenomenon of causation, from the perspective of the observer, is the same regardless of which of these opinions one favours. Ibn Taymiyah argues that sensory experience supports the latter position.³⁹⁶ However, the truth is that this question is

³⁹¹ al-Ghazālī, *Iḥyā' 'Ulūm al-Dīn* (4/379).

³⁹² Ibn Taymiyah, *Majmū' al-Fatāwā* (8/139).

³⁹³ Ibn Taymiyah, *Majmū' al-Fatāwā* (8/68).

³⁹⁴ Ibn Taymiyah, *Majmū' al-Fatāwā* (3/112-113) or separately as *al-'Aqīdah al-Tadmuriyyah* (211).

³⁹⁵ Ibn Taymiyah, *Majmū' al-Fatāwā* (8/70).

³⁹⁶ Ibn Taymiyah, *Majmū' al-Fatāwā* (8/175).

purely theological and cannot be resolved empirically. Even on the Ash‘arī position, the causative relationships will exist on every possible level of observation and will be exactly the way God wants them to be. All that the observer sees are the relationships themselves.

What matters to us in all of this is the common ground upon which these scholars agree. The point of consensus between these two opinions is that the effectiveness of natural causes is not something that has to be. Both opinions, therefore, are contrary to deism – the idea that God created natural laws and placed them in the universe and then passively allowed things to go on from there. The cause and effect relationship – whatever its true nature – is determined by the will of God and can only be realized in the world in any given instance with His express permission.

Though causation is only by God’s will, al-Ghazālī nevertheless warns against disputing scientific conclusions about causation on a pretext of religious grounds. In the introduction to his *“Refutation of the Philosophers”* he discusses the conclusion arrived at by Greek thinkers that the solar eclipse is the result of the Moon passing between the Earth and the Sun and that the lunar eclipse is the result of the Earth’s shadow falling upon the illuminated surface of the Moon. Then he says:³⁹⁷

This discipline is also something that we do not delve into trying to refute, since doing so does not serve our objectives. Whoever thinks that arguing to refute such things is part of his faith has committed a crime against the faith and placed himself in a compromised position. This is because these matters are established by mathematical and geometric proofs that leave no room for doubt. Whoever reviews these matters, verifies their proofs, and is thereby informed of the times of these eclipses, their extent, and the duration of their occurrence, if it is then said to him: “This goes against Islamic teachings” it is not going to make him doubt (the cause of the eclipse) but rather the Islamic teachings. The harm caused to Islam by those who defend it using false means is greater than the harm caused for it by those who attack it directly. As the saying goes: “A rational enemy is better than an ignorant friend.”

Knowledge of these natural causes, as discussed before, is the domain of scientific enquiry. It is totally distinct from revealed knowledge. The prophets were not always privy to this knowledge. It is even possible that some of their contemporaries, by virtue of their worldly experience, might have possessed knowledge about natural causes that the prophets did not have. The famous story regarding the cross-

³⁹⁷ al-Ghazālī, *Tahāfut al-Falāsafah* (46).

pollinating of date palms in Madinah is a case in point. Ṭalḥah b. ‘Ubayd Allah gives the following account of it:³⁹⁸

I was with God’s Messenger when we passed by some people who were tending the tops of their date palms.

He asked: “What are these people doing?”

(Some people) replied: “They are pollinating the trees by bringing the male parts into contact with the female parts.”

God’s Messenger said: “I do not think that this brings any benefit.”

They were informed of this and abandoned the practice. Then God’s Messenger was informed of their abandoning it and said: “If that will benefit them, then they should practice it. Indeed I only ventured a thought. Do not hold me account for what I think. However, when I speak to you about anything regarding God, then accept it, for indeed I never speak falsely about God the Almighty.”

This ḥadīth is cited as evidence that in practical matters pertaining to the physical world, where knowledge is gained through experience, the prophets are not necessarily better informed than others. Knowledge of natural causes and processes is distinct from revealed knowledge. The former is the domain of specialists and practitioners of trades. The second is the domain of the prophets. Al-Qurtubī writes:³⁹⁹

The Prophet said: “I do not think that this brings any benefit” referring to the practice of cross-pollination. The Prophet only said this because he did not have knowledge that this was a long-enduring customary practice, since he had never been concerned with either agriculture or farming and had never engaged in it. Therefore, he was unaware of the circumstances.

Al-Nawawī writes:⁴⁰⁰

Scholars have said that this statement was not an assertive declaration, but was only an expression of what he had thought, as he himself made clear in these narrations. They have said that his opinions regarding the practical questions of life and his thoughts on such matters are the same as those of others. Therefore, situations like this one are not impossible. There is no deficiency in this; it is because of their concern for the Hereafter and knowledge thereof.

³⁹⁸ *Ṣaḥīḥ Muslim* (2361).

³⁹⁹ al-Qurtubī, *al-Mufḥim* (6/186).

⁴⁰⁰ al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (1727),

Natural causes are to be assumed and acted upon in our daily lives and in our investigations into the natural world. They are, in a sense, to be taken for granted while we are safe in the knowledge that God maintains his creation with these natural patterns showing themselves to us with consistency.

When God contravenes these customary cause and effect relationships, it is regarded as a miracle. The Arabic term for miracle is *kharq al-‘ādah*, which literally means “violation of the natural order”. An example of this is where Abraham was placed in the fire but did not burn. For an Ash‘arī theologian, this simply means that God did not create the customary effect of burning along with its cause.⁴⁰¹ For a Salafī, this means that God negated the effectiveness that He had placed within the cause.⁴⁰² However one wishes to understand it, the result is the same – a contravention of the natural order of things.

God brings about miracles for numerous reasons. He does so to attest to the truthfulness of His prophets, like Abraham entering the fire without being burned, Jesus resurrecting the dead, and the moon splitting for Muhammad. Miracles can presage the prophecy of a Prophet, like the Immaculate Conception of Jesus and the childhood miracles of Muhammad. Miracles can come as an honour or distinction for a pious person, as an answer to a prayer, or for whatever other reasons God wishes to bring a miracle about.

In any case, miracles are exceptions to the norm and are not to be assumed. The existence of natural causes should be the default assumption for any phenomenon except when there is specific textual evidence indicating otherwise. There are many examples in the Qur’ān that attest to the principle that conformity to natural causes should be taken as the initial assumption.

Mary invokes natural causes when approached by the angels foretelling to her that she is to give birth to a child:

She said: “My Lord! How will I have a child when no man has touched me?” He said: “Such is God. He creates what he pleases. When He decrees a matter, He but says ‘Be’ and it is.”
[*Sūrah Āl ‘Imrān*: 47]

⁴⁰¹ al-Ghazālī, *Tahāfut al-Falāsafah* (178).

⁴⁰² Ibn al-Qayyim, *Shifā’ al-‘Alīl* (334).

She said: How will I have a boy when no man has touched me and I have not been unchaste?"
[*Sūrah Maryam*: 20]

Al-Rāzī comments:⁴⁰³

She only expressed surprise at the glad tidings that Gabriel gave her, because she knew that the natural law is that bearing a child does not come about except with the participation of a man. Natural laws are what people of knowledge take into consideration in matters, even though they concede other things to be possible by God's power. Her statement does not indicate that she was unaware of God's ability to create a child from scratch.

Zechariah invokes natural causes when given glad tidings that John the Baptist will be born to him in his old age, citing his age and the sterility of his wife:

He said: "How will I have a boy when old age has overtaken me and my wife is barren?" He said: "Thus God does what He pleases." [*Sūrah Āl 'Imrān*: 40] (See also: *Sūrah Maryam*: 7)

Zechariah was a Prophet who understood full well God's ability to do as He pleases. Indeed, Zechariah had prayed to God to give him a child, and he would not have done so had he not known that God was capable of bringing it about. Nevertheless, he still found it quite sensible to ask such a question, in recognition of the preponderance of God working in His creation by way of natural causes.⁴⁰⁴

In Mālikī Law, there is an opinion that the pregnancy of an unmarried woman is sufficient proof to determine her to be guilty of fornication in the absence of any evidence indicating that she was under compulsion. This is due to the fact that sexual intercourse is the cause of pregnancy.⁴⁰⁴ They cite as a precedent for this ruling the verdict of Ibn 'Abbās that a woman can be found guilty of adultery on such grounds.⁴⁰⁵

Mālik states that the wife of a pre-pubescent youth is to be deemed guilty of adultery if she falls pregnant, since her husband is incapable of impregnating her.⁴⁰⁶ He reserves judgment on the wife of a eunuch and of a man without a penis, deferring the

⁴⁰³ al-Rāzī, *Maḥāṭib al-Ghayb* (21/170).

⁴⁰⁴ Ibn Rushd (2/419).

⁴⁰⁵ *Ṣaḥīḥ al-Bukhārī* (6829, 6830) and *Ṣaḥīḥ Muslim* (1691).

⁴⁰⁶ Ibn Qāsim (2/25).

question of whether such a husband could possibly impregnate her to the scientific community of his day.⁴⁰⁷

Of course, the majority of jurists have objected strongly to this opinion, primarily because of the fact that it is impossible to ascertain whether or not the woman was under compulsion or other extraordinary circumstances that would negate guilt on her part.⁴⁰⁸ It is a matter of juristic consensus that a woman who is raped or otherwise forced to engage in sex against her own free will is not guilty of fornication.⁴⁰⁹ Then there is the more general problem of the validity of using such circumstantial evidence in criminal cases.

What is important for us to note here is that their objections to the Mālikī legal ruling are not based on the possibility that God could cause a woman to become pregnant by way of Immaculate Conception, but rather because an unmarried woman can be subjected to totally natural insemination without incurring any criminal or moral culpability on her part.

In Islamic Law, a pregnant woman is assumed to have been engaged in a sexual act, whether willingly or unwillingly, or to have had at least somehow been inseminated by male semen. Abū al-Faraj b. Qudāmah al-Maqdisī writes, regarding a man who swears that he will not have sex with his wife until she falls pregnant, that by doing so he has taken a binding oath of abstention from her. He argues:⁴¹⁰

Pregnancy without sexual intercourse is impossible according to natural law...and the proof of its impossibility is Mary's statement: "How will I have a boy when no man has touched me and I have not been unchaste?"⁴¹¹ Had it not been for its impossibility, she would not have attributed impropriety to herself on account of the existence of a child.

He further denounces the possibility that the hapless wife could fall pregnant by way of insertion of his semen – barring a miracle – since experience shows pregnancy by such means of insemination to be impossible. By taking this stance, he shows that the

⁴⁰⁷ Ibn Qāsim (2/26).

⁴⁰⁸ al-Maqdisī, Abū al-Faraj (26/342) and al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (1299).

⁴⁰⁹ al-Maqdisī, Abū al-Faraj (26/289).

⁴¹⁰ al-Maqdisī, Abū al-Faraj, *al-Sharḥ al-Kabīr* (23/157).

⁴¹¹ *Sūrah Maryam*: 20.

possibility of miraculous happenings is not to be entertained in such matters. He says:⁴¹²

This is something impossible according to natural law. If it were to occur, it would come under the category of miracles (*khawāriq al-`ādāt*). Medical specialists have confirmed that if semen grows cold, it cannot produce a child.

Conversely, a child is assumed to have parents, whether living or dead. This is because miraculous suspension of natural causation is never to be assumed.

Muslim biologists are therefore fully within their rights if they make the same assumptions when drawing inferences from the fossil record.⁴¹³ For any creature that they find fossil remnants for, they may automatically assume that it had parents.

For instance, when we look at the late Jurassic strata, we see a myriad of various large sauropods. We must assume that each and every one of these sauropods had parents. If we go back far enough, we will no longer see these species, but we see fewer species of smaller sauropods. We must assume, however, that all of those later individuals had ancestors from this earlier time unless we have textual evidence – in other words, from the Qur`ān and authentic Sunnah – that specifically declare the miraculous creation of new species appearing out of nowhere at various times in the past.

This does not mean that we can say for certain that all of the earlier species left descendants that are represented by the later species, since it is very possible that some of the earlier species simply went extinct. Just like we cannot assume by merely seeing a person that he or she has children, we cannot assume that a species that we find in the fossil record has left living descendants. In the same way that a man or woman can die without leaving behind any children, a species can go extinct. Though every living creature by virtue of its existence is evidence that it has come from a line of ancestors; its existence is no guarantee that its lineage will continue into the future.

The textual evidence does not rule out the possibility that new species appeared out of thin air at the time of their first appearance. At the same time, neither does the textual evidence state that they did. Therefore, what is left is simply what we can observe in

⁴¹² al-Maqdisī, Abū al-Faraj, *al-Sharḥ al-Kabīr* (23/158).

⁴¹³ For a detailed explanation on how evolutionary biologists understand the fossil record, refer to Chapter 9.

nature, and consequently the default assumption remains that any specimen of a living or fossil organism must have had a parent that came before it.



CHAPTER THIRTEEN

CHANCE AND DETERMINISM

We have seen in Part Two that evolution is neither a random process nor is it wholly governed by chance. Chance, however, does play a limited role in evolutionary theory through mechanisms such as mutation and genetic drift, in the former case by way of introducing variation for other non-chance processes like natural selection to act upon and in the latter by contributing to the loss of genetic information.

As we have already discussed, the scientific understanding of “chance” is that the final state of a system cannot be completely specified in terms of its initial conditions.⁴¹⁴ The question now is: Does the role that chance plays in the evolutionary process pose any problems from an Islamic perspective?

Muslims believe that God is the Creator and Sustainer of the universe and that every single detail of the universe is in accordance with His will. At the same time, it can be shown that Islam recognizes probability and chance as phenomena that exist in the world that God has created. This practical recognition of chance can be seen in Islamic Law in the drawing of lots and in the prohibition of gambling and commercial contracts entailing chance.

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The practice of drawing lots, which is evidenced by both the Qur’ān and Sunnah, is recognition of the phenomenon of chance. It is the element of chance – the fact that the outcome of the draw cannot be precisely determined by the initial conditions – that affords the practice its impartiality.

In the Qur’ān, we read how Jonah cast lots along with the others aboard the ship to see who was to be thrown overboard:

And recall when he ran away to the laden ship. And he drew lots and was among the losers.
The whale swallowed him while he was blameworthy. [*Sūrah Ṣāffāt*: 140-142]

It is obvious from the general context of these verses that God had predetermined the outcome. It was meant for Jonah to be swallowed by the whale and then to go back to the duty that he was fleeing from.

⁴¹⁴ Refer to the discussion on mutations and randomness in Chapter Seven.

The same relationship between this chance process and God's will can be seen when Zechariah participated in the casting of lots in order to determine who would get custody of Mary:

These are from the reports of the unseen that We reveal to you. And you were not with them when they cast their lots to decide who would receive guardianship over Mary and you were not with them when they disputed amongst themselves. [*Sūrah Āl 'Imrān*: 44]

Again, the undeniable aspect of chance in the casting of lots in no way detracts from the outcome being fully determined by God. The Qur'ān makes it clear that God is the one who appointed Mary to Zechariah's care by saying:

So her Lord accepted her with goodly acceptance, made her grow in a good manner, and placed her under the custody of Zechariah." [*Sūrah Āl 'Imrān*: 37]

Al-Ṭabarī says:⁴¹⁵

It means that God united her to him, because Zechariah, in turn, took responsibility for her by God making it incumbent for him to do so. He took custody of her by way of casting the lots that God made to result in his favour.

In the Sunnah, the drawing of lots is resorted to in various instances as an impartial means of apportioning shares and entitlements when the people involved are equally worthy of them.⁴¹⁶ Prophet Muhammad used to draw lots between his wives when he embarked upon a journey. 'Ā'ishah relates:⁴¹⁷

When God's Messenger wanted to travel, he would draw lots between his wives, and depending on which wife's lot was drawn, she would be the one he would take with him.

The drawing of lots is a fair determiner of the travel rights of co-wives precisely because of the element of pure chance that is involved. In the same way, the Emigrants, when they came to Madinah, were given lodgings by the Madanites by means of drawing lots to see who would lodge with whom.⁴¹⁸ Likewise, when a man made a provision in his will for the manumission of slaves, the Prophet drew lots to determine which slaves were to get their freedom.⁴¹⁹ He recommended it along with

⁴¹⁵ al-Ṭabarī (5/345).

⁴¹⁶ See: al-'Asqalānī, *Fath al-Bārī* (5/330). al-Qurṭubī, *al-Jāmi'* (4/87) commentary of *Sūrah Āl 'Imrān'*: 44 and Ibn Taymiyah, *Majmū' al-Fatāwā* (20/387).

⁴¹⁷ *Ṣaḥīḥ al-Bukhārī* (2661, 4141, 4750) and *Ṣaḥīḥ Muslim* (2770).

⁴¹⁸ *Ṣaḥīḥ al-Bukhārī* (2687). al-'Asqalānī, *Fath al-Bārī* (5/331).

⁴¹⁹ *Ṣaḥīḥ Muslim* (1668).

an oath in judicial claims⁴²⁰ and inheritance disputes⁴²¹ where neither party can furnish evidence. The Prophet also referred to the practice of drawing lots with respect to who gets to stay on the upper deck of a ship when he said:⁴²²

The parable of the one who upholds God's limits and the one who compromises them is that of people who draw lots on board a ship to see who would be on the upper deck and who would get the lower deck...

The Prophet also said:⁴²³

If the people knew what is in the call to prayer and the first row and found no way but drawing lots to determine who would be entitled to it, then they would draw lots.

The Companion Sa'd b. Abī Waqqāṣ put this ḥadīth into practice on the Day of Qādisiyyah when the people disputed with one another over who should offer the call to prayer.⁴²⁴

The practice of drawing lots shows that chance is not only a recognized phenomenon in the natural world, but it is also one that human beings can take into account and capitalise upon in their dealings. Though the outcome of the draw is part of God's determination, the unpredictability of that outcome with respect to the human participants is what matters, for it is what gives the drawing of lots its impartiality.

The same recognition of chance can be seen in the prohibition in Islamic Law of gambling and certain commercial contracts entailing chance. Among these contracts is the sale by the toss of a stone. Abū Hurayrah relates that: "God's Messenger prohibited the sale by a stone toss and sales entailing uncertainty."⁴²⁵

This was a practice in Arabia in pre-Islamic times where the seller and buyer would agree upon a fixed price to the effect that the purchaser pitched a stone upon the goods, and whichever goods the stone lands upon were sold to the purchaser for that price.⁴²⁶ Such a sale violates the condition in Islamic Law that the goods being

⁴²⁰ *Ṣaḥīḥ al-Bukhārī* (2674). Also: *Sunan Abī Dāwūd* (3616) and *Sunan Ibn Mājah* (2329).

⁴²¹ *Musnad Aḥmad* (26717) and *Sunan Abī Dāwūd* (3584). Shu'ayb al-Arna'ūṭ *et al* grade it as a good (*ḥasan*) ḥadīth. [Critical edition of *Musnad Aḥmad* (44/306)]

⁴²² *Ṣaḥīḥ al-Bukhārī* (2493, 2686).

⁴²³ *Ṣaḥīḥ al-Bukhārī* (615, 654, 721, 2689) and *Ṣaḥīḥ Muslim* (437).

⁴²⁴ Ibn Taymiyah, *Majmū' al-Fatāwā* (28/264).

⁴²⁵ *Ṣaḥīḥ Muslim* (1513).

⁴²⁶ See: al-Nawawī, *Sharḥ Ṣaḥīḥ Muslim* (1160) and al-Ghazālī, *al-Wasīṭ* (3/71).

purchased are clearly known to both parties.⁴²⁷ From the discussion on causation in the previous chapter, we know that according to Islamic beliefs, God not only knows what the outcome of the toss will be, but actually brings that outcome about. Regardless, what matters here is that in the natural world there is an inarguable and legally intolerable element of chance – the final state of the sale cannot be completely specified by either the customer or the vendor in terms of its initial conditions. Consequently, this type of sale is forbidden by Islamic Law.

To put it in other words, we know that every time we flip a coin, there is a 50-50 chance of it coming up “heads”. For each flip, it is absolutely impossible for us to call “heads” with certainty. However, for 10,000 flips, we can safely assume that “heads” will come up roughly 5000 times. This probability curve is one of the many patterns that God in His wisdom has decreed to exist in His creation. Every time a coin is flipped, it comes up exactly the way God wills it to. However, it is God’s will that it will come up in a pattern that we cannot determine on a case by case basis but that we can determine probabilistically if the event is repeated a considerable number of times.

Since patterns of chance exist in the world, it follows that God can make such patterns evident in natural processes whenever and however He wishes to do so. Therefore, there should be no objection, from a theological perspective, to the idea of observing chance as playing a vital role in biological evolution. The phenomenon of chance, of randomness – the inability of humans to determine outcomes after assessing initial conditions – exists in the universe because God wants it to.

Is the physical universe deterministic?

Since chance events and probabilities are the creations of God and since the outcomes of such events are entirely according to His will, this leads us to the question of whether the universe is to be described as deterministic or indeterminate. Determinism is the view that causal chains link all events in nature invariably, so that the future course of any system can be predicted from a complete and accurate knowledge of its present state. Altaie points out that, according to the Ash‘arī view,

⁴²⁷ See: al-Ghazālī, *al-Wasīṭ* (3/26) and al-Rāfi‘ī (4/104).

since all cause and effect relationships in nature are the direct actions of God and God does as He pleases, consequently the laws of nature cannot be deterministic.⁴²⁸

However true this may be on a purely philosophical level, it is irrelevant on the empirical level, and that is the level upon which scientific discussions about the determinism or indeterminism of the physical universe are to be had. We see al-Ghazālī making this distinction between the philosophical and the empirical when he insists, on the one hand, that cause and effect relationships are merely two separate divine actions occurring in conjunction with one another and then insists with equal vigour that the scientific causes of the lunar and solar eclipses are facts that cannot be disputed.⁴²⁹

As we have said earlier, whether causal relationships are created into the nature of things or are merely the consequences of consistency in God's actions, it will look the same to an observer. Therefore, whether the physical universe is or is not deterministic from a human perspective is an issue that cannot be resolved scripturally, since scripture does not provide an answer one way or another. It is a question that falls squarely within the domain of scientific enquiry.

The Ash'arī view on causation allows for a number of possibilities. It is possible in any instance for God to:

1. bring about the expected effect along with its cause.
2. bring about some other effect.
3. bring about no effect whatsoever.

The latter two possibilities would be described as miraculous (*kharq al-'ādah*) from an Ash'arī point of view.

This does not rule out the possibility that the universe is deterministic on an empirical level, aside from miracles of course. If God wills to act consistently on every level in Creation in such a way that all causes and effects can be precisely known and linked to one another, then this is what we would call a deterministic universe. If He wills to

⁴²⁸ Altaie (14).

⁴²⁹ al-Ghazālī, *Tahāfut al-Falāsafah* (174 and 46 respectively)

act in a way that everything falls within certain probabilities without individual actions being predictable, this also poses no problem from the perspective of classical Islamic views on causation. It is equally plausible that in some matters, God wills to act in ways that would defy any human attempt at prediction. In short, God does as He pleases.



CHAPTER FOURTEEN

EXTINCTION AND DIFFERENTIAL REPRODUCTIVE SUCCESS

Some Christian thinkers have taken objection to the idea that God controls the biological events of evolution. They argue that many mutations are harmful or lethal and object to the idea that God would have to be responsible for them as well. Barbour writes: “There seems to be too many blind alleys and extinct species and too much suffering and waste to attribute every event to God’s specification.”⁴³⁰

This is also what caused Tennyson so much grief and inspired him to write:⁴³¹

Who trusted God was love indeed
And love Creation’s final law--
Though Nature, red in tooth and claw
With ravine, shrieked against his creed--

Who loved, who suffered countless ills,
Who battled for the True, the Just,
Be blown about the desert dust,
Or sealed within the iron hills?

Are the objections being raised here problematic from an Islamic perspective? Suffering and death are recognized to be as much a part of God’s creation as are joy and life. God is the creator of it all. The Qur’ān is clear that it is all part of God’s order:

And that it is He who causes to laugh and causes to weep. And it is He who causes death and causes life. And that He created the pairs, male and female. [*Sūrah al-Najm*: 43-45]

We have decreed death among you, and We will not be superseded, to replace the likes of you and to create you in forms that you know not. [*Sūrah al-Wāqi’ah*: 60-61]

Indeed, the Qur’ān makes mention of death first when it speaks about God creating life and death:

(He) who has created death and life that He might test you which of you are best in deeds.
[*Sūrah al-Mulk*: 2]

⁴³⁰ Barbour (112).

⁴³¹ Tennyson, “In Memoriam A.H.H.” (315).

Moreover, is it a Muslim's place to describe anything in God's Creation as wasteful or to criticize what might be perceived as blind alleys? The notion of wastefulness, for instance, requires a pre-existing assessment of value, of need, and of loss in the face of limited resources. What notion of the value of created things can a human being presume to impose upon God? What needs does God have and what limitations are there to His ability to dispose of affairs, so that any of His actions in Creation could possibly be described as wasteful or injudicious?

Al-Ghazālī answers these questions when he discusses the difference between divine wisdom and human wisdom in the disposal of affairs:⁴³²

The meaning of "the Wise" is the Knower of the reality of things, the Capable of precision in making them accord precisely to His will. From this, where is the need of considering best interests? As for a wise man among us, he takes the best interests into consideration looking out for himself to achieve distinction in this world and reward in the Hereafter or to repel misfortune from himself, all of which is impossible to conceive for God.

The Prophet makes it clear that nothing that transpires in created existence can possibly increase or decrease God's dominion in any way. He says, relating the words of his Lord:⁴³³

O My servants! If the first of you and the last of you, human of you and jinn of you, were as the most God-fearing heart of any single man among you, this would not increase My dominion in the least. O My servants! If the first of you and the last of you, human of you and jinn of you, were as the most sinful heart of any single man among you, this would not decrease My dominion in the least. O My servants! If the first of you and the last of you, human of you and jinn of you, were to stand as one and ask of Me and I were to give each person what he asked for, it would not diminish what I have, any more than the ocean would be diminished if a needle were dipped into it.

Consequently, a human perspective on God's handiwork is necessarily incomplete. This is due to human limitations and to humanity's position within creation. For instance, we are constrained by time. We are moving through time in one direction and can only witness it moment by moment. This means that we get only a cross-sectional glimpse of the universe within the time dimension. We can only see an object as it is at the present moment. It cannot be assumed that God's perspective is anything like that. He is not constrained. He creates without any limitations and He

⁴³² al-Ghazālī, *Iḥyā' 'Ulūm al-Dīn* (1/163).

⁴³³ *Ṣaḥīḥ Muslim* (2577).

relates to creation in a way that it is impossible for us to even guess at. Al-Ghazālī describes God’s knowledge as follows:⁴³⁴

His knowledge of all things is timeless and eternal. He has always possessed it. His knowledge is not acquired or renewed, nor does it manifest itself in His being from outside experience.

Ibn Abū al-‘Izz writes:⁴³⁵

God knows what has been and what is to be. For what does not occur, He knows what the circumstances would be if it were to occur.

God’s knowledge, therefore, is not limited by temporal constraints. Human knowledge, by contrast, is constrained by time. This is why, in order to get a glimpse of the patterns and forms that exist in the temporal dimension of creation, people develop abstract models, since it is impossible for people to view these patterns directly. In biology, for instance, it is common to draw a branching tree of life showing patterns of descent and divergence among biological lineages over time. It would be wrong to assume that this is the way God sees it, since it is only an attempt to abstractly perceive one aspect of creation within a temporal context, a dimension wherein the human perspective is limited.

However, assuming this construct, the tree of descent, is a rough approximation of reality, a Muslim would have to concede that what this tree represents is God’s creation too, every branch of it, every tangle, every symmetry and asymmetry. The tree in our backyard is God’s creation. Its long branches are as long as He wants them to be. Its smallest twigs are in accordance to His will. No orthodox Muslim would have any objection to this. By extension, every branch on the tree of life would be exactly as God wants it to be, since this tree whose branches stretch through time instead of space is just as much His creation as the one growing in the ground. Its boughs are as long (stretching through time) as He determines them to be. It branches (through speciation) diverge as many times as He wills, and they come to an end (through extinction) when He so decrees.

These branching lineages through time are God’s creation though they cannot be seen in the clear and easy way that we can see a tree in our backyard or a single living animal standing before us. It is easy to appreciate a single animal as a creation of God,

⁴³⁴ Al-Ghazālī, *Iḥyā’ ‘Ulūm al-Dīn* (1/132).

⁴³⁵ Ibn Abū al-‘Izz (1/219-220).

whereas human limitations make it a bit more difficult to appreciate a lineage through time in the same way. This does not in the least detract from the beauty of that temporal tree of life or the magnificence of its conception and the totality of its creation and, though we might only be able to clearly discern the tips of its youngest shoots (living species) and glimpse indirectly at its boughs and branches and grand design, as if through a fog. Failure to grasp its magnificence is simply the danger of trying to project a human perspective of things onto God.

Nevertheless, the Prophetic Sunnah indicates that the lineage through time is indeed a creation of God; something determined by Him precisely. The Prophet speaks about his own lineage in the following manner:⁴³⁶

Verily, God selected Kinānah from the progeny of Ishmael and selected Quraysh from the progeny of Kinānah, and selected Banū Hāshim from Quraysh, and selected me from Banū Hāshim.

This brings us to the critical question: Should Muslims have a problem with the idea of extinctions? The Qur'ān speaks repeatedly of nations that have passed away. Also, the Sunnah speaks about the possibility of God removing those who exist today and replacing them with other peoples. The Prophet said:⁴³⁷

I swear by Him in whose hand is my soul. If you were never to sin, God would remove you and bring forth a people who would commit sins and then seek God's forgiveness so He could forgive them.

God also refers to other forms of animal life as being nations like ourselves. This leaves no clear reason for objecting to the idea that God might totally wipe out some of these forms. We can find no objection whatsoever to that idea in the Qur'ān.

We should consider:

And there is no beast in the Earth nor bird that flies with its wings except that they are nations like yourselves. We have not neglected the recording of anything. Then unto their Lord they will be gathered. [*Sūrah al-An 'ām*: 38]

⁴³⁶ *Ṣaḥīḥ Muslim* (2278).

⁴³⁷ *Ṣaḥīḥ Muslim* (2749).

It is generally understood that the term nation (*ummah*) in this verse refers to the various types or species of animal life. Mujāhid explains these nations to be “types that are categorized and that are known by their names.”⁴³⁸

Al-Farrā’ says: “It is said for every category of beast that it is a nation.”⁴³⁹ He then goes on to cite the following ḥadīth as proof that the term “nations” is applicable to species:⁴⁴⁰

If it were not for that dogs are a nation among the nations, I would have commanded them to be killed.

In another ḥadīth, we find the term used in reference to a smaller population within a species:⁴⁴¹

An ant once bit one of the prophets and he ordered the anthill to be burnt, so God revealed to him that: a single ant bit you and you burnt a nation among the nations that glorifies God.

Scholars differ as to what is meant by the similarity alluded to in the phrase “nations like yourselves”. A wide range of opinions are ventured, most of which are equally plausible.⁴⁴² To be sure, neither the verse nor the ḥadīth provide any evidence that other animal populations have actually met with extinction in the same way that human populations have; yet they are more than sufficient for accepting the notion that the extinction of species is plausible within the context of Islamic teachings.

More crucial to evolutionary theory than the question of extinction is the concept of differential reproductive success, since this is the driving force behind the adaptive evolutionary change by which species come into existence in the first place. Should Muslims find any objection to the important role that is played in evolutionary theory by differential reproductive success?

Differential reproductive success is not only observable in nature; it is something that the Qur’ān addresses quite clearly and directly while discussing God’s mercy upon his creatures and also their misfortunes. The Qur’ān attributes this phenomenon entirely to God’s will and power, saying:

⁴³⁸ al-Ṭabarī (9/233).

⁴³⁹ al-Rāzī, *Maḥāṭib al-Ghayb* (12/175).

⁴⁴⁰ *Sunan al-Tirmidhī* (1489), *Sunan Abī Dāwūd* (2845), *Sunan al-Nasā’ī* (4280), and *Sunan Ibn Mājah* (3205).

⁴⁴¹ *Ṣaḥīḥ al-Bukhārī* (3019) and *Ṣaḥīḥ Muslim* (2241).

⁴⁴² See: al-Baghawī (2/95) and al-Rāzī, *Maḥāṭib al-Ghayb* (12/175-177).

To God belongs the dominion of the heavens and the Earth. He creates what He wishes. He bestows females upon whom he wishes and bestows males upon whom He wishes. Or he gives them both males and females. And He renders whom He wishes childless. Indeed He is knowing and capable. [*Sūrah al-Shūrā*: 49-50]

In this verse, the Qur’ān attributes reproductive success to God’s decree and places it under His control. Moreover, it shows that all individuals are not equally successful in this matter. Some people have only female progeny and some have only males. Some have both. While others leave no descendants at all.

This verse follows immediately after another verse discussing God’s mercy and the misfortunes that befall humanity.⁴⁴³ Al-Nasafī points out the significance of this context:⁴⁴⁴

Since God mentions a person’s experiencing mercy and being afflicted with its opposite, He follows this up by mentioning that His is the dominion and that He distributes blessings and hardship as He wills. And He bestows upon His servants progeny as He wishes. To some He gives only females, to some only males, to some he gives children of both sexes, and some He makes childless.

Since it is a Muslim’s belief that reproductive success is part of God’s decree, it follows that Muslims should have no reason to object to a scientific theory in which differential reproductive success plays a crucial role in the history of life.

⁴⁴³ In the previous verse, it reads: “And indeed when We let man taste mercy from Us, he rejoices in it, but if evil befalls him for what his hands have put forth, then indeed man is ungrateful.” [*Sūrah al-Shūrā*: 48]

⁴⁴⁴ al-Nasafī (4/162-163). This is almost identical to what al-Zamakhsharī says in *al-Kashhāf* (982).

CHAPTER FIFTEEN

ETHICAL CONSIDERATIONS

It has already been discussed how the theory of evolution, as a purely scientific theory, does not assert any moral claims or any ethical system. The question that remains is whether, from an Islamic perspective, moral values and ethical norms *should* be drawn from nature, so that if Muslims were to accept biological evolution as true, certain moral or ethical consequences would be implicit in their doing so.

Indeed, for some Muslim thinkers, what disturbs them most about evolutionary theory is what they perceive as the troubling moral values that it seems to advance. They see biological evolution as embodying the values of “might makes right”, selfishness, and an overemphasis on material success and sexual prowess.⁴⁴⁵

It is, of course, easy to refute such claims by simply pointing out that these ideas derive from an erroneous, or at best, a highly oversimplified understanding of evolutionary theory. However, there is a far more fundamental question at work here – whether moral values can, for a Muslim, be derived from nature or, at least, are regarded as being enshrined in the workings of the natural world.

The answer to this question lies in the distinction that classical Islamic thinkers make between God’s actions – on the one hand – and the accountability that human beings have – on the other – for the actions that they carry out of their own free will. What goes on in nature is by the will of God and is a consequence of His direct action. This includes those events that conform to the natural laws that can be observed with regularity, the miraculous events that run contrary to those laws, as well as the outward manifestation of the actions that God permits his creatures to carry out of their own volition.

We have already seen that scientific explanations of what is going on in the natural world, from an Islamic viewpoint, are merely an attempt to discern patterns in God’s actions as they are observed in nature. However, there is also the accountability that human beings have regarding the actions that they carry out of their own free will. This, in Islam, is the domain of human moral and ethical considerations.

⁴⁴⁵ See: Nadvi, *Darwinism on Trial* (118) and Maqsood, *The Sign of the Gnat* (46).

Scholars of the different orthodox theological schools differ in how they understand this distinction. Many scholars approach this matter by positing a distinction between God's creation of all things (through His direct action) and the human acquisition of accountability for what is attributed of those actions to their free will.⁴⁴⁶ This is known in Islamic theology as the Doctrine of Acquisition and is one of the hallmarks of Ash'arī thought. It is also mentioned by al-Ṭaḥāwī, who writes in his short treatise on theology:⁴⁴⁷

The actions of the servants are God's creation and an acquisition of the servants.

By way of this doctrine, Ash'arī thinkers seek to reconcile between the idea of God's creation of all things – including all human actions – on the one hand, and the idea of human free will on the other. Though God creates a person's actions, the person acquires those actions in accordance with human free will.⁴⁴⁸ The person's accountability for such actions is based on the person's acquisition of them.⁴⁴⁹ The person, consequently, is only held accountable for what is acquired.

They cite the following verse of the Qur'ān in support of this:

God holds no soul accountable except to the extent of its abilities. For it, it has what it acquires, and against it, it has what it acquires. [*Sūrah al-Baqarah*: 286]

This means that there is no moral significance to any action except by way of its acquisition by someone who is morally accountable. In this way, although God creates actions that can be described as evil with respect to the people who carry them out, evil cannot be attributed to God. It is attributed to the one who acquires it. Evil, in Ash'arī thinking, is defined as what God has forbidden and therefore immorality is only possible where a morally accountable being acquires an action in a way that constitutes disobedience to God.⁴⁵⁰

⁴⁴⁶ al-Ghazālī, *Iḥyā' 'Ulūm al-Dīn* (1/161).

⁴⁴⁷ al-Ṭaḥāwī, *al-'Aqīdah*, published with Ibn Abī al-'Izz (2/662).

⁴⁴⁸ As for whether and to what extent this acquisition has an effect or influence on the creation of an action, this is a matter of considerable disagreement among the scholars who follow this approach, especially between scholars of the Ash'arī and Māturīdī schools of thought, though also among the Ash'arī scholars themselves. Refer to: al-Juwaynī, *al-Irshād* (188-191) and *al-'Aqīdah al-Nizāmiyyah* (185-193) and to al-Ghaznawī, *Uṣūl al-Dīn* (168). However, this dispute has no bearing on the questions that we are presently exploring.

⁴⁴⁹ al-Bāqillānī, *Tamhīd al-Awā'il* (346).

⁴⁵⁰ al-Bāqillānī, *Tamhīd al-Awā'il* (347-348).

On this basis, people cannot take what God does in Creation as a model for their own moral decisions, since human beings are not comparable to Him. “He is the doer of what He pleases”⁴⁵¹ and “He is not questioned about what He does but they will be questioned.”⁴⁵²

Commenting on this last verse, al-Bāqillānī says:⁴⁵³

It means that they will be asked about what they earn and He will not be asked about what He creates, because there is no one above Him to command Him and there is no requirement upon Him in what He creates. Rather, the command and the requirements are upon them in what they acquire.

God’s actions in nature, consequently, can never fall into the domain of moral discourse. They are not subject to ethical considerations, nor can such considerations be drawn from them, since the domain of moral and ethical considerations is only the result of human acquisition, of which natural phenomena – which are not attributable to human acquisition in any way – do not form a part.

Other scholars, especially those who follow a Salafī approach to theology, approach the issue of God’s actions and human accountability by making a distinction between the “existential” and the “legislative”. They do so with respect to God’s decree, His will, and His command. Moral values and ethical considerations are relevant only to the legislative and not to the existential.⁴⁵⁴ Ibn Abū al-‘Izz sums this idea quite nicely when he says:⁴⁵⁵

When he (al-Ṭahāwī) says: “Everything takes place by God’s wish, his knowledge, His decree, and His ordinance” he means by this His existential and not His legislative decree, for indeed the decree might be existential or legislative. The same is the case for His will, command, permission, prescription, ruling, prohibition, words, and so forth.

God’s existential decree is often illustrated with the following verse:

So he decreed them to be seven heavens in two days. [*Sūrah Fuṣṣilat*: 12]

...which can be contrasted with his legislative decree in the verse:

⁴⁵¹ *Sūrah al-Burūj*: 16.

⁴⁵² *Sūrah al-Anbiyā*: 23

⁴⁵³ al-Bāqillānī, *Tamhīd al-Awā’il* (358).

⁴⁵⁴ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (8/58).

⁴⁵⁵ Ibn Abī al-‘Izz (2/677).

And your Lord decreed that you should worship none but Him [*Sūrah al-Isrā'*: 23]

The creation of the heavens and the Earth came about by God decreeing that they would come into existence. Human beings are not morally accountable for the coming into existence of the universe, since it did not come about as a result of human action. God also decreed that humanity should worship Him alone. This, however, is a legislative decree that people can choose to obey or disobey. Consequently, they are morally accountable for their decision.

In the same way, God's existential will and legislative will are contrasted. Ibn Abū al-‘Izz writes:⁴⁵⁶

The later scholars of *Ahl al-Sunnah wa al-Jamā‘ah* state that “will” in the Qur’ān and Sunnah are of two kinds: (first) the ordained, existential, creative will, and (second) the religious, commanding, legislative will. It is the legislative will that relates to what God loves and is pleased with.

He then cites the following verses to illustrate the distinction. For God's existential will, he cites:

And whomever God wills to guide, He opens his breast to Islam, and whomever He wills to lead astray, he makes his breast tight and restricted, as though he were climbing into the sky. [*Sūrah al-An‘ām*: 125]

Contrasted with this is His legislative will:

God wills to make matters clear to you and to guide you to the good practices of those before you and forgive you. And God is knowing and wise. [*Sūrah al-Nisā'*: 26]

On this basis, Ibn Abī al-‘Izz asserts:⁴⁵⁷

God wills sin to exist by His ordinance, but he does not love it nor is He pleased with it, nor does he command it. By contrast, He hates, loathes, and detests it.

Again, with God's command, Ibn Abū al-‘Izz contrasts the existential command, which has no implications for human morality and ethics, with the legislative command.⁴⁵⁸ God's existential command can be seen in the following verse:

⁴⁵⁶ Ibn Abī al-‘Izz (1/174).

⁴⁵⁷ Ibn Abī al-‘Izz (1/173).

His command, if He wills something, is but to say “Be!” and it is. [*Sūrah Yāsīn*: 82]

Whereas His legislative command is as follows:

Indeed, God commands justice, good conduct, and generosity towards relatives and forbids licentiousness, immorality, and injustice. He admonishes you that perhaps you will take heed. [*Sūrah al-Nahl*: 90]

According to this approach, just like with the Ash‘arī one, what God does in Creation cannot be taken as a model for human moral decisions. With respect to all existential matters “He is the doer of what He pleases”⁴⁵⁹ and “He is not questioned about what He does but they will be questioned.”⁴⁶⁰ Ibn Taymiyah points out that these verses do not negate that God acts out of wisdom and justice.⁴⁶¹ At the same time, human beings are not always in a position to understand the underlying wisdom and justice behind God’s actions. Ibn al-Qayyim writes:⁴⁶²

Comparing God’s actions to the actions of His servants is one of the falsest of analogies. Likewise is comparing His wisdom to theirs or His attributes to theirs. It is acknowledged that the Lord knows that His servants will fall into unbelief, injustice, and wrongdoing and that He is capable of either not creating them or of creating them as one heart upon what He loves and is pleased with, or of preventing them from transgressing against one another. However, His infinite wisdom keeps Him from doing so and requires that He creates them the way they are.

What matters to us, again, is the common thread shared by these two approaches. Regardless of the approach used, moral values in Islam are to be derived from religious teachings and not from the natural world. Muslims are not commanded to take natural phenomena as an example for moral conduct. They are taught what is right and wrong by God and His Messenger, and are further taught to take the Messenger as their example. The Qur’ān says:

Indeed for you, in God’s Messenger, is an excellent example to be followed for anyone whose hope is in God and the Last Day and who remembers God often. [*Sūrah al-Aḥzāb*: 21]

⁴⁵⁸ Ibn Abī al-‘Izz (2/677).

⁴⁵⁹ *Sūrah al-Burūj*: 16.

⁴⁶⁰ *Sūrah al-Anbiyā’*: 23

⁴⁶¹ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (13/225).

⁴⁶² Ibn al-Qayyim, *Shifā’ al-‘Alīl* (423).

From this vantage point, we can see the fallacy in the argument that biological evolution is incompatible with the moral values and ethical standards that are taught by Islam.

An illustrative case – Noah’s Flood

The Flood provides an illustrative example of these principles. It is clear from the Qur’ān that God brought about the Flood to punish a community of people who disbelieved. Regardless of how extensive the Flood actually was, there can no question that it was a formidable event that had devastating effects on the environment it affected and not just upon the recalcitrant humans for whom it was intended.

Would it be right for a Muslim jurist or scholar of ethics to derive from the Flood the lesson that it is alright for people to lay waste to the environment in order to achieve a particular objective? Indeed not. The Flood, like any natural disaster, was not under the charge of human discretion. The Qur’ān makes it clear that God caused it to happen. Human beings were not accountable for the destruction of the environment that the Flood brought about, since the acquisition of accountability is only for actions that human beings carry out by their own free will.⁴⁶³ Likewise, Muslims are not called upon to emulate such environmental destruction in pursuing their own goals, since the Flood was a matter of God’s existential decree and will; not His legislative decree and will. In other words, the people of the time were not commanded to cause the Flood to happen.

Still, are there any moral lessons that might be derived from the events of the Flood? There might be. One of these lessons can be found in what God commanded Noah – a legally and morally accountable human being – to do when the Flood occurred. God ordered him to take with him on the Ark “...of every set of mates a pair...”. Here is a direct command from God to one of His human creatures to salvage other living things for the future. This is something from which Muslim scholars of law or ethics may very well wish to derive moral teachings.⁴⁶⁴ They could easily draw from this the

⁴⁶³ Human beings would be morally accountable for consequences in nature that came about as a direct result of human action; for instance, global warming and ozone depletion.

⁴⁶⁴ The fields of Islamic Law and ethics allow scholars a greater scope of interpretation than that of Theology. Matters of the belief and of unseen must be established with certainty. As for questions pertaining to practice, scholars have far greater freedom to engage in such pursuits as deriving

idea that human beings are morally liable to do what they can to preserve the natural environment for future generations, providing an ethical basis in Islam for conservation efforts.

Essentially, in the story of the Flood, there are two actions. The first action is the Flood itself, an act of God that no human being was commanded to bring about. Therefore, the Flood is not something people are to emulate in their own behaviour, nor is it something from which people are to derive their standards of moral conduct. The second action is Noah's action of rescuing living things from the deluge. It is an action God commanded one of His creatures to carry out of his own free will. Therefore, it is something from which Muslim scholars may derive moral and ethical teachings.



meanings (*istinbāṭ*) from the texts and in applying analogical reasoning (*qiyās*) to resolving questions of practical importance that are not directly addressed by the texts.

CHAPTER SIXTEEN

HUMAN EVOLUTION

The apparent meaning of the textual evidence, as we have discussed in Chapter Three, indicates that Adam was directly created by God from earth, and that he had no mother or father. It also indicates that the human beings living on the Earth today are all the direct descendents of Adam and his wife Eve.

What implications does embracing this traditional understanding of Adam's origins have for the acceptability of human evolution within a traditional Islamic framework? Specifically, if Muslims accept that the theory of evolution applies to the various species of the genus *Homo*, would this be in conflict with a belief in the direct creation of Adam or his unique and singular status? Would this not be a contradiction?

From what preceded, we can conclude that Islam can accommodate the claim that God created the many species of animal and plant life on Earth through gradual stages, changing His creations slowly from generation to generation by His will in such a manner that a pattern of mechanisms such as genetic mutation and natural selection can clearly be discerned. These mechanisms could simply be understood as patterns of cause and effect that God has placed in Creation. God does whatever He pleases. If God wishes to create His living creatures in this manner, He is able to do so.

What about the scientific claim that the genus *Homo* evolved in this way from other primates, and more specifically a group of primates known as the australopithecines? Can Muslims accept the idea that God at one time brought forth from the descendents of certain primates any number of intelligent species that walked upright, used tools, some of which may have looked roughly similar – or even identical – to modern humans? If so, what implications would this have for understanding the story of Adam?

Science, as we have mentioned before, is empirical. It only deals with the norms of nature. Muslims regard these norms as patterns in God's creation or in His actions.⁴⁶⁵ These patterns are discernable in God's creation according to His divine will. This

⁴⁶⁵ Refer to Chapter Eleven for a discussion on causation as well as a discussion on miracles.

would apply to any observation of evolutionary patterns observed in nature with respect to the genus *Homo* or other hominid genera.

However, it follows that He who created these norms can break them whenever He pleases and however He wills. In classical Islamic discourse, these contraventions of the norms are referred to as miracles.

Since science is empirical, science can only observe God's creation and record what it sees. Science can never hope to be able to determine the manner in which a single human being, Adam, (who, according to the apparent meaning of Islam's sacred texts, is the father of all human beings living today) was specifically created. As discussed in Chapter Three, the creation of Adam is a matter of the unseen, known only through revelation.

What the sacred texts say about the creation of Adam has led classical scholars to the conclusion that his creation was unique; even miraculous. The Qur'ān emphasizes the uniqueness and special status of Adam's creation when it says that God created Adam with His "two hands":

O Satan, what prevented you from prostrating to that which I created with My two hands? Are you too proud or are you among the exalted? He (Satan) said: "I am better than he is. You created me from fire and You created him from mud. [*Sūrah Ṣād*, 75-76]

Regardless of how the scholars might have differed in interpreting the meaning of God's "two hands" in this verse, there is a general agreement that this verse indicates that the creation of Adam was somehow special and distinct from the creation of other things, as this is perfectly clear from the context.

Ibn Taymiyah mentions the different opinions held by Muslims with respect to the interpretation of two hands, then says:⁴⁶⁶

In any event, they all agree that Adam has favour and distinction not possessed by anything else on account of God creating him with His two hands.

Al-Bayhaqī likewise discusses the various interpretations that can be applied to the "two hands" and rules out the idea that they could convey the same meaning as the

⁴⁶⁶ Ibn Taymiyah, *Majmū' al-Fatāwā* (4/366).

“hands” mentioned in verse 71 of *Sūrah Yāsīn*⁴⁶⁷. He comes to this conclusion on the grounds that doing so would negate the honour and distinction that the verse is clearly conferring to Adam over Satan. He writes:⁴⁶⁸

It cannot be interpreted to mean... (God’s) power, dominion, or providence, or be taken as an emphatic reference to the subject, because this would be something equally applicable to God’s devotee Adam and to His enemy Satan. This would negate what is mentioned of the favour that Adam has over Satan, since any meaning of distinction would be lost. There is no alternative but to interpret them as two attributes that relate to the creation of Adam – as an honour to him – that do not apply to the creation of Satan.

Al-Bayḍāwī writes:⁴⁶⁹

“*I created with my two hands*” meaning: “I created Him by Myself without the intermediary step of a mother or father.” The mention of two hands is on account of what his creation entailed of additional capability and dissimilarity of action.

Ibn Taymiyah continues his discussion of this point by referring to some ḥadīth wherein the manner in which Adam was created is mentioned as one of the distinctions that he has over the rest of created things.⁴⁷⁰

In the Sunnah, Moses mentions Adam’s mode of creation when he enumerates his distinctive qualities:⁴⁷¹

Adam won an argument with Moses. Moses had said to him: “You are Adam whom God created with His hand and breathed into you of His spirit and made the angels prostrate to you and gave you to dwell in Paradise. Then you brought humanity down with your mistake to the Earth...”

⁴⁶⁷ “*Do they not see that We have created for them – from among the things Our hands have wrought – cattle, which are in their possession?*” Al-Bayhaqī interprets the “hands” of this verse as indicating an emphatic reference to the subject – i.e. “from what We Ourselves have wrought.” See: *Kitāb al-Asmā’ wa al-Ṣifāt* (2/49). For Ibn Taymiyah’s discussion on the difference in meaning between this verse and verse 75 of *Sūrah Sād*, refer to *Majmū’ al-Fatāwā* (3/45-46) or separately as *al-‘Aqīdah al-Tadmuriyyah* (73-75). See also *Majmū’ al-Fatāwā* (6/370-372).

⁴⁶⁸ al-Bayhaqī, *Kitāb al-Asmā’ wa al-Ṣifāt* (2/49).

⁴⁶⁹ al-Bayḍāwī (5/35).

⁴⁷⁰ Ibn Taymiyah, *Majmū’ al-Fatāwā* (4/366).

⁴⁷¹ *Ṣaḥīḥ Muslim* (2652)

Ibn Taymiyah cites another ḥadīth foretelling that the believers will mention Adam’s unique qualities to him when they plead with him to intercede on their behalf on the Day of Resurrection:⁴⁷²

The believers will gather together on the Day of Resurrection and say: “If we could seek intercession with our Lord.” They will approach Adam and say: “You are the father of humanity. God created you with His hand and made the angels prostrate to you and taught you the names of all things, so intercede for us with your Lord so that He may relieve us of this place of ours.”

Ibn Taymiyah comments on these two ḥadīth, saying:⁴⁷³

This is enumerated as one of the blessings that God had bestowed upon Adam when Moses said to him: “God created you with His two hands...” Likewise, it will be said to him on the Day of Resurrection. This is mentioned among the blessings that God had bestowed upon him exclusively and that other created things do not share with him. This is a clear indication of his preferential status over the rest of Creation.

Another indicator of the exceptional nature of the creation of Adam is that the Qur’ān compares it with the creation of Jesus:

Verily, the likeness of Jesus with God is the likeness of Adam. He created him from earth and then said to him: “Be!” and he was. [Sūrah *Āl ‘Imrān*, 59]

Al-Nasafī explains this comparison as follows in his commentary on the verse:⁴⁷⁴

He created Adam from earth without the agency of a father or mother. Likewise is the case with Jesus, even though coming into existence without a father or mother is stranger and more miraculous (*akhraq lil-‘ādah*) than coming into existence without a father. Therefore, He compares that which is strange to that which is stranger...”

The exact nature of Adam’s distinctiveness over other creations that is indicated by his being created by “two hands” is not discernable from the texts. It would be an overextension of their meaning to present these texts as definitive proof that no other life form was created directly without the agency of a parent. However, these texts are evidence enough to indicate that the creation of Adam was somehow unique. Consequently, there is no reason to assume that the creation of Adam had to follow the same pattern as the creation of other life forms.

⁴⁷² *Ṣaḥīḥ al-Bukhārī* (4476, 6565) and *Ṣaḥīḥ Muslim* (193-195).

⁴⁷³ Ibn Taymiyah, *Majmū‘ al-Fatāwā* (4/366).

⁴⁷⁴ al-Nasafī (1/242).

Al-Alūsī, while discussing the verse “*O mankind, fear your Lord who created you from one soul and created from it its mate...*” quotes Zayn al-‘Arab as going so far as to declare as unbelief the Twelver Shi’ite claim⁴⁷⁵ that God independently created numerous thousands of unique Adams in succession, each with his own progeny.⁴⁷⁶ Al-Alūsī then says, concurring with Zayn al-‘Arab’s incredulosity, if not necessarily with his ruling of unbelief:⁴⁷⁷

This Adam of ours was preceded by other creations like the angels, the Jinn, numerous animals, and other things about which only God has knowledge, but not with the creation of the likes of him.⁴⁷⁸

Why was Adam’s creation of such an exceptional manner? The simple answer for a Muslim would, of course, be that God simply wanted it that way. A Muslim must believe that God does whatever he pleases and is not required to know why, except where the texts make it clear. Here, though, the texts do make clear at least part of the significance for Adam’s unique creation. It was a sign of distinction and honour for him, and by extension, for his descendants. This is seen in the context of the verse where God challenges Satan by asking: *O Satan, what prevented you from prostrating to that which I created with My two hands?* It is understood as being an honour when mentioned by Moses and by the people on the Day of Resurrection.

The uniqueness of Adam’s creation that is indicated by these texts has relevance to the question of human evolution in that, by being such a miraculous event, by its very nature it falls outside the scope of scientific enquiry. Whatever science may discover, through observation and experimentation, about the development of life on Earth, it does not have the scope to investigate such a singular and unique act as God’s creation of an individual human being.

⁴⁷⁵ It is related by Ibn Bābawayh in *al-Tawhīd* that Ja‘far al-Ṣādiq said: “Perhaps you see that God never created a human being other than yourselves. Nay, but God had created a million Adams and you are of the last of those Adams.” Maytham al-Bahrānī relates in *al-Sharḥ al-Kabīr ‘alā Nahj al-Balāghah* from al-Bāqir: “Before the Adam who is our father, a million Adams or more had passed from existence.” [quoted in: al-Alūsī (4/531-532)] These reports have no authority according the conditions set forth by the scholars of ḥadīth.

⁴⁷⁶ al-Alūsī (4/532), commentary on *Sūrah al-Nisā’*: 1

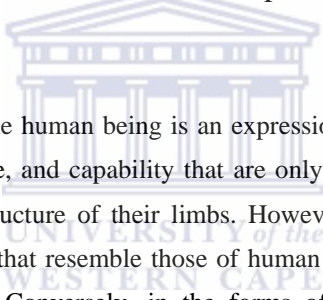
⁴⁷⁷ Al-Alūsī (4/532), commentary on *Sūrah al-Nisā’*: 1

⁴⁷⁸ Al-Alūsī’s follows this statement by saying “He is contingent as a species and as an individual, in contrast to the claim of some philosophers that the human species is eternal.” The statement that Adam and the human species are contingent means that they existed after having not existed. Here, al-Alūsī is bringing up another topic, that of refuting the claim of some peripatetic philosophers who considered both the Earth and the human species to be eternal in their antiquity. This is independent of his refutation of the Shi’ite claim that God created thousands of unique Adams in historical succession. The contingency of the human species is obvious; in fact, it is necessary simply upon the belief that the universe itself is contingent and does not stretch back eternally into the past.

Likewise, it is highly unlikely that science would ever be able to determine at what time such a directly-created Adam might have made his appearance on Earth or what creatures he may have encountered when he got there. The sacred texts are silent on this matter as well. This, therefore, is something of the unseen to which no answer can be given.

What a Muslim might say on the authority of the sacred texts is that Adam was singularly unique and that he and his descendants were all fully human. One might wish to argue that, from a religious perspective, Adam and his descendants define what it means to be human.

Such a definition is not based upon considerations of biology or physiology, and indeed, al-Rāzī considers it to be incorrect to define a human being – at least where theological and philosophical matters are concerned – in physical, biological terms, since he sees the meaning of humanness to be independent of the physical appearance of humanness. He writes:⁴⁷⁹



The third opinion is that the human being is an expression of physical bodies possessing the qualities of life, knowledge, and capability that are only distinct from other animals in their physical forms and the structure of their limbs. However, this is problematic, because the angels can come in forms that resemble those of human beings, so here we have the human form without humanness. Conversely, in the forms of transformed beings, we have the meaning of humanness being realized while the human form is not being realized. Therefore, the consideration of the physical form in determining the meaning of what is human is false from both directions.

Al-Rāzī then goes on to affirm that the human being is an entity that is neither the physical body nor anything of a physical nature, and attributes this opinion to the majority of theologians, including al-Aṣfahānī and al-Ghazālī.⁴⁸⁰

Biological classifications are another matter altogether, and with respect to the question of human evolution, biological terms are of particular relevance. If it is to be assumed that Adam is the forefather of all humans on Earth today, then it is without a doubt that the descendants of Adam have diversified in colour, stature, and physical appearance as they spread throughout the Earth. In the absence of any unequivocal textual evidence describing Adam's earliest descendants in detail, there is no way to

⁴⁷⁹ al-Rāzī, *Maḥāṭib al-Ghayb* (21/37-38).

⁴⁸⁰ al-Rāzī, *Maḥāṭib al-Ghayb* (21/28).

gauge the extent or rate of genetic and phenotypic change that has taken place among Adam's later progeny. Therefore, scriptural evidence does not indicate whether Adam's earliest descendants would have been classified biologically as *Homo sapiens* or possibly as some earlier human species.

This means that there is no way to answer questions like whether *Homo neanderthalis* were from Adam's descendants, or alternatively whether or not creatures that scientists would classify as being biologically *Homo sapiens* had already evolved on Earth before Adam's arrival upon it. (Refer to *fig 15.1* for a diagram of some of the possibilities that are compatible with a traditional reading of Islamic scriptures.)

Such questions, however, are of neither scientific nor theological importance. The sacred texts do not bring up these questions, and science does not and cannot deal with singularly unique and miraculous events like the creation of Adam.

What matters is that a belief in the uniqueness of Adam and in his special, direct creation does not prevent Muslims who hold that belief from viewing humanity biologically in the context of a broader evolutionary perspective. The idea that Adam was directly created does not make his descendants any less a part of the broader biological human family that they are genetically a part of, any more than Jesus' immaculate conception makes him any less human – biologically or otherwise. Admittedly, Jesus's miraculous birth has a direct consequence on his historical lineage – he is not attributed to the family of any man but rather called “the son of Mary” – but his membership in the broader human family is not in the least way compromised. The Qur'ān emphasizes that he is fully human in every possible sense of the word, right down to the most basic of physical needs:

The Messiah, the son of Mary, was none other than a Messenger; other Messengers had passed away before him. And his mother was a truthful one. They both used to eat food. Look how We make clear to them the signs. [*Sūrah al-Mā'idah: 75*]

This verse comes to refute the claim that Jesus is divine.⁴⁸¹ Islam sees it as a fatal error to take the immaculate conception of Christ as proof that he was somehow other than fully human. This led to the Christian doctrine of divinity in Christ – either as having a dual nature both human and divine or as being wholly divine. In this verse, Christ is compared in his biological nature to other human beings in the fact that he

⁴⁸¹ Ibn Kathīr (2/583). al-Rāzī, *Mafāṭīḥ al-Ghayb* (12/52).

was born and in the fact that both he and his mother ate food.⁴⁸² The idea of his divinity is also refuted in the Qur’ān by likening the creation of Jesus to that of Adam, as we have already seen.

It must be conceded that the example of Adam is more extreme than that of Jesus, since a directly-created Adam has no direct physical kinship to any other being whereas Jesus does have a direct biological kinship to his mother. Just as Jesus cannot be attributed to any man before him, a directly-created Adam and Eve cannot be attributed to any particular individuals – from *Homo sapiens* or otherwise – who might have lived before them or contemporaneously with them. This is a historical, genealogical position that Muslims who adopt it can only accept on faith. All the same, just as Jesus is fully part of the human family – and fully a man – Adam’s descendants can be seen just as fully members of the broader human family – and of the animal kingdom and of life itself – with whom they share an unquestionable genetic kinship.

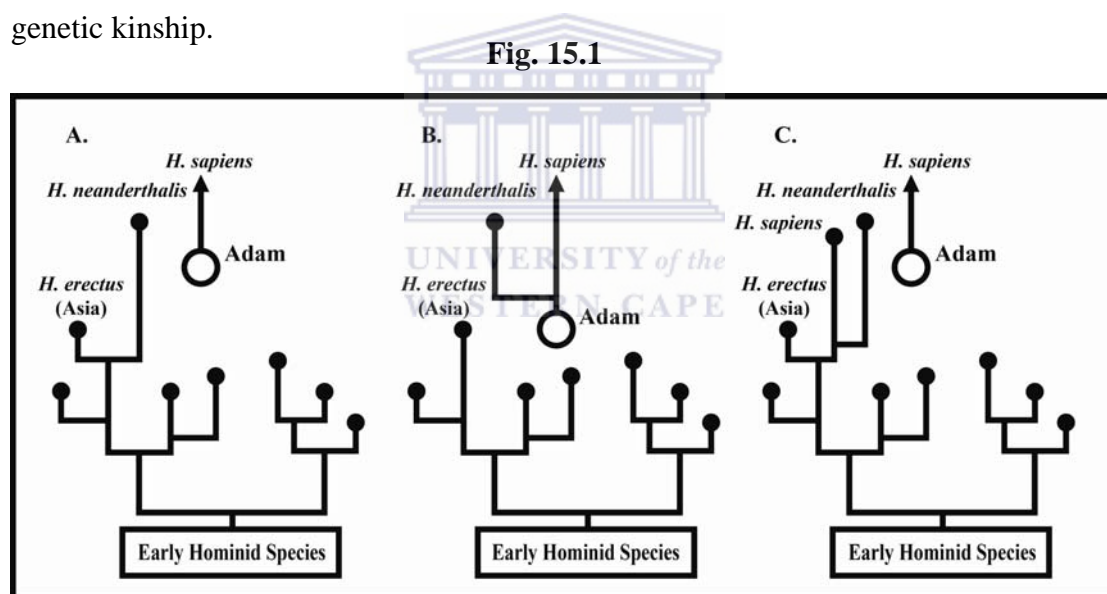


fig 15.1: Imaginary phylogenetic trees representing three of the many possible relationships between Adam, his descendants and *Homo neanderthalis* that are compatible with a literal reading of the account of Adam’s special creation and his status as father of all living humans as understood by Classical Islamic scholars from the apparent meaning of the Qur’ān and Sunnah.

A. Adam arrives in a world populated by at least one other member of the genus *Homo* – *Homo neanderthalis* – but no populations of beings that could be classified as *Homo sapiens*. All members of *Homo sapiens* are descendants of Adam.

B. Adam arrives in a world populated by earlier species of the genus *Homo*, but not by the modern species *Homo sapiens* and *Homo neanderthalis*. As his descendants spread throughout the Earth, they diversify into *Homo sapiens* and *Homo neanderthalis*, with all members of both species belonging to his descendants. *Homo neanderthalis* later becomes extinct and only *Homo sapiens* persists.

C. Adam arrives in a world populated by both *Homo neanderthalis* and *Homo sapiens*. However, all populations of these species become extinct and only Adam’s descendants remain.

The sacred texts do not indicate which, if any, of these situations would be historically correct. Therefore, the question is a matter of the unseen that must remain unresolved. It is not being suggested here that any of these scenarios are likely to have been adopted by Muslim scholars. What matters is that all of these scenarios are in consonance with a traditional reading of Adam’s special creation, and they demonstrate one possible way in which such a reading could without difficulty accommodate a broader acceptance of hominid evolution.

⁴⁸² al-Qurtubī, *al-Jāmi‘* (6/235).

CONCLUSION

A Muslim scientist, on the basis of faith, will accept that God created everything. As a believer, a Muslim accepts this as fact, knowing that everything in created existence is His design. A Muslim investigating the natural world will not lose sight of that, and will regard the pursuit of science to be an investigation of the natural patterns and relationships that exist within God's creation. This is also part of faith, stemming from the Muslim's confidence that the Creator has placed in Creation natural patterns and causal relationships – from the physical origins of the universe to the origin and diversity of life on Earth – and that is what the scientist sets out to discover.

Since God's universe is vast, and human knowledge can never hope to grasp it all, there will always be more questions left unanswered than answered. Since Muslims do not take miraculous events as their default assumption about what they observe in nature, Muslim scientists will not be expected say in the absence of scientific knowledge: "Well that is how God wanted it" or "That just goes to show you that there is an Intelligent Designer behind it". Such beliefs are but the starting point of the believing scientist's quest, not the results of scientific enquiry.

Science does not investigate miracles. For a Muslim scientist, this is not a denial that miracles happen, for Muslims acknowledge that they do. It is just that miracles are not the concern of science. Muslim scientists need not hide an inability to explain some natural phenomenon behind a veiled claim that some miracle must have taken place. They will not be expected to cite natural causes as an explanation whenever they know what those causes are and invoke God's name only when they do not know what those causes are. The awareness of God's creative role is ever-present. This awareness is neither diminished by human knowledge of natural causes nor enhanced by human ignorance of those causes.

From what preceded, no incompatibility is discerned between Islamic beliefs and teachings on the one hand and biological evolution on the other. Islam neither advocates evolution nor condemns it. The scriptures make no clear references to evolution or to any alternative processes that contradict it. Evolutionary biology, in turn, presents nothing that either confirms or contradicts Islamic beliefs or that presents Muslims with any thorny theological problems. Whether evolution is

scientifically true or false – and whether any theory about evolution turns out to be valid or invalid – has no implications for a Muslim’s beliefs one way or the other.

In Chapter Three, it is shown that the orthodox Muslim understanding of the scriptures requires the belief that Adam was directly created and furthermore, that he is the common forefather of all later generations of human beings. This leads us to predict that Muslims would have more difficulty accepting the idea of human evolution than accepting biological evolution in general. However, an examination of the theological dimensions of this question in Chapter Fifteen suggests that the doctrine of Adam’s special creation is not entirely irreconcilable with a broader acceptance of human – or at least hominid – evolution.

Since, in the Muslim mindset, belief in God does not rest on an absence of natural causes for phenomena in the natural world, why then have some Muslims turned so strongly to Creationism?

The answer, I think, lies in the way different Muslims have reacted to Western influences. The Muslim world has become increasingly exposed to Western standards and ways of thinking. As a consequence, Muslims have adopted, almost unquestioningly, many aspects of Western cultural and embraced many of their intellectual assumptions. It may seem ironic to assume Creationism is the result of Western influence. However, as we shall see, nearly all Muslim Creationists today have imported their arguments against evolution directly from those of Christian Creationism in the West, and particularly America.

If we were to look at Muslim criticism of evolution, it comes from two sources. The earliest opponents of evolution were from the ranks of traditional scholars who were simply reacting to socialist and atheist incursions into their cultural space. They linked the concept of biological evolution to socialism and atheism because that is how they first came into contact with it. The anti-religiousness of evolution seems to have been something taken for granted by these scholars, since little of their criticism of evolution is of a theological nature. Their focus was mainly on debunking the soundness of evolution as an idea. Their approach to refuting evolution, however, was not empirical, but rather highly polemical, and they took recourse mainly to the rational arguments and *a priori* reasoning typical of traditional scholastic theology.

Most of their arguments, understandably, show a poor conceptual understanding of evolutionary principles.

Typical of this approach are the arguments brought against evolution by al-Būṭī in *Kubrā al-Yaqīniyyāt al-Kawniyyah*, a book that is, for the most part, an excellent contemporary presentation of the Ash‘arī creed. For instance, he argues:⁴⁸³

The reality that we observe is in sharp contrast to what Darwin calls the law of natural selection and survival of the fittest. The world – in spite of the long stretch of time it has endured – is still teeming with the fittest, the fit, and the unfit from all kinds of animals, starting from the jellyfish to the apes to human beings.

If that law were correct, one of its simplest and clearest contingencies would have been that the advancement of animals would have at least progressed beyond its starting point, no matter how slow we assume the process of evolution and selection to take place. However, that starting point is still bustling with its various weak animals that still enjoy life and their unique ways of living just as their predecessors did.

We can see how al-Būṭī superimposes the idea of a great chain of being starting from the “lowest” organisms to the “highest” upon the quite contradictory idea of evolution. He assumes that jellyfish are somehow lower and more primitive than apes and humans. He fails to understand that the theory he is trying to criticize envisions all animals today as equally modern and whose evolutionary heritage is best depicted as a branching tree with no aim, progress, or direction. He sees evolution as being goal directed, with a clear starting point and destination. For some reason, he assumes jellyfish to be less fit than apes, though evolutionary theory would consider all living species to be well suited to their respective environments.

Elsewhere, he argues – again missing out on the idea that evolution is not something pre-planned or directional – that if the principle of natural selection is the impetus for the evolution of living things, and if evolution always tends toward what is fittest, then it follows that we should see more animals having greater and more advanced intellectual powers since this confers benefit. “Why”, he asks, “do the great apes not acquire intellectual powers to the same extent that human beings have?”⁴⁸⁴

⁴⁸³ al-Būṭī (260).

⁴⁸⁴ al-Būṭī (262).

In this argument, we can see that he takes it as an *a priori* assumption that human-like intelligence is always selectively beneficial for animals, though he does not explain why he feels this to be the case.

Traditional scholars who were reared on a diet of scholastic theology may also have found evolution harder to accept on account of the influence that Greek formal logic has had on their field of study. Though Aristotelian metaphysics was condemned by Ahl al-Sunnah theologians as heresy – al-Ghazālī writing what was for them the decisive refutation of it in his *Tahāfut al-Falāsafah* – many of them warmed to Greek logic and to their natural sciences. Indeed, it was al-Ghazālī who was most influential in introducing Greek logic to mainstream Islamic discourse. He considered it a useful science⁴⁸⁵ and wrote an important treatise on logic which he entitled *Mi yār al-‘Ilm* (The Standard of Knowledge). Formal logic becomes steadily more predominant in the writings of later scholastic theologians who were strongly influenced by Ghazālī, such as al-Rāzī, al-Ījī, and al-Taftazānī.

Greek logic brought with it the idea of essentialism, that all types can be placed into unchanging classes and that these types in turn each have an immutable, clearly definable essence. According to essentialism, the abstract essence is what is real. Differences among concrete individuals are accidental and irrelevant. Greek logic attempts to define these essential types with rigorous definitions constructed from the class to which the type belongs and its distinguishing character. Most classical Muslim scholars admitted that in practice, such essential definitions were nearly impossible to come by for natural subjects.⁴⁸⁶ They often could manage no better than to define a lion as a “predaceous animal” and a horse as a “braying animal”.

Though the direct influence that such logical investigations had on actual tenets of faith relating to matters of the unseen might arguably be limited, the typological thinking to which many traditional scholars were introduced must have had some influence on their worldview and – consciously or unconsciously – may have made evolutionary ideas less palatable to them. Evolution sees individuals as intrinsically unique, belonging to populations in which they contribute variability. A species is composed of a number of these populations, and these populations are not fixed but they evolve, the variation present among their member individuals in constant flux. It is easy to see

⁴⁸⁵ al-Ghazālī, *al-Mustasfā* (10).

⁴⁸⁶ al-Ghazālī, *al-Mustasfā* (14).

how the “population thinking” presented by evolution would be a serious paradigm shift for scholars reared upon the “typological thinking” of essentialism.

This is not to say that all scholars who have come from a traditional approach have been antagonistic to evolution. A number of them have, to a greater or lesser extent, conceded that Islamic beliefs and evolution are compatible.

Nuh Keller, though doubting the veracity of evolution, draws the conclusion that evolution is compatible with Islamic theology from traditional Ash‘arī teachings about rational possibility. He discusses the concept of rational possibility as it is elaborated in standard Ash‘arī texts like *Hāshiyah al-Dasūqī*:⁴⁸⁷

As for what is permissible with respect to God, it consists of his doing or refraining from anything that is possible – meaning anything that the dictates of reason concludes to be possible, *i.e.* its existence or non-existence of it being equal.

Basically, this means that anything which can rationally be conceived of as being possible is necessarily something that God is capable of bringing about. From this point of departure, Keller concludes:⁴⁸⁸

...God’s changing one thing into another (again, in other than the origin of man) has not been traditionally considered to be contrary to the teachings of Islam. Indeed, the daily miracle⁴⁸⁹ of nutrition, the sustenance God provides for his creatures, in which one creature is transformed into another by being eaten, may be seen in the food chains that make up the economy of our natural world, as well as our own plates.

If, as in the theory of evolution, we conjoin with this possibility the factors of causality, gradualism, mutation, and adaptation, it does not seem to me to add anything different to these forms of change. For Islamic tenets of faith do not deny causal relationships as such, but rather that causes have effects in and of themselves...

He does not extend this possibility to the evolution of human beings on account of what he sees to be direct and contrary textual evidence:⁴⁹⁰

⁴⁸⁷ *al-Dasūqī* (227-228).

⁴⁸⁸ Keller, “Islam and Evolution” (– online).

⁴⁸⁹ Keller’s use of the word “miracle” here is colloquial. It is not in accordance with the terminology of Islamic theological discourse. Nutrition conforms to the norms of nature. It does not contravene the natural order.

⁴⁹⁰ Keller, “Islam and Evolution” (– online).

As for the claim that man has evolved from a non-human species, this is unbelief (*kufr*) no matter if we ascribe the process to God or to “nature”, because it negates the truth of Adam’s special creation that God has revealed in the Qur’ān.

Nadīm al-Jisr – following his mentor Ḥasan al-Jisr, both of whom were scholars of a strictly traditional background – goes further by embracing evolutionary theory, even allowing for its possible application to humanity. He starts by saying:⁴⁹¹

What is important and necessary is the belief that God is the creator of the world and of all the species it contains. Beyond this belief, there is no difference between the principle of Creationism and that of Evolution from some original matter created by God from which he made all species, branching them off by way of evolutionary processes in conformity with natural laws that He placed in the universe.

He then goes on to point out the neutrality of the sacred texts on the matter:⁴⁹²

What is found in the Law of Muhammad from the *mutawātir* and *mashhūr* texts regarding the creation of things and the variation of species, all of these texts that do not clarify the precise details of creation or the manner in which it took place.

He then addresses the texts about the special creation of Adam and says:⁴⁹³

These texts are not unequivocal in indicating that God created the first human being from dirt in a single instant or alternatively by a way of a gradual formation of its own, so our approach is to withhold judgment on either of these two possibilities... However, the apparent meaning of the texts indicate a unique creation, and it is not permissible to interpret these texts and take them off of their apparent meanings unless absolutely certain (*qaṭ’ī*) rational evidence establishes evolution. When such certain rational evidence establishes the existence of the human being by way of evolution, it is possible to reinterpret these texts and reconcile them with the certain evidence. This does not contradict with the beliefs of the Muslims in any way, as long as the underlying principle with them remains that God is the Creator of the human being in any event.

The other source for Muslim Creationism comes from contemporary Muslim thinkers who are active in investigating possible scientific miracles of the Qur’ān and Sunnah. Among their number are those who seek to draw out scientific discussions from the Qur’ān, even when such discussions are not all that apparent. This tendency to read

⁴⁹¹ al-Jisr (208).

⁴⁹² al-Jisr (211).

⁴⁹³ al-Jisr (215).

into the Qur'ān what is not explicitly stated is possibly what has brought some of these people to come at odds with evolution.

Most of them focus their efforts less on theology and more on attacking the scientific credibility of evolution. In doing so, they tend to borrow their arguments from the ICR and other American Creationist organizations. This is evident in the many inaccurate statements about evolution found in their writings that have clearly been lifted from Creationist sources. For instance, they borrow the idea that there are no transitional forms in the fossil record,⁴⁹⁴ that all mutations are harmful,⁴⁹⁵ and that evolution somehow violates the Second law of Thermodynamics.⁴⁹⁶ This group, like the former, also seems chiefly motivated by the idea that evolution equates to atheism and a rejection of God's creative role in the universe.⁴⁹⁷

Again, as is the case with the classically trained scholars, not all Muslim thinkers in the “scientific miracles movement” deny the possibility that evolution is compatible with Islamic beliefs. Al-Zindānī, one of the leading figures in these investigations, is critical of evolution, and brings forth much of the same objections as others do. However, when it comes to discussing evolution from the angle of Islamic beliefs, he allows for two opinions, one being that of Ḥasan al-Jisr that we discussed above, and the other being that evolution can be accepted for all living things apart from the human being.⁴⁹⁸

We can see that, though resistance to evolution is to be found among Muslim scholars and intellectuals of both classical and modern orientations, this resistance is primarily due to an assumed association of evolution with “Godlessness” and to a poor understanding of evolutionary principles, and is not so much due to strictly theological or scriptural considerations.

⁴⁹⁴ Yahya (27). Compare with Perloff (9) and Morris (78-79).

⁴⁹⁵ Yahya (26). Compare with Perloff (25) and Morris (55-57).

⁴⁹⁶ Yahya (114). Compare with Morris (38-46).

⁴⁹⁷ Yahya (2).

⁴⁹⁸ al-Zindānī (93-94).

APPENDIX: SHORT BIOGRAPHIES OF CLASSICAL SCHOLARS CITED IN THE WORK

The biographical information appearing in this appendix is taken primarily from al-Dhahabī's Siyar A'lām al-Nubalā', Ibn Kathīr's al-Bidāyah wa al-Niyhāyah, al-Subkī's Ṭabaqāt al-Shāfi'iyyah, and the editorial notes for the critical editions of the various classical works cited.

I use the phrase "legal theory" to translate the Arabic term uṣūl al-fiqh, which is often translated as "jurisprudence". Uṣūl al-fiqh is the Islamic science that deals extensively with investigating methods of deriving meaning from textual evidence, as well as with methods of deducing legal rulings.

Abū Ḥanīfah, Nu'mān b. Thābit (d. 148 AH/765 CE)

Pre-eminent jurist and early theologian, founder of the Ḥanafī school of law. Scholars of the Māturīdī theological school claim to represent Abū Ḥanīfah's theological views.

Abū Ḥayyān al-Andalusī, Muḥammad b. Yūsuf. (d. 745 AH/1344 CE)

Grammarians. He was Ash'arī in his theological views. His commentary on the Qur'ān, al-Baḥr al-Muḥīṭ, is regarded as being excellent in its discussion of questions relating to language.

Abū Ya'lā al-Farrā', Muḥammad b. al-Ḥusayn "al-Qāḍī". (d. 458 AH/1066 CE)

Ḥanbalī jurist and legal theorist. The work cited, al-'Uddah fī Uṣūl al-Fiqh, is referred to as a source for questions of legal theory.

Aḥmad Ibn Ḥanbal. (d. 241 AH/ 845 CE)

Pre-eminent jurist and ḥadīth scholar, founder of the Ḥanbalī school of law and author of the ḥadīth compilation known as Musnad Aḥmad. He had strong, orthodox views in matters of creed, but disapproved of scholastic theology. Salafī scholars claim to represent his approach in matters of creed.

al-Alūsī, Abū al-Thanā' Maḥmūd b. 'Abd Allah. (1270 AH/1854 CE)

Later Iraqi exegete and literary scholar from a traditional Sunni background. His commentary on the Qur'ān, Rūḥ al-Ma'ānī, is extremely detailed and encyclopedic in

nature, often giving and exhaustive survey and critical analysis of the opinions of earlier exegetical scholars.

al-Āmidī, Abū al-Ḥasan ʿAlī b. Abī ʿAlī. (d. 631 AH/1233 CE)

Ashʿarī theologian and Shāfiʿī legal theorist. The work *al-Iḥkām fī Uṣūl al-Aḥkām* is an important sourcework in Shāfiʿī legal theory.

al-Ashʿarī, Abū al-Ḥasan (d. 322 AH/ 936 CE).

Theologian, founder of the Ashʿari school of theology. This theological school has generally been embraced by scholars of the Shāfiʿī and Mālikī legal schools and is regarded as a traditionalist reaction to the rationalism of the earlier Muʿtazilī theological school.

al-Baghawī, al-Ḥusayn b. Masʿūd. (d. 516 AH/1122 CE)

Shāfiʿī jurist and ḥadīth scholar. The work cited, *Maʿālim al-Tanzīl*, is a commentary on the Qurʾān.

al-Bāqillānī, Abū Bakr Muḥammad b. al-Ṭayyib. (d. 403 AH/1013 CE)

Ashʿarī theologian and Mālikī legal theorist. The work *Tamhīd al-Awāʿil fī Talkhīṣ al-Dalāʿil* is an extremely important Ashʿarī theological work.

al-Bayḍāwī, ʿAbd Allah b. ʿUmar. (d. 685 or 691 AH/1286 or 1292 CE)

Shāfiʿī legal theorist, Ashʿarī theologian, and grammarian. The work *Anwār al-Tanzīl wa Asrār al-Taʾwīl* is a popular commentary of the Qurʾān. This commentary abridges and draws heavily on the Ashʿarī commentary *Mafātīḥ al-Ghayb* by al-Rāzī (d. 606 AH/1209 CE), as well as on *al-Kashshāf*, by the Muʿtazilī scholar al-Zamakhsharī (d. 538AH/1144 CE), though he takes from the latter what conforms with Ashʿarī views.

al-Bayhaqī, Abū Bakr Aḥmad b. al-Ḥusayn. (d. 458 AH /1066 CE)

Important early Ashʿarī theologian and ḥadīth scholar. The work *al-Asmāʾ wa al-Ṣifāt* focuses on the interpretation of verses of the Qurʾān and ḥadīth texts which have relevance to the Divine Epithets.

al-Bayjūrī, Ibrāhīm b. Muḥammad. (d. 1277 AH/ 1861 CE)

Later Ash‘arī theologian. His *Tuḥfah al-Murīd fī Sharḥ Jawharah al-Tawḥīd* became a standard introductory textbook on Ash‘arī creed.

al-Bukhārī, ‘Abd al-‘Azīz b. Aḥmad “‘Alā’ al-Dīn”. (d. 730 AH/ 1330 CE)

Ḥanafī jurist and legal theorist. The work *Kashf al-Asrār* is a legal theory text.

al-Dābūsī, Abū Zayd ‘Abd Allah b. ‘Umar. (d. 512 AH/1118 CE)

Ḥanafī jurist, legal theorist, and scholar of ethics. The work *Taqwīm al-Adillah* is a legal theory text.

al-Dasūqī, Muḥammad b. Yūsuf. (d. 1230 AH/1815 CE)

Later Ash‘arī theologian and Mālikī jurist. His *Ḥāshiyah al-Dasūqī ‘alā Umm al-Barāhīn wa Sharḥihā* became a standard introductory textbook on Ash‘arī creed.

al-Dhahabī, Muḥammad b. Aḥmad. (d. 748 AH/1348 CE)

Ḥadīth scholar and historian. He followed the Shāfi‘ī legal school and was sympathetic to the theological teachings of Ibn Taymiyah who had been one of his teachers. The work *Siyar A‘lām al-Nubalā’* is an encyclopedic bibliographic reference on Muslim scholars and notables up to the author’s time.

al-Fayrūzabādī, Abū al-Ṭāhir b. Ibrāhīm. (d. 817 AH/1414 CE)

Arabic lexicographer. The work *al-Qāmūs al-Muḥīṭ* is an important Arabic dictionary.

al-Ghazālī, Abū Ḥāmid Muḥammad b. Muḥammad. (d. 505 AH/1111 CE)

Ash‘arī theologian, Shāfi‘ī jurist, legal theorist, and scholar of ethics. Al-Ghazālī was a leading Muslim polymath, acquainted with most of the major academic disciplines of his time. The work entitled *Al-Iqtisād fī al-‘Itiqād* is his primary work in theology, followed by pertinent sections of the encyclopedic *Iḥyā’ ‘Ulūm al-Dīn*. The works *al-Mankhūl* and *al-Mustasfā fī ‘Ilm al-Uṣūl* are both important works in Shāfi‘ī legal theory. The work *al-Wasīṭ fī al-Madhhab* deals with law and is referenced in this study for Shāfi‘ī legal opinions. Finally, *Tahāfut al-Falāsafah* is a refutation of the metaphysics of the Peripatetic philosophers.

al-Ḥākīm al-Naysābūrī, Muḥammad b. ‘Abd Allah. (d. 405 AH/1014 CE)

Ḥadīth scholar. The work entitled *al-Mustadrak ‘alā al-Ṣaḥīḥayn* is an attempt to catalogue ḥadīth that al-Ḥākīm regarded as being authentic according to the conditions set by al-Bukhārī and Muslim. However, many of the ḥadīth contained in the book are not regarded as authentic. The work entitled *Ma‘rifah ‘Ulūm al-Ḥadīth* deals with the methodology of ḥadīth criticism.

al-‘Irāqī, ‘Abd al-Raḥīm b. al-Ḥusayn. (d. 806 AH/1404 CE)

Ḥadīth scholar and Shāfi‘ī legal theorist. The works *al-Taqyīd wa al-Īdāḥ* and *Sharḥ al-Tabṣīrah wa al-Tadhkirah* deal with the methodology of ḥadīth criticism.

al-Juwaynī, ‘Abd al-Malik “Imām al-Ḥaramayn”. (d. 478 AH/1085 CE)

Ash‘arī theologian and Shāfi‘ī legal theorist. He was the primary theology teacher of al-Ghazālī. His books *Kitāb al-Irshād* and *al-‘Aqidah al-Niẓāmiyyah* are both important theological works. *Al-Burhān fī Uṣūl al-Fiqh* is a work in legal theory.

al-Kalbī, Muḥammad b. Aḥmad. b. Juzayy (d. 741 AH/1340 CE)

Mālikī jurist, legal theorist, and exegete. The work *Taqrīb al-Wuṣūl ilā ‘Ilm al-Uṣūl* is a work in Mālikī legal theory.

al-Khaṭīb al-Baghdādī, Aḥmad b. ‘Alī. (d. 463 AH/1071 CE)

Shāfi‘ī jurist, legal theorist, ḥadīth scholar, and historian. The work *al-Faqīh wa al-Mutafaqqih* discusses Shāfi‘ī legal theory and educational ethics.

Al-Māturīdī, Abū Manṣūr. (d. 333 AH/944 CE)

Theologian and Ḥanafī legal theorist, founder of the Māturīdī school of theology. Al-Māturīdī is credited with systematically codifying a school of scholastic theology representative of the theological beliefs of Abū Ḥanīfah. Scholars of the Ḥanafī legal school, especially in Central Asia and India, have generally embraced this theological school.

al-Nasafī, ‘Abd Allah b. Aḥmad. (d. 710 or 711 AH/1311 or 1312 CE)

Māturīdī theologian, Ḥanafī jurist, and exegete. The work cited is his commentary on the Qur’ān entitled *Madārik al-Tanzīl wa Ḥaqā’iq al-Ta’wīl*. This work is chiefly a re-write of an earlier commentary *al-Kashshāf* by the Mu‘tazilī scholar al-

Zamakhsharī (d. 538AH/1144 CE). Al-Nasafī abridged this work and adapted it to conform with Māturīdī ideas.

al-Nawawī, Yaḥya b. Sharaf. (d. 676 AH/1278 CE)

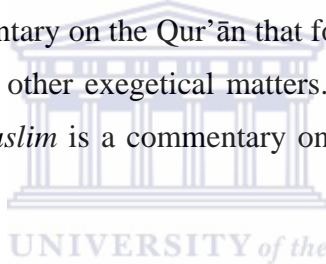
Shāfi'ī jurist and ḥadīth scholar. He was Ash'arī in his theological views. The work *al-Minhāj fī Sharḥ Ṣaḥīḥ Muslim b. al-Ḥajjāj* is an extremely important commentary on *Ṣaḥīḥ Muslim*.

al-Qāḍī 'Iyāḍ b. Mūsā al-Yaḥṣabī. (d. 544 AH/1149 CE)

Mālikī jurist and ḥadīth scholar. He was Ash'arī in his theological views. His work *Ikmāl al-Mu'lim bi-Fawā'id Muslim* is an important commentary on *Ṣaḥīḥ Muslim*.

al-Qurṭubī, Aḥmad b. 'Umar. (d. 671 AH/1273 CE)

Mālikī jurist. He was Ash'arī in his theological views. The work entitled *al-Jāmi' li-Aḥkām al-Qur'ān* is a commentary on the Qur'ān that focuses heavily on legal matters but also extensively explores other exegetical matters. The work entitled *al-Mufhim limā Ashkala min Talkhīṣ Muslim* is a commentary on an abridged version of *Ṣaḥīḥ Muslim*.



al-Rāfi'ī, Abū al-Qāsim 'Abd al-Karīm b. Muḥammad. (d. 623 AH/1226 CE)

Shāfi'ī jurist. The work *al-'Azīz Sharḥ al-Wajīz* is a commentary on *al-Wajīz*, a treatise on Shāfi'ī law written by al-Ghazālī (d. 505 AH/1111 CE). The work is cited in this study as a reference for Shāfi'ī legal rulings.

al-Rāzī, Muḥammad b. 'Umar "Fakhr al-Dīn". (d. 606 AH/1209 CE)

Ash'arī theologian and Shāfi'ī legal theorist. His *al-Maḥṣūl fī 'Ilm al-Uṣūl* is a work in legal theory. His *Mafātīḥ al-Ghayb* is a commentary of the Qur'ān that explores many theological issues.

al-Sakhāwī, Muḥammad b. 'Abd al-Raḥmān. (d. 902 AH/1497 CE)

Ḥadīth scholar. The work *Fatḥ al-Mughīth* deals with the methodology of ḥadīth criticism.

al-Sam‘ānī, Maṣūb b. Muḥammad. (d. 489 AH/1096 CE)

Shāfi‘ī legal theorist and expert in comparative law. The work *Qawāfi‘ al-Adillah* pertains to legal theory.

al-Sarakhsī, Abū Bakr Muḥammad b. Aḥmad. (490 AH/1097 CE)

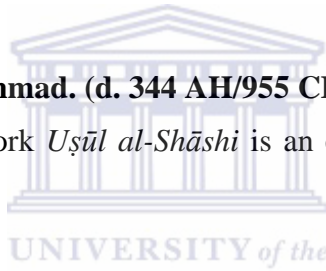
Hānaḥī jurist and legal theorist. The work cited, *Uṣūl al-Sarakhsī*, is an important work in Ḥanaḥī legal theory.

al-Shāfi‘ī, Muḥammad b. Idrīs. (d. 204 AH/820 CE)

Pre-eminent jurist, legal theorist, and ḥadīth scholar, founder of the Shāfi‘ī school of law. He was not involved in theology, though he is unanimously regarded by scholars of all three theological schools as having held correct and orthodox views in matters of creed. His work entitled *al-Risālah* is generally recognised as being the first work ever written in Islamic legal theory.

al-Shāshī, Aḥmad b. Muḥammad. (d. 344 AH/955 CE)

Ḥanaḥī legal theorist. The work *Uṣūl al-Shāshi* is an essential work in Ḥanaḥī legal theory.



al-Shawkānī, Muḥammad b. ‘Alī. (d. 1250 AH/1834 CE)

Later Zaydī jurist, legal theorist, and exegete. He was strongly influenced by the teachings of Ibn Taymiyah and is regarded by many to be a Salafī in his theology. In his legal opinions, he was independent and primarily Sunni, but he still drew heavily upon Zaydī Shī‘ite sources and texts along with those of the Sunni legal scholars. The work *Fath al-Qadīr* is a commentary on the Qur’ān highly regarded for the way it brings together and summarizes earlier opinions.

al-Suyūṭī, Jalāl al-Dīn. (d. 911 AH/1505 CE)

Shāfi‘ī jurist and ḥadīth scholar. The work *al-Durr al-Manthūr* is an extremely comprehensive collection of narrations from the Prophet, the Companions, and the Successors that pertain to the exegesis of the Qur’ān. *Tadrīb al-Rāwī* deals with the methodology of ḥadīth criticism.

al-Ṭabarī, Muḥammad b. Jarīr. (d. 310 AH/923 CE)

Theologian, historian, and independent jurist affiliated with the Shāfi'ī legal school. He was an independent Sunni theologian contemporaneous with al-Ṭaḥāwī (321 AH/933 CE), al-Ash'arī (d. 322 AH/936 CE), and al-Mātūrīdī (d. 333 AH/944 CE), all of whom codified their theological works around the same time. His theological work is entitled *al-Tabṣīr fī Ma'ālim al-Dīn*. The work cited in this study, *Jāmi' al-Bayān fī Ta'wīl Āy al-Qur'ān*, is an essential early sourcework for the commentary of the Qur'ān, gathering together most of the exegetical narrations of the Prophet, the Companions, and the Successors that later exegetes relied upon, along with al-Ṭabarī's own interpretations and preferences.

Al-Ṭaḥāwī, Abū Ja'far Aḥmad b. Muḥammad. (d. 321 AH/933 CE)

Theologian, ḥadīth scholar, and Ḥanafī jurist. He was an independent Sunni theologian contemporaneous with al-Ṭabarī (d. 310 AH/923 CE), al-Ash'arī (d. 322 AH/936 CE), and al-Mātūrīdī (d. 333 AH/944 CE), all of whom codified their theological works around the same time. His brief treatise in theology, known as *al-'Aqīdah al-Ṭaḥāwiyyah* enjoys the unique status of being generally embraced by all three Sunni theological schools.

al-Zamakhsharī, Maḥmūd b. 'Umar. (d. 538AH/1144 CE)

Grammarians and literary scholar. He was Mu'tazalī in his theology, so his theological views fall outside the scope of this study. His commentary on the Qur'ān entitled *al-Kashshāf 'an Ḥaqā'iq al-Tanzīl wa 'Uyūn al-Aqāwīl fī Wujūh al-Ta'wīl* is especially valued for its discussion of the rhetorical devices employed in the Qur'ān. The Mātūrīdī scholar al-Nasafī (d. 710 or 711 AH/1311 or 1312 CE) adapted and abridged this commentary.

Ibn 'Abbās, Abd Allah. (d. 68 AH/687 or 688 CE)

Companion of the Prophet. He is regarded in Sunni sources as being the most knowledgeable Companion with respect to the interpretation of the Qur'ān.

Ibn Abī al-'Izz, 'Alī b. 'Alī. (d. 792 AH/ 1390 CE)

Salafī theologian and Ḥanafī jurist. His *Sharḥ al-'Aqīdah al-Ṭaḥāwiyyah* is an important commentary of al-Ṭaḥāwī's creed which interprets the creed according to a Salafī understanding.

Ibn al-‘Arabī, Abū Bakr. (d. 543 AH/1148 CE)

Mālikī jurist and Ash‘arī theologian. The work *Ahkām al-Qur‘ān* is a commentary on the Qur‘ān that focuses primarily on deriving legal rulings from its verses. He should not be confused with the sufi saint Muḥī al-Dīn Ibn ‘Arabī (d. 638 AH/1240 AD).

Ibn al-Jawzī, Abū al-Faraj. (d. 597 AH/1201 CE)

Ḥanbalī jurist, legal theorist, ḥadīth scholar, and theologian. His theological ideas departed from the Ḥanbalī norm, especially regarding the interpretation of the Divine Epithets, where his thought most closely paralleled Ash‘arī ideas. The work cited, *Zād al-Maṣīr fī ‘Ilm al-Tafsīr* is a major commentary of the Qur‘ān.

Ibn al-Ṣalāh, ‘Uthmān b. ‘Abd al-Raḥmān. (d. 643 AH/1245 CE)

Ḥadīth scholar. The work *Muqaddimah fī ‘Ulūm al-Ḥadīth* pertains to the methodology of ḥadīth criticism.

Ibn ‘Aṭīyyah al-Andalusī, ‘Abd al-Ḥaqq. (d. 541 AH/1147 CE)

Exegete and Mālikī jurist. The work *al-Muḥarrar al-Wajīz fī Tafsīr al-Kitāb al-‘Azīz* is his commentary on the Qur‘ān. He was from Andalusia, and his commentary was very influential on the works of other Andalusian exegetes like al-Qurṭubī (d. 671 AH/1273 CE) and Abū Ḥayyān (d. 745 AH/1344 CE).

Ibn Ḥajar al-‘Asqalānī, Aḥmad b. ‘Alī. (d. 852 AH/1448 CE)

Ḥadīth scholar. He followed the Shāfi‘ī school of law. Though he was not a theologian, his views generally concurred with the mainstream Ash‘arī views of his day. *Fath al-Bārī* is probably the most highly regarded commentary written on *Ṣaḥīḥ al-Bukhārī*. His *al-Iṣābah fī Tamyīz al-Ṣaḥābah* is a biographical encyclopedia of the Prophet’s Companions. The works *al-Nukat ‘alā Kitāb Ibn al-Ṣalāh* and *Nuzḥah al-Nazar fī Tawdīḥ Nukhbah al-Fikar* pertain to the methodology of ḥadīth criticism.

Ibn Ḥazm al-Andalusī, ‘Alī b. Aḥmad b. Sa‘īd. (d. 456 AH/1064 CE)

Zāhirī legal theorist, jurist, and theologian. His theological views, while still within the general scope of Ahl al-Sunnah, are unique and somewhat controversial in the view of other orthodox scholars, making his theological views outside the scope of the present study. The work cited, *al-Iḥkām fī Uṣūl al-Aḥkām*, is a text in legal theory,

referenced for matters relating to the authority of the ḥadīth and matters pertaining to the methodology of textual analysis.

Ibn Hishām, ‘Abd al-Malik. (d. 218 AH/833 CE)

Biographer. The work cited, *al-Sīrah al-Nabawiyyah*, is an important biographical work about the life of Prophet Muhammad, drawn chiefly from the earlier work of Ibn Ishāq (d. 150-153 AH/767-770 CE), which is now lost.

Ibn Hishām al-Anṣārī, ‘Abd Allah b. Yūsuf. (d. 761 AH/1360 CE)

Grammatician. The work cited, *Mughnī al-Labīb ‘an Kutub al-A‘arīb* is referenced for grammatical purposes.

Ibn Jarīr al-Ṭabarī.

See above: al-Ṭabarī, Muḥammad b. Jarīr. (d. 310 AH/923 CE)

Ibn Kathīr, Ismā‘īl b. ‘Umar. (d. 774/1373 CE)

Leading historian and exegete. He followed the Shāfi‘ī legal school and was sympathetic to the theological teachings of Ibn Taymiyah who had been one of his teachers. His commentary on the Qur’ān, generally known as *Tafsīr Ibn Kathīr*, is very highly regarded. His opinions are also cited from his work entitled *Ikhtishār ‘Ulūm al-Ḥadīth*, which pertains to the methodology of ḥadīth criticism.

Ibn Mas‘ūd, ‘Abd Allah. (d. 32 AH/652 or 653 CE).

Companion of the Prophet. He is highly regarded for his knowledge of the Qur’ān.

Ibn Qāsim al-‘Abbādī, Aḥmad. (d. 994 AH/1585 CE)

Shāfi‘ī jurist and legal theorist. The work cited in the study, *Al-Āyāt al-Bayyināt*, is a legal theory text.

Ibn Qayyim al-Jawziyyah, Muḥammad b Abī Bakr. (d. 751 AH/1350 CE)

Ḥanbalī theologian and legal theorist. He was Ibn Taymiyah’s primary and most articulate student, second only to Ibn Taymiyah in propounding his theological views. His work entitled *Shifā’ al-‘Alīl* treats the topic of Divine Decree in depth. *Ma‘ārij al-Sālikīn* focuses primarily on spiritual and ethical matters.

Ibn Qudāmah al-Maqdisī, ‘Abd Allah b. Aḥmad b. Muḥammad “Muwaffaq al-Dīn”. (d. 620 AH/1223 CE)

Ḥanbalī jurist and legal theorist. The work *Rawḍah al-Nāzir wa Jannah al-Munāzir* is a work in Ḥanbalī legal theory modelled after *al-Mustasfā* by the Shāfi‘ī scholar al-Ghazālī.

Ibn Qudāmah al-Maqdisī, Abū al-Faraj ‘Abd al-Raḥmān b. Muḥammad “Shams al-Dīn”. (d. 682 AH /1283 CE)

Ḥanbalī jurist. The work *al-Sharḥ al-Kabīr* is a major work of Ḥanbalī law.

Ibn Rushd al-Ḥafīd, Muḥammad b. Aḥmad. (d. 595 AH/1198 CE)

Mālikī jurist and peripatetic philosopher. He is known in the West as Averroes. As a peripatetic philosopher, his theological views are at variance with those of orthodox Islam and therefore fall outside the scope of this study. His work entitled *Bidāyah al-Mujtahid* is widely regarded as an excellent work in comparative law from a Mālikī perspective, and is referred to in the study as a source for Mālikī legal opinions.

Ibn Taymiyah, Aḥmad. (d. 728 AH/1326 CE)

Ḥanbalī theologian and polymath. He is regarded as the single most important proponent of the theological views referred to in this study as Salafī. The work entitled *Majmū‘ al-Fatāwā* is an encyclopaedic collection of writings in a wide variety of religious disciplines, including many theological treatises, among which is *al-‘Aqīdah al-Tadmuriyyah*.

Mālik b. Anas. (d. 179 AH/795 CE).

Pre-eminent jurist and ḥadīth scholar, founder of the Mālikī school of law and author of the ḥadīth compilation known as al-Muwatta’. He was not involved in theology, though he is unanimously regarded by scholars of all three theological schools as having held correct and orthodox views in matters of creed.

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