Al Quds
Jurnal Studi Alquran dan Hadis

Volume 6, Nomor 2, 2022
ISSN 2580-3174 (p), 2580-3190 (e)
http://journal.iaincurup.ac.id/index.php/alquds

The Inheritance of Human Traits in the Qur'an
Based on the Scientific Interpretation of Zaghlūl Rāghib Muḥammad an-Najjār

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DOI: 10.29240/alquds.v6i2.4199
Submitted: 2022-03-01 | Revised: 2022-08-13 | Accepted: 2022-09-03

Abstract. This article aims to analyze the inheritance of human traits in the Qur'an, specifically at Surah An-Nisa verse 1, based on the scientific interpretation of Zaghlūl an-Najjār. This study discusses Zaghlūl an-Najjār because he is a geologist and Muslim scholar who has written many books related to science in the Qur'an. The type of this study was qualitative research with a descriptive method. Primary data were obtained through library research related to the works of an-Najjār and interpretations of the Qur'an and hadith, while articles and books were used as secondary data. The employed research approaches were the character approach to study the history, ideas, and socio-historical conditions of Zaghlūl an-Najjār, the exegesis approach to study the content of the Qur'an, and the scientific approach to understand and reveal the meaning of the verses of the Qur'an. This study concludes that the inheritance of human traits in the Q.S. An-Nisa' verse 1 according to Zaghlūl an-Najjār is in the words "*al-nafs al-wāḥidah*" (one soul), which means all humans come from the first created creatures, namely Adam. Likewise, the creation of Eve is explained in the words "*wa khalaqa minhā zaujahā*" (and We created his wife from himself).

Keywords: Inheritance of Human Traits; Zaghlūl an-Najjār; Adam and Eve.

Introduction

Humans are principally social creatures,[1] meaning that they depend on each other. In other words, they cannot live without the help of other humans.

[1] Henk ten Have and Maria do Céu Patrão Neves, "Social Ethics," *Dictionary of Global Bioethics*, 2021, 951–951, https://doi.org/10.1007/978-3-030-54161-3_469.; Jialin Li, "Humans as

In addition, humans need to interact which is not only with one individual but also require other individuals to respond. Thus, they create social interaction.[2] These traits essentially invite humans to socialize. According to research, individuals with more social support tend to live longer, have stronger immune systems, and experience increased well-being and decreased feelings of depression compared to individuals who are more socially isolated.[3] Apart from being social beings, humans are born as individual beings. Humans are considered to be individual beings because they have elements known as physique-spirituality,[4] physique-psychology, and body-soul, all of which differentiate one individual from another.

As individual beings, humans have respective characteristics that make them different from other humans. These characteristics are influenced by phenotypic and genotypic factors. The phenotype is the environmental factor concerning the condition where the human lives. This phenotypic factor is divided into two: the physical environment (the surrounding nature) and the social environment (where the individual interacts socially). Meanwhile, the genotype is a factor that an individual carries from birth. This factor is also known as a gene factor. Characteristics that are influenced by genes are traits that are inherited from parents, such as skin color, physical shape, and gender.

Gene comes from the Dutch "*gen*" which means the unit of inheritance for organisms. In terminology, a gene is a unit cell that controls the genetic characteristics of an individual and plays an important role in the inheritance of traits. Genes consist of an acidic fluid known as deoxyribonucleic acid (DNA). There are thousands of genes in the body of each individual. These genes form spiral threads known as chromosomes. When fertilization occurs (the meeting of sperm cells and egg cells in the womb), the genes of both parents also meet to create a new individual who has a combination of the characteristics of both

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Social Beings-From 'People First' to 'People-Centered,'" *Scientific and Social Research* 2, no. 2 (September 23, 2020): 43–46, https://doi.org/10.36922/ssr.v2i2.957.

[2] Habib Shahhosseini and Aysan Taghizadeh Mosen, "Identifying Effective Elements of Women's Social Interactions in Cultural Centres," *Indoor and Built Environment* 31, no. 1 (January 13, 2022): 279–87, https://doi.org/10.1177/1420326X211010277.; Mitja D. Back, "Social Interaction Processes and Personality," in *The Handbook of Personality Dynamics and Processes* (Elsevier, 2021), 183–226, https://doi.org/10.1016/B978-0-12-813995-0.00008-X.

[3] Maria Cohut, "What Are the Health Benefits of Being Social?," Medical News Today, February 23, 2018, https://www.medicalnewstoday.com/articles/321019.php.; Angela K. Troyer, "The Health Benefits of Socializing," Psychology Today, June 30, 2016, https://www.psychologytoday.com/us/blog/living-mild-cognitive-impairment/201606/the-health-benefits-socializing.

[4] Mukhammad Zamzami et al., "Physical and Spiritual Dimensions of Happiness in the Thought of Al-Fārābī and Ibn Sīnā," *Teosofia: Indonesian Journal of Islamic Mysticism* 10, no. 2 (December 27, 2021): 229–48, https://doi.org/10.21580/TOS.V10I2.8629.

parents. In short, it can be said that when reproduction occurs, the process of inheritance of traits also takes place.

The inheritance of traits is discussed in a branch of biology called genetics. Genetics comes from the Latin "*genos*" which means ethnicity or origin. In terminology, genetics means the study of hereditary traits that are passed on to offspring and the variations that may arise in them. In addition to inheritance, genetics also deals with evolution, embryology, ecology, molecular biology, and forensic science.

Genetics emerged in the 19th century AD when Gregor Johann Mendel studied peas. He found that certain traits of peas were passed down according to a certain pattern. His study established Mendel's Law which becomes the forerunner of the science of genetics. In the 20th century, several renowned geneticists emerged including William Bateson (d. 1926) and Francis Crick (d. 2004). At the beginning of the emergence of genetics, scientists only focused on plants. It was only in the mid-20th century AD that scientists began researching human genetics and the inheritance of traits in humans.

This study was conducted to answer the question of the inheritance of human traits in Q.S. An-Nisa' verse 1. The meaning of the verse is popularly used as a reference to the origin of human creation.[5] However, the rationalization of human creation, especially the inheritance of human traits in the verse and its relevance to contemporary scientific discoveries, is still debatable. This article aims to analyze Zaghlūl an-Najjār's scientific interpretation of human traits in Q.S. An-Nisa' verse 1. In this study, the researcher applied qualitative research with a descriptive analysis method. The employed research approaches were the character approach to study history, ideas, and socio-historical conditions of Zaghlūl an-Najjār, the exegesis approach to study the content of the Qur'an through the translation and research on the Qur'an by the Qur'an commentators, and the scientific approach to understand and reveal the meaning of the verses of the Qur'an in scientific terms. Primary data were obtained through library research related to the works of an-Najjār. In addition, this study was also supported by journal articles and relevant Islamic and scientific books as secondary data. Research data related to the interpretation of the Qur'an cited from various sources were described using scientific reasoning with inductive logic as an analytical tool.

[5] Muhammad Quraish Shihab, *Wawasan Al-Qur'ān* (Bandung: Mizan, 1998), 229.

Discussion

Zaghlūl an-Najjār: Biography, Works, and Thoughts

Zaghlūl an-Najjār (full name: Zaghlūl Rāghib Muhammad an-Najjār) is a Muslim geologist and scholar, who was born on November 17, 1933, in Masyal, al-Gharbiyah, Egypt.[6] His father, Rāghib an-Najjār, worked as a teacher, while his grandfather, Sheikh Muhammad an-Najjār, was an imam in Basyoun City, al-Gharbiyah, Egypt. His father and grandfather are scholars who graduated from al-Azhār University and are fond of science and books, especially related to Islam and literature.[7] Their house has a large library and a meeting place for scholars from inside and outside Egypt.

In the mid-1940s, the Zaghlūl an-Najjār family moved to Cairo when the Kingdom of Egypt was under British colonial control and authority whose soldiers often abused women and indigenous people. This fostered an anti-colonial spirit in an-Najjār. Through Sheikh Mohammad Amin al-Hussayni (d. 1974), an Arab-Palestinian cleric and nationalist from a member of the Jerusalem al-Husayni clan who had attended the Sahur Council of the an-Najjār family, an-Najjār learned a lot about nationalism, Western colonialism, and the issue of the Jewish nation in Palestine. Other figures who have colored his thoughts are Hasan al-Banna and Sayyid Qutb. He dubbed the two figures as "remarkable men" who contributed a lot to the idea of Islamic revival, especially to the social life of Egyptian society. An-Najjār then determined to help the two figures by participating in anti-British demonstrations. During the demonstration, an-Najjār lost two fellow al-Ikhwān al-Muslimīn activists named Omar Shahin and Ahmed al-Mineisi.

In 1951, an-Najjār continued his education at the University of Cairo. Higher education institutions at that time were the center of the revolutionary movement. The lecturers, including those with the title of professor, also took part in the revolutionary movement, holding weapons like troops ready to fight. The peak of the movement known as "the 23 July Revolution/the July 23 coup" was the movement of the Egyptian military army against the kingdom in Egypt on July 23, 1952. In 1955, an-Najjār received a bachelor's degree with cum laude predicate and an award in geology from the University of Cairo.[8] In the same year, he was sentenced to 9 months in prison for fighting with some Egyptian security officers who did not like the activities of his organization.

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[6] Zaghlūl Rāghib Muḥammad An-Najjār, *Al-Arḍ Fī Al-Qur'ān Al-Karīm* (Beirūt: Dār al-Ma'rifah, 2005), 5.

[7] Gamal Gorkeh Nkrumah, "Zaghlūl Rāghib Muḥammad An-Najjār: Scientific Being," Al-Ahram Weekly, November 17, 2005, https://www.masress.com/en/ahramweekly/15153.

[8] "Biography of Zaghlūl Rāghib Muḥammad An-Najjār," Assabile, accessed January 30, 2022, http://www.assabile.com/zaghloul-el-naggar-316/zaghloul-el-naggar.htm.

Prison is a very influential mental and spiritual place for an-Najjār. In that narrow room, one night, he dreamed of meeting the Prophet Muhammad SAW who encouraged him to fight for Islam. Once free, he was unable to realize his dream of becoming a teacher because of his involvement with the al-Ikhwān al-Muslimīn organization, whose activities at that time were considered a threat by the Egyptian government. However, this did not make him despair. With the cum laude predicate and the award he received, an-Najjār applied for and was accepted for a job at a Sahara oil mining company with high wages. Despite that, two months later, he was fired because the government knew about his criminal record. In late 1955, he joined the National Research Center (NRC) headquartered in Dokki, Cairo, Egypt.[9] In his new place, an-Najjār's position was not necessarily secure. He continued to be under pressure from the Egyptian government. This condition made him leave his hometown in 1960. He could not even attend the funerals of his father (d. 1961) and his mother (d. 1968) [10].

After leaving Egypt, an-Najjār taught at King Saud University, Riyadh. He continued his postgraduate education at the University of Wales, England, and earned his Ph.D. under the guidance of a renowned geologist, Professor Allen Wood. For his achievements, in 1963, an-Najjār was awarded a post-doctoral research fellowship at the same university for 3 years. Then, the academic community of King Saud University asked him to participate in establishing the Geology Department. Furthermore, as a form of appreciation, the university financed his trip to England every summer to complete his 7 years of study.[11]

An-Najjār began to pursue the scientific field of the Qur'an when he was elected as a Member of the Islamic World Research Council in Cairo (1981). In the same year, he participated in the establishment of the world scientific body for the scientific wonders of the Qur'ān al-Karīm and al-Sunnah al-Muṭahharah (Association of the Islamic World) in Mecca. In addition, he was also elected a member of the Islamic World Research Council in Cairo. In 2001, he was entrusted as chairman of the al-I'jāz al-'Ilmī Committee of the Supreme Council of Islamic Affairs in Egypt.[12] Moreover, an-Najjār who has received an award from the President of Sudan is also known as a writer. He wrote 45 books and more than 150 articles in various disciplines. He also guided 45 theses and dissertations at various universities around the world. His works include *Mu'jizah*

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[9] Zaghlūl Rāghib Muḥammad An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm*, 1st ed. (Kairo: Maktabah al-Syurūq al-Daūliyah, 2007), 9.

[10] Zaghlūl Rāghib Muḥammad An-Najjār, *Ṣuwar Min Tasbīḥ Al-Kāināt Lillāh* (Mesir: Dār Nahdhoh Misr, 2003).

[11] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 11.

[12] Zaghlūl Rāghib Muḥammad An-Najjār, *Min Āyāt Al-I'jāz Al-'Ilmi Al-Ḥayawān Fi Al-Qur'Ān Al-Karīm* (Beirūt: Dār al-Ma'rifah, 2006), 6.

al-Makān wa al-Zamān fī al-Rukn al-Khāmis min Arkān al-Islām, *Kitāb al-I'jāz al-Anbā'ī wa al-Tārīkhī fī al-Qur'ān al-Karīm*, *Hakaz\ā ta'arraftu 'alā Allāh, Khawāṭir… fī Ma'iyyah khātam al-Anbiyā' wa al-Mursalīn Muḥammad Sallallāh 'alaīh wa sallam*, *Ḥaqīqah al-Masiḥ*, *Falisṭīn… liman?*, and *Al-Mafhūm al-'Ilmī li al-Jabāl fī al-Qur'ān al-Karīm.* Almost all of his works have been published and translated into English and French. During his life, he also regularly wrote articles in the *Min Asrār al-Qur'ān* rubric every Monday in the Egyptian al-Ahram Daily which sold 3 million copies every day. To date, he had more than 250 published articles addressing the miracles of science in the Qur'an.

The author divides Zaghlūl an-Najjār's thoughts into three important terms, namely the miraculous aspects of the Qur'an, the cosmological cues of the Qur'an, and *tafsr 'ilmī.*

1. Miraculous Aspects of the Qur'an

Zaghlūl an-Najjār believes that the miracle of the Qur'an lies in the beauty and accuracy of its language and literature, its perfect explanations of *tasyri'*, historical information, and scientific cues.[13] From the aspect of language and literature, the Qur'an has no match. The following are the words of Allah SWT in Q.S. Al-Isra' [17]:88.

> *Say, "If mankind and the jinn gathered in order to produce the like of this Qur'an, they could not produce the like of it, even if they were to each other assistants."*[14]

In addition to the strength of the Qur'an from the aspect of language and literature, the Qur'an also contains a detailed explanation of *tasyri'*, such as *aqidah*, worship, law, and morals. Historical events are also one of the miraculous aspects of the Qur'an. The stories of the previous people from the Prophet Adam AS to the Prophet Muhammad SAW are explained in detail, which stories were not known by the people at that time or at the time the Qur'an was revealed to this world.[15] For example, the story of 'Ād and Ṣamud is told in Q.S. Al-Haqqah [69]: 4-7, as follows.

> *4. Thamud and 'Aad denied the Striking Calamity. 5. So as for Thamud, they were destroyed by the overpowering [blast]. 6. And as for 'Aad, they were destroyed by a screaming, violent wind. 7. Which Allah imposed upon them for seven nights and eight days in succession, so you would see the people therein fallen as if they were hollow trunks of palm trees.*[16]

Although some doubt the information in the Qur'an above, the evidence for the truth of the story is gradually being revealed, such as archaeological

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[13] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 25.
[14] Kementrian Agama RI, *Al-Qur'ān Dan Terjemahnya* (Jakarta: Jamunu, 1971), 437.
[15] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 25.
[16] Kementrian Agama RI, *Al-Qur'ān Dan Terjemahnya,* 967.

evidence of earthquakes and hurricanes that occurred at the time of the life of the people who were destroyed by Allah SWT. In addition, the place indicated by the scriptures is similar to the Jordan Valley, the Red Sea Coast, and South Arabia. Thus, the truth of the information and stories of the Qur'an is getting stronger.[17]

Meanwhile, concerning the miracles of the Qur'an from the scientific aspect, an-Najjār said as follows.

> *The miracles of the Qur'an refer to many facts of the universe and we will have nothing known to man at the time of the revelation of the Qur'an and not for many years.*[18]

This last-mentioned miraculous dimension means that the Qur'an is a book that provides a lot of amazing and accurate information about the nature of the universe and its phenomena which no one knows except after centuries of the revelation of the Qur'an. This is concrete evidence for intellectuals in modern times that the Qur'an calls on humans to stand on a solid foundation.

2. Cosmological Cues in the Qur'an

In addition to discussing matters of faith, worship, morals, the basics of sharia and law, and *muamalah*,[19] the Qur'an also discusses cosmological signs of the universe and its contents, such as the movement of the planet Earth which runs on its axis, moves ahead, expands, and does not collide with other planets in the solar system, the process of rain, the process of human creation in the womb, and the phenomenon of islands, countries, and oceans being fragmented and not united. An-Najjār said that the cosmological cues in the Qur'an have four purposes.[20] The first is to provide arguments for the very creative power of Allah SWT in the creation of the universe. The second is to assert that the One who created the universe is capable of destroying and re-creating it. He is Allah SWT that created and He may also destroy His creation.[21] The third is to remind Muslims of the importance of recognizing Allah's creation, learning all His rules, and investing them in prospering the earth and carrying out the obligations of the caliphate. The fourth is to provide opportunities for humans to *ijtihad*, research, and prove the verses of Allah SWT from generation to generation. The inclusion of cosmological signs in the Qur'an is an invitation to humans to use their minds

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[17] Muhammad Quraish Shihab, *Mukjizat Al-Qur'ān: Ditinjau Dari Aspek Kebahasaan, Isyarat Ilmiah, Dan Pemberitaan Gaib* (Bandung: Mizan, 2003), 198.

[18] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 26.

[19] Yūsuf Al-Qaraḍawi, *Kaifā Nata'āmal Ma'a Al-Qur'ān Al-'Aẓim* (Kairo: Dār al-Syurūq, 2000).

[20] Zaghlūl Rāghib Muḥammad An-Najjār, *Al-I'jāz Al-Ilmī Fī Al-Sunnah Al-Nabawiyyah* (Mesir: Dār Nahdhoh Misr, 2012).

[21] Yūsūf Al-Hājj Aḥmad, *Musū'ah Al-I'jāz Al-'Ilmī Fī Al-Qur'Ān Al-Karīm Wa Al-Sunnah Al-Muṭahharah* (Damaskūs: Maktabah Ibn Ḥajr, 2003), 975.

and devote their attention to researching these signs in reaching many natural facts. This provision applies generally to the *Kauniyyah* verses in the Qur'an except for the creation verses.

The creation of man is supernatural and absolute but the Qur'an commands man to reflect on the process of creation. Q.S. Al-'Ankabut [29]:19-20 stated as follows.

> *19. Have they not considered how Allah begins creation and then repeats it? Indeed that, for Allah, is easy. 20. Say, [O Muhammad], "Travel through the land and observe how He began creation. Then Allah will produce the final creation. Indeed Allah, over all things, is competent."*[22]

From the purposes of the cosmological cues of the Qur'an, an-Najjār said that these signs became an important means of *da'wah*[23] in inviting people to embrace Islam. Cosmological cues in the Qur'an contain elements of strengthening faith and provide guidance for polytheists and unbelievers, which can be seen from the perspective of the pioneers of the Qur'an in hinting at natural facts in the form of secrets, phenomena, and rules that far precede all human scientific knowledge. In addition, the Qur'an also narrates all the facts of nature simply and scientifically.

3. *Tafsīr 'Ilmī*

In the contemporary era, a new model of *tafsīr* (English: interpretation) has emerged, namely *tafsīr 'ilmī*. Al-Qaraḍawi said that *tafsīr 'ilmī* is a commentary that contains modern cosmic sciences, such as physics, astronomy, geology, chemistry, biology (concerning plants and animals), medicine, anatomy, physiology, mathematics, and others.[24] Meanwhile, according to al-Jumaīlī, *tafsīr 'ilmī* is an interpretation that talks about scientific terms in the al-Qur'an.[25]

An-Najjār mentions about a thousand *Kauniyyah* verses that are *shariḥ* in the Qur'an and hundreds of verses related to natural phenomena, which still require interpretation and exploration of meaning with a scientific approach that can be accounted for, understood, and applied. An-Najjār mentioned some scholars who agree with the style of *tafsīr 'ilmī*. The first is Tantawi Jauhari (d. 1940) who invites Muslim intellectuals to pay attention to the interpretation of the *Kauniyyah* verses which are more numerous than the verses on *fiqh*. The verses that talk about animals, plants, the sky, and the earth cannot be denied besides

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[22] Kementrian Agama RI, *Al-Qur'ān Dan Terjemahnya,* 781.

[23] Zaghlūl Rāghib Muḥammad An-Najjār, *Al-I'jāz Al-'Ilmi Fī Al-Sunnah Al-Nabawiyyah* (Jakarta: Amzah, 2006), xx-xxiii.

[24] Al-Qaraḍawi, *Kaifa Nata'āmal Ma'ā Al-Qur'ān Al-'Aẓīm,* 369.

[25] Sayyid Al-Jumaīlī, *Al-I'jāz Al-'Ilmī Fī Al-Qur'Ān Al-Karīm* (Beirūt: Dār wa Maktabah al-Hilāl, 1992), 94.

the need for law.[26] In addition, al-Ghāzalī (d. 505 H) as a figure who helped legitimize *tafsīr 'ilmī* said in his books *Iḥyā' 'Ulūm al-Dīn*[27] and *Jawāhir al-Qur'ān*[28] that one of the signs of the miracle of the Qur'an is that it includes all sciences, such as astronomy and medicine. Then, we have al-Rāzī (1149/1150–1209) with his commentary *Mafātiḥ al-Ghaib*[29] and al-Iskandarānī (d. 1306 H) with his book *Kasyf al-Asrār al-Nūrānīyah al-Qur'ānīyah*.[30] In the 20th century, several books appeared with the style of *'tafsīr 'ilmī*, such as *al-Islām wa al-Ṭibb al-Ḥadīth* by Abdul Aziz Ismail, *Riyaḍ al-Mukhtār* by Ahmad Mukhtar al-Ghazi, and *Mu'jizah al-Qur'ān fī Waṣf al-Kāināt* and *al-Tafsīr al-'Ilmī li al-Āyāt al-Kuniyyah* by Hanafi Ahmad.

The interpretation of the *Kauniyyah* verses is intended to broaden knowledge and reveal the essence of the meaning of the verses of the Qur'an which have not been revealed previously. The Qur'an as a pioneering work containing scientific facts can be found in Q.S. Fussilat [41]:53, as follows.

> *We will show them Our signs in the horizons and within themselves until it becomes clear to them that it is the truth. But is it not sufficient concerning your Lord that He is, over all things, a Witness?.*[31]

An-Najjār views the Qur'an as a book full of miracles, not only from the linguistic, historical, and tasyri' aspects but also from scientific contents, which were only reached by the human mind in later centuries. In the modern age, interpretation of the meaning of the scientific content of the Qur'an is highly needed. Considering the rapid development of science, scientific interpretation methods are needed to defeat the arguments of the polytheists.[32]

The Debate on Theories of the Inheritance of Human Genetic Traits

Etymologically, genetics comes from the word "*genos*" (Latin), which means "ethnic or origin". It can be also from the words "*genetica*" (Dutch), "*genetics*" (English), and "*genno*" (Greek), which means "to give birth". In terminology, genetics is the science that discusses the inheritance of parental traits to their offspring and the variations that may arise in them (organisms and sub-organisms). The science of genetics evolved from empirical genetics to pure

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[26] An-Najjār, *Tafsīr Al-Āyat Al-Kauniyyah Fī Al-Qur'an Al-Karim,* 26.

[27] Muḥammad Al-Ghazālī, *Iḥyā' 'Ulūm Al-Dīn* (Kairo: Dār al-Ḥadīts, 1997).

[28] Muḥammad Al-Ghazālī, *Jawāhir Al-Qur'ān* (Beirūt: Dār Iḥyā' al-'Ulūm, 1999).

[29] Fakhr al-Dīn Al-Rāzī, *Tafsīr Al-Kabīr Mafatiḥ Al-Ghaib* (Beirūt: Dār al-Fīkr, 2005).

[30] Muḥammad ibn Aḥmad Al-Iskandarānī, *Kashf Al-Asrār Al-Nūrānīyah Al-Qur'ānīyah : Fīmā Yata'allaq Bi-Al-Ajrām Al-Samāwīyah Wa-Al-Arḍīyah Wa-Al-Ḥayawānāt Wa-Al-Nabātāt Wa-Al-Jawāhir Al-Ma'danīyah* (Mesir: al-Maṭba'ah al-Wahabīyah, 1879).

[31] Kementrian Agama RI, *Al-Qur'ān Dan Terjemahnya*.

[32] An-Najjār, *Tafsīr Al-Āyat Al-Kauniyyah Fī Al-Qur'an Al-Karim,* 26.

genetics and applied genetics (*eugenics*), then developed into several branches of science, such as plant genetics, human genetics, cytogenetics, molecular genetics, and euphenics.

Experts have put forward various theories of the process of inheritance from parents to children. The first is the theories of Ovism and Animalculism.[33] The Ovism theory views the egg cell (ovum) as having declining characteristics, while the male is just a giver of fluids to stimulate the development and growth of the ovum into a new individual. This theory assumes that women are superior to men.[34] After the invention of the simple microscope (17 AD), in the fluid produced by males, there are something like small animals called animalcules (spermatozoa) which are considered to carry traits that are passed on to offspring, while the ovum is only a place for animalcules to grow and develop into ordinary human. This view gave birth to the theory of Animalculism which views men as superior to women. However, at the end of the 18th century, the theories of Ovism and Animaculism were disproved by Joseph G. Koelreuter (1733-1806) who sowed pollen from one maize variety to the stigma of another maize variety reciprocally. He found that the cross-breeding between the two maize varieties resulted in offspring having similar properties to the two parents. His research concluded that, between men and women, there is no superior or inferior one genetically.[35]

In contrast to the previous theories, Antoni van Leeuwenhoek (1632-1723), Swammerdam Jan (1637-1680), and Charles Bonnet (1720-1793) through a simple microscope saw small human-shaped living creatures called homunculus in spermatozoa. This view then gave birth to the Preformation theory.[36] This theory was corroborated by other researchers in their era who saw the homunculus in the egg, which gradually grew and developed into an adult human.[37] However, this theory was refuted by studies conducted by Caspar F. Wolff (1733-1794) and Karl E. von Baer (1792-1876) that gave birth to the theory of Epigenesis.[38] This theory states that neither the spermatozoa nor the ovum has

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[33] R. C. Punnett, "Ovists and Animalculists," *The American Naturalist* 62, no. 683 (November 1928): 481–507, https://doi.org/10.1086/280227.

[34] Matthew Cobb, "Heredity before Genetics: A History," *Nature Reviews Genetics* 7, no. 12 (December 2006): 953–58, https://doi.org/10.1038/nrg1948.

[35] Ernst Mayr, "Joseph Gottlieb Kolreuter's Contributions to Biology," *Osiris* 2 (January 1986): 135–76, https://doi.org/10.1086/368655.

[36] J. Kremer, "Antoni van Leeuwenhoek, The Founder of 'Spermatology,'" in *Immunological Influence on Human Fertility: Proceedings of the Workshop on Fertility in Human Reproduction* (Elsevier, 1977), 3–12, https://doi.org/10.1016/B978-0-7295-0006-7.50005-7.

[37] Tiffany Wang, "Good Theory Gone Bad--Preformationism," *Essai* 16, no. 29 (2018): 80–81, https://dc.cod.edu/essai/vol16/iss1/29.

[38] Linda van Speybroeck, Dani de Waele, and Gertrudis van de Vijver, "Theories in Early Embryology," *Annals of the New York Academy of Sciences* 981, no. 1 (January 24, 2006): 7–49, https://doi.org/10.1111/j.1749-6632.2002.tb04910.x.

a homunculus as described by the Preformation theory. Those within the ovum that has been fertilized by spermatozoa will grow and develop the tools and parts of the human body gradually until it is formed as complete humans.

After the theories of Preformation and Epigenesis, Charles Darwin's theory of Pangenesis (1809-1882) was born.[39] This theory views that, in sex cells, gemmules are collected from various organs carried by the blood. If a person loses one of them, the organs of the body cannot give gemmule to the blood to be carried to the sex cells. As a result, the offspring will not have the relevant organs. The Pangenesis theory was refuted by a study by Francis Galton (1822-1911)[40] through the experiment of transfusing blood from a black rabbit to a white rabbit. He argued that if the gemmule from black was carried in the blood as proposed by the Pangenesis theory, then the child of the white rabbit marriage would be black. However, all the descendants of the white rabbit turned out to be white. Not only Galton but the theory of Pangenesis was also refuted by August Weismann (1834-1914) with the Seed Plasma theory.[41] This theory argues that cells that function as sex cells or gametes are formed in different tissues from other body tissues so that damage to one body tissue has no effect on sex cells and will not be passed on to children. Sex cells produce germ plasma which is different from body plasma. The meeting between the seed plasma of the male determines the offspring. The Seed Plasma theory is a theory that forms a strong foundation for the development of modern genetics. However, the theory of Pangenesis is still used today with the phrase "in the blood" or already in the lineage.

In the mid-19th century, various discoveries emerged that became a bright spot for the development of genetics. Gregor J. Mendel (1822-1884) was the first to formulate the process of inheritance of traits from parents to offspring,[42] which was based on careful and strong data recording, mathematical calculations, and statistical analysis. Mendel believed that the inheritance of traits from parents to their offspring was in the form of units of inheritance. Mendel began his research in 1857 by collecting several types of peas to study the differences between them

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[39] R. C. Olby, "Charles Darwin's Manuscript of Pangenesis," *The British Journal for the History of Science* 1, no. 3 (June 5, 1963): 251–63, https://doi.org/10.1017/S0007087400001497.

[40] Francis Galton, "I. Experiments in Pangenesis, by Breeding from Rabbits of a Pure Variety, into Whose Circulation Blood Taken from Other Varieties Had Previously Been Largely Transfused," *Proceedings of the Royal Society of London* 19, no. 123–129 (December 31, 1871): 393–410, https://doi.org/10.1098/rspl.1870.0061.

[41] August Weismann, *The Germ-Plasm: A Theory of Heredity* (New York: Charles Scribner's Sons, 1893).

[42] Nils Chr. Stenseth, Leif Andersson, and Hopi E. Hoekstra, "Gregor Johann Mendel and the Development of Modern Evolutionary Biology," *Proceedings of the National Academy of Sciences* 119, no. 30 (July 26, 2022): 1–10, https://doi.org/10.1073/pnas.2201327119.

and doing cross-breeding on these plants. After doing about 7 years of observation, Mendel concluded that inheritance is carried through heredity/genes. In each plant, a trait is determined by a pair of genes, each of which comes from different parents. The two genes can separate in the process of gamete formation and recombine in marriage. This conclusion is called the Law of Segregation.[43] Another conclusion from Mendel's experiment is that if two individuals have two or more pairs of traits, then the pair of traits are inherited independently, not depending on the other pair of traits (Law of Independent Assortment). In 1865, Mendel submitted his research results to a scientific meeting convened by the Natural History Society of Brunn.[44] Later, his research was printed and published by the Transaction of the Society in 1866. In the early 20th century, Mendel's work was recognized as the basic law of genetics by many biologists, such as Hugo de Vries (1848-1935), Carl Correns (1864-1933), and Erich von Tschermak (1871-1962).

Technological advances in the late 19th century supported the development of genetics. In 1879, Walther Flemming (1843-1905) found fine objects in the nucleus of a cell.[45] Then in 1888, these objects were named chromosomes by H. W. G. von Waldeyer-Hartz (1836-1921).[46] Walter S. Sutton (1877-1916) found a parallel between the behavior of chromosomes[47] when cells were dividing with the segregation of genetic material that Mendel discovered. Chromosomes, hereinafter known as genes, were introduced by Wilhelm Johannsen (1857-1927)[48] to refer to the genetic material discovered by Mendel in 1903. In 1914, Thomas H. Morgan (1866-1945) discovered that genes, which are the smallest units of genetic material, are present in large numbers on a single chromosome.[49] The science of genetics was getting advanced since the discovery

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[43] E. Schwarzbach et al., "Gregor J. Mendel – Genetics Founding Father," *Czech Journal of Genetics and Plant Breeding* 50, no. 2 (June 12, 2014): 43–51, https://doi.org/10.17221/54/2014-CJGPB.

[44] M. D. Marsh, "Mendel's Principles of Heredity," *East African Geographical Review* 2, no. 3 (1911): 52–60, https://doi.org/10.10520/AJA19376812_341.

[45] Paul A. Hardy and Helmut Zacharias, "Walther Flemming on Histology in Medicine 1878: A Newly Discovered Letter to His Father," *Annals of Anatomy - Anatomischer Anzeiger* 191, no. 2 (April 2009): 171–85, https://doi.org/10.1016/j.aanat.2009.01.002.

[46] Paolo Mazzarello, "A Unifying Concept: The History of Cell Theory," *Nature Cell Biology* 1, no. 1 (May 1999): E13–15, https://doi.org/10.1038/8964.

[47] L.A.-C.P. Martins, "Did Sutton and Boveri Propose the So-Called Sutton-Boveri Chromosome Hypothesis?," *Genetics and Molecular Biology* 22, no. 2 (June 1999): 261–72, https://doi.org/10.1590/S1415-47571999000200022.

[48] Nils Roll-Hansen, "The Holist Tradition in Twentieth Century Genetics. Wilhelm Johannsen's Genotype Concept," *The Journal of Physiology* 592, no. 11 (June 1, 2014): 2431–38, https://doi.org/10.1113/jphysiol.2014.272120.

[49] Giulia Frezza and Mauro Capocci, "Thomas Hunt Morgan and the Invisible Gene: The Right Tool for the Job," *History and Philosophy of the Life Sciences* 40, no. 2 (June 24, 2018): 31, https://doi.org/10.1007/s40656-018-0196-z.

of the molecular arrangement of genes consisting of two different nucleic acids (i.e., RNA and DNA) in the 1920s. In 1953, James D. Watson (1928/age 93) and F.H.C. Crick (1916-2004) demonstrated the double structure of DNA which was later refined by M.H.F. Wilkins (1916-2004) in 1961.[50] In 1977, the genetic code of organisms was read for the first time although it was only on the type of virus. The code contains 5,386 genetic codes. The first copy of the human genome, which is about 3 billion ciphers long, was published in February 2001.

The Inheritance of Human Genetic Traits in Islamic Literature

The inheritance of human traits (genetics) is not only discussed within the scope of modern science but can also be found in many works of Islamic literature, the Qur'an, hadith, and exegetical thoughts.

Q.S. Al-Baqarah [2]:223

> *Your wives are a place of sowing of seed for you, so come to your place of cultivation however you wish and put forth [righteousness] for yourselves. And fear Allah and know that you will meet Him. And give good tidings to the believers.*[51]

Q.S. Ali 'Imran [3]:6

> *It is He who forms you in the wombs however He wills. There is no deity except Him, the Exalted in Might, the Wise.*[52]

Q.S. An-Nisa' [4]:1

> *O mankind, fear your Lord, who created you from one soul and created from it its mate and dispersed from both of them many men and women. And fear Allah, through whom you ask one another, and the wombs. Indeed, Allah is ever, over you, an Observer.*[53]

Q.S. Al-A'raf [7]:172

> *And [mention] when your Lord took from the children of Adam - from their loins - their descendants and made them testify of themselves, [saying to them], "Am I not your Lord?" They said, "Yes, we have testified." [This] - lest you should say on the day of Resurrection, "Indeed, we were of this unaware."*[54]

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[50] T. V. Danylova and S. V. Komisarenko, "Standing on the Shoulders of Giants: James Watson, Francis Crick, Maurice Wilkins, Rosalind Franklin and the Birth of Molecular Biology," *The Ukrainian Biochemical Journal* 92, no. 4 (September 10, 2020): 154–65, https://doi.org/10.15407/ubj92.04.154.

[51] Kementrian Agama RI, 54.

[52] Kementrian Agama RI, 75.

[53] Kementrian Agama RI, 114.

[54] Kementrian Agama RI, 250.

Q.S. An-Najm [53]: 45-46

> *And that He creates the two mates - the male and female - 46. From a sperm-drop when it is emitted.*[55]

Q.S. 'Abasa [80]:17-19

> *17. Cursed is man; how disbelieving is he. 18. From what substance did He create him?. 19. From a sperm-drop He created him and destined for him.*[56]

Discussions on the inheritance of genetic traits are also found in several hadiths, such as the Bukhari hadiths from Abu Hurairah RA and Anas RA,[57] Muslim hadith from Tsauban,[58] and Tirmidhi hadith from Umar bin al-Khattab.[59] In addition, they are also found in the thoughts of the commentators. Difda' said a mother does not have a role in determining the sex of the fetus as presented in some research results in the medical field. According to him, sex determination is entirely determined by the sperm of the father[60] as implied in Q.S. An-Najm [53]:45-46. Meanwhile, Yūsūf al-Hājj Aḥmad said that every human being is born carrying the genes of his ancestors in his sex cells. He argued that Allah SWT has given every human being the perfection of knowledge, will, and power[61] as in Q.S. Al-A'raf [7]:172. Similarly, Ahmad Mustafa Mutawalli[62] said that the phrase "*al-nuṭfah al-amsyāj*" in Q.S. Al-Insan [76]:2 means a mixture of male and female semen so that the fetus is a mixture of sperm and ovum. Muhammad Fayyad also proposed the argument as did Ahmad Mustafa Mutawalli. In addition, he said that the origin and process of human creation[63] can also be found in Q.S. At-Thariq [86]:5-7.

Zaghlūl an-Najjār's Scientific Interpretation of the Inheritance of Genetic Traits in Q.S. An-Nisa' Verse 1

Zaghlūl an-Najjār said the scientific cue in Q.S. An-Nisa' is a sign of the creation of man from *an-nafs al-wāḥidah* (one soul) who was created from clay; The

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[55] Kementrian Agama RI, 875.

[56] Kementrian Agama RI, 1025.

[57] Abu Abdillah Al-Bukhārī, *Ṣaḥiḥ Al-Bukhārī* (Beirut: Dār Ibn Kasīr, 2002), 1694 & 818.

[58] Muslim Ibn Hajjaj, *Ṣaḥiḥ Muslim* (Riyadh: Dār Ṭayyibah li al-Nasyr wa al-Tauzī', 2006), 154-155.

[59] Abu 'Isa At-Tirmidzi, *Al-Jāmi' Al-Kabīr* (Beirut: Dār al-Garb al-Islāmī, 1996), 158.

[60] Bassam Difdha', *Al-Kaun Wa Al-Insān Bain Al-'Ilm Wa Al-Qur'ān* (Damaskus: Matba'ah al-Syām, 1983), 165.

[61] Aḥmad, 132.

[62] Ahmad Musthafa Mutawalli, *Mausū'ah Al-Zahabiyyah Fī I'jāz Al-Qur'ān Al-Karīm Wa Al-Sunnah Al-Nabawiyyah* (Kairo: Dār Ibn al-Jauzī, 2005), 271-272.

[63] Muhammad Fayyadh, *I'jāz Āyāt Al-Qur'ān Fī Bayān Khalq Al-Insān* (Kairo: Dār al-Syurūq, 1999), 54-55.

creation of his partner is from himself; Furthermore, from them both, male and female offspring can be born.[64] In Q.S. An-Nisa' [4]:1, Allah SWT says as follows.

O mankind, fear your Lord, who created you from one soul and created from it its mate and dispersed from both of them many men and women...[65]

The meaning of the above verse contains scientific cues, as follows.

1. Genes of the Prophet Adam AS

All humans who now fill the earth, both humans in the past and those who live in the future, came from a seed that was in Adam's rib, as in Q.S. Al-A'raf [7]:172, as follows.

And [mention] when your Lord took from the children of Adam - from their loins - their descendants and made them testify of themselves, [saying to them], "Am I not your Lord?" They said, "Yes, we have testified." [This] - lest you should say on the day of Resurrection, "Indeed, we were of this unaware."[66]

Principally, humans are destined to live through what Allah SWT planted in Adam's rib. Then, Adam and Eve shared the genetic stock through marriage. Both passed genetic characteristics to their children from one generation to the next with a fixed share of the genetics. Regarding this long series, genetics calls it the variation of a single origin. Without variation, each individual must only have one form, causing the growth of mutual hatred between humans so that it is impossible for life to take place.[67] Therefore, Allah SWT creates his creatures differently, as in Q.S. Ali 'Imran [3]:6, as follows.

It is He who forms you in the wombs however He wills…[68]

According to genetics, differences between Adam's descendants are influenced by chromosomal factors and dominant & recessive genes. In 1912, Thomas H. Morgan (d. 1945) discovered that the genes that Mendel found in the nucleus of living cells have a concrete role in cell activity.[69]

Chromosomes are present in the nucleus of every living cell in a certain number. The number is influenced by the size of the organism. Humans have 46 chromosomes (23 pairs), consisting of 44 body chromosomes which contain genes that regulate the physical characteristics of the body, and 2 sex chromosomes that regulate the sex of each individual. In addition, human cells consisting of body cells, sex cells, and red blood cells also have different numbers

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[64] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm.*
[65] Kementrian Agama RI, 114.
[66] Kementrian Agama RI, 250.
[67] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 132.
[68] Kementrian Agama RI, 75.
[69] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 158.

of chromosomes. Body cells have 46 chromosomes and sex cells (ovum or spermatozoa) have 23 or 1/2 of the total chromosomes of body cells.[70] Meanwhile, red blood cells that do not have a cell nucleus do not have chromosomes.

Male body cells contain 46 chromosomes plus 2 sex-determining chromosomes that are dissimilar. Male sex chromosomes consist of X and Y chromosomes. With the same composition, female body cells contain 44 chromosomes and 2 sex-determining chromosomes. However, what distinguishes male and female body cells is the sex chromosomes, in which women on both sex chromosomes have the same type, namely the X chromosome only (X, X).[71]

Human cells duplicate themselves by division. In body cells, the division process is carried out by mitosis, which means that each chromosome divides itself on its axis in a longitudinal position. The new cell resulting from this division retains the total of parent chromosomes, namely 46 chromosomes. Concerning the division conditions to produce reproductive cells (ova and spermatozoa), body cells divide by meiosis (reduced), which means that each cell divides by giving half the number of chromosomes in the body's cells to each reproductive cell after division. Therefore, the resulting reproductive cells only have 23 chromosomes, consisting of both ova and spermatozoa. The number of chromosomes will be back to normal when the two reproductive cells fuse during fertilization.[72]

Chromosomes directly have a role in determining sex. Chromosomes in the male body during meiosis division produce spermatozoa that carry the X and Y chromosomes. If the spermatozoa carrying an X chromosome succeed in fertilizing the ovum that carries an X chromosome, the fetus that will be born will be female. However, if the spermatozoa carrying the Y chromosome manage to reach the oviduct and fertilize the ovum, then the sex of the fetus will be male.[73] Therefore, Allah SWT says in Q.S. An-Najm [53]:45-46, as follows.

> *45. And that He creates the two mates - the male and female - 46. From a sperm-drop when it is emitted.*[74]

The verse above shows that the sex of a child is determined by the sex chromosomes that come from the father. The father has two types of sex chromosomes: X and Y chromosomes. Meanwhile, the mother has only an X chromosome. For this reason, the sex chromosome of the zygote will be XY

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[70] An-Najjār, *Al-I'jāz Al-'Ilmi Fī Al-Sunnah Al-Nabawiyyah,* 165.
[71] An-Najjār, 171.
[72] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 160.
[73] An-Najjār, *Al-I'jāz Al-'Ilmi Fī Al-Sunnah Al-Nabawiyyah,* 187.
[74] Kementrian Agama RI, 857.

(male) or XX (female) depending on the sex chromosome carried by the spermatozoa (father).

In addition to chromosomal factors, dominant and recessive genes also affect Adam's offspring. Modern genetics emphasizes that the resemblance between children and their parents may not be visible because of the alternation of physical characters from Adam and Eve to the birth of mankind. Some of these characters may seem prominent characters and some of them are recessive. If the father and mother or their ancestors both carry a recessive character (e.g., black skin), then some of their children certainly have the same character following the recessive character.[75] This is as in a hadith narrated by Bukhari[76] from Abu Hurairah which contains a story in the time of the Prophet Muhammad SAW being visited by a Bedouin Arab who asked about something that had happened to his newborn child. The man doubted his son because he had dark skin that was different from his parents. Then, the Prophet Muhammad SAW answered his question by asking about the color of his camel and the reason behind it. That person had a camel that was red mixed with gray and the cause of his camel's color was a genetic trait from the ancestors of the camel. Therefore, the Prophet Muhammad SAW told the Arab Bedouin that his son's skin color difference was due to a genetic trait from his ancestors similar to what happened to his camel.

Within the framework of genetics, it can be understood that differences in physical characteristics (e.g., differences in the skin color of a child and his parents as mentioned in the hadith above) are because the father or mother, or one of their ancestors, has black skin color with a recessive character (hidden). The characters may not appear to both parents. However, these characteristics may be gathered in one of their children as the dominant character so that the black color character which is the ancestral gene will be visible in their children or great-grandchildren.[77]

The emergence of dominant or recessive genes is influenced by the similarity between the father's and mother's genes which are mixed in the fertilization process. If the two genes are different (heterozygous), then the strongest character will be dominant while the weak will be hidden. Meanwhile, if the two genes are similar (homozygous), then both will be concentrated and the recessive character will be dominant. These homozygous genes must meet when inbreeding takes place.[78]

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[75] An-Najjār, *Al-I'jāz Al-'Ilmi Fī Al-Sunnah Al-Nabawiyyah,* 113.
[76] Al-Bukhārī, 1694.
[77] An-Najjār, *Al-I'jāz Al-'Ilmi Fī Al-Sunnah Al-Nabawiyyah,* 118.
[78] An-Najjār, 119.

It has been scientifically proven that second-degree relatives (cousins/sons of uncles and aunts) have the same genes up to a certain percentage. In other words, if there is a marriage between them, the rate of occurrence of recessive characteristics also increases and it could be that some of them are contributing factors to many diseases that make the offspring to be born weak or disabled.[79] The prohibition against marrying relatives is contained in Q.S. An-Nisa' [4]:23 as follows.

> *Prohibited to you [for marriage] are your mothers, your daughters, your sisters, your father's sisters, your mother's sisters, your brother's daughters, your sister's daughters, your [milk] mothers who nursed you, your sisters through nursing, your wives' mothers, and your step-daughters under your guardianship [born] of your wives unto whom you have gone in. But if you have not gone in unto them, there is no sin upon you. And [also prohibited are] the wives of your sons who are from your [own] loins, and that you take [in marriage] two sisters simultaneously, except for what has already occurred. Indeed, Allah is ever Forgiving and Merciful.*[80]

The above verse is supported by modern scientific evidence that marriage between first-degree relatives inherits 50% of genetic diseases and defects, marriage between second-degree relatives inherits 12% of genetic diseases and defects, and marriage between third-degree relatives inherits 6% of genetic diseases and defects. Meanwhile, in the fourth-degree marriage between relatives, the potential for transmitting genetic diseases and defects to the next generation decreases.[81]

Apart from the two things above, there are other factors causing human diversity, namely DNA which is a double spiral and is associated with proteins. DNA is composed of sugars, phosphoric acid, and four nucleobases (adenine, thymine, guanine, and cytosine). Regarding the inheritance of genetic traits, Zaghlūl an-Najjār believes that the nucleobases consist of only four molecules, in which the genetic code is written in it and exchanged among all human beings who live in the past, present, and future. Each person has a special gene seal and personality traits, which are not repeated in others. This gene seal forms the characteristics of the human body, both visible and hidden, such as physical properties, chemical properties, reasoning, identity, health, and others.

2. Mitochondria DNA (mtDNA)

Regarding the meaning of the verse و خلق منها زوجها (and Allah created the partner of His creation from himself), Zaghlūl an-Najjār believes that the first pair of humans (i.e., Adam and Eve – the forerunners of all humans) is special.[82] It is

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[79] Nadiyyah Thayyarah, *Musuā'ah Al-I'jāz Al-Qur'ān* (Jakarta: Zaman, 2014), 176.
[80] Kementrian Agama RI, 120.
[81] Thayyarah, *Musuā'ah Al-I'jāz Al-Qur'ān,* 176.
[82] An-Najjār, *Tafsīr Al-Āyāt Al-Kauniyyah Fī Al-Qur'ān Al-Karīm,* 161-162.

a miracle that proves the inability of any creature to create such a thing. Allah SWT created Adam from clay which is a wonderful thing. In addition, Allah SWT created Eve from Adam's rib which is also great.

A study confirms the nature of Eve's creation as the first woman on earth. An-Najjar[83] said as follows.

أَنَّ الدِّرَاسَاتِ الْحَدِيْثَةَ فِى عِلْمِ الْأَحْيَاء الْجَزِيْئِي قَدْ أَثْبَتَتْ أَنَّهُ يُمْكِنُ تَتَّبع السّلَالَات الْأَحْيَائِيَّة بِوَاسِطَةِ الْحَمْدِ بِالنَّووِى الرِّيْبِى الْمَنْقُوْصِ الْأَكْسَجِيْن فِى بَعْضِ عضيات خَلِيّة الْبَيِيْضَةِ الْمَعْرُوْفَة وَهِىَ عضيات غشائية التَّكْوِيْن, شَدِيْد الضَآلَّةِ ,عَظِيْمَة (*Mitochondria*) بِاسْمِ الْمُتَقَدِّرَات الْفَائِدَةِ تُسبَحُ فِى سَائِلِ الْخَلِيَّةِ ,وَتَقُوْمُ بِتَحْوِيْلِ غَذَاءِ الْخَلِيَّةِ اِلَى طَاقَةٍ تَحْتَاجُ كُلّ مَكُوْنَاتِ الْخَلِيَّةِ فِى نشاطاتها الْمُخْتَلِفَة ,وَمُحْتَوِى الْمُتَقَدِّرَات مِنَ الْحَمْضِ النَّووى وَالْمَعْرُوْف بِاسْمِ (*The Mitochondrial DNA*) لَا يُوْرَثُ إِلَّا مِنَ الْأُمِّ فَقَطْ

The results of the research above prove that the genealogy of living things can be traced through the DNA contained in the unit of the egg cell called the mitochondria – membrane particles that are very small but have many benefits. These particles are in charge of producing energy that is needed for cell activity. Mitochondria are also the only cell organelles other than the nucleus that have DNA. The entire content is only inherited from the mother's side and is not included in the recombination or mixing of the genes of both parents when fertilization occurs in the egg.

The human body is composed of cells forming tissues, organs, and organ systems. Cells contain genetic material, which consists of RNA and DNA. The DNA molecule is a polynucleotide chain in the form of a double helix that has several types of purine and pyrimidine bases. DNA is found in the cell nucleus and mitochondria. Mitochondrial DNA (mtDNA or mDNA) of humans is located within the mitochondrial matrix and is a circular double-stranded nucleotide with a complete sequence of 16,569 base pairs. The mtDNA molecule consists of heavy (H) and lighter (L) strands. In the H strand, there are more purine bases than pyrimidines, making it heavier than the L strand.

Mitochondrial DNA is different from DNA in the cell nucleus even though both are in the same cell. mtDNA has a higher mutation rate, which is 10-17 times nuclear DNA. In addition, mtDNA is present in large quantities in each cell, which is more than 1000 copies, while nuclear DNA only has two copies. The size of the genome in mtDNA is relatively small compared to the nuclear

[83] An-Najjār, 159-160.

DNA genome. The size of the mtDNA genome in each organism varies greatly. For example, in humans, the mtDNA size is 16.6 kb, while, in Drosophila melanogaster, it is approximately 18.4 kb. In yeast, the genome size is relatively larger, namely 84 kb. In terms of shape, unlike nuclear DNA which is linear, mtDNA is circular.

The inheritance in mtDNA is different from the inheritance in nuclear DNA. If the inheritance of nuclear DNA traits is carried out through the recombination of DNA from both parents, the inheritance of mtDNA traits is carried out maternally or without recombination. Pure mtDNA is inherited from the mother only. This is because only the egg cell carries the mitochondria when it fuses with the sperm in the fertilization process. The egg cell has 100,000 mitochondria, while the sperm has only 50-100 mitochondria in the tail of the sperm. The tail of the sperm is a means of locomotion that requires high energy from the mitochondria. 14 hours after the fertilization process, the tail of the sperm containing mitochondria will be released and discarded. The nucleus of the ovum and sperm will fuse into one to form a zygote. The nucleus of the zygote is a combination of the nucleus of the sperm and the ovum, while the cytoplasm and cell organelles are derived from the organelles of the ovum, including the mitochondria.

A recent biomolecular study found that a mother passes 75% of her genetic elements to her child, while the father only passes 25%. The results of this study refute the previous theory which states that the characteristics and intelligence of children are inherited from their mother and father in equal proportions (50:50). It was revealed after it was proven that the mitochondria, which function as the body's energy producers, were inherited maternally (from the mother).[84] Therefore, the good or bad, intelligent or stupid, and obedient or disobedient characters of a child are largely determined by the mother. This fact is in line with the hadith of the Prophet Muhammad SAW which narrates that one of the *sahabah* came and asked him "Who is the first person I have to devote to?" The Messenger of Allah SAW replied: "Your mother (three times) and then your father."[85] It indicates that the ratio of the importance of a child being devoted to his mother compared to his father is 3:1.

Thus, the maternal inheritance of mtDNA traits can help all female genealogies on earth be traced. Likewise, the genealogy of women who will live in the future until the Day of Judgment can be traced to Eve through the mtDNA contained in each of their cells. This is what makes the creation of Eve a miracle like the creation of Adam.

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[84] Tauhid Nur Azhar and Eman Sulaiman, *The Secret of Mother-Organela Cinta* (Jakarta: Salamadani, 2010), 50.

[85] Al-Bukhārī, *Ṣaḥiḥ Al-Bukhārī,* 1500.

Conclusion

The inheritance of genetic traits in Q.S. An-Nisa' verse 1 according to Zaghlūl an-Najjār is found in the words "*al-nafs al-wāḥidah*" (one soul), which means that all humans in this world come from the first creation of Allah SWT, namely Adam. This indicates that the traits contained in Adam have been passed down from generation to generation to all mankind to this day. The same thing happened to Eve, as found in the words "*wa khalaqa minhā zaujahā*" (And we created his wife from himself). In Eve, there are mitochondria and DNA that collect all the mitochondria of her offspring. This is known based on the results of the latest scientific research which proves that, in cells, there are mitochondria that are only inherited by the mother.

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