Contributions of Muslim Scientists

Jabir Bin Hayan:

Ibn-Khaldun described him in his book when he came to talk about chemistry and said, ''The pioneer in chemistry was Jabir Ibn-Hayan, they even attribute the science to him and say 'the science of Jabir', and he wrote seventy books on chemistry''
He is Abu-Musa Jabir Ibn-Hayan Ibn-Abdullah Al-Azdy, from the Yemeni tribe of Azd. Some of the people of this tribe migrated to Al-Kufa after the collapse of the dam of Ma'areb. He was born in Tus and settled in Baghdad after the establishment of the Abbassid caliphate. His relation was tightened with the Persian family of Al-Baramekah and his life extended from 103-200 Hijri/ 721-815 AC.
Jabir is considered the founder of experimental chemistry. He was the first to acquire his information from experiments, observation and scientific conclusion. He had so many discoveries and works to the extent that chemistry was attached to his name, they used to say ''the chemistry of Jabir'' and ''chemistry is for Jabir'', and also '' Jabir's craft''. He was also named '' the master of chemists'' and '' the father of chemistry.''
Before Jabir, there were merely several primitive old jobs, that mingled with many crafts like embalming (in ancient Egypt), leather tanning, dying, mining and oil purification. But Jabir Ibn Hayan managed to develop chemistry and elevate it from this lowly rank into a high science, by adding so much theoretical, practical and scientific knowledge and by setting the basis and rules for preparing and dealing with chemical substances, thus he is considered the master of chemists without any counterpart.
Chemistry started—as we mentioned in the first article on chemistry—as a superstitious science that depended on old legends. The idea of turning cheap metals into valuable ones controlled the scene because scientists who came before Islam believed that metals such as gold, silver, copper, iron, lead and tin are from the same type, and only differ due to the effect of heat, cold, dryness or humidity on it. These are all changeable attributes according to the theory of the four elements (fire, air, water and earth) and thus these elements can be changed into one another with the aid of a third element, elixir. Based on this view, some scientists from the civilizations that preceded the Islamic civilization imagined that they could invent the elixir of life or the stone of wisdom that can remove the deficiencies of life and prolong life, and this was known as the science of alchemy.
Some of the early Arab and Muslim scientists like Jabir Ibn Hayan and Abu Bakr Al-Razi were influenced by the theory of the four elements that the Arab and Muslim scientists inherited from the Greek. However they studied it accurately and this led them to discovering the scientific experimental method and applying it in the field of experimental sciences.
Jabir used to say about this experimental method that ''the condition for perfecting this craft, is work and experiment. He who does not work or experiment will achieve nothing.''
Also, in the first article in the great book of properties he says: ''In this book we mention the properties of what we have seen after experiments and tests regardless of what we have heard or read. And thus we mentioned what proved to be right and we refused what proved to be wrong and we also compared what we discovered to what people mentioned''
And thus Jabir is considered to be the first to introduce scientific laboratory experiments in the scientific research method that he established. He sometimes called experimenting ''training''. He used to say that ''he who is well-trained is a real scientist, and he who is not well-trained is not a real scientist; you better train well in all crafts, a well-trained craftsman excels and he who is not well-trained fails''

And thus, Jabir made a bigger step than the Greeks, by introducing experiment as a basis for work and not only static meditation.
Jabir's works that depended on laboratory experiments were the most important serious trials in studying nature in an accurate scientific way. He was the first to introduce the laboratory experimental method, and the procedures he pursued in his researches are almost identical to those followed today. His procedures can be summarized in three steps:
The first: the chemist has to set an assumption through his observations so as to explain the phenomenon he wants to explain.
The second: to deduce conclustions based theoretically on his assumptions.
The third: to take these conclusions back to nature and see whether it will support his new findings or not. If they proved to be true, the hypothesis changes into a scientific law that can be relied upon in detecting how nature will react under certain circumstances.
Halymyard was very interested in Jabir's works, his scientific method and his books. He was keen on showing the scientific value of his work, and he said later that ''the special thing about Jabir was that he showed and insisted upon the importance of experiment much more than all the alchemists who came before him''

Jabir Ibn Hayan...Priorities and Achievements:

Jabir conducted so many laboratory experiments, some of which were already known before his time and some of which were new experiments. Among the methods that he used were evaporation,distillation, crystallization, sublimation, filtration, melting, condensation, and dissolution. He studied the properties of some elements accurately and thus discovered the complex silver ammonium ion.
He prepared many chemical substances, he was the first to prepare sulfuric acid from alum by distillation, he also prepared mercury oxide, nitric acid, which is known as silver water and he used to call it hydrolyzing water or water of fire. He also prepared hydrochloric acid, which is called the spirit of salt. He was the first to discover caustic soda, as well as the first to retrieve silver nitrate, which he called the rock of hell. He also prepared mercury chloride (Al Sulaymany), nitrohydrochloric acid (the royal water) which was named thus because it could dissolve gold, the king of metals.
He was the first to notice the precipitates of silver chloride upon adding table salt to silver nitrate. He also used alum to make dyes on cloth permanent. He prepared certain substances that can waterproof clothes; these substances are aluminum salts that are derived from organic salts that contain hydrocarbon molecules. He concluded that fire adds a blue color to copper, while copper adds a green color to fire. He was the first to separate gold from silver using an acid, and he explained in detail the method of preparing arsenic, purifying metals and dying cloth.
He was the first to use the sensitive balance and the extremely accurate weights in his laboratory experiments; he weighed amounts that are less than 1/100 pounds. He was the one who prepared potassium carbonate, sodium carbonate, alkaline lead and antimony. He also used manganese dioxide to remove colors in the glass industry. He also crystallized the theory that states that a chemical reaction is achieved by a combination between the atoms of the reacting elements, and he gave as an example for that mercury and sulpher, when they unite to form a new substance. He used to carry out most of his experiments in a special laboratory that was discovered in the ruins of the city of Al-Kufa at the end of the twelfth Hijri century (the eighteenth century A.C.)

Jabir's Publications:

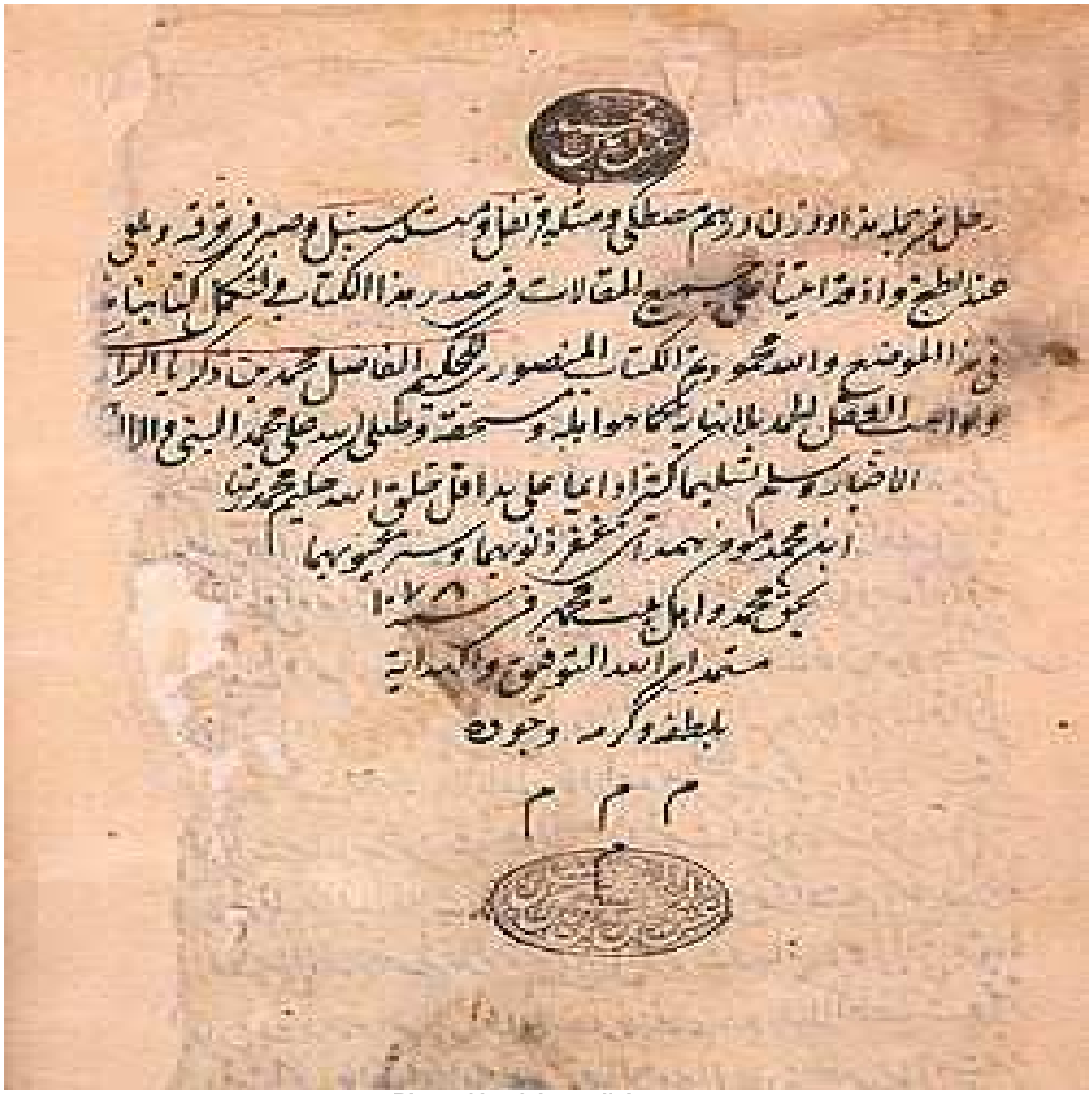
G. Lebon says in his compilations ''A scientific encyclopedia is made from the works of Jabir, this encyclopedia contains the best of what the Arabic scientist achieved in his times. His books contained the description of chemical compounds that were completely unknown before him.''
Jabir had so many works that influenced the West, and they copied from these works. Ibn al-Nadeem said that he had 306 books in chemistry all over the world written in his special style, and although most of them were lost, still eighty of these books are preserved in libraries in the East and West. Robert Alshestry (539 A.H- 1144 A.C), Girard Alcremony (583 A.H-1187 A.C) and others translated most of his books into Latin in the twelfth century. His translated works represent the base from which the modern science of chemistry was launched to the entire world.
The book of Poisons and Preventing Their Damages is the most famous work of Jabir and it is composed of five chapters. He divided poisons in it into animal, plant and rock poisons.

He also mentioned the antidotes to these poisons and their reactions in the body. This book is considered a link between chemistry and medicine.
One of his most famous books as well is The Big Book of Properties and its original version exists in the British museum.
He wrote also the book of Measures and it means the work that is dependent upon experiment, the book of Weights, and the book of Iron in which he describes the process of retrieving iron steel from its prime resources, and describes how to make steel by melting in special bowels. He also wrote a book named The End of Perfection and it is an amazing book in chemistry. He also wrote a paper on ovens.
He, additionally, has written papers on mirrors. He wrote The Book of Seventy, which is composed of seventy articles about his most important experiments in chemistry and the conclusions that he reached. It is considered the best of what the Arabs reached in their time.
Furthermore, Jabir has a book on alchemy that he named Mercy. In this book he discusses the possibility of converting metals to gold. He also wrote other books called The Twenty Sentences, The Secrets of Chemistry, The Basis of Chemistry. He had works in mathematics, philosophy and poetry as well. Some of his books were translated to Latin, such as The Book of Seventy and The Book of Mercy, and there are books by him in Latin, that could not be found in the original Arabic version like the books of The Search for Perfection and, The Covenant and The Furnace.
Jabir's books were translated to Latin, and they remained the best reference in the field of chemistry for around a thousand years. His works were studied by famous Western scientists such as, Coup, Bartholiet, Krauss, and Halymard who was fair in his assessment of Jabir and who and put him on the top, thereby eliminating all doubts that were directed at him by unfair or biased scientists. Also, Sarton who enriched a period of time with the history of the Islamic civilization, writes, ''Jabir did not know that the books he wrote could never be perceived to be written by a man who lived in the second Hijri century, because of the vast number of books and because of the abundance of information included in them.''
This is how Muslim scientists were and this is what their creations were like. We ask Allah SWT to give back to our nation its glory and pioneering through the efforts and hard work of its sons and daughters, who follow the footsteps of their ancestors.

Source: islamstory.com

Al-Razi

It is



Rhazes' book in medicine

remarkable when a human being is deemed as one of the faces of civilization. We often ascribe civilization to the achievements of a group of people who have excelled in contributing to the knowledge of fields such as medicine, engineering, and architecture. The Islamic civilization introduced men and women who were figures of civilization to the extent that a study of their lives is actually a study of civilizations itself.

Islam has helped the progress of humanity in a broad spectrum of fields, with its followers representing all dimensions of civilization. One example is Al Razi (Rhazes) ,may Allah have mercy on him, who was not only a doctor and a teacher but a master in many other fields including ethics and religion. He excelled in these fields and was an eminent figure in religious and medical sciences becoming unquestionably one of the most important figures in Islamic civilization.

Al Razi : the Man

Abu-Bakr Muhammad Ibn-Zakariya Al Razi was born in the year 250 A.H (864 A.D) in the city of Rayy, six kilometers south east of Tehran. From an early age, he loved the study of science and scholarly discipline. In Rayy he studied law, medicine, and philosophy, but this did not satisfy his craving for knowledge. Although the city was full of scientists and scholars, it was not a city that embraced all the earth sciences at that time.

Therefore, Al Razi headed to the world's center of knowledge, Baghdad, capital of the AbbasidsCaliphate. He studied in an intensive exchange program and studied different sciences with a special focus on medicine. The first professor in that field was Ali Ibn-Zain at-Tabariyy, author of the first international medical encyclopedia named "Ferdaus al-Hikma" or the Paradise of Wisdom.

Passionate about Medicine

Al Razi was also interested in other sciences related to medicine such as chemistry and herbal medicine. He was interested in philosophy because it included the views of Greek philosophers, who were also students of medicine with his main teacher in philosophy, al-Balkhiyy. Al Razi, may Allah have mercy on him, devoted many years of his life, to learning all that he could about medicine until he excelled noticeably in that field.

After he had returned to Rayy from Baghdad, he became director of the hospital of Rayy, one of the most advanced hospitals known in Islam and gained an unrivalled reputation in terms of his success in treating previously incurable cases. His achievements were known to all and eventually the Prime Minister of the Abbasid State, Ibn-Boyeh invited him to become chief of medicine at the Adodiyy Hospital in Baghdad. At the time, this hospital was regarded as one of the biggest hospitals worldwide, employing over fifty doctors. It was an institute of science and an advanced school of medicine, as well as a hospital.

Al Razi, may Allah have mercy on him, became an incomparable scientific reference to not only Baghdad, but the entire world.

No Success without Effort

It is very important to stop and ask how Al Razi,may Allah have mercy on him reached such heights of glory and dignity. It is important to understand that such success is not coincidental; rather it is achieved due to great effort and sacrifice. Success never occurs randomly for it requires planning, discipline and skill. This is what characterized the life of Al Razi. He searched for knowledge from every source and exerted so much effort in order to learn as much as possible. This process was followed by careful thought, numerous experiments, and meticulous studies, to the extent that he was always analyzing, criticizing and modifying,theories, until he reached the stage of innovation and invention.

At the time of Al Razi, may Allah have mercy on him, the Greek, Persian, Indian and Egyptian forms of medicine,spread as a result of efforts to translate scientific literature from these nations. Al Razi read all these works but was not satisfied with just reading, preferring instead to observe and experiment before making any final deductions.

Al Razi and the Establishment of the Experimental Theory

Greek medicine was the most important form of medicine at that time, but it was dependent on untried theories. Greek doctors approved this approach and became known as philosophers of medicine because they rarely applied their theories. Even great figures of Greek medicine such as Galen and Hippocrates adopted this approach.

On the other hand, Al Razi believed that "when reality contradicts a prevailing theory, one should always accept reality no matter how great the scientist who coined it . He made his famous statement which is regarded as one of the laws of science in general, and medicine, in particular. He said, "Whenever a prevailing theorem and a real fact are contradictory, the latter is to be accepted as true no matter how wide the extent to which the theorem is acted upon is in advocation of the scientist who put it." He believed that a scientist, no matter how famous, could not endorse a theory if it contradicts an actual observation, a real experiment or an existing fact. Therefore, Al Razi made his own deductions, based on fact and experimentation and not on hypothesis. He regularly criticized other scientist's views and wrote one book refuting the views of Galen the eminent Greek doctor, named "Doubts about Galen". In it he highlighted mistakes in Galen's ideas, giving his own suggestions and describing the process by which he reached his conclusions

Al Razi was very keen on asking patients every detail about their disease, stating that a doctor should always ask his patient about every detail of his ailment. Medical history taking is the first step in the treatment of a patient in modern medicine as well as thorough knowledge of the disease itself and its causes. Al Razi would start to examine each patient by measuring his temperature and pulse to ascertain if they needed to be admitted into hospital. The patient would then be put under careful observation in order to record every single piece of information that might be useful in detecting the cause of the disease or in prescribing treatment.

Al Razi was renowned for his precision to an extent that astonished those who read his notes on pathological cases. What is more astonishing is that Al Razi was one of the first to carry out drug testing on animals such as monkeys to see how safe a drug was. Nowadays, most drugs are not approved unless they are first tested on animals

A Pioneer of Medicine

As a result of his unique scientific approach, Al Razi achieved unprecedented scientific breakthroughs in many different fields

He pioneered in the following achievements:

- **The invention of a suture which he constructed from cat guts. This invention was used by doctors many centuries after his death, until the invention of an improved version at the end of the twentieth century.**
- **The invention of mercury ointments.**
- **The differentiation between venous and arterial hemorrhages, using the finger pressure to stop a venous hemorrhage and a bandage to stop the arterial one in the same way as modern medicine**
- **The description of cataract extraction**
- **The use of opium in treating dry cough.**
- **The introduction of laxatives to pharmacy**

- **Considering fever as a symptom, not a disease.**

He also paid a lot of attention to descriptions of a patient's urine and blood, treating it as useful information that could help the patient's treatment. He avoided the use of chemical drugs if there was a chance that the patient's ailment could be treated with herbal medicine or through a change in diet, as recommended by doctors nowadays. Al Razi was not an innovator in just one specialty of medicine but offered detailed commentary on internal medicine, pediatrics, obstetrics and gynecology, sexually transmitted diseases, ophthalmology and surgery.

Al Razi and the Gift of Intelligence

Al Razi, may Allah have mercy on him, was an extremely intelligent and gifted man. This is clearly illustrated in the process by which he chose the location to build a grand hospital in Baghdad. He picked four possible locations and in order to ascertain which the optimum location was. He placed a piece of fresh meat at each site and monitored their decay. The site where the meat decayed the slowest was chosen because it had the cleanest air, preferable for the location of a hospital where disease can be cured.

Al Razi: Teacher of Medicine

Al Razi was eager to disseminate his knowledge and experience. He taught medicine at the renowned medical school in the governmental hospital of Baghdad. His teaching methods involved two approaches; a theoretical and a clinical experimental approach. He taught his students medical books, giving lectures, holding scientific circles and taking his students on ward rounds to teach and explain certain cases.

He taught his students medicine in three years, starting with theoretical then scientific topics in exactly the same way that medicine is taught nowadays. At the end of the third year, he gave out an exam consisting of two parts. The first test was in anatomy and the second was a practical test of the student's knowledge in treating patients. Those who failed the first part could not proceed to the second.

Al Razi was not content with simple teaching to convey his knowledge, so he paid great attention to recording information and wrote many medical books. In his book "Kitab al-Fihrist" or "The Index", Ibnul-Nadim stated that Al Razi had written a total of 113 books and twenty-eight theses. This number is very large, particularly since all the books were written on the subject of medicine.

The Great Legacy of Al Razi

One of the greatest books written by Al Razi, may Allah have mercy on him, is"Al-Hawi fi elm al- tadawi" or "The encompassing Book on Medicine", a complete medical encyclopedia of all medical information discovered during Al Razi's era. In it he compiled information on all his clinical experiences.

This book was translated into more than one European language and was published for the first time in Brescia north Italy in 891 A.H (1486 A.D),. It was the biggest book ever printed after the invention of printers. It was printed in 25 volumes and reprinted many times in the Italian city of Venice in the 10th century of Hijrah (the 16th A.D). The historian

Max Mayer Hoff mentioned that in 1500 A.D, there were five editions of this book and numerous publications containing extracts from it.

Another of Al Razi's most famous books is "al-Tibb al-Mansouri" named after Mansour Ibn-Ishaq, ruler of Khurasan. The book tackled various medical issues on internal medicine, surgery, and ophthalmology. Al Razi intended to make it a concise work even though it was eventually ten chapters long! Many European scientists were therefore motivated to translate the book into different languages like Latin, English, German, and Hebrew. It was first distributed in Milan in 1481 A.D and remained a key reference text for European doctors up until the 17th century.

One of his most successful books was the book of "Smallpox and Measles" in which he recorded very important and precise notes about the differences between the two diseases and was the first to differentiate between smallpox and measles, . This book was reprinted in Europe four times between the years 903-1283 A.H, (1498-1869 A.D).

He also wrote a book titled "Al-Asrar fi al-Kimyaa" or "Secrets of Chemistry", which remained a fundamental reference for chemistry in eastern and western schools for many years. He also wrote another book named "At-Teb ar-Rawhani" or "Spritual Medicine" which aims to encourage people to respect the mind, repress whims and reject immorality in order to discipline the soul

Al Razi: An Ethical Perspective

Al Razi's works were written with unique and complete scientific honesty. He always clearly referenced information if it had been discovered by others, which is why his books were full of names such as Galen, Hippocrates and Armansous He also mentioned modern doctors of his time such as Yehia Ibn-Masawhey and Hanin Ibn-Ishaq.

He urged his students to follow a certain approach in writing, stating "if a student reads a large number of books and understands their content, he should always seek to write a book that includes what others have neglected". He advised his students to record information collected during their studies and practice so that other students could benefit from their knowledge and writings in the future.

Al Razi was not only a scientist but he was a very well-behaved man and was renowned for his generosity. He was devoted to his friends and acquaintances and was compassionate to the poor and sick, providing for them and in some cases giving them jobs. He advised his students to be motivated primarily by caring for patients and not by financial reward. He also encouraged them to give equal care and attention to the poor as well as the rich.

His interest in the medical treatment of the poor encouraged him to write a book titled "Teb al Fuqaraa" or "Medicine of the Poor". In it he described different diseases and symptoms which afflict the poor and suggested different herbal and nutritional treatment methods instead of expensive drugs. This interest in good ethics led him to write a book called "Akhlak at-Tabeeb" or The Ethics of a Doctor in which he described the doctor-patient relationship in detail.

Al Razi: The Testimony of Scientists

All people acknowledge Al Razi's excellence, greatness and unprecedented knowledge in the field of medicine Moreover, his works were translated to European languages and were

reprinted many times. There are some recorded incidents and cases highlighting the importance of this great scholar and scientist. Among these incidents, is the fact that King Louis the 11th of France (ruler of France 1461-1483 A.D), paid gold in abundance for his doctors to make a special copy of the book "Al- Hawi" as his own reference text should he become afflicted with any disease.

Moreover, the old English poet "Geoffrey Chaucer" praised Al Razi in one of his famous poems in his celebrated work "The Canterbury Tales". Also the American University of Preston still calls its biggest annex by Al Razi's name. There is also a monument in Al Razi's honor at the Paris University medical school and his portrait can be found on St German street in Paris.

Al Razi is a truly unique and magnificent face of the Islamic civilization rarely matched in history. He was a doctor, scientist, teacher and humanitarian. He lived his life serving Islam, science and humanity and died at the age of 60 in Sha'ban 311 A.H (November 923 A.D). . However, it is hard to say that he died because his achievements have immortalized him. .On this subject, Prophet Muhammad (SAWS) stated in a hadith that when a person dies, his deeds come to a halt except in three cases, one of which is when he bequeaths a knowledge that benefits humanity.

Source: islamstory.com

Al-Hassan Ibn al-Haytham

Isaac Newton is, as most will agree, the greatest physicist of all time.
At the very least, he is the undisputed father of modern optics, or so we are told at school where our textbooks abound with his famous experiments with lenses and prisms, his study of the nature of light and its reflection, and the refraction and decomposition of light into the colours of the rainbow.

An artist's impression of al-Hassan Ibn al-Haytham

Yet, the truth is rather greyer; and I feel it important to point out that, certainly in the field of optics, Newton himself stood on the shoulders of a giant who lived 700 years earlier.
For, without doubt, another great physicist, who is worthy of ranking up alongside Newton, is a scientist born in AD 965 in what is now Iraq who went by the name of al-Hassan Ibn al-Haytham.
Most people in the West will never have even heard of him.
As a physicist myself, I am quite in awe of this man's contribution to my field, but I was fortunate enough to have recently been given the opportunity to dig a little into his life and work through my recent filming of a three-part BBC Four series on medieval Islamic scientists.

Modern methods

Popular accounts of the history of science typically suggest that no major scientific advances took place in between the ancient Greeks and the European Renaissance.
But just because Western Europe languished in the Dark Ages, does not mean there was stagnation elsewhere. Indeed, the period between the 9th and 13th Centuries marked the Golden Age of Arabic science.

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Great advances were made in mathematics, astronomy, medicine, physics, chemistry and philosophy. Among the many geniuses of that period Ibn al-Haytham stands taller than all the others.

Ibn-al Haytham conducted early investigations into light

Ibn al-Haytham is regarded as the father of the modern scientific method.
As commonly defined, this is the approach to investigating phenomena, acquiring new knowledge, or correcting and integrating previous knowledge, based on the gathering of data through observation and measurement, followed by the formulation and testing of hypotheses to explain the data.
This is how we do science today and is why I put my trust in the advances that have been made in science.
But it is often still claimed that the modern scientific method was not established until the early 17th Century by Francis Bacon and Rene Descartes.
There is no doubt in my mind, however, that Ibn al-Haytham arrived there first.
In fact, with his emphasis on experimental data and reproducibility of results, he is often referred to as the "world's first true scientist".

Understanding light

He was the first scientist to give a correct account of how we see objects.
He proved experimentally, for instance, that the so-called emission theory (which stated that light from our eyes shines upon the objects we see), which was believed by great thinkers such as Plato, Euclid and Ptolemy, was wrong and established the modern idea that we see because light enters our eyes.

Prof Jim Al-Khalili

What he also did that no other scientist had tried before was to use mathematics to describe and prove this process.
So he can be regarded as the very first theoretical physicist, too.
He is perhaps best known for his invention of the pinhole camera and should be credited with the discovery of the laws of refraction.
He also carried out the first experiments on the dispersion of light into its constituent colours and studied shadows, rainbows and eclipses; and by observing the way sunlight diffracted through the atmosphere, he was able to work out a rather good estimate for the height of the atmosphere, which he found to be around 100km.

Enforced study

In common with many modern scholars, Ibn-al Haytham badly needed the time and isolation to focus on writing his many treatises, including his great work on optics.
He was given an unwelcome opportunity, however, when he was imprisoned in Egypt between 1011 and 1021, having failed a task set him by a caliph in Cairo to help solve the problem of regulating the flooding of the Nile.
While still in Basra, Ibn al-Haytham had claimed that the Nile's autumn flood waters could be held by a system of dykes and canals, thereby preserved as reservoirs until the summer's droughts.
But on arrival in Cairo, he soon realised that his scheme was utterly impractical from an engineering perspective.
Yet rather than admit his mistake to the dangerous and murderous caliph, Ibn-al Haytham instead decided to feign madness as a way to escape punishment.
This promptly led to him being placed under house arrest, thereby granting him 10 years of seclusion in which to work.

Planetary motion

He was only released after the caliph's death. He returned to Iraq where he composed a further 100 works on a range of subjects in physics and mathematics.
While travelling through the Middle East during my filming, I interviewed an expert in Alexandria who showed me recently discovered work by Ibn al-Haytham on astronomy.
It seems he had developed what is called celestial mechanics, explaining the orbits of the planets, which was to lead to the eventual work of Europeans like Copernicus, Galileo, Kepler and Newton.
It is incredible that we are only now uncovering the debt that today's physicists owe to an Arab who lived 1,000 years ago.

By: Professor Jim Al-Khalili
University of Surrey
Source: BBC

Muhammad bin Musa Al-Khawarizmi

To celebrate the 1200th birth anniversary of Muhammad bin Musa Al-Khawarizmi the former USSR issued a postal stamp with his picture.
The terms Algebra and Algorithm are familiar to all of us but how many have heard of their founder Mohammed Al-Khawarizmi. In Geography he revised and corrected Ptolemy's view and produced the first map of the known world in 830 CE. He worked on measuring the volume and circumference of the earth, and contributed to work related to clocks, sundials and astrolabes.

His Life

Abu Abdallah Muhammad ibn Musa Al-Khawarizmi. The last-mentioned name (his nisba) refers to his birthplace, Khwarizm, modern Khiva, south of the Aral Sea. He was born around 780 in the town of Kath part of Khwarism. Kath is now buried in the sand. He died around 850. He was summoned to Baghdad by Caliph Al-Mamun and appointed court astronomer. From the title of his work, Hisab Al-Jabr wal Mugabalah (Book of Calculations, Restoration and Reduction), Algebra (Al-Jabr) derived its name.
Algebra symbolizes the debt of Western culture to Muslim mathematics.Ironically, when it first entered the English language it was used as a term for setting of broken bones, and even sometimes for the fractures themselves. This reflects the original literal meaning of the Arabic word al-Jabr, 'the reuniting of broken bones,' from the verb jabara 'reunite.' The anatomical connotations of this were adopted when the word was borrowed, as algebra, into Spanish, Italian and medieval Latin from one or other of which English acquired it. In Arabic, however, it had long been applied to the solving of algebraic equations (the full Arabic expression was 'Ilm aljabr wa'l muqabalah' 'the science of reunion and equations,' and the mathematician Al-Khawarizmi used aljabr as the title of his treatise on algebra.
In the twelfth century Gerard of Cremona and Roberts of Chester translated the algebra of Al-Khawarizmi into Latin. Mathematicians used it all over the world until the sixteenth century.
A Latin translation of a Muslim arithmetic text was discovered in 1857 CE at the University of Cambridge library. Entitled 'Algoritimi de Numero Indorum', the work opens with the words: 'Spoken has Algoritimi. Let us give deserved praise to God, our Leader and Defender'.
It is believed that this is a copy of Al-Khawarizmi's arithmetic text, which was translated into Latin in the twelfth century by Adelard of Bath (an English scholar). Al-Khawarizmi left

his name to the history of mathematics in the form of Algorism (the old name for arithmetic).

His Work

Al-Khawarizmi was a mathematician, astronomer and geographer. He was perhaps one of the greatest mathematicians who ever lived, as, in fact, he was the founder of several branches and basic concepts of mathematics. In the words of Phillip Hitti:
"He influenced mathematical thought to a greater extent than any other mediaeval writer."
His work on algebra was outstanding, as he not only initiated the subject in a systematic form but he also developed it to the extent of giving analytical solutions of linear and quadratic equations, which established him as the founder of Algebra.
Hisab Al-jabr wAl-muqabala, contains analytical solutions of linear and quadratic equations and its author may be called one of the founders of analysis or algebra as distinct from geometry. He also gives geometrical solutions (with figures) of quadratic equations, for example x2 + 1Ox = 39, an equation often repeated by later writers. The 'Liber ysagogarum Alchorismi in artem astronomicam a magistro A. [Adelard of Bath] compositus!' deals with arithmetic, geometry, music, and astronomy; it is possibly a summary of Al-Khawarzmi's teachings rather than an original work.
His astronomical and trigonometric tables, revised by Maslama Al-Majrti (Second half of tenth century), were translated into Latin as early as l126 by Adelard of Bath. They were the first Muslim tables and contained not simply the sine function but also the tangent (Maslama's interpolation).
His arithmetic synthesised Greek and Hindu knowledge and also contained his own contribution of fundamental importance to mathematics and science. Thus, he explained the use of zero, a numeral of fundamental importance developed by the Arabs. Similarly, he developed the decimal system so that the overall system of numerals, 'algorithm' or 'algorizm' is named after him. In addition to introducing the Indian system of numerals (now generally known as Arabic numerals), he developed at length several arithmetical procedures, including operations on fractions. It was through his work that the system of numerals was first introduced to Arabs and later to Europe, through its translations in European languages.
He developed in detail trigonometric tables containing the sine functions, which were probably extrapolated to tangent functions by Maslamati.
He also perfected the geometric representation of conic sections and developed the calculus of two errors, which practically led him to the concept of differentiation. He is also reported to have collaborated in the degree measurements ordered by Al-Mamun which were aimed at measuring of volume and circumference of the earth.

His Books

Several of his books were translated into Latin in the early 12th century. In fact, his book on arithmetic, Kitab Al-Jam'a wal- Tafreeq bil Hisab Al-Hindi, was lost in Arabic but survived in a Latin translation. His astronomical tables were also translated into European languages and,later,into Chinese. His geography captioned Kitab Surat-Al-Ard,(The Face of the Earth) together with its maps, was also translated. In addition, he wrote a book on the Jewish calendar Istikhraj Tarikh Al-Yahud, and two books on the astrolabe. He also wrote Kitab Al-Tarikh and his book on sun-dials was captioned Kitab Al-Rukhmat, but both of them have been lost.

A Servant of God

Al-Khawarizmi emphasised that he wrote his algebra book to serve the practical needs of the people concerning matters of inheritance, legacies, partition, law suits and commerce. He considered his work as worship to God.

Source: islamstory.com

Al-Kindi

Al-Kindi was born in Kufa about 800 CE. His full name is: Abu-Yusuf Ya`qub ibn Ishaq ibn as-Sabbah ibn `Omran ibn Isma`il al-Kindi. He was the son of the governor of Kufa, an important city in Southern Iraq at that time. He studied first in Kufa and at Baghdad, and won a high reputation at the courts of al-Mam'un (reigned until 833) and al-Mu'tassim (reigned 833–842) as scholar, scientist, and philosopher.

Al-Kindi General Hospital, one of the biggest medical centres in present day Baghdad was named after the tremendous contributions in medical and pharmaceutical disciplines of the great Arab philosopher al-Kindi.

Al-Kindi was best known as a philosopher, but he was also a physician, pharmacist, He was also concerned with music, physicist, mathematician, geographer, astronomer, and chemist.

Human virtues seem to preoccupy Al-Kindi greatly but without overshadowing the importance and value of divine virtues. The way to worldly happiness, he says, is to reduce to a minimum all external possessions, which cause only sorrow, and the way to other worldly happiness is to know God and to perform those actions, which we know bring us nearer to him

On the scientific front, Al-Kindi plays a central role in Islamic scholarship for two principal reasons:

- his early role in establishing a scientific methodology;

- the diversity of subjects he addressed.

Al-Kindi refutes his Greek predecessors in every single discipline, which thus, once more proves that the assertion found in most Western books of his being a mere disciple of Greek science is groundless; Al-Kindi's work in the laboratory is reported by a witness who said: "I received the following description, or recipe, from Abu Yusuf Ya'qub b. Ishaq Al-Kindi, and I saw him making it and giving it an addition in my presence." As for scientific rigour, Al-Kindi is also the symbol of Islamic deviation from previous Greek practices of associating folklore and myths with science.

One such works by Al-Kindi is a short treatise with the long title Treatise on the Azure

Colour which is Seen in the Air in the Direct of the Heavens and is Thought to be the Colour of the Heavens.

One of Al-Kindi's works which has survived in Latin while it has apparently been lost in the original Arabic is his treatise on geometrical optics. Gerard of Cremona's Latin translation of the work was published in 1912 by the Danish scholars A. A. Bjornbö and Sebastian Vogel

Al-Kindi, as a medical man, addressed amongst the diseases epilepsy, which is well detailed by Dunlop. Al-Kindi states in his introduction: "May God surround you with salvation, and establish you in its paths and aid you to attain the truth and enjoy the fruits thereof! You have asked me –may God direct you to all things profitable!– that I should outline to you the disease called Sar' [the falling-sickness, epilepsy].

Al-Kindi was one of the first Arab scholars involved in studying and commenting on Greek scientific and philosophical manuscripts. He defined philosophy as "the establishment of what is true and right".

Although Al-Kindi was influenced by the work of Aristotle (384-322 BCE), he put the Greek's ideas in a new context and laid the foundations of a new philosophy.

Al-Kindi also delved in medicine. He produced twenty two publications on medical topics. One of his major contributions in medicine and pharmaceutics was to determine and apply a correct dosage, which formed the bases of medical formulary.