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Medical Breakthroughs in the Islamic Golden Age: Models and Inspirations for Muslim Youth and Adults Alike

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Medical Breakthroughs in the Islamic Golden Age:
Models and Inspirations for Muslim Youth and Adults Alike
By: Shareef Gamal Mohamed Kotb

Knowledge. Curiosity. Humility. Power. Perseverance. These are all virtues and characteristics which have shaped some of the most powerful and influential people throughout history. Such figures are responsible for discovering planets, quantifying the mass of electrons, ending terrible wars, and even identifying the flow of blood in the pulmonary circulatory system. This small population of individuals often had the odds against them, whether it was the lack of technology, resources, the countless naysayers, or even some religious leaders. Despite all of these challenges, they were able to develop the foundations of many branches of knowledge, such as Physics, Astronomy, Mathematics, Chemistry, Biology, and Linguistics. Much of what we do today refers back to them. Who are some of these people whom we speak of? We are talking about scholars and scientists such as Isaac Newton, Albert Einstein, Avicenna (ابن سينا), René Descartes, Niels Bohr, Leonardo Da Vinci, Galileo Galilei, Nikola Tesla, Al-Zahrawi (أبو القاسم خلف بن العباس) (الزهرراوي)...the list could go on and on.

These figures of scientific discovery have been influential at the universal level as well as at the more personal level. I myself have been able to reflect and relate to them. The absolutely brilliant revolutionary thinkers of the Islamic Golden Age, a time that spans from the mid-7th to 13th century, have had a strong influence on me. These thinkers built much of the scientific and educational foundations for the western world, taking on some of the most challenging tasks, including what I think to be the most difficult of all: understanding the human body. Some of these people include Avicenna (أبن سينا), and Al-Zahrawi (أبو القاسم خلف بن العباس الزهرراوي), as already mentioned, as well as Abu Bakr Mohamed Ibn Zakaria Al-Razi (أبو بكر أبن زكريا الرازي), Ibn Al-Haytham (أبن الهيثم), Ibn Al-Baytar (أبن البيطر), Ibn Al-Nafees (أبن النفيس), and Ibn Al-Quff (أبن القف).

I have a lot in common with these Islamic scholars and scientists. Like them, I am a Muslim. I have a good grasp of the Arabic language. I have developed an interest in medicine and

the sciences. I face difficult challenges every day. I am as young as many of them were when they started their professional careers, and I am extremely driven. Let me introduce myself to you further so I can better explain how this is true.

My name is Shareef Gamal Mohamed Kotb (شريف جمال محمد قطب) and I am from Lawrence, Massachusetts. Being from Lawrence already makes my childhood a tough one, as this city has a reputation for being very difficult to live in. I am a 20 year old senior at Merrimack College majoring in Biochemistry with great hopes of becoming a physician. I am a proud Muslim, being French-Canadian from my mother's side and Egyptian from my father's side. I started learning Arabic at a young age, and have been using it fluently ever since. Many of those who know me marvel at the fact that I was born in the United States of America yet have such a firm grasp of the Arabic language. I often hear, "You were born here? But you don't have an accent at all!". "You don't look Arabic at all, and you speak it very well." I love how this has allowed me to live in two completely different cultures.

However, this has not been an easy task. I learned Arabic in a part of the world where the culture and environment is polar opposite to the Middle East. I have my parents, entirely, to thank for allowing me this golden opportunity, to live two different lives, to speak two languages fluently, and to express myself to so many more people whom I would not be able to otherwise. My mother had to put up with my sister, father and me as we rambled off in a foreign language, providing us ample time to tackle 'the great monster', which is what I called Arabic. Believe me, at the time, it was not fun at all. However, not until recently have I had a chance to really appreciate the Arabic language for what it is.

I hope to go to medical school and become a physician. My fascination with becoming a physician originated from my many visits to the doctors' offices and hospitals, as I was a very frail

child. I dislocated my left hip, broke my right arm along with the right fifth digit, jammed all of my fingers, and sprained my right ankle a couple of times. Ironically, what was first a strong hatred of the medical setting quickly became an appreciation and fascination for it. Additionally, as I continued my schooling I realized that I really enjoyed the sciences, especially chemistry, biology, and physics. The more I was exposed to medicine, learning about the human body, and the medical sciences and how they are intricately intertwined, the more I felt I was meant to go into practicing medicine myself. Some of those who know this comment by saying, “Yeah, sure...you just want the money and all the perks of being a doctor.” The truth is that none of this had crossed my mind at all as I searched for my future career. I have always loved helping people, and have been doing so for as long as I can remember.

One cold snowy night, as I cuddled under a soft red flannel heated blanket, staring blankly at the ceiling of my dark room, which I pictured as a clear star filled sky, my 18 year old self asked me, “Hey Shareef, how can you help others to the best of your ability? How can you take what you are good at and make it useful? How can you make a difference in the world, making it a better place?” “Well”, I responded to myself, “You can be a doctor. You can take what you are passionate for-helping people for nothing save a beautiful smile in return-as well as the sciences which you like, and try your best to heal people”. I know it may sound a little corny and somewhat typical, but it is the honest truth. I feel as if this is my calling from Allah (الله).

My facility with the Arabic language, along with my vocation to medicine, led me to a new question. Is the Arabic language, Islam, and my historical Arabic culture connected to medicine in any way? Through some brief research I found that these scientists from the Islamic Golden Age, whom I have already mentioned, are responsible for many of the early discoveries in medicine as we know it today. I was absolutely astonished at what I had stumbled upon. At this

moment I realized how these historical connections carried great meaning for me. Just like me, this research is positioned right in the middle of two very different yet connected times. We are sandwiched between a slice of archaic Arabic and Islamic culture and a slice of technologically advanced medical practice.

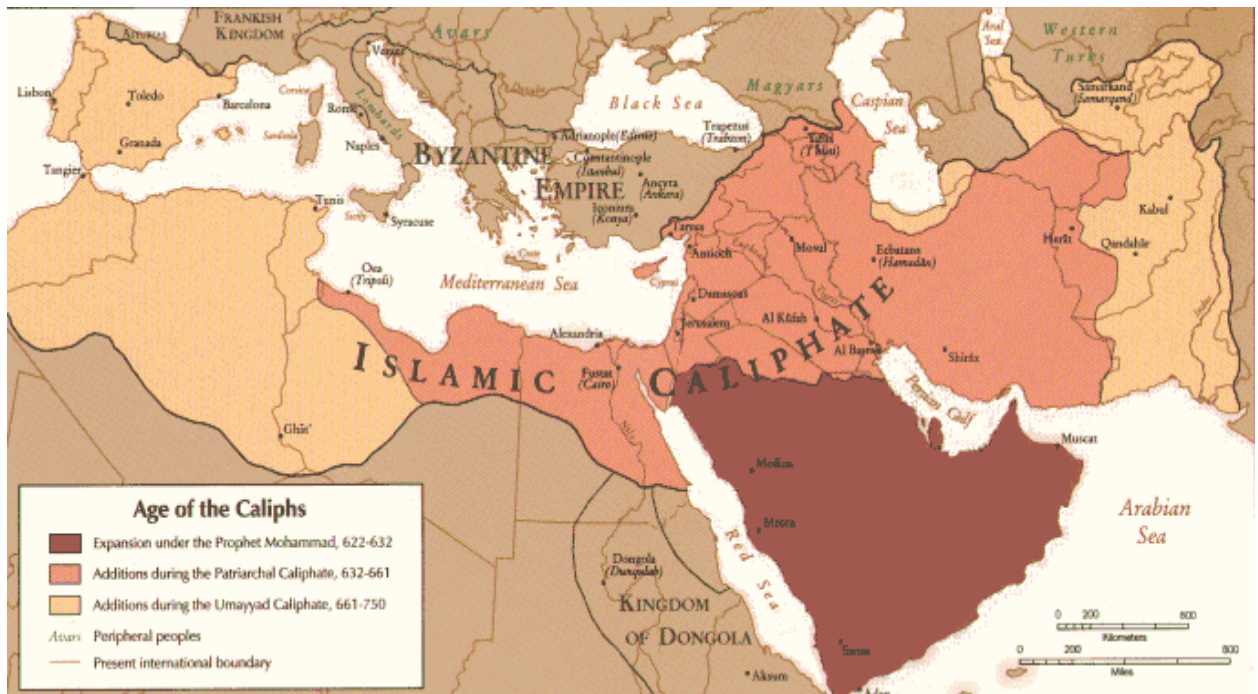
This connection between Islam and scientific discovery allows me and other Muslims to have a better understanding of our past, showing us what a great thing we are a part of, how medicine began, and the influence these Islamic scientists had on medicine. In turn, all this allows us to appreciate and embrace our past rather than be ashamed of it, to make us want to better understand the Arabic language, the religion, and to learn more about this topic. It enables Muslims to stand up for their past and support it. In large part, it was their religious faith that allowed these scientists to make great discoveries. In addition to this, many of these revolutionary thinkers were very young when they started their professional scientific careers. For example, Avicenna was only 18 years old when he “entered into the service of the Samanid court of Nuh Ibn Mansur (نوح بن منصور) (r. 976-997) as a physician”¹. This single fact, in itself, is enough to encourage and inspire so many young Muslims and Arabs to become great, to reach for the stars and not lose hope.

What were some of the discoveries, developments, inventions, and contributions that these people made? How progressive and influential were they in shaping medicine as we know it today? How applicable and relevant are these discoveries for medical practices today? How much of their discoveries are still used? And most controversially, why does it seem that awareness of their contributions is so limited today? Why does this critical time in medicine seem to be hidden in the shadows, forgotten over time? These are all questions I want to explore. Before we delve into any

¹ H. Rizvi, Sajjad. "Avicenna (Ibn Sina)." Internet Encyclopedia of Philosophy. Accessed January 12, 2016. <http://www.iep.utm.edu/avicenna/>.

of these questions, I would like to provide a brief description of the Islamic Golden Age, as is the foundation for better understanding the topic in question.

The Islamic Golden Age spans from the mid-7th to the 13th century. During this time period, the Islamic Empire covered vast lands spanning from Spain and Morocco, across North Africa, into the Arabian Peninsula, up through Turkey, and across Pakistan, just touching India. Here is a color coded map presenting these lands:



Source: https://upload.wikimedia.org/wikipedia/commons/2/20/Age_of_Caliphs.png

This is a large area of land, especially considering the fact that a small group of people were responsible for ruling it and keeping it orderly. This involved efficiently enforcing the laws of the lands while also being fair and just, maintaining a strong army, protecting the land's assets and economies, and being on good political terms with neighboring empires. This was a monumental task that the very organized, strict, religious group of people, the Caliphs of Islam, accomplished.

The first four of these caliphs are Abu-Bakr (أبو بكر عبد الله بن أبي قحافة الصديق) (632-634 A.D.), his successor Umar I (عمر بن الخطاب) (634-644 A.D.), Uthman Ibn Affan (عثمان بن عفان) (644-656 A.D.), and Ali Ibn Abi Talib (علي بن أبي طالب) (656-661 A.D.). These four set the example for the rest of the caliphs to come, including the 14 Umayyad caliphs of Damascus (661-750 A.D.) the 38 Abbasid caliphs of Baghdad, whose dynasty fell to the Mongols in 1258 A.D., and the Fatimid Caliphs (909-1101 A.D.).²

This group not only ruled these vast lands, but they helped develop and maintain an environment and culture which intertwined religion, faith, education, the arts, literature, and architecture, making them all an integral part of life rather than disconnected branches of knowledge. The Caliphs were able to connect the secular and religious parts of life, meshing them together beautifully, like different pieces of colored glass joined to create a wonderful stain glass window.

This way of life no longer truly exists, as the secular and religious aspects of life are now seen as two separate entities. The main reason for this is that back then the Quran was their guide to life, and their model was the Prophet Mohammed, Peace Be Upon Him (PBUH). That was the recipe. The politics, life, language, and all they encompassed, including scientific discovery and research, were living applications of the religion.

Islam is a religion which strongly encourages seeking knowledge. When the angel Gabriel descended from the sky to visit the Prophet (PBUH) in the cave of Hira, the first word that was spoken to the Prophet was “اقرأ”, pronounced Iqra, which means “read”. The fact that the first word revealed from the Quran was “read” speaks volumes to the religion’s values, and how much it urges Muslims to seek knowledge and education. The Quran also tells Muslims to pray “Oh Lord!

² "Caliph Islamic Title." Encyclopedia Britannica Online. November 10, 2014. Accessed January 12, 2016. <http://www.britannica.com/topic/caliph>.

Give me knowledge” (Surat Taha verse 114), to question “Are those who know equal to those who know not?”, also written as “...هل يستوي الذين يعلمون والذين لا يعلمون...” (Surat Al-Zumar verse 9). The Prophet (PBUH) also urged Muslims to seek knowledge, as he said “A person who follows a path for acquiring knowledge, Allah will make easy the passage to Paradise for him.”³ He also said “a Muslim will not tire of knowledge until he reaches Heaven.”⁴ The “Prophet said it is compulsory for every Muslim male and female to acquire knowledge. He also said that ink in the pen of a scholar is holier than the blood of a martyr. He further commanded to go acquire knowledge even if it is in China. He said that a man who travels seeking knowledge is in the way of Allah.”⁵ More simply stated, a person who seeks knowledge is *truly fulfilling the religion*.

In those centuries, finding knowledge was not as easy as calling up someone or looking something up on the internet. People had to travel across deserts and often put their lives on the line in order to find an expert in a specific topic to ask him a question. It was common that a person would leave his home and never return, dying in the desert with his horse or camel beside him, who might sadly die as well. This led to one of the most powerful statements about seeking knowledge that the prophet (PBUH) said “من خرج في طلب العلم كان في سبيل الله حتى يرجع”, which translates to “Whoever goes out seeking knowledge, then he is in Allah's cause until he returns” (Hadith 2647 from Al-Tirmidhi). When looked at more deeply, this statement means that a person who seeks knowledge for the sake of Allah, for the sake of doing good and helping others, will be in the path of Allah. Furthermore, a person who dies doing so would be considered a martyr. Another Hadith says “من جاءه أجله وهو يطلب العلم لقي الله ولم يكن بينه وبين النبيين إلا درجة النبوة”, meaning that

³ "On the Qur'an and Knowledge." Inside Islam. September 21, 2011. Accessed January 12, 2016. <http://insideislam.wisc.edu/>.

⁴ Ibid

⁵ Rafiabadi, Hamid Naseem, ed. (2007). *Challenges to Religions and Islam: A Study of Muslim Movements, Personalities, Issues and Trends, Part 1*. Sarup & Sons. p. 1141. ISBN 9788176257329.

a person who dies while searching for knowledge meets Allah, and there is nothing between that person and the prophets but the degree of prophecy.⁶

One can see that since the politics of the time period were formed and guided by the religion, and the religion was a very strong advocate for seeking knowledge, no matter where it may be found or at what cost, then the political rulers must have strongly encouraged the scientists to follow their paths seeking for knowledge.

Another important historical connection to make is the importance of Arabic as the official language of the region, and its connection to politics and religion. Arabic, being the language of the Holy Quran, was cherished and was essential for understanding Islam. Without a strong grasp of the Arabic language, there would be a lack of understanding of Islam, leading to a lack of knowledge overall.

There were many ways in which language was emphasized and reinforced as an important part of everyday life. For example, there were often poetry contests that would take place in the middle of a Bazaar where several people in the community would stand up on a stage and recite the most recent and most popular poems. In doing so, there were poetry competitions, or what I would call a 'poem off', seeing who had the best word choice, the best flow of verses, the most sophisticated vocabulary, most clever rhyming schemes, etc. These were huge events back then. People from all over would come on horseback to listen, to benefit from the knowledge of these clever poets of the time. Poets were very much respected in this society. In fact, scholars in general were given the utmost respect in this culture. These gatherings were also occasions for spreading word about recent events and news about politics, public figures, stories of courage in battle, and so on. The winners of these competitions would be rewarded a sum of money, usually from the

⁶ كنز العمال. المكتبة الشاملة" Accessed January 12, 2016. [shamela.ws/browse.php/ book-2677/page-7150](http://shamela.ws/browse.php/book-2677/page-7150).

local political figure. In fact, it was not unheard of that a ruler would offer a winning prize in a sum of gold with the same weight of the scroll, or any other material, the poem was written on.

As one can see, having a strong grasp of the Arabic language was a huge part of society during these very precious times. People saw the language as a way to get closer to the religion which, as we already mentioned, was absolutely pivotal. The government during that time recognized this, and therefore encouraged these poetry contests, as well as the flourishing, reinforcement, and strengthening of the Arabic language. These were vital and intertwined connections between the four aspects of life: religion, language, politics, and the seeking of knowledge.

Scientists and scholars of the time benefited from these inter-connected aspects of life. They enjoyed support from the politicians and rulers of the time, embraced the Arabic language, and the applications and important teachings of Islam to seek knowledge, more specifically in the sciences and medicine. After all, the prophet (PBUH) did say, “لكل داءٍ دواءٌ، فإذا أُصِيبَ دواءُ الداءِ بَرِيَّ”⁷, which means “every illness has a cure, and when the proper cure is applied to the disease, it heals by Allah's Will”. The prophet (PBUH) also said “مَا أَنْزَلَ اللَّهُ عَزَّ وَجَلَّ دَاءً إِلَّا أَنْزَلَ لَهُ دَوَاءً”⁷, meaning “Allah, the Exalted, has not sent down any disease except that He also sent down its cure. Those who know it will know it, and those who do not know it will not know it.” It is also important to note that since Islam was a way of life, their findings were done for the sake of the religion. Their work benefited others in ways that made people become more contemplative of Allah and of existence as a whole. They helped others to further marvel at Allah’s creations and to make them more religious.

⁷ متون الحديث. "المكتبة الإسلامية-الكتب" 1996. Accessed January 13, 2016.
http://library.islamweb.net/newlibrary/display_book.php?idfrom=6638&idto=6660&bk_no=53&ID=1048

Now, I would like to introduce to you some of these magnificent scientists, progressing chronologically. It is important to discuss these scientists in order of time since the discoveries made by one influenced the discoveries and contributions of the next. The first notable contributor to medicine was Abu Yusuf Ya‘qub Ibn ‘Ishaq Al-Sabbah Al-Kindi, or أبو يوسف يعقوب بن إسحاق الكندي in Arabic. He was better known to the western world as Al-Kindi. He was born in Kufa, Iraq in 801 A.D. and died in Baghdad in 873 A.D. This man was a great philosopher, hence his nickname “The philosopher of the Arabs”. He was also a polymath, mathematician, musician, and a physician.

As an observant scientific figure, Al-Kindi opened a wide variety of subjects, providing a lot of ideas that would be investigated more thoroughly later on. He wrote hundreds of treatises on a very wide variety of scientific and philosophical disciplines like mathematics, philosophy, psychology, optics, music, and medicine. Over 30 of these treatises were in the discipline of medicine. It has been noted that his approach to medicine and science in general was very mathematical, and this became very obvious in his contributions to medicine, more specifically pharmacology. For example, his major contribution to pharmacology was his development of a mathematical scale to quantify the strength of drugs, especially compound drug.⁸ This is extremely important, especially considering how particular, responsive, and sensitive the body is to foreign substances such as drugs. The fact that he realized that certain drugs and chemicals inserted into the body must be quantified very accurately is a historical achievement in itself. Developing a mathematical system to explain pharmacology is absolutely pivotal in establishing that medicine and any other science dealing with the human body must be very particular and exact.

⁸"Al-Kindi." Stanford University. March 17, 2015. Accessed January 12, 2016. <http://plato.stanford.edu/>.

In addition, Al-Kindi created a system based on the phases of the moon to quantify the strength of a system that would allow a doctor to determine in advance the most critical days of a patient's illness⁹. He used a unit of time that Muslims were used to, the lunar system, as this is the foundation of the Islamic Hijri Calendar. Additionally, by making this idea of a numerical basis to medicine accessible to those around him allowed for two things; it allowed people not only to practice and become more familiar with this concept of time and connecting that with the rhythmic nature of the body, but it also allowed this concept to grow and become more developed as it would be used later on, although in a more accurate and sophisticated manner.

Al-Kindi was greatly influenced by the great Greek philosopher and physician, Galen. Al-Kindi's contributions, as well as of the other Islamic scientists were greatly indebted to Galen's works. Other Scientists from the Islamic Golden Age who were greatly influenced by Galen's works include Muhammad Ibn Zakariya Al-Razi (محمد بن زكريا الرازي) and Avicenna (أبن سينا). With the Islamic Empire being at its peak between the 7th and 13th centuries, while Europe was in its dark ages or early medieval period, it was the Muslims who advanced the work of the Greeks. The Islamic Empire, more specifically their scientists, learned from the sophisticated and quite advanced logic and knowledge found in Ancient Greece, using it as a basis for further exploration and discovery. Despite their differences in religion, these scientists kept their minds wide open and learned from the Greeks, forming a bridge between the Greeks and the Europeans, as well as the rest of the world. These Islamic scientists were knowledgeable and open minded, listening to and understanding the masterful works of the Greeks in many fields, especially medicine. Their openness to the work and wisdom of different culture allowed them to innovate and evolve the

⁹ Reffner, Ervin. "Islamic Alchemists." In *The Esoteric Codex: The Alchemists*, 74. First Edition ed. Lulu.com, 2015.

science they formed then. These scientists can be role models for Muslims today, exemplifying how knowledge and religion are very much intertwined.

Another great scientist from the Islamic Golden Age was Muhammad Ibn Zakariya Al-Razi (محمد بن زكريا الرازي). He was born in 854 A.D. and died in 925 A.D. in the Persian city of Rey. In Persian, the name ‘Razi’ means ‘from the city of Rey’, hence his last name. It is common in the Muslim world for the last name of a person to indicate where they are from. Al-Razi is considered to be one of the greatest physicians of the Islamic world.¹⁰ It has been said that he was an alchemist before he knew about medicine. He did, however, learn about medicine from historical figures including the Greeks, as well as from other Arab scientists. As a good scientist, he took what he learned from others and added to it from his own findings and judgment. He wrote several books which have proved to be some of the most important contributions to medicine. Some of these books include the “Kitab Al-Mansuri” (كتاب المنصوري), “Al-Burhan” (البرهان), and “Kitab Al-Hawi fi Al-Tib” (كتاب الحاوي في الطب), the last of which includes some of his more notable contributions, including his treatise on Smallpox and Measles, distinguishing the two from each other. There was so much vital information that the book was translated into several languages, including Latin, and Greek amongst others. A picture of the cover for the revised book is as follows:

¹⁰ "Al-Razi | Persian Physician." Encyclopedia Britannica Online. Accessed January 12, 2016. <http://www.britannica.com/biography/al-Razi>.

الحاوي في الطب

تأليف

أبي بكر محمد بن زكريا الرازي الطبيب
المتوفى سنة ٥٢١٣ هـ

مراجعة وتصحيح

د. محمد محمد إسماعيل

المجلد الأول

والمحتوى:

الجزء الأول : في أمراض الرأس

الجزء الثاني : في أمراض العين

الجزء الثالث : في أمراض الأذن والأنف والأسنان

منشورات

مركز أبي براهيم

للشؤون الثقافية والاجتماعية

دار الكتب العلمية

بيروت - لبنان

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Beirut: 2000.

The Kitab Al-Hawi fi Al-Tib is one of the most important books written about medicine.

This book contains much information regarding many diseases of different parts of the body. I

managed to find a copy in the original Arabic, which is 3945 pages long, showing the magnitude of Al-Razi's work. There are 8 sections to this piece of work, each of which is divided into multiple subsections. Some titles of these subsections include "Diseases of the head", "Diseases of the eye", "Diseases of the ear, nose, and tongue", "Diseases of the lungs", "Diseases of the esophagus and stomach", etc. This book contains as much information Al-Razi could gather about every part of the body, including the, heart, liver, spleen, intestines, uterus, kidney, urinary tract, and much more. He even includes different sections which discuss medicines, cures, and pharmacology.

The 17th subsection of the book is called "The Smallpox, The Measles, and The Plague." As the name suggests, this section reveals much information regarding the identification, signs, and treatments of these diseases, or at least how to minimize their effects. Al-Razi constantly refers to what others have said with regards to this topic, adding his own thoughts, observations, and expertise, as already mentioned. It is this interaction, combined with his writings about this topic, which created one of the world's first foundational pieces for the understanding of measles, smallpox, and the plague. This is something that we Muslims should be extremely proud of, that a Muslim so long ago, during a time when others were in the dark, started something as groundbreaking as this.

Additionally, Al-Razi was the "first one to use animal gut for surgical sutures and used plaster of Paris for casts to heal broken bones."¹¹ This is another important contribution to the medical field, as it paves the pathway for future innovations in surgery, showing that not only can surgery be practiced more safely and efficiently, but that there is much to be developed in this field.

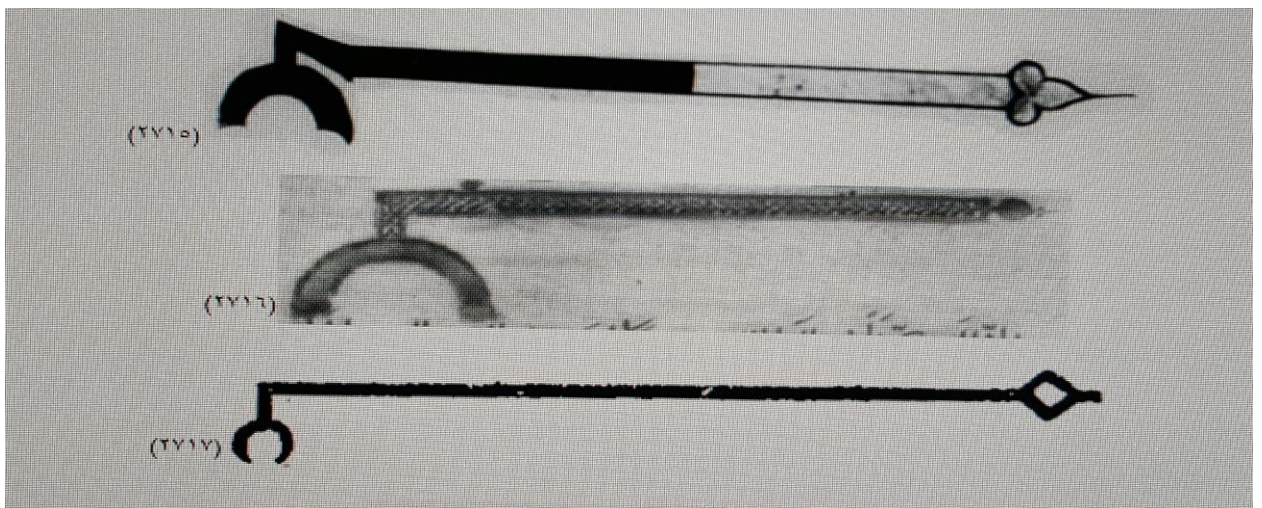
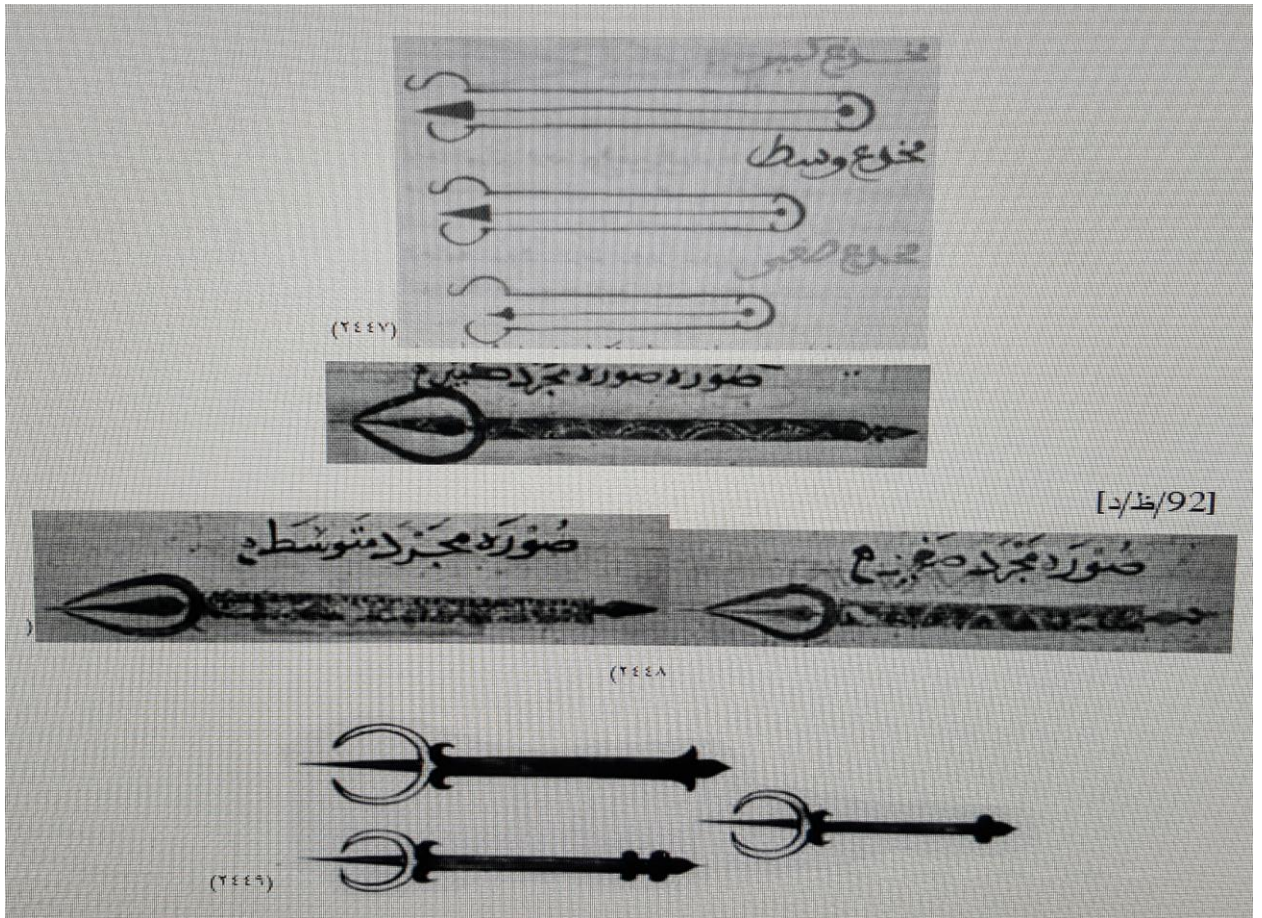
¹¹ Virk, Zakaria. "Abu Bakr Zakariya Al-Razi (d.925)." Abu Bakr Zakariya Al-Razi (d.925). Accessed January 12, 2016. http://www.academia.edu/6593202/Abu_Bakr_Zakariya_al-Razi_d.925_.

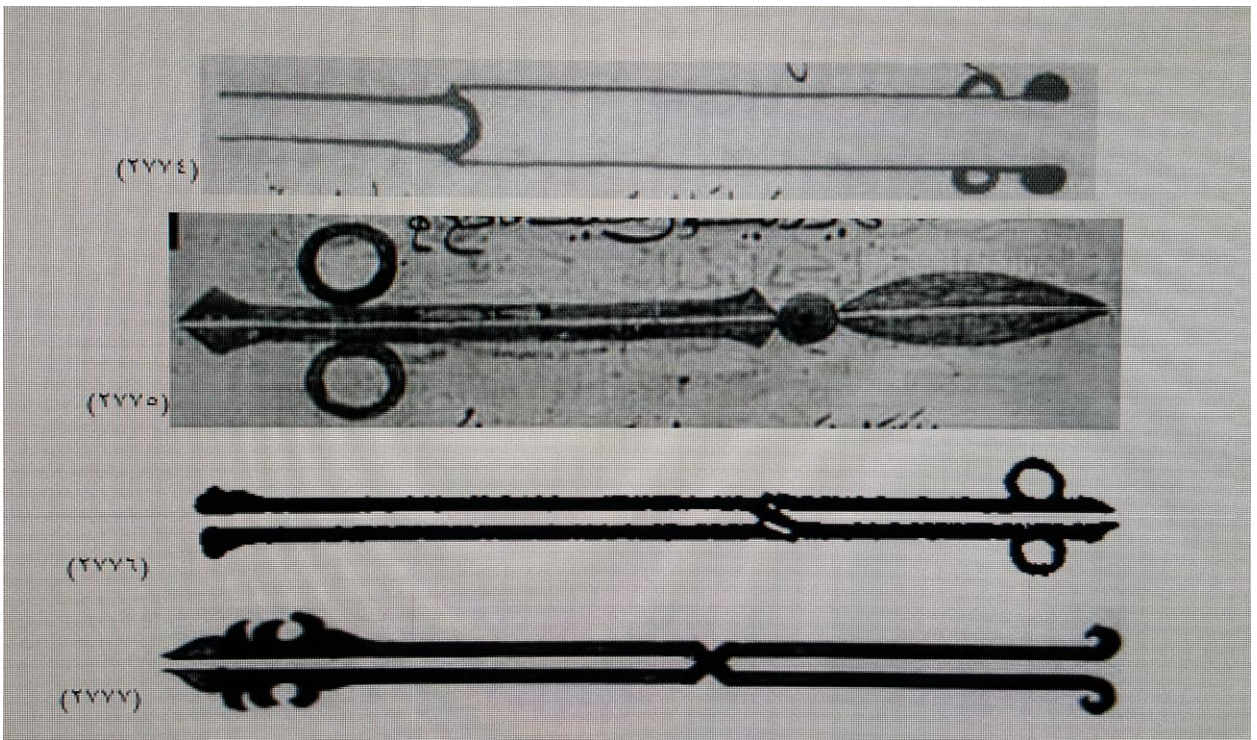
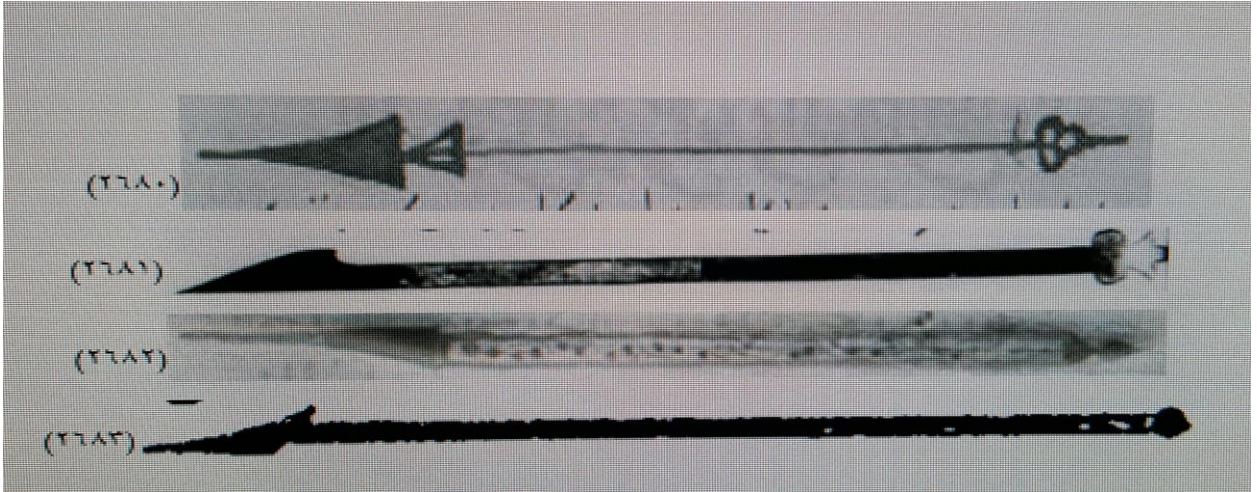
Abu Al-Qasim Khalf Bin Al-Abaas Al-Zahrawi (أبو القاسم خلف بن العباس الزهراوي) is the next major figure in medicinal development in the Islamic Golden Age. He was born in 936 A.D. near Cordoba, Spain and died there in 1013 A.D.¹²Al-Zahrawi was known as the ‘father of surgery’, becoming the greatest medieval surgeon to have appeared in the Islamic world. He was appointed to be a court physician to the Andalusian Caliph, Al-Hakim II. In fact, Al-Zahrawi developed more than 200 tools and instruments for medicine, a lot of which were subsequently updated and evolved into some of those we still use today in surgery. These methods and tools that he had developed are presented clearly in several books including “Kitab Al-Tasrif” (كتاب التصريف) and “Kitab Al-Zahrawi Fi Al-Tib L’amal Al-Jaraheen” (كتاب الزهراوي في الطب لأعمال الجراحين). The latter of these books, which consists of 30 volumes, contains information explaining how to cauterize a wound, the differences between cauterizing different tissues in various parts of the body, the different tools that are necessary for certain tasks at hand, instructions on how to use these different tools, how to position your hands during an operation, how to cure different physical conditions, etc. This is just a short list of what this book contains, as it goes into much depth regarding these issues, as well as others. This encyclopedia became a standard reference for Islamic and European medicine for over 500 years.¹³

In looking at this book, one can observe several things. First, it contains many pictures of the tools that are used for the different procedures. Initially, many of these tools resemble medieval torture devices, looking somewhat crude, dark, sharp in strange parts, and somewhat awkward. Some of these instruments are as follows:

¹² Science Museum. Brought to Life: Exploring the History of Medicine." Abu Al-Qasim Khalaf Ibn Al-Abbas Al-Zahrawi, Known as Albucasis (936-1013). 2005. Accessed January 12, 2016. <http://www.sciencemuseum.org.uk/broughttolife/people/albucasis.aspx>.

¹³ Shaikh, Ibrahim. "Abu Al-Qasim Al-Zahrawi the Great Surgeon." Abu Al-Qasim Al-Zahrawi the Great Surgeon. Accessed January 12, 2016. <http://www.muslimheritage.com/article/abu-al-qasim-al-zahrawi-great-surgeon>.





Source for all images: عباس الزهراوي, أبي القاسم خلف بن. كتاب الزهراوى في الطب لعمل الجراحين. *Damascus*: وزارة الثقافة: مديرية احياء ونشر التراث. محمد هاشم زكور and د. محمد ياسر زكور. Edited by العربي.

This select few tools are different types of probes, scissors, and clamps to help keep the incision open, and what seem to be pointed extractors.

I myself have been fortunate enough to shadow many doctors in the operating rooms at Lawrence General Hospital, seeing 22 procedures. During my time spent in the operating room, I

have seen hundreds of tools, instruments, machines, and chemicals used during these procedures. These many tools are all different, each serving a slightly different purpose. During these many hours, I have always wondered who came to design them, and how did they know to make one look the way it does, especially when some of them look quite interesting. When I looked at the pictures in this book, I recognized some of them, being able to guess what their role was in each procedure Al-Zahrawi talks about. The fact that they resemble some of the tools used in today's medicinal practice, shows that he was indeed a great influence in shaping surgery as we know it today.

Also, during the surgeries that I have seen, all of them have included some cauterizing component to help with the incision, extract an organ, or simply stop the bleeding. After looking at all of discussion Al-Zahrawi has about cauterizing, I can now say that we have him to thank for this development in surgery.

In addition to this, Al-Zahrawi was the first to surgically remove gallstones and kidney stones. Instructions in how to do so, including the different tools he used to carry out these procedures, are explained in detail in "Kitab Al-Zahrawi Fil-Tib". To be the first to successfully perform such a procedure is a huge accomplishment, one that shows a promising future in the surgical field.

As one reads this book, the number of religious references become very clear, as he constantly uses the phrase "إن شاء الله", meaning "God willing". This phrase is usually used when one tries to accomplish something, and does everything they can to complete this goal. After having done everything in their power, they say this phrase to show that the goal will only be reached by God's Will. Again, Al-Zahrawi shows that science and religion can be an integrated

lifestyle rather than two completely unrelated fields, that being religious and relying on God is of the utmost importance in the practice of medicine and in everyday activities.

During Al-Zahrawi's time, another man by the name of Abu Ali Al-Hasan Ibn Abdullah Ibn Sina (سينا أبو علي الحسين ابن عبد الله ابن), more commonly referred to by the Western World as Avicenna. This man, one of the founding fathers of modern medicine, was born in 980 A.D. in a small village called Ashfanah, near Bukhary, Iran, and died in 1037 A.D. in Hamadan, Iran. This Muslim physician was the most famous and influential of the philosopher scientists of the medieval Islamic world. Whenever one discusses the Islamic influence on medicine, Avicenna's name is usually the first name mentioned. He wrote many books on medicine, which are the main reasons why he is considered to be the most influential man on medicine during the Islamic Golden Age. Two of these hundreds of books include "Kitab Al-Shifa" (كتاب الشفاء), or "The Book of Cures", which is a four part encyclopedia covering topics from logic, physics, Mathematics, and Metaphysics, and The Canon of Medicine (القانون في الطب)", which is the most popular and arguably the most referenced book for medicine from this time period.

"The Canon of Medicine", is a five part book which eventually became the preeminent source for medical schools in Europe (rather than the Al-Hawi fi Al-Tib by Al-Razi), due to its better organization and clarity when covering different topics. The topics covered in this book are vast, discussing high fevers, the different organs, differences amongst races and ages in medicinal issues, all the different kinds of bones including teeth, vertebrae and the appendicular skeleton bones, how to mend broken bones, the different muscles of the body, how they move, their anatomy, the nerves of the body, where they originate and where they insert, etc. In other words, this book discusses, in great detail, the anatomy of the body, the etiology of diseases, hygiene, colds, the topic of health and sickness, compound drugs, death's inevitability, 'head-to-toes'

diseases, and diseases that are not specific to a certain organ. Similar to Al-Zahrawi, Avicenna discusses how to cauterize wounds, although in less depth.

In addition to this, Avicenna was “the first physician to recognize that germs can be transmitted through air, water, or soil, noting in *The Canon of Medicine* ‘at certain times air becomes infected and anyone breathing the infected air falls sick.’¹⁴ This is a great accomplishment, to be able to identify that there are airborne and waterborne diseases in a time when scientific advancements were not strong enough to allow one to physically see anything much smaller than what can be seen with the naked eye. “Avicenna, and to a lesser extent Rhazes (Al-Razi), gave many prominent medieval healers a framework of medicine as an empirical science, therefore influencing modern medical practice.”¹⁵

All of the scientists who came after Avicenna during the Islamic Golden Age were so influenced by his works, findings, and discoveries that they used him as a source of information when writing their books on medicine. Some of these books that were written by other scientists were in fact commentaries on *The Canon of Medicine*, either clarifying what had been said, adding their own discoveries, experiences, and pieces of expertise. One of these later scientists is Ibn Rushd.

Abu Al-Waleed Mohammed Ibn Ahmed Ibn Rushd (أبو الوليد محمد ابن احمد ابن رشد), more commonly known as Averroes, was another contributor to medicinal discovery during this time period, as he lived from 1126-11198 A.D.. Ibn Rushd was from Cordoba, Spain, like Al-Zahrawi. Just like many of the other scientists, he influenced many different subjects including physics, astronomy, psychology, philosophy, and medicine. Some of his more noteworthy pieces of writing

¹⁴ Khan, Aisha. "Avicenna (Ibn Sina): Muslim Physician and Philosopher of the Eleventh Century." In *Avicenna (Ibn Sina): Muslim Physician and Philosopher of the Eleventh Century*, 68. First Edition ed. New York, New York: Rosen Pub. Group, 2006.

¹⁵ "Avicenna (Ibn Sina)." Accessed January 12, 2016. <http://www.iep.utm.edu/avicenna/>.

about medicine were a medical encyclopedia called *Kulliyat*, or *Colliget*; a compilation of works referring to Galen, and a commentary on Avicenna's "The Canon of Medicine". Although he was well known for his contributions in philosophy, his additions to the field of medicine are indeed noteworthy.

Another major contributor to the medical field was Ibn-Albaitar (ابن البيطار) who lived from 1197 to 1248 A.D. He was a pharmacist, botanist, physician, and scientist from Malaga, Spain. He was called 'Ibn-Albaitar' because his father was a veterinarian, and in Arabic that name means 'the son of the Veterinarian'. It is common for the last name to have some indication about who that person is, just like his teacher, 'Al-Nabati', which means 'the botanist'. Many may not have heard of this great man despite his important accomplishments. Studying at the hands of Abu Al-Abbas Al-Nabati (أبو العباس النباتي), he learned much about plants and their uses in everyday situations. With this very useful knowledge that he obtained, he added between 300 and 400 types of medicine to the one thousand previously known, systematically recording these additions in a book called *The Book of Medicinal and Nutritional Terms* (كتاب الجامع لمفردات الادوية و الأغذية). This book

“is a pharmaceutical encyclopedia listing 1400 plants, foods, and drugs and their uses. It is organized alphabetically by the name of the useful plant or plant component or other substance -- a small minority of the items covered are not botanicals. For each item, Ibn Al-Baitar makes one or two brief remarks himself, and gives brief extracts from a handful of different earlier authors about the item.”¹⁶

One of these early authors include Avicenna, whose second part of "The Canon of Medicine" is referenced.

Equally as important to this was the discovery of the pulmonary circulatory system by Ibn Al-Nafis (علاء الدين أبو الحسن عليّ بن أبي حزم القرشيّ الدمشقي). He was born in a village called Al-

¹⁶ Reffner, Ervin. "Islamic Alchemists." In *The Esoteric Codex: The Alchemists*, 106. First Edition ed. Lulu.com, 2015.

Qurashiyya near Damascus and lived from 1210-1288 A.D. This man was a great contributor to the advancement of medical knowledge and science during the 13th century. Though an ophthalmologist by trade, he is most recognized for the pulmonary circulatory system. He was the one who not only identified it, he also proposed which blood in this system was oxygenated and deoxygenated, identifying that the blood travels from the heart to the lungs and back, which chamber of the heart the blood enters and exits.

Al-Nafis, just like many other scientists, also wrote a commentary on Avicenna's "The Canon of Medicine", in addition to his many other writings. These writings included "Al-Shamil fi Al-Tib" (الشامل في الطب), which was an encyclopedia of medicine comprised of 300 volumes, although left incomplete due to his death, an original contribution to the field of ophthalmology, and a book on the effects of diet on health called "Kitab AL-Mukhtar Min Al-Agghiya" (كتاب المختار من الأغذية).

The last of these scientists is Ameen Al-Daula Abu Al-Farag Ibn Ya'qub Ibn Ishaq Ibn Al-Quff Al-Karaki (أمين الدولة أبو الفرج بن يعقوب بن إسحاق بن القف الكركي). Just like Al-Nafis, Ibn Al-Quff (1233– 1286 A.D.) wrote many books and had just as influential a scientific career, arguably even more so. Born in Jordan, he was an Arab physician, surgeon, and author of the earliest medieval Arabic treatise intended solely for surgeons. He authored Kitab Al-'Umda fi Al-Giraha (كتاب العمدة في الجراحة) or *Basics in the Art of Surgery*, a general medical manual covering anatomy and drug therapy as well as surgical care, with some detailed concentration on wounds and tumors. Kitab Al-Umda fi Al-Giraha was by far the largest Arabic text on surgery during the entire medieval period. In this book Ibn Al-Quff explained the connections between arteries and veins, which was the earliest description of capillaries. He also explained how valves worked, as well as the direction

they opened and closed. Ibn Al-Quff did this work before the invention of a microscope, which is absolutely amazing in its own right.

Al-Quff wrote many other books. A sample of these include “The Comprehensive of the Healing Arts” (الشافى فى الطب), which was his first medical encyclopedia completed in 1272 A.D., Zubad at-Tabib (زباد الطب), a book with advice for practicing physicians, and Sharh Al-Kulliyat (شرح الكليات), another commentary on Avicenna's work “The Canon of Medicine”, Risala fi Manafi Al-Ada’ (رسالة فى منافى الأءاء), a treatise on the anatomy of the body's organs, and Jami’ Al-Gharad fi Hifz Al-Sihhah Wa-Daf’ Al-Marad (جامع الغرض فى حفظ الصءة وءفع المرض), which describes preventive medicine and the preservation of health in 60 chapters.

All of these great thinkers, innovative minds, and influential people in the field of medicine are some of the most notable people in human history. It is important for us to reminisce about these founding fathers of medicine. They remind us of some of this world’s precious treasures that have been somewhat lost overtime in the shadows of technology and ignorance. It is especially important for the Muslim and Arab youth, those currently practicing medicine, and those interested in the medical field to know and think about these figures, as we can connect to them at a personal level. Their stories, influences and existence provided more than just what they physically did. These scholars showed the world how great the Islamic Golden Age was, how wonderfully religion and the sciences meshed together and, how seemingly anything is achievable.

What are some of the ideas that we can take away from these scientists? These scientists accomplished more than any one person could have ever dream of. If they could do what they did with so much less resources than we have, why can’t we do the same? Why don’t we do more? The knowledge, resources, and help is out there we just need to look for it. These scientists faced unimaginable adversities, yet due to their great determination, hard work, and self-discipline they

made it seem like anything was possible. They showed us not to fear failure. Like Thomas Edison and his famous 1,000 ways to not make a light bulb, they failed many times, yet were able to find a way to succeed in their endeavors. These great thinkers also showed us to not be afraid of starting a trend or to initiate a movement, but to be afraid of not taking action. We learn, using them as good role models, to not hesitate from doing something great, but to face life with full confidence, enthusiasm, and determination.

Some may read this and ask, “Where should I direct myself after having read this? Where do we go from here?” To this I would respond, “Use these models as inspiration for discovery. Look to lives for guideline. Direct yourself to shed light onto darkness. Venture into the unknown. Build yourself up rather than blindly allowing others to shape you. Live without fear or pessimism, but face challenges with optimism. Eliminate any negativities with a vengeance. Be proud of your past and cherish your present. Befriend your religion and use it as a stepping stone to become stronger, confident, and great. Rely on God while having great determination. Don’t shy away from the help of others. Above all, inspire.”

These scientific accomplishments of the Islamic Golden Age are historical facts. Yet they have been forgotten over the years, even in the scientific and medical communities. Why is this the case? One explanation is that people prefer to look forward, to the future. People tend to care less about the past than the present and future. This is part of human nature. Naturally, people are more likely to care about, be interested in and discuss the latest and greatest of technological advancements and new groundbreaking ways to cure diseases that were once deemed incurable. The thought process is, if the past couldn’t cure these diseases, why should we even consider to talk about it? But without this magnificent past, the present could not be possible. We could very well still be in the dark ages without this vitally important past.

Secondly, the fact that Muslims were the ones to discover all of these things could be a factor as well. With all of the unfortunate tragic events that are taking place, seemingly daily, worldwide, it is absolutely understandable. One may pose the question: “How can we praise the religion that is a commonality between both these scientific figures and Islamic extremists?” The answer, simply put, is that Islamic extremists do not exemplify the religion's teachings and therefore do not represent what Islam teaches. But these scientists of the Golden Age do.

Another reason for such a disappearance of this topic is that westerners seem to like to think medicine started with the Enlightenment of 17th century Europe. Unfortunately, the western world forgets to look further back than this time period, neglecting the Ancient Greeks, Muslims, and any other major civilization who proved to be the true founding fathers of medicine.

Lastly, and probably the most obvious, is the fact that these scientists lived so long ago. Naturally overtime, their works have been lost, misplaced, buried, burnt, tarnished, weathered, or anything else that would have physically affected their works. If a book did not physically survive, it could not have influenced people living hundreds of years later. However, now that this topic has resurfaced, I can only hope that this becomes an inspiration for those who can personally connect to this topic. I hope that those who are positively affected spread the word to teach and inspire others. After all, the prophet Mohammed (PBUH) said “خيركم من تعلم العلم وعلمه”, meaning “The best of you are those who learn knowledge and teach it.”

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