History of Persian Scientists and Poets:

28 Centuries of Contributions

Mo Jamshidi

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Mo Jamshidi

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Book covers over 150+ distinguished Persian and Iranian individuals in science, poetry, writers, directors, screenwriter, painters, patriot, etc. since 1000 BC to 2021.

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PREFACE

Persia and Iran since 1935, is a very ancient land. She has over thousands years of recorded civilization. Persia, from 11th century BC until 7th Century AD consisted of a large region from Anatolia, the Bosporus and Egypt in the west. In the east, the Empire extended to borders of ancient India and to the Caucasus and the Eurasian Steppe in the north to the Persian Gulf and the Gulf of Oman in the south [1]. Iran is home to one of the world's oldest continuous major civilizations, with historical and urban settlements dating back to 7000 BC [2].

Prophet Zoraster, perhaps born 1000 years BC in the Balkh area (currently a major city in Afghanistan) was the religious leader of ancient Persia

> "Cyrus commonly known as *Cyrus the Great* as the founder of the Achaemenid Empire, the first Persian Empire. Under his rule, the empire embraced all the previous civilized states of the ancient Near East, in which expanded vastly and eventually conquered most of Western Asia and much of Central Asia. From the Mediterranean Sea and Hellespont in the west to the Indus River in the east, Cyrus the Great created the largest empire the world had yet seen. Under his successors, the empire eventually stretched at its maximum extent from parts of the Balkans (Bulgaria-Paeonia and Thrace-Macedonia) and Eastern Europe proper in the west, to the Indus Valley in the east. His regal titles in full were "The Great King, King of Persia, King of Anshan, King of Media, King of Babylon, King of Sumer and Akkad, and King of the Four Corners of the World". The Nabonidus Chronicle notes the change in his title from simply "King of Anshan", a city, to "King of Persia". Assyriologist François Vallat wrote that "When Astyages marched against Cyrus, Cyrus is called 'King of Anshan'" but when Cyrus crosses the Tigris on his way to Lydia, he is 'King of Persia'. The coup took place between these two events" [3].

For the past twenty years, the author, who had an idea about writing a history of Persian and Iranian scientists, poets, and some artists early on in his life, has been collecting and documenting data on old Persian and moderns Iranians of great talent. This book's aim is to create a historical and factual account of who Persian scientists, poets and few others were or are and what the Persian / Iranian citizens (Azaris, Baluchis, Elamites, Gilanese, Kurdish, Meads, Persian, Turks, Partians, et. al.) have achieved for the past 28 centuries and how their work have impacted the world civilization at large. This book's intention is neither politics nor religion.

This project is unavoidably tied with the History of Persia, now Iran and throughout the years in spite of political problems and invasions, Iran, like only some nations in the world, have rejected outsiders and have always kept their identities and cultures. They do not celebrate an independence day. Poetry in Persian and now Iran is an ancient integral part of the Persian and Iranian civilization. In addition, there are chapter on ancient Persian Prophet Zardosht, Cyrus the Great, and two chapters on history of medical and engineering education in modern Iran.

The book is structured in four segments: Chapters (5 to 15 pages), also, included are Iranian members of US National Academy of Science (NAS), US National Academy of engineering (NAE) and fellows of The World Academy of Sciences (TWAS). Biography of four patriotic

ministers (Bozorgmehr, Nezam-ol-Molk, Amir-Kabir, and Mossadegh), Perspectives (shorter 2-4 pages) of over 56 scientists, engineers, artists, and poets.

This project has proven to be extremely challenging as the longevity of Persians and Iranians going over 28 Centuries one can find thousands of great individuals who are deserving of recognition. The list of individuals discussed in this book is only the "tip of the iceberg". The author sincerely apologizes to hundreds of those who were left out of this book and his wish is that other compatriots will take it from this writing and move it on to many other great Persian and Iranians individuals.

The author is in debt to many people who have helped and inspired him to take on this mission. First and foremost, his family: wife Jila, daughter Ava and son Nima. Shown in this photo, left to right are son Nima, Wife Jila, daughter Ava, and the author at his 60th birthday in Hawaii

Author is thankful to Professor Soroosh Sorooshian of University of California at Irvine for his support and foreword in the book. I wish to thank my sister Pooran-Dokht Jamshidi and my niece Dr. Armita Banani, as well as my dear friend Mr. Reza Sadeghi, for their help in the publication of Parsi version. The valuable help from Mr. Tony and Mrs. Emily Nolan of Sydney, Australia, Ms. Debra Rivard of Rio Rancho, NM, USA and Ms. Sandi Morga of Albuquerque, NM, USA for their collaborations in many aspects of this book are all very much appreciated.. The translation and proof of this book into Parsi would not have been possible without the hard work of Mr. Ali Taghavi Rashshed-Zadeh, Mr. Amir Mehdi Abbasi, Mr. Amin Sahba, and Mr. Ramin Sahba.

This book is humbly dedicated to all Persian and Iranians around the world.

Mo M. Jamshidi
June 22, 2021
San Antonio, TX USA

References:

[1] https://en.wikipedia.org/wiki/History_of_Iran

[2] People, "New evidence: modern civilization began in Iran", 10 Aug 2007, retrieved 20 February 2021.

[3] https://en.wikipedia.org/wiki/Cyrus_the_Great

ABOUT THE AUTHOR

We have to confess to you, my dear reader, that this is the hardest biographical piece we have ever written. This is a book about Persian Heroes. Persians whose lives have contributed greater than a person is expected to, to Persia and the world in general. In fact, our world would be different if these people had never lived. What compounds this, is that Heroes are generally associated with the past. We tend not to believe in modern day Heroes in the ways of historical figures, because there is a type of fable, mystical element, and let us say it, exaggeration about them. Even researching Mo for this piece is difficult and complex. In 1999, I Tony Nolan, first met Mo in Sydney, Australia. However, I first got to know Mo virtually by email in late 1998, after we were introduced to each other by the late Lotfi Zadeh.

So, let's revisit my problem of a biographical piece on Mo Jamshidi. I intend to justify my view that he is a Hero by addressing three points of view;

1. That he is not a fictional character. There really is a Mo Jamshidi, who from difficult beginnings rose up through adversity, and has made his way through the world.
2. That he has risen through near impossible odds to make a better life for himself and his family. That through being a smart and astute person, he has made his way through the world and reached the heights of his profession and career.
3. That along his life's journey so far, he has not been selfish. In fact, it is just the opposite. He has been selfless is so many ways, that he has actually put himself at risk, in financial, reputation, and physical, in helping others along their life paths also.

My first piece of evidence is that there really is a person called Mo Jamshidi. Mo Jamshidi was born on May 10th 1944 in Shiraz, Iran to Habib and Mohtaram (Kobra) Jamshidi. He was the last child born into a family of ten children. His brothers Hossein, Hassan, Ahmad, Mahmoud, Abolghassem, and his sisters Parvin, Mahin, Pooran and Gity. Mo's father Habib was a very successful merchant and landholder who died tragically near the start of 1944, around five months before Mo was born. Kobra at the age of 35, found herself pregnant with Mo, along with many sick children from typhoid, coping with not only the death of her husband, but also her mother forty days later. Still with all this sorrow, hardships, and struggles, gave birth, and named him after the Prophet Mohammad, because he also lost his father before he was born.

Mo went to primary school called Sultani in the fall of 1950, and he entered Sultani High School in 1955, finishing 11th grade in Shiraz. For his 12th grade, he went to Tehran to attend Hadaf No. 1 High School (one of the top private schools in Iran). He graduate from Hadaf School in May 1961. Even though he had several opportunities to enter top universities in Iran, he chose to go to USA in early 1963.

Upon his BS, MS and PhD and Post-doctoral in USA, he went back to Shiraz in the fall of 1971 to assume a position of assistant professor at Pahlavi (Now Shiraz) University. It was during this period that he met a young lady Jila Salari, who was a 3rd year economic student at the same university. They have now been married for 47 years and have two adult children, Ava Jamshidi and son Nima Jamshidi.

My second piece of evidence to proof that Mo is a real person is his extensive range of achievements in his career and professional life.

Mo has university qualifications in English Proficiency, BS Electrical Engineering, MS Electrical Engineering, Ph.D. Electrical Engineering, Post-Doctoral Fellowship, Honorary Doctorate degree, Hon Doctor of Engineering Degree.

Mo has been employed full time or part-time at 11 universities in Asia, Europe, Middle East, Australia and the USA. Mo has also worked in consulting or Inter-Personal Act or special Government Employee for NASA, USA Air Force, U.S. Department of Energy, European Commission, IBM, Siemens, and General Motors.

Mo has 75 books (12 textbooks) in print and another 730 published works. Mo has also presented at a number of lectures, given many conference presentations, keynote addresses, and over a dozen multimedia presentations. Mo has delivered educational content on all the continents, and has lectured in over 20 universities. Mo has researched and produced material on over 50 different topics.

Some of Mo's areas of interests are;

Analytics, Autonomous Control, Big Data, Business Administration, Complexity, Computing, Decision Science, Engineering, Electronics, Fuzzy Logic, Large scale complex systems, Linear Systems, Manufacturing, Mechatronics, Modelling, Nuclear Energy, Optimization, Persian History, Persian Poetry, Project management, Robotics, Space Technology, Complex Systems of Systems Engineering, Artificial Intelligence, Machine Learning, etc.

These topics are applied to;

Exploration, Manufacturing, Mentoring, Pollution, Power Generation, Teaching, Water and Air Purification, Robotic Swarms, Air-Born Systems, Space Telescopes, Water Desalination, Solar and Wind Energy, Water Resources Management, Renewable Energy Forecasting, etc.

Mo's activities in these topic areas are not confined to purely a passive approach of just reading, Mo has an active if not aggressive approach to trying to understand the whole of any topic that he takes an interest in. Mo's methodology, procedures, and activities generally fall into 4 different areas.

1- *How things work (what are the parts / elements that make up the item),*
2- *How do they fit together (how do they connect, and what is the cause & effect),*
3- *Where can they be applied (how can these findings be used in the real world),*
4- *Sharing information (telling and teaching people about the benefits and the how to).*

For each of these areas there are sub themes of;

1. The physical side (building them),
2. The practical & applied side (making them work),
3. The theoretical side (designing them),
4. The educational side (telling and mentoring others about them),
5. The why side (what is the reason for doing it).

Mo applies his skills & competencies in producing a quality product;

1. Mathematics
2. Writing
3. Design
4. Problem solving
5. Critical thinking
6. Research & investigation
7. Cause & effect
8. Teaching & mentoring

The third part of my describing Mo as an ancient super hero in our modern world really has to do with the generosity and un-selfishness in how he deals with others. In interviewing Mo, he tells me of his childhood, and how he had a daily allowance of a coin to buy some food (what we would call tuck shop money) which was to buy his lunch. How on occasions, he would donate it to a beggar he had befriended on his way to school. Mo's was also very friendly and often helped to cheer up his class mates in challenging times. Mo seems to have made friends with the wealthy and the poor, and always treats them equally. There have been times when Mo returned to his home city, Shiraz (or from where he lives in USA), spent his time, and donated resources to the development of educational and medical facilities for the very needy people in deprived rural areas. He has also established endowed scholarships at Oregon State (his first Alma Mater), University of Texas (his last academic work place), as well as joint US National Scholarship called *Jamshidi-Zadeh Scholarship* for Persian College students in the USA. If you read Mo's CV, you will find many projects that increase his reputation in many areas. Mo has funded millions of Touman (Iran's currency) in building a medical clinic outside of Shiraz, which gives service to over 35,000 residents of nearby villages. However, there are also many smaller projects, including building a high school in Sistan-Baluchistan (one of the most deprived areas of Iran). Ones that you do not take a second look at, because they would not advance your career. Ones like helping to turn dirty water to clean drinking water in the African desert. Projects that help the poorer people, or the neglected regions of the world, rather than making lots of money for companies, patents, etc. Recently for a significant event, many of Mo's students wrote of his support, and going beyond the job of a supervisor, teacher, or mentor. Mo is forever giving advice, lending his name and help to research, and supporting new endeavors in emerging technologies.

In 1995, Mo headed NASA's Autonomous Control Engineering (ACE) Program at the University of New Mexico. Over 50 minority students graduated in the first 5 years, many went on to bring many of the successes and achievements that we know of NASA pioneering work today.

Overall, he has helped American Ethnic minorities at highest levels of engineering education with over 120 MS and PhD's among these groups. In a magazine article Mo Jamshidi – Big Thinker with a Big Heart, Mo is quoted saying, "I always have my heart open to minorities because I know they are struggling, and I have felt that struggle myself." (Hispanic Outlook, dated 01/09/2006, page 19.)

Even now during Covid-19 times, he is donating his time to help alliances of Artificial Intelligence research bodies to join, to help use AI to advance in the fight to save our planet.

In 2006, Mo and his wife Jila moved to San Antonio Texas, where Mo received a prestigious Endowed Chaired Professorship at the University of Texas at San Antonio. Mo who is in his 70's at the writing of this biographical piece, still continues to be active in pursuing all his interests and activities, and following his driving passion to inform, change, and lead the world's community towards a better future. When I asked Mo what his plans were for the next 5 years, he responded with, "Continue to help and mentor students, study the history of science in difference cultures around the world, and relax in Hawaii".

But Mo's achievements didn't stop here, as he has over time encouraged others to follow in his path. People like Lotfi Zadeh, Vladik Kreinovich, Mohamed Mansour, Jim Tien, Djuro Zrilic, Junku Yuh, Masoud Nikravesh, etc.

In closing this piece dear reader, we hope that we have proved to you that Professor Mohammad Jamshidi is truly a very real & special person, has achieved more than most people, and is still contributing to making the world a safer place. Indeed he is a super hero, a great Persian, and a friend and mentor to many.

The Authors

Tony and Emily Nolan live in Sydney Australia, and have two children Ryley (10) and Flynn (7). Together Tony and Emily have developed Symbiotic Relativity, HyperPanoFiction, and co-authored several books together. They are also researching gamification and game design.

Tony Nolan

Tony is a data mathematician, futurist, profiler, inventor, musician, artist, and author. He also works with horses, plays several sports, believes in God, and supports his local communities. Tony scored a perfect score on an IQ test, and received an Order of Australia Medal for serviced to the Australian Community. Tony has a mixed race background, which includes Australian, British, Dalmatian, Irish, Persian, and Scandinavian.

Tony's research and invention focuses on the areas of Artificial Life, Astronomy, Cognition, Decision Sciences, Fuzzy Logic, Interval Math, Gap Analysis, Mathematics, Predictive Modelling, Quazi Fractals, Profiling, relativity, System of Systems, Sentient Analysis, Text Analysis, Time, and Writing.

Tony has invented Nolan's Mathematics, which is an axis offset, which allows the properties of binary to be applied to interval and ratio numbers. A digital hash (Discrete Cosine Transformation). A text message obscuration system, an Universe Interconnection of Things model, CogKnowlogy, Hyperpanometrics, Deep Fuzzy Logic (formally 3d Fuzzy Logic), and System of System Gap Realivity.and a Relative Fuzzy Logic Time Series Forecasting Tool.

Emily Nolan

Emily is currently a Finance Manager with the NSW Police Force. She has a background in writing, music, horse riding, publishing, and graphic design. In 2008, she published a biography

about her father entitled, *Bach to God*. Emily has worked as a graphic designer, journalist, media liaison officer, and website designer. Emily also has a Bachelor of Arts in Communications Degree (majoring in Writing & Contemporary Cultures), an Advanced Diploma in Graphic Design, and a Certificate IV in Accounting. Emily has an eclectic range of interests such as architecture, astronomy, culture, engineering, math, physics, philosophy, real estate, robotics, science fiction, and has plans to travel the world.

By Tony and Emily Nolan
Sydney, Australia

FOREWORD

History of Persian Scientists and Poets by Mohammad "Mo" Jamshidi

Soroosh Sorooshian, Ph.D., NAE

It is only fitting that before providing my forward for Professor Mohammad "Mo" Jamshidi's current book *History of Persian Scientists and Poets: 28 centuries of contributions,* to first reflect on his remarkable scientific and engineering contributions over the past four decades that I have known him. I first got to know of Mo Jamshidi while I was starting as an Assistant Professor in systems engineering at Case Western University, Cleveland, Ohio in the late 1970's. When a colleague at Case Western, Dr. Yacov Haimes, asked if I knew of Mo Jamshidi, I became curious and learned that he was already an established scientist/engineer and academic in the field of control and systems engineering. A few years later, as luck would have it, I had the opportunity to meet Mo Jamshidi at the International Federation of Automatic Control (IFAC) conference in San Francisco, California in the early 1980's. The rest is history and my friendship, both in terms of professional interactions as well personal interactions, has continued over the years and up to the present time. Mo has served as a great role model for me as well as many other younger colleagues. He has shown us that with proper discipline, hard-work, and respect for others one can accomplish much. In the earlier days of his career his remarkable energy and contributions to the field of systems engineering, robotics and control theory was visionary, especially for his pioneering work in proposing the field of "system of systems" which resulted in many groundbreaking theoretical developments, leading in the now well-known and established branch of systems and control engineering. He has published over 800 articles including over 75 books and edited volumes, a number of which have been translated into other languages. Mo has also been instrumental in serving the professional community in numerous capacities including editor-in-chief of five prestigious journals, several of which he was the founding editor. Naturally such talent does not go unnoticed especially in the US where he has continuously been invited to serve and provide advice to many agencies and boards including the US National Academy of Sciences, NASA, U.S. Air Force Research Laboratories, etc. I can go on and talk a lot more about his engineering accomplishments but it will take me away from my intended task of providing a foreword for this book.

What separates Dr. Mohammad Jamshidi from many other well-accomplished and renown scientists is the ability to think and contribute "outside the box" of his direct professional discipline of engineering. Ever since I have known Mo Jamshidi he has always demonstrated his keen interest and passion about the history of our Persian heritage and culture. There are those who can carry on a casual conversation about many subjects and there are a few who do something about it in a tangible way. Over the years Dr. Jamshidi has spent much of his free time outside of work by researching the historical account of two key aspects of scientific and educations evolution in Iran as well as studying the profile of famous Persian scholars, poets, artists, etc. whose contributions, as significant as they have been to the world, have gone unnoticed until this time or have been scattered in the literature. To my knowledge this collection which Jamshidi has compiled in his book is the first such attempt to provide a comprehensive historical evolution of medical and engineering education in Iran and concise biographical information of the prominent individuals who are the subject of the book. It is

certainly a must-read for the new and younger generation of Iranian's most of whom have been born outside of their motherland (Iran). Needless to say, while the younger generation will benefit the most by learning about the remarkable impact Persian scientists, poets, and scholars have had over the centuries but it also should provide a valuable read for the broader audience. 39 of the 41 chapters cover the biography of influential and famous Persians over the period of almost 3000 years, starting with the Prophet Zoroaster and Cyrus The Great to the more recent famous scientist, engineers, poets, philosophers, and mathematicians such as the late Maryam Mirzakhani. The last two chapters (40 and 41) provide respectively, the history of medical and engineering education in modern Iran. Jamshidi has also included brief profiles of a selected number of contemporary Iranians who in their own right have made major contributions to the field of education, engineering, medicine, arts, and more.

In closing, if there was a word or phrase that captures Mo Jamshidi it is that he is truly a "21st century Renaissance man" in the sense of his myriad interests as demonstrated by this major undertaking which took at least two decades to complete. Lastly, what is also important to mention about Dr. Jamshidi is his unselfish efforts to recognize the contributions of the Persian/American/European scholars through various activities. As an example, for years he has been recognizing many Iranian-American scientists and engineers for their seminal work through his bi-annual World Automation Congress (WAC, http://www.wacong.org) for which he has served as the general chairman since its inception in 1968. It has been a great honor to have the good fortune of knowing Mo Jamshidi over the years and learn from him including gaining knowledge about the people he has written about in this volume. I am certain others will benefit by reading this book and appreciating the contributions many Iranians have made to the world.

Soroosh Sorooshian was born in a Zoroastrian family in Kerman, Iran. He received his primary education in Kerman before moving to the United States in 1966. He earned his Bachelor of Science in mechanical engineering from Cal Poly San Luis Obispo and his MSc, operations research, Engineer Degree, systems engineering, and Ph.D., engineering from UCLA. Sorooshian is a member of such prestigious organizations such as the National Academy of Engineering (NAE), the World Academy of Sciences (TWAS); and the International Academy of Astronautics (IAA) [1]. He is also a fellow of the American Association for the Advancement of Science (AAAS), American Geophysical Union (AGU), American Meteorological Society (AMS), *International Union of Geodesy and Geophysics* (IUGG), International Water Resources Association (IWRA) among others and is a life member of the American Society of Civil Engineers (ASCE). Besides being a member and fellow of academies and professional societies, Sorooshian has served as Chair of the Scientific Steering Committee (SSG) for the Global Energy and Water Cycle Experiment (GEWEX) of the World Climate Research Programme (WCRP). He has also served as a present and past Member and Chair of over 30 other advisory and review committees and boards for NASA, NOAA, DOE, EPA, NSF, National Labs, UNESCO, WMO, and professional societies. National Research Council (NRC) service over the past 15 years, which includes being a member of 7 NRC committees. He has served as Editor of *Water Resources Research*, Associate Editor of the *Journal of Hydrology*, and member of numerous editorial boards.

Scientists and Poets

CHAPTER 1 Zoraster (Prophet)

1.1 Introduction

In this chapter, a brief life story of the world's first prophet believing in a unity God – Zoraster will be given. Zoraster, also known as Zarathustra, Zarathushtra Spitama or Ashu Zarathushtra, was an ancient Iranian spiritual leader who founded what is now known as Zoroastrianism [1]. He preached three commandments for his followers to do:

1. *Pledge yourself to the well-thought thought.*
2. *Pledge yourself to the well-spoken word.*
3. *Pledge yourself to the well-done action. [2]*

1.2 Facts on Zoraster [1]

Zoraster	AKA Zardosht, Avestan (In his native language)
Born	As Airyanem Vaejah, year unknown (Age 77 years)
Place of Birth	Balkh, Great Khorasan (Now in Afghanistan)
Nationality	Iranian
Religion	Zoroastrian
Death	1500 BC – 1000 BC
Place of Death	Unknown, possibly Balkh or Mazar-e-Sherif in present Afghanistan
Children:	Pourucista, Isat Vastar, Uruvat-Nara, Hvare Chithra, Triti, Freni
Parents	Pourušaspa Spitāma, Dughdova

1.3 Biographical Sketch

Zoraster Also known as "**Zarathustra** (Greek), **Zarathushtra Spitama** or **Ashu Zarathushtra** (Persian) was an ancient Iranian spiritual leader who founded what is now known as Zoroastrianism. His teachings challenged the existing traditions of the Indo-Iranian religion and inaugurated a movement that eventually became the dominant religion in Ancient Persia. He was

a native speaker of the Old Avestan and lived in the eastern part of the Iranian Plateau, but his exact birthplace is uncertain [1].

According to Wikipedia [1], there is "no scholarly consensus on when he lived. However, approximating using linguistic and socio-cultural evidence allows for dating to somewhere in the second millennium BC. This is done by estimating the period in which the Old Avestan language (as well as the earlier Proto-Indo-Iranian and Proto-Iranian languages and the related Vedic Sanskrit) were spoken, the period in which the Proto-Indo-Iranian religion was practiced, and the correlation between the burial practice described in the Gathas with the archeological Yaz culture. However, other scholars still date him between the 6th and 7th century BC as a near contemporary of Cyrus the Great (Chapter 2) and Darius I. Zoroastrianism eventually became the official religion of Ancient Persia and its distant subdivisions from 6th century BCE to the 7th century CE. Zoraster is credited with authorship of the Gathas as well as the Yasna Haptanghaiti, hymns composed in his native dialect, Old Avestan. These works comprise the core of Zoroastrian thinking. Most of his life is known from these texts. By any modern standard of historiography, no evidence can place him into a fixed period, and the historicization surrounding him may be a part of a trend from before the 10th century that historicizes legends and myths".

Figure 1.1 An 8th-century Tang Dynasty Chinese Clay Figurine of a Sogdian Man.

Family

Zoroaster's father was **Pourusaspa**, a nobleman, and his mother, **Dughdova** was also part of nobility. So, Zoroaster would have had a comfortable upbringing with such wealth and high caste. Zarathustra's name literally means "the one who owns old camels;" probably not a name you would give to your child today! When Zarathustra was older, he married a woman named **Huvovi**, and they had three boys and three girls. When Zoroaster founded his new religion, his wife and children were among the first to convert [3].

1.4 Influences of Zoraster [1]

Islam

"A number of parallels have been drawn between Zoroastrian teachings and Islam. Such parallels include the evident similarities between Amesha Spenta and the archangel Gabriel, praying five times a day, covering one's head during prayer, and the mention of Thamud and Iram of the Pillars in the Quran. These may also indicate the vast influence of the Achaemenid Empire on the development of either religion. The Sabaeans, who believed in free will coincident with Zoroastrians, are also mentioned in the Quran".

Muslim scholastic views

"Figure 1.1 shows an 8th-century Tang dynasty Chinese clay figurine of a Sogdian man - an Eastern Iranian person wearing a distinctive cap and face veil. He may be a camel rider or even a Zoroastrian priest engaging in a ritual at a fire temple, (since face veils were used to avoid contaminating the holy fire with the breath or saliva); a Museum of Oriental Art (Turin), Italy" [1].

Like the Greeks of the classical antiquity, the Islamic tradition understands Zoraster to be the founding prophet of the Magians (via Aramaic, Arabic *Majus* and the collective *Majusya*). The 11th-century Cordoban Ibn Hazm (Zahiri school) contends that *Kitabi* "of the Book" cannot apply in light of the Zoroastrian assertion that their books were destroyed by Alexander. Citing the authority of the 8th-century al-Kalbi, the 9th and 10th century Sunni historian al-Tabari (i.648) reports that Zaradusht bin Isfiman (an Arabic adaptation of "Zarathustra Spitama") was an inhabitant of Israel and a servant of one of the disciples of the prophet Jeremiah. According to this tale, Zaradusht defrauded his master, who cursed him, causing him to become leprous (cf. Elisha's servant Gehazi in the Jewish Scripture).

The apostate Zaradusht eventually made his way to Balkh (present day Afghanistan) where he converted Bishtasb (i.e. Vishtaspa), who in turn compelled his subjects to adopt the religion of the Magians. Recalling other traditions, al-Tabari (i.681–683) recounts that Zaradusht accompanied a Jewish prophet to Bishtasb/Vishtaspa. Upon their arrival, Zaradusht translated the sage's Hebrew teachings for the king and convinced him to convert (Tabari also notes that they had previously been *Sabi*s) to the Magian religion.

The 12th-century heresiographer Al-Shahrastani describes the Majusiya into three sections, the *Kayumarthiya*, the *Zurwaniya* and the *Zaradushtiya*, among which Al-Shahrastani asserts that only the last of the three were properly followers of Zoraster. Regarding the recognition of a prophet, Zoraster said, "They ask you as to how should they recognize a prophet and believe him to be true in what he says; tell them what he knows the others do not, and he shall tell you even what lies hidden in your nature; he shall be able to tell you whatever you ask him and he shall perform such things, which others cannot perform". (Namah Shat Vakhshur Zartust, 5–7, 50–54) When the companions of Muhammad, on invading Persia, came in contact with the Zoroastrian people and learned these teachings, they at once came to the conclusion that Zoraster was really a Divinely inspired prophet. Thus, they accorded the same treatment to the Zoroastrian people, which they did to other "People of the Book". Though the name of

Zoraster is not mentioned in the Qur'an, still he was regarded as one of those prophets whose names have not been mentioned in the Qur'an, for there is a verse in the Qur'an: "And We did send apostles before thee. There are some of them that We have mentioned to thee and there are others whom We have not mentioned to Thee" (40: 78). Accordingly, the Muslims treated the founder of Zoroastrianism as a true prophet and believed in his religion as they did in other inspired creeds, and thus according to the prophecy, protected the Zoroastrian religion. James Darmesteter remarked in the translation of Zend Avesta, "When Islam assimilated the Zoroastrians to the People of the Book; it evinced a rare historical sense" [1].

Ahmadiyya View [1]

"The Ahmadiyya Community views Zoraster as a Prophet of Allah and describes the expressions of the all-good Ahura Mazda and evil Ahriman as referring merely to the coexistence of the forces of good and evil enabling humans to exercise free will".

In Manichaeism

"Manichaeism considered Zoraster to be a figure (along with the Buddha and Jesus) in a line of prophets of which Mani (216–276) was the culmination. Zoraster's ethical dualism is, to an extent, incorporated in Mani's doctrine, which viewed the world as being locked in an epic battle between opposing forces of good and evil. Manicheanism also incorporated other elements of the Zoroastrian tradition, particularly the names of supernatural beings; however, many of these other Zoroastrian elements are either not part of Zoraster's own teachings or are used quite differently from how they are used in Zoroastrianism".

The Bahá'í Faith

"Zoraster appears in Bahá'í's Faith as a "Manifestation of God", one of a line of prophets who have progressively revealed the Word of God to a gradually maturing humanity. Zoraster thus shares an exalted station with Abraham, Moses, Krishna, Jesus, Muhammad, the Báb, and the founder of the Bahá'í Faith, Bahá'u'lláh Shoghi Effendi. The latter was the head of the Bahá'í Faith in the first half of the 20th century, and saw Bahá'u'lláh as the fulfillment of a post-Sassanid Zoroastrian prophecy that saw a return of the Sassanid emperor Bahram: Shoghi Effendi also stated that Zoraster lived roughly 1000 years before Jesus".

1.5 Death

Zoraster's death date and place is not known. Based on literature of those days (i.e. earlier Proto-Indo-Iranian and Proto-Iranian languages) and later on in the Archimedeans' Persian Empire, it was estimated that he passed away 1000 – 1500 BC in Badakhshan area of today's Afghanistan. Figure 1.2 shows the Kabeh of Zoraster and the last photo of Zoraster.

Figure 1.2 The Kabeh of Zoraster and the Last Photo of Zoraster.

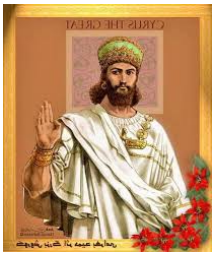
References

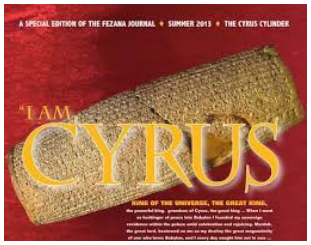
[1] https://en.wikipedia.org/wiki/Zoroaster

[2] https://www.hinduwebsite.com/zoroastrianism/creed.asp

[3] https://study.com/academy/lesson/prophet-zoroaster-biography-quotes.html

CHAPTER 2 Cyrus the Great (Founder of Persia's 1st Empire)





2.1 Introduction

This chapter is dedicated to the founder of the Achaemenid Empire – Cyrus the Great. Figure 2.1 shows the map of the Empire early into the dynasty. Figure 2.2 shows the map of the Persian Empire as late as 330 BC.

2.2 Facts on Cyrus the Great [1]

Cyrus	AKA Kourush
Born	590–580 BC
Place of Birth	Anshan, Persia, Media or Elam Province (Southwest of current Iran)
Nationality	Persian, Iranian
Founded:	Achaemenid Empire
Death	4 December 530 BC (age 68-70) Along the Syr Darya
Place of Death	Buried in Pasargadae, Iran
Father	Cambyses I or Cambojieh
Mother	Mandane of Media
Grandfather	Astyages, last king of the Median Empire
Children:	Cambyses II, Bardiya, Atossa

Figure 2.1 Map of the Early Archimedean Empire of Persia [1].

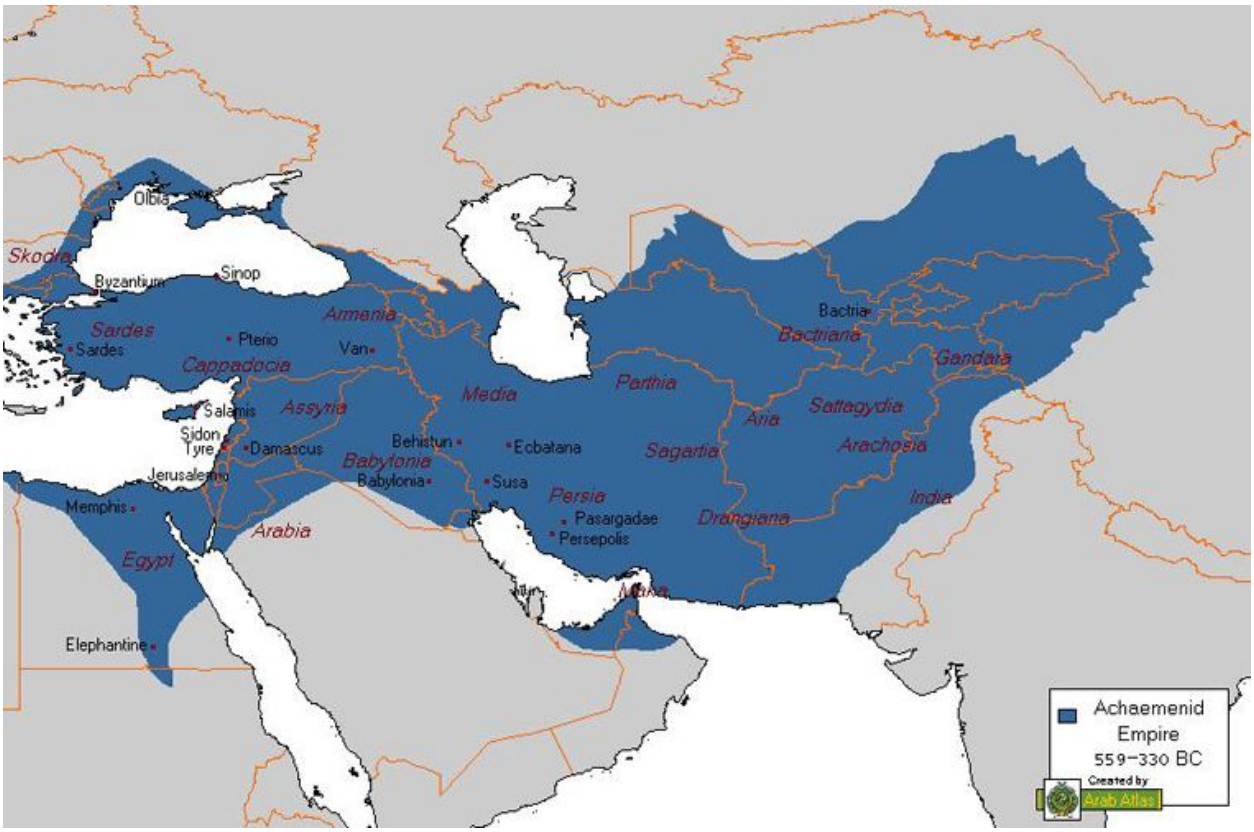


Figure 2.2 Map of the Persian Empire as Late as 330 BC. [1]

2.3 Biographical Sketch

"Cyrus commonly known as Cyrus the Great, and also called Cyrus the Elder by the Greeks, was the founder of the Achaemenid Empire, the first Persian Empire. Under his rule, the empire embraced all the previous civilized states of the ancient Near East, in which expanded vastly and eventually conquered most of Western Asia and much of Central Asia. From the Mediterranean Sea and Hellespont in the west to the Indus River in the east, Cyrus the Great created the largest empire the world had yet seen. Under his successors, the empire eventually stretched at its maximum extent from parts of the Balkans (Bulgaria-Paeonia and Thrace-Macedonia) and Eastern Europe proper in the west, to the Indus Valley in the east. His regal titles in full were "The Great King, King of Persia, King of Anshan, King of Media, King of Babylon, King of Sumer and Akkad, and King of the Four Corners of the World". The Nabonidus Chronicle notes the change in his title from simply "King of Anshan", a city, to "King of Persia". Assyriologist François Vallat wrote that "When Astyages marched against Cyrus, Cyrus is called 'King of Anshan'" but when Cyrus crosses the Tigris on his way to Lydia, he is 'King of Persia'. The coup therefore took place between these two events".

2.4 Innovations of Cyrus the Great Era

Persians from several centuries BC have discovered many firsts' technologies, services, and practices, some of them are still being used in Iran and other nations. Here are some of innovative practices started by Archimedeans, led by the Cyrus the Great.

Animation: As far back as 5 centuries BC, Persians used a sequence of cartoon like photos of a goat jumping from tree to tree, as seen in Figure 2.3 [2].

Figure 2.3 A Jumping Goat Animation of 500 BC by Persians [2].

Battery: Again, around the same time of the Persian Empire, the Persians used a clay pot and some metal and vinegar and some electrolytes to device a battery of about 1/5 to 2 volts. This battery device was invented centuries before Alexander Volta (18 February 1745 – 5 March 1827) discovered the battery as an electrical device [2]. Figure 2.4 shows two photos of the first battery of the Cyrus the Great era (see Figure 2.4).

Figure 2.4 Photos of the First Battery Device Invented by the Persians Around 500 BC [2].

First Human Rights Declaration: Around 534 BC, Cyrus the Great declared the first human rights of the world. This declaration was made in the ancient Pahlavi language on a clay cylinder (see Figure 2.5), which was found among the ruins of the Babylon of then Persia (current north of Baghdad, Iraq). This Cyrus Cylinder is now being housed in the British Museum in London [1, 2].

Figure 2.5 Photo of the Cyrus Cylinder on the Human Rights Declaration Around 500 BC [2].

Postal Services: Archimedeans at the time of Cyrus the Great had a vast empire, as shown in Figure 2.1. From one end to another, highways with a 2500 miles length had to device a means of communicating among various districts, provinces or states. To achieve that, they erected stations in specific distances of housing, many fresh horses were ready to take the messenger(s) to the next station [2]. Figure 2.6 shows one such station of the Cyrus era [2].

Figure 2.6 Photo of a Postal Service of the Cyrus Era Around 500 BC [2].

Yachchal (Refrigerator): About 400 BC, Persians had created dome structures, which would allow hot air to ascend and leave into the atmosphere allowing water at the base of the dome turning into ice. The sizes (volume) of these domes (see Figure 2.7) were as high as 5000 m^3. In this segment's title, "Yach" means ice and "hal" means pit or "ice pit". These domes are still in use in parts of Iran and some neighboring nations.

Figure 2.7 Photo of a *Yachchal* Dome of the Persian Empire Era [2].

Water Supply System: As early as 1000 BC, the Persians constructed underground supply houses of water that could remain cool and clean for months. They were called "Qanat" or "Kariz". The way they worked "is a gently sloping underground channel to transport water from an aquifer or water well to the surface for irrigation and drinking, acting as an underground aqueduct (see Figure 2.8). This is an old system of the water supply from a deep well with a series of vertical access shafts. The qanats still create a reliable supply of water for human settlements and irrigation in hot, arid, and semi-arid climates but the value of this system is directly related to the quality, volume, and regularity of the water flow. Traditionally qanats are built by a group of skilled laborers, (muqannīs), with hand labor. They historically paid well was typically handed down from father to son. According to most sources, the qanat technology was developed in ancient Iran by the Persian people sometime in the early 1st millennium BC, and spread from there slowly westward and eastward" [3].

2.5 Cyrus the Great International Online University

Recently, an outstanding effort for further cultivation of Iranian culture an online university for Cyrus the Great [4]. Below is the narrative for creation of such an entity. "What is called the culture of the Iranian world today is the result of thousands of years of history of the inhabitants of a great land that is extensive and pervasive in the world from Khutan to Farang (culture). Each part of the geology of this cultural area alone is inherited and tries to provide a clear way for children and future generations to preserve the data of their ancestors for thousands of years, away from the hustle and bustle of the religious and politicians and the current political boundaries. The World University of Cyrus the Great, named after one of the greatest men of this field of culture, Cyrus the Achaemenid, was founded in line with these aspirations. This university, with the cooperation of intellectuals who are the children of this origin, will pave the way for the further cultivation and flourishing of this great culture, which has left its world remnants in other civilizations, in such a way that its borders are stable and stay away from the sting of time." [4]. Figure 2.9 shows the charter of this University.

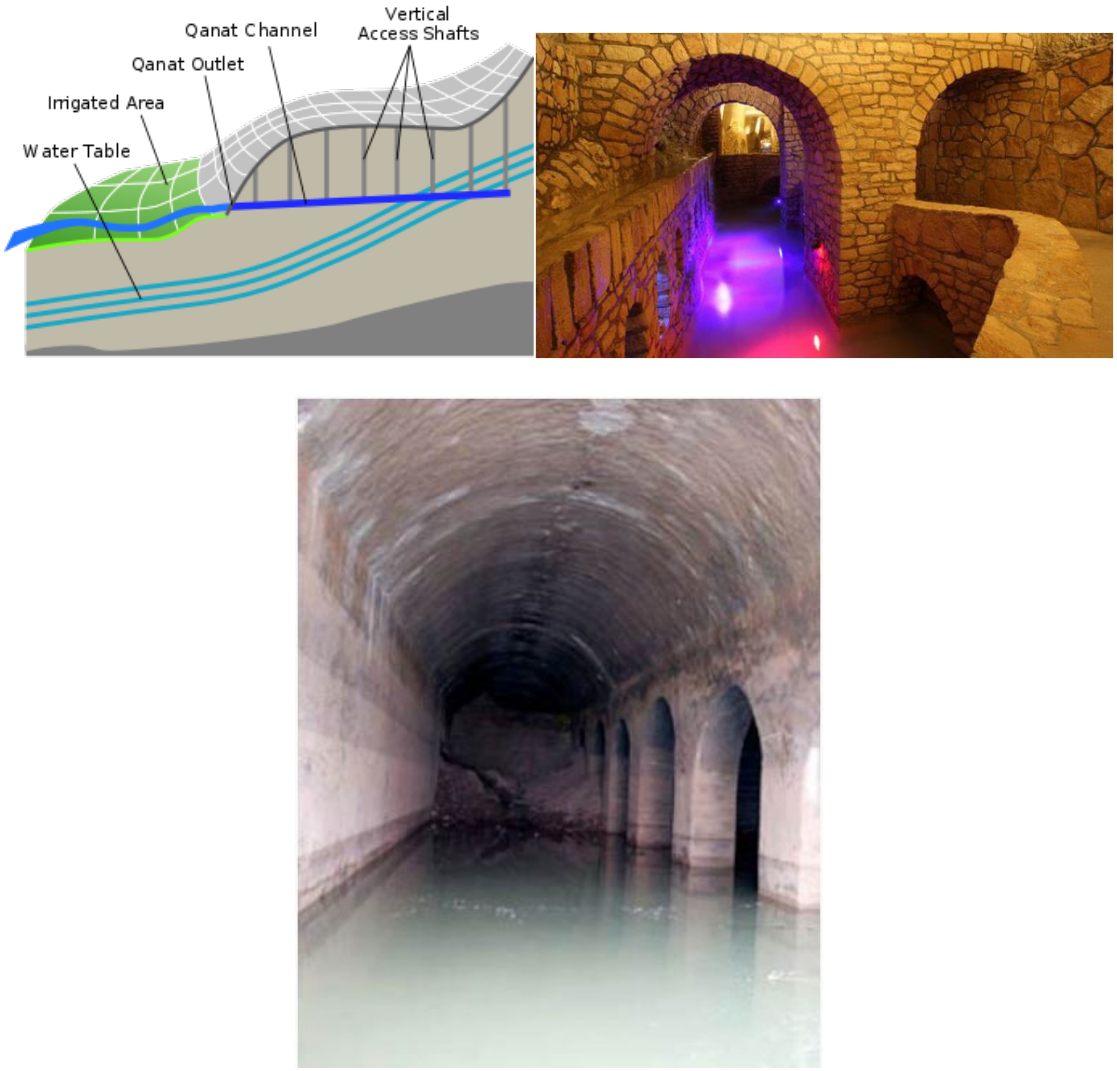


Figure 2.8 Photos of a *Qanat* Water System of the Ancient Persian Empire Era [2,3].

2.6 Philosophy and Death

Cyrus earned his greatness as he respected each and every region that he conquered and left their religious beliefs alone and respected their cultures and style of living. In 539 BC, Cyrus entered the city of Babylon, the capital of the Babylonian empire. Mesopotamia, Elam, Syria, and Judaea seem to all have submitted to Cyrus as well. By 535 BC at the latest he controlled all the lands up to the borders of Egypt.

After the conquest of Babylon, Cyrus styled himself "King of Babylon, king of the lands." He ruled his multinational conquests through the governing structures already in place in different nations. In Babylonia he maintained the traditional bureaucratic apparatus, which had grown up there over the centuries, in the Phoenician cities of Syria and the Greek cities of Asia. Minor He installed native "tyrants" (a word, which did not then carry the pejorative implications it has today) as rulers; elsewhere he often kept the previous rulers in place, on the condition that they remain obedient to him. Over them he apparently placed Persian and the Mede governors (satraps) who had almost complete power over large portions of the empire.

Figure 2.9 Charter of the Cyrus the Great International University, New York, Sydney and Dushanbe [4].

Cyrus followed a policy of religious toleration throughout his empire, although he himself was almost certainly a devotee of the chief god of the Iranians, Ahura Mazda, and indeed may have been a follower of Zoroastrianism, (which had probably been spreading amongst the Iranians since the 7th century) and therefore a monotheist. Nevertheless, he presented himself to the Babylonians as the one appointed by their god, Marduk, to restore his religion (after being

neglected by the last Babylonian king, Nabonidus). He reinstalled the statues of the gods, which Nabonidus had brought to Babylon from various Mesopotamian cities to their former sanctuaries. He ordered the reconstruction of the temples in Mesopotamia and Elam, which had fallen into ruin. Most famously, he allowed the Jews to return to their homeland and restore the temple to Yahweh in Jerusalem. The book of Isaiah, in the Jewish and Christian Bible, refers to Cyrus as the "anointed one (messiah) of the Yahweh".

Cyrus, therefore, seems to have gone out of his way to respect the customs and religions of the conquered people. This is perhaps reflected in the judgement of the Greeks, the long-standing enemies of the Persians, who considered him both a great conqueror and a wise statesman. He also benefited from the teachings of the Zoraster (Chapter 1).

In 530 BC Cyrus went on a campaign against the Massagetae tribe, in central Asia, who were raiding the northwest frontier of his empire, and was killed in battle. His body was brought back to the new capital he founded, Pasargadae, for burial. Figure 2.10 shows Cyrus's tomb as it stands now and the affection of Iranian people who celebrate his birthday.

Figure 2.10 Tomb of Cyrus the Pasargadae, Pars, Iran [5].

References

[1] https://en.wikipedia.org/wiki/Cyrus_the_Great

[2] Lorey Kenton, https://www.youtube.com/watch?v=v6KoIyDneME

[3] https://en.wikipedia.org/wiki/Qanat

[4] https://www.google.com/imgres?imgurl=https%3A%2F%2Fwww.ancient.eu%2Fuploads%2Fimages%2F264.jpg%3Fv%3D1485680718&imgrefurl=https%3A%2F%2Fwww.ancient.eu%2Fimage%2F264%2Ftomb-of-cyrus%2F&docid=Y3zu9dw10KCAHM&tbnid=_X18mhcQUIDHdM%3A&vet=10ahUKEwiCl-OBk4vnAhUMQ60KHQSKACgQMwhcKAkwCQ..i&w=1024&h=801&bih=554&biw=1163&q=Iranian%20people%20at%20Cyrus%20the%20great%20tomb%20with%20flower&ved=0ahUKEwiCl-OBk4vnAhUMQ60KHQSKACgQMwhcKAkwCQ&iact=mrc&uact=8

CHAPTER 3 Borzuya (Physician)

3.1 Introduction

In this chapter, the life of an ancient Persian physician of 5th Century AD will be covered. It is said in the literature that Borzuya "journeyed to India in search of medicine to revive the dead" [1,2].

3.2 Facts on Borzuya [1]

Borzuya	Borzuya or Burzōē or Burzōy
Born	5th Century AD (exact date unknown)
Place of Birth	Abarshahr or Merv (Near modern-day Nishapur, Iran)
Nationality	Persian (Iranian)
Death	6th Century AD (exact date unknown)
Place of Death	(exact place unknown)
Education	Gundishapur Medical Complex (see Chapter 4)

3.3 Biographical Sketch [1]

"Borzuya (or Burzōē or Burzōy) was an ancient Persian physician in the late Sassanid era, at the time of King Khosrau I. He translated the Indian *Panchatantra* ("*Panchatantra is an ancient Indian collection of interrelated animal fables in the Sanskrit verse and prose, arranged within a frame story"*[1]) from Sanskrit into Pahlavi (Middle Persian). But both his translation and the original Sanskrit version he worked from are lost [2], perhaps due to book burnings of the Arab invaders of the 7th century. It is reported that before their loss, however, his Pahlavi version was translated into Arabic by Ibn al-Muqaffa under the title of *Kalila and Dimna* or *The Fables of Bidpai* and became the greatest prose of Classical Arabic. The book contains fables in which animals interact in complex ways to convey teachings to princes in policy.

The introduction to *The Fables of Bidpai* or *Kalila and Dimna* presents an autobiography by Borzūya. Beside his ideas, cognitions and inner development leading to a practice of

medicine based on philanthropic motivations, (Borzuya's search for truth), his skepticism towards established religious thought and his later asceticism are some features lucidly depicted in the text" [2].

There is considerable discussion whether Borzūya is the same as Bozorgmehr, while sources indicate they are different people, the word "Borzūya" *can* sometimes be a shortened form of Bozorgmehr [2].

Figure 3.1 Map of the Persia Empire (6th[th] and 7[th] Centuries) [3].

3.4 Contributions and Achievements

"In the mid-sixth century, the Persian physician Borzuya journeyed to India in search of medicine to revive the dead. Borzuya was the leading physician to the Persian King Khosrau Anushirawan. He came from an elite family, had a scholarly education in medicine, and was respected as a scholar and a sage as well as a physician [1]. Borzuya's journey seeking medicine to revive the dead indicates that reviving the dead was a reasonable interest in professional medicine in the ancient world. The outcome of Borzuya's journey was unexpected: he delivered to Anushirawan the still-famous book of *Kalilah wa Dimnah* and turned to a life of piety and asceticism" [1].

"One day Borzuya submitted to the king a letter in which he mentioned that he found in the books of the sages that in the land of the Indians there are mountains on which shrubs and different kinds of plants grow, such that if they are recognized, and gathered, and blended, then one could extract from these plants a medicine with which the dead are brought to life. He asked the king to allow him to search for them and to aid him by giving him the money necessary for this undertaking and to write letters on his behalf to every one of the kings of the Indians asking them to assist him in his task" [1].

Borzuya brought to the attention of the king in writing his interest in reviving the dead, and related this proposal to learning from the books of sages? He described the technical aspects of professional physicians' processing of *materia medica*. He requested funding for his proposal and proper documentation to allow the project to secure necessary cooperation from other officials. The king responded to Borzuya's request with similar professionalism:

> *"The king agreed to this and ordered that what he had requested be given to him and he prepared gifts for the kings whom Borzuya was to meet, as was the custom of kings when they sent ambassadors to one another on account of their business. Borzuya set out on this business and paused for nothing until he arrived in the land of the Indians. He handed over the letters and the things which he had with him to every one of those kings and asked their permission to search for that thing on account of which he had come to them. All of them granted permission to do this and they let him go about his search in complete freedom in the whole country and in all of the mountains. And they supplied him with guides, helpers, and instruments. Borzuya persisted in his search for twelve months gathering shrubs and plants which grew in those mountains and mixing them with the medicines described in his books and supervising everything diligently and then applying his concoction to the dead, but without seeing any corpse restored to life"[2].*
>
> *Borzuya began to have doubts about his books and to suspect them and have no faith in what they said but at the same time it seemed intolerable to him that he should return to the king a failure, a liar, and in error [2].*

Borzuya recognized that a medical profession's knowledge is ultimate futile. That reality is difficult to recognize socially and would not absolve Borzuya from responsibility for his project's failure.

> "Borzuya vindicated his project to revive the dead by pivoting to a different field of knowledge. Borzuya shifted to work on eternal truths of a relatively abstract type. He translated from the Sanskrit into Persian wisdom in the form of stories of animals acting like humans. Borzuya thus produced the book of *Kalilah wa Dimnah* [3]. Over the next millennium, that book became widely known and highly influential around the world. By the modern scientific standard of publication influence, Borzuya's work to find medicine to revive the dead was very successful" [2].
>
> Borzuya's work on reviving the dead contributed importantly to a different understanding of reviving the dead. Describing books of wisdom as medicines, the Indian sages told Borzuya: *The dead who are brought to life with these medicines are the ignorant among men who have no knowledge, but when they are treated with knowledge and made to understand things and when they make things easy by learning from these books, which owe their existence to those scholars, then it is not long until they know and see.*

It should be noted that due to the mass burning of the library books of the Persian Empire by Arab invaders in the 7th century, little solid references can be found about pre-Islam scientists and poets.

References

[1] https://en.wikipedia.org/wiki/Borzuya

[2] https://www.purplemotes.net/2013/07/14/borzuya-revive-dead-kalilah-wa-dimnah/

[3] Map: https://www.google.com/search?q=map+of+Persian+during+Sassanids&client=firefox-a&rls=org.mozilla:en-US:official&channel=np&tbm=isch&source=iu&ictx=1&fir=mch_jK-JYnoqtM%253A%252CRFhmkLSMAPKXtM%252C_&usg=__u64y5vmetz3Etdmi5v2ARQ42Bwg%3D&sa=X&ved=0ahUKEwjxtvGS6svYAhVmw4MKHd05BAwQ9QEIKzAB

CHAPTER 4 Gondishapur Medical Complex

4.1 Introduction

In this chapter a comprehensive medical center in the southwest of current Iran and part of the Persian Empire era will be briefly described. Gondishapur was one of three Centers of Science and Medicine during the third century AD, and during the Persian Empire Shapur I (241-272 AD). These three centers were Gondishapur, Ctesiphon and Resaina [1]. Figure 4.1 shows the map of Persian Empire during the existence of the Gondishapur Medical Complex.

Sassanid's Emperor Khosrau I commissioned the refugees (from the Byzantine and Roman Empires) to translate Greek and Syriac texts into Pahlavi. They translated various works on medicine, astronomy, philosophy, and useful crafts. He also turned towards the east, and sent the physician Borzouye (see Chapter 3) to invite Indian and Chinese scholars to Gondishapur. These visitors translated Indian texts on astronomy, astrology, mathematics and medicine and Chinese texts on herbal medicine and religion. Borzouye is said to have translated himself the *Pañcatantra* from Sanskrit into Persian as *Kalila u Dimana* [2].

4.2 Facts on the Gondishapur Medical Complex [3]

Gondishapur Medical Complex	
Established	Early third Century AD
Location	Southwest Iran of today in Khuzestan Province and then near Susa
Nature of Complex	First Medical Education Center in the World
Academician	Persians, Indians and Greek
Special Event	First known medical conference in the world
Impact	The Complex was the education model of the era after the Arab invasion and the creation of the "House of Wisdom" in Baghdad based on Gondishapur

4.3 Description of Gondishapur

As it was mentioned, Gondishapur was built during the reign of Sassanid King Shahpur, the First, in early part of the 3rd Century AD. The construction was made by employing Roman and Greek prisoners after defeating a Roman army led by Emperor Valerian [2]. The Center was a frequent destination of scientists and physicians of the time from as far places such as India and Greece and the Center was a venue of development of the Persian Culture. The Center had a lasting impact on not only the Islamic world but also in the West, especially during the Medieval

times [1]. After the Moslem invasion, the Gondishapur Medical Complex acted as a model for Baghdad's "House of Wisdom" during the Abbasid's Caliphate [1].

Figure 4.1 The Map of the Persian Empire during the Sassanid Dynasty [3].

Figure 4.2 shows photos from the 2nd Educational Center – Ctesiphon [2]. Ctesiphon from Middle Persian / Parthian was an ancient city on the eastern banks of the River Tigris and about 35 kilometers (22 miles) southeast of Baghdad (current Capital of Iraq). In 58 BC, the city was the capital of the Sasanian Empire until year 651 AD at the inception of the Islamic invasion. During the late sixth and early seventh centuries, Ctesiphon advanced into a rich commercial metropolis and was a key center along both shores of the river, which included Seleucia – a Hellenic City [2]. These two cities and other nearby metropolises were known as "*The Cities*", or *al-Mada'in* (in Arabic) [2]. After the Islamic invasion, Ctesiphon declined and was depopulated by the end of the 8th century. The economic and political place of this city was taken down to Baghdad – at that time, the Capital of Ababsid Caliphates. Figure 4.2 shows what is left of the Ctesiphon City of the *"Learning City*" [2ww], also known as the Archway of Ctesiphon or "Taq--Kasra" in Parsi. Figure 4.3 shows a statue of Shapur I King of Sassanid [2].

Figure 4.2 Scenes from the Ctesiphon City and the Academic and Educational Center (In central Iraq).

Figure 4.3 The Statue of Shapour I King of Sassanid's (Southern Iran of today).

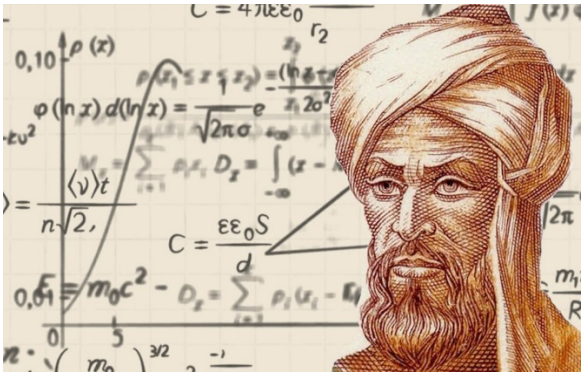
References

[1] https://en.wikipedia.org/wiki/Academy_of_Gondishapur

[2] https://en.wikipedia.org/wiki/Ctesiphon

[3] https://www.ncbi.nlm.nih.gov/pubmed/18154434

CHAPTER 5 Khwārizmī (Founder of Algebra)



5.1 Introduction

In this chapter, the life story and scientific contributions of a legendary Persian scientist of 8th and 9th Centuries of Persia is given. His name is Khwārizmī (Persian from city of Khwarazm, now Kiva in Uzbekistan) or Al-Khwārizmī (Arabic name). He was a Persian, mathematician, astronomer and geographer during the Abbasid Caliphate, a scholar in the House of Wisdom in Baghdad. The content of this chapter is as follows: Section 5.2 provides Facts about Khwārizmī, in Section 5.3 his full biographical Sketch is given, while his Contributions are given in Section 5.4 and finally impact of his collective work are provided in Section 5.5.

5.2 Facts on Khwārizmī [1]

Khwārizmī	AKA Mohammad Khwārizmī, Father of Computer Algorithms and Algebra
Born	780 AD
Place of Birth	Khwārizmī (now Khiva), in Khorasan province of Persia (now in Uzbekistan).
Nationality	Persian (Iranian)
Religion	Indication is that as a youth he was a Zoroastrian and converted to Islam later on

Death	850 AD
Place of Death	Baghdad, Abbasid Dynasty Capital
Parents	Unknown

5.3 Biographical Sketch

Mohammad Khwārizmī was born in the city of Khwārizm (Arabic name of Greater Khorasan Province in 9th Century Persia) in 780 AD [1]. The city, now called Kiva lies in Uzbekistan – south of the Aral Sea (See Figure 5.1, [2]). His birthplace was a way station of the Great Silk Road at the time [1].

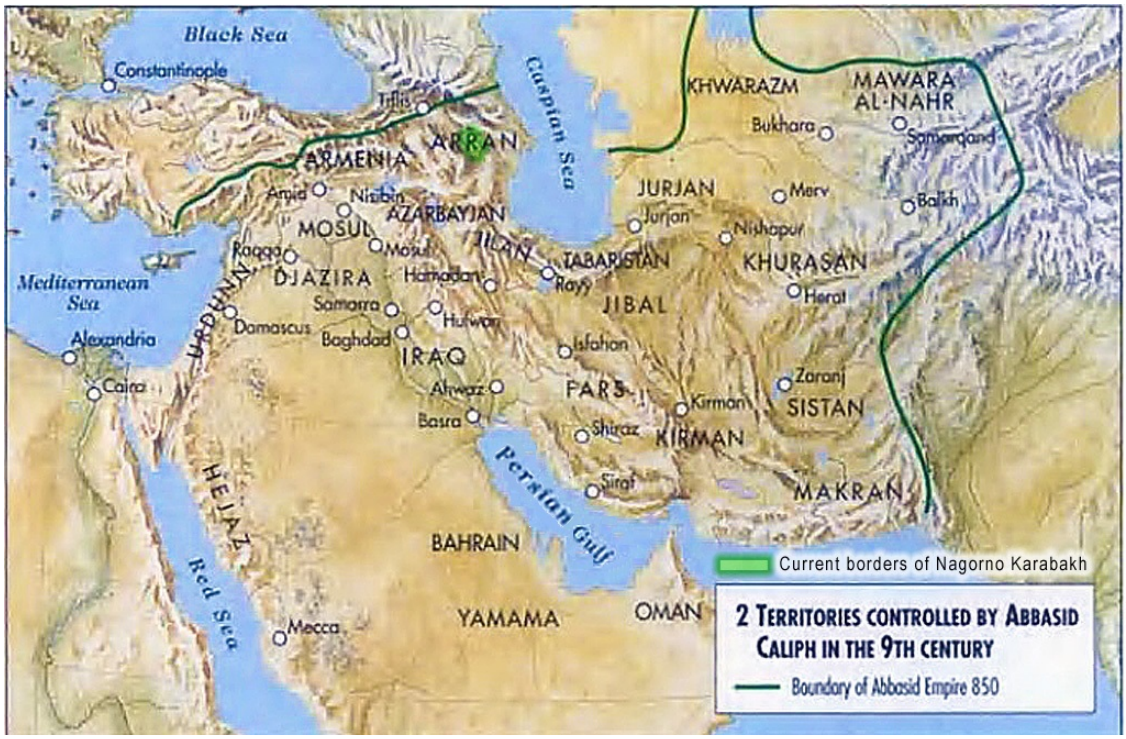


Figure 5.1 Map of Persia during Abbasid Dynasty (9thth Century) [2]

> Even though this town becomes part of other empires and countries, it goes back to ancient Persia and this "lean and bearded man with long black hair carries the soul of Persia within him' [3].

Khwārizmī had signs of genius at an early age, his Arab friends were calling him "the Magnus," or "the magician." Later his magical contributions in numbering systems, arithmetic, trigonometry, geometry, geography, algebra, and what can now be noted a computational algorithm (namesake after his Arabic name – Al-Khwārizmī) all showed this nickname later in his life. His genius was flourished when he joined the House of Wisdom in Baghdad in the Court of Abbasids' Calipha Al-Mamun [3]. At the House, he joined a lot of notable scientists from Arab lands and other locations and finally found fertile ground for his discoveries and innovations.

His religion during his youth is speculated that he was a Zoroastrian – the pre-Islam religion of the Persian Empire. Later on, he converted to Islam and was known to be an orthodox Muslim [3].

5.4 Contributions and Achievements

Algebra – al-Kitāb al-mukhtaṣar fī ḥisāb al-jabr wal-muqābala translated as *Compendious Book on Calculation by Completion and Balancing*. This book constitutes one of his lasting and pioneering pieces of work. This book was written with the encouragement of Abbasid Caliph Al-Mamun in Baghdad. This work was turned into creation of a branch of mathematics for calculations and applications to surveying, trade, etc. [4,5]. The new field will be called "Algebra". The word "al-Jabr," means "Algebra" in Arabic and Persian of today. This name, in turn, refers to "restoration," or adding numbers or terms to both sides of an equation to cancel or consolidate terms [5,6]. He used the "restoration" approach to solve a series of linear quadratic equations [3,5]. Figure 5.2 shows a print page of his book on Algebra. Figure 5.3 shows an original page of the book on Algebra.

Figure 5.2 A page from the original Arabic print manuscript of Khwārizmī's book on Algebra [5]

In order to solve a linear quadratic equation, Khwārizmī first reduced the equation $ax^2 + bx + c = 0$, where a, b, and c are positive integers. Note here that time the concept of "zero 0" was not yet discovered [5].

1) *$ax^2 = bx$, squares equal*
2) *$ax^2 + bx = c$, squares and roots equal numbers*

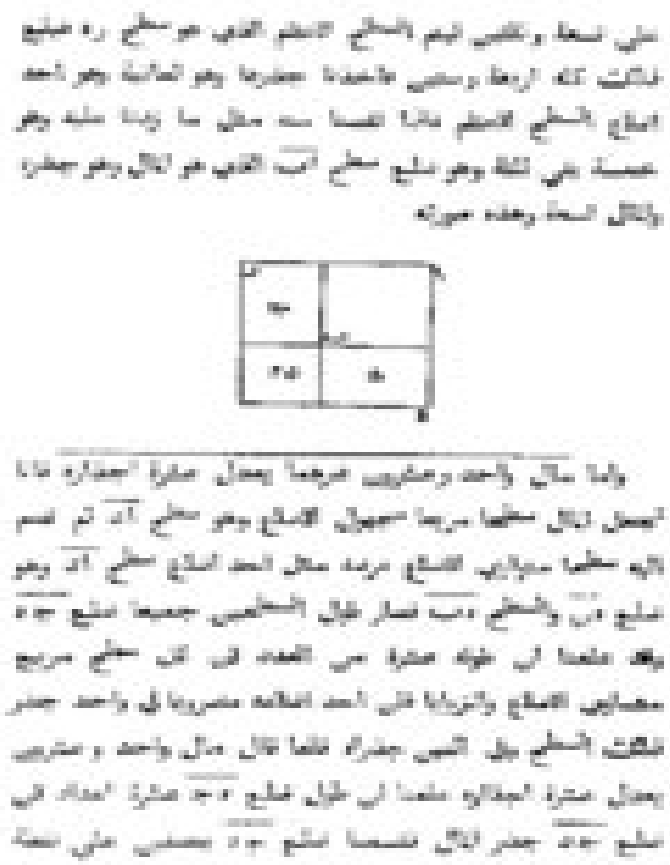


Figure 5.3 The original Arabic print manuscript of Khwārizmī's book on Algebra (Courtesy: The Algebra of Al-Khwārizmī by Fredrick Rosen, in English and Wikipedia.org [5])

3) *$ax^2 = c$, squares equal numbers*
4) *$bx = c$, roots equal numbers*
5) *$bx + c = ax^2$, roots and number equal squares*
6) *$ax^2 + c = bx$, squares and numbers equal roots*

Then by dividing both sides by coefficient of the quadratic term and using "restoration" and "balancing", for example, x2 = 60x – 5x2 is changed to 6x2 = 60x or x2 + 15 = x + 5 is similarly changed to x2 + 10 = x. It needs to be indicated that these examples uses modern algebraic operations. But, Khwārizmī, in his time, used ordinary text to describe the operations needed to solve these equations [5]. Years later his work for solution of linear quadratic equation ax2 + bx + c = 0 led to two well-known relations relating roots of the equation to its coefficients - x1x2 = c/a and x1 + x2 = -b, or x1,2 = {[-b ± SQRT (b2 – 4ac)]} / 2a, where SQRT(.) is the square root operation.

Another example: Assume you want to solve this quadratic equation: $x^2 + 10x – 39 = 0$. Khwārizmī. He solved it via geometry as follows:

1) *Rewrite the equations as $x^2 + 10x = 39$*
2) *Draw a square with side x, see Figure 5.4 (part 1).*

3) *Divide the linear term 10x into 4 equal segments, in this case 4x2.5x = 10x and add that to the square in the figure. The area of the shape in Figure 5.4 (part 2) is known to be 39.*
4) *Complete the larger square by adding 4 smaller square at the 4 corners each 2.5x2.5 = 6.25 in area. The larger square in now shown in Figure 5.4 (part 3). Its area is 39 + 4x6.25 = 39 + 25 = 64. Hence the side of the larger square in now know to be (x + 5) = $64^{1/2} = 8$.*
5) *Answer x = 8 – 5 = 3.*

Of course with the standard quadratic equation $x_{1,2} = \{[-b \pm SQRT (b^2 - 4ac)]\} / 2a$ there is another root which is $x = -5 - 64^{1/2} = -5 -8 = -13$. It is much more difficult to find the second root via geometry. Perhaps the notion number "0" was not yet introduced by Khwārizmī at the time.

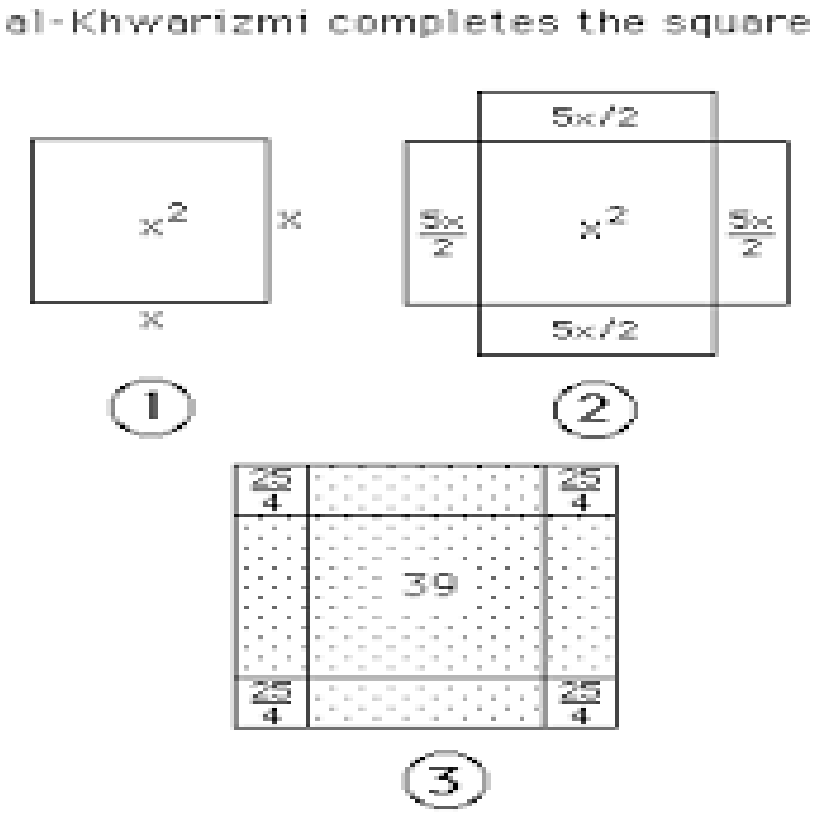


Figure 5.4 Khwārizmī's geometrical solution of quadratic equation $x^2 + 10x - 39 = 0$ [5]

a) ***Arithmetic*** *– Kitāb al-Jamʿ wa-l-tafrīq bi-ḥisāb al-Hind with a possible English translation as: "The Book of Addition and Subtraction According to the Hindu Calculation". This is the second book and second branch of modern mathematics whose foundations were laid by Khwārizmī - Arithmetic. The original arithmetic book in Arabic was lost, but its untitled Latin translation (possibility in 12th Century) survived later on [3]. The untitled Latin version was referred to by two words: "Dixit algorizmi," or" So said Al-Khwārizmī" [5]. Khwārizmī, knowledgeable in Greek, had learned through searches that earlier Hindus had made progress on mathematics. The Indian scientist*

was called "Kanka" at the court of former Caliph al-Mansour who used a book by a fellow late Indian named "Brahmagupta" to calculate relative locations of sun and planets [3,5]. At this point Kanka had also passed away and all there was the news about the existence of "a book by Hindu Brahmagupta". Khwārizmī had heard of the book that Kanka had used. He was searching everywhere for the Hindu book and asked numerous librarians and archivists to locate it [5,6]. The archivists were finally successful in locating that book and much more for Khwārizmī as a treasure of information and knowledge all written in Sanskrit (A philosophical language of Hinduism). Although Khwārizmī did not read Sanskrit, nevertheless, he was able to see a new Hindu character looking like a dot (". " or "0"), a new number that the West and rest of the world know it as "zero". He realized that the then finger-counting accounting not Arabic letter characters are not appropriate for the task [3]. What has come from Brahmagupta's booked revealed to Khwārizmī that he needs to revise some of his own thinking and wrote his Arithmetic book. He introduced the decimal (0 to 9) system and proposed different combinations of these now known as 10 digits to formulate and solve many challenging problems in astronomy and a more reliable means for creating calendars, including religious ones [3]. These new applications and relative distance of sun from earth and other planets, leads him to his next book on astronomy. Figure 5.5 shows the 0-9 decimal system resulting from Khwārizmī's work.

b) ***Astronomy – "****Khwārizmī's Zij al-Sindhind," or "Astronomical tables of Sind Hind". This book consists of 37 chapters and 116 tables full of astronomical, calendrical and astrological data [5]. The book's Tables depict and archives movements of the sun, the moon and the five known planets of the time. This book acted as a turning point on astronomy of the era of Islamic Caliphate. The original copy of this book in Arabic was lost like the arithmetic found three Latin versions of it were located in libraries in Madrid, Paris, and Oxford [5]. Figure 5.6 shows a table and a photo with the relative location of the sun, the moon and the earth [7].*

c) ***Trigonometry –*** *Khwārizmī's Zīj al-Sindhind. Among the tables in Khwārizmī's astronomy book, there were trigonometric sine and cosine values [5]. The book included his treatise on spherical geometry depicting relations between sides and angles of spherical polygons like spherical triangles defined by a number of intersecting great circles on the sphere. Its key use is in astronomical and navigational calculations [3].*

d) ***Geography –*** *Kitāb ṣūrat al-Arḍ, or "Book on the appearance of the Earth" or "The image of the Earth" translated as Geography). Khwārizmī's another major post-mortem contribution is his book on what one can call "World Map," or more generally a book on Geography. This book was a revised and corrected version of Ptolemy's Geography [5]. The book included coordinates of 2402 cities of his era in 833 AD. The only surviving copy of his book resides at the Library of Strasbourg University in France. Its Latin translation lies in National Library of Spain in Madrid [MM]. Latitudes and longitudes in order of weather zone of cities are included in the book on Geography. It is noted that none of the copies of this book actually included the then world map [5]. The map, shown*

in Figure 5.7, was a recreation of Hubert Daunicht who used Khwārizmī's list of coordinates [3]. In the original Kitab surat al-Ard, Khwārizmī corrected Ptolemy's length of the Mediterranean Sea from eastern shores to the Canary Islands. It includes the extent of open waters o Atlantic and Indian oceans among other bodies. A Photo of an Astrolabe – Ancient astronomical instrument described in 2 books by Khwārizmī is shown in Figure 5.8 [3].

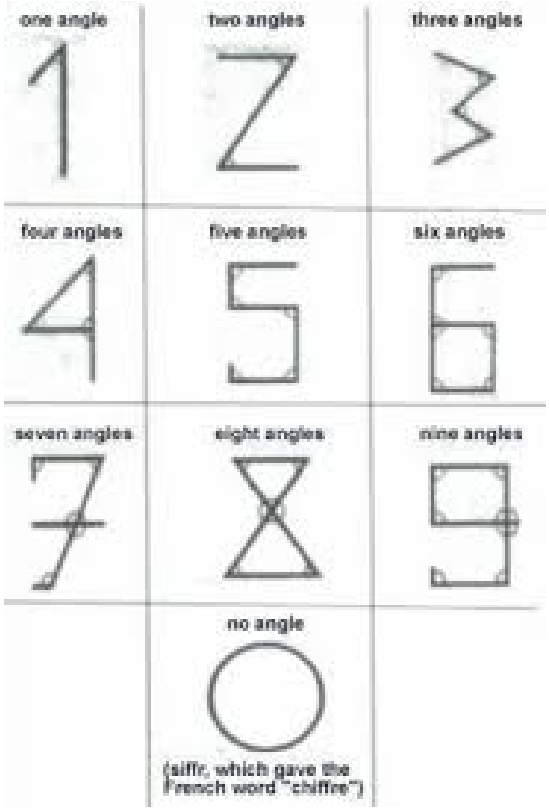


Figure 5.5. The 0-9 decimal system devised by Khwārizmī after he learned the concept of "**zero**" from Hindu mathematicians [5].

a) ***Jewish Calendar*** *– Risāla fi istikhrāj ta'rīkh al-yahūd "Extraction of the Jewish Era". This book describes a 19-year intercalation cycle (insertion of a leap day, week or month into a calendar), in order to determine on what week day the first day of the month Tishri (first month of the civil year in the Jewish calendar). It calculates the intervals between the Jewish era (creation of Adam) and the Seleucid era (the first system of continuous year numbering introduced in the Middle East as a forerunner of the Christian, Islamic, and Jewish years [Iranica]. Khwārizmī delivered rules to compute mean longitude of the sun and the moon using his Jewish calendar. Similar works can be found in Biruni's work (see Chapter 11). Khwārizmī has done a lot more work on more manuscripts that are at libraries in Istanbul, Berlin, Paris, Tashkent and Cairo. These works and books on the Fihrist (10th Century AD survey of Islamic culture) guided people in direction of Mecca.*

He has two books on Astrolabes (an instrument for astronomical calculations), see Figure 5.7 for a photo of an astrolabe.

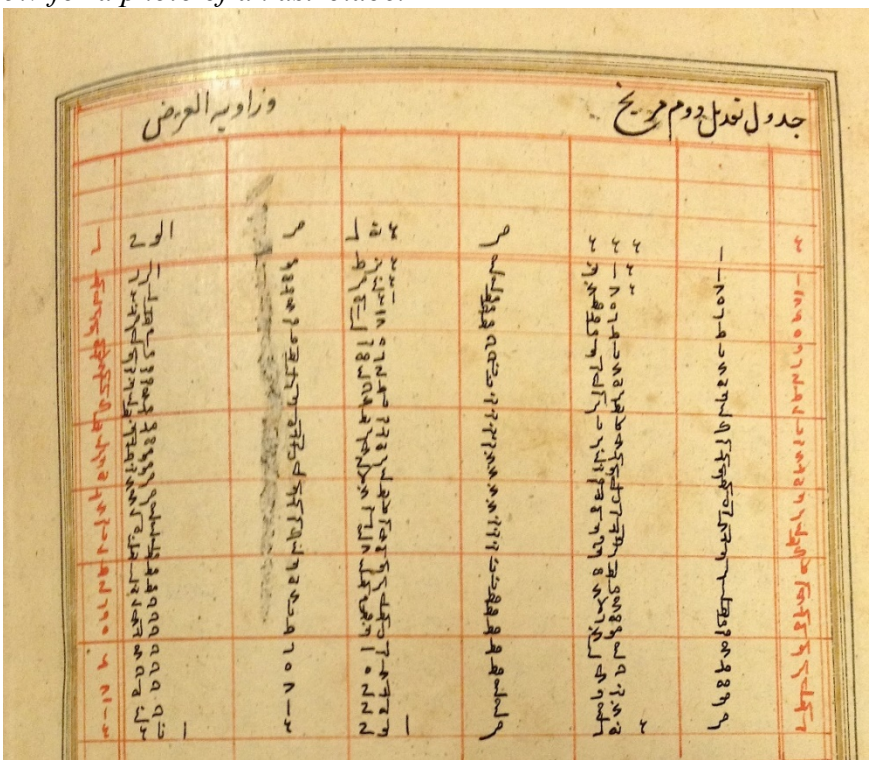


Figure 5.6 A table in Khwārizmī's Astronomy book [5]

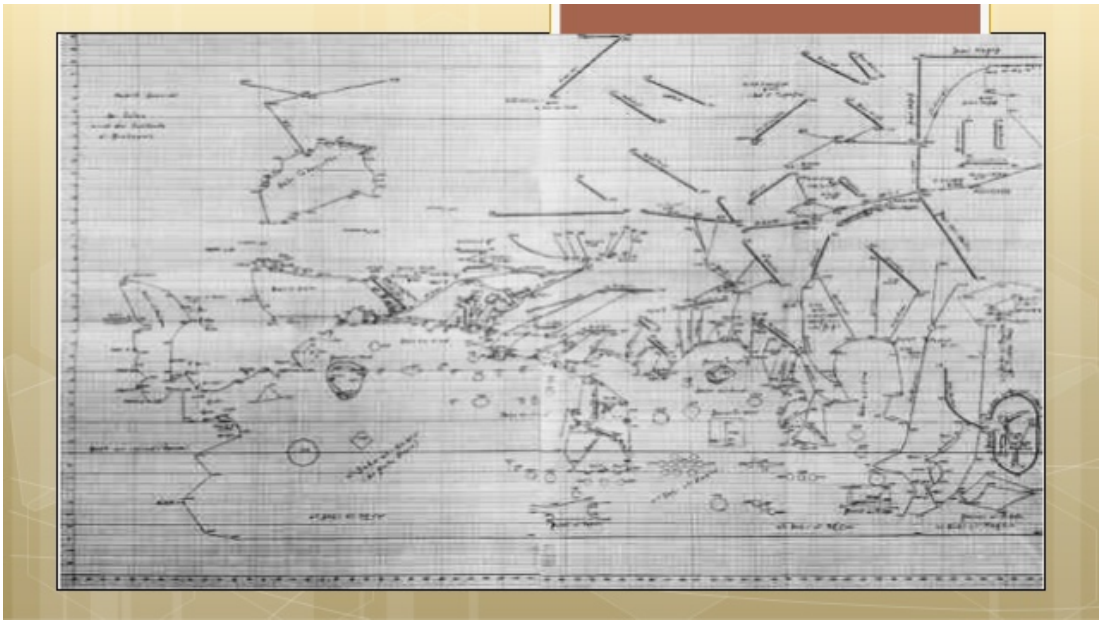


Figure 5.7 The world map constructed by Hubert Daunicht based of the data from Khwārizmī's book on geography [5].

Figure 5.8 Photo of an Astrolabe – Ancient astronomical instrument described in 2 books by Khwārizmī [3,5].

5.5 Summary

Khwārizmī is one of the most consequential scientist, mathematician, and astronomers in our 1st Century civilization. He is credited with the following lasting contributions:

1. ***Algebra****: He was the first who created in mathematics. He is the "Father of Algebra".*
2. ***Algorithm****: He invented the notion of algorithm in computing. Some consider him as the "Forefather of computer science".*
3. ***Digit Zero "0"*** *: He used the Hinus' work on a dot later called zero number and developed the (0-9) decimal counting system impacting arithmetic all the way to our current 21st Century.*
4. ***World Map and Calendar****: He made lasting impacts to trigonometry, astronomy, geography, calendars, etc.*
5. ***Final Points:*** *NASA – Space agency of United States has dedicated a North Moon Crater in honor of Khwārizmī, see Figure 5.9 [7].*

References

[1] https://www.google.com/#q=bio+of+Khwarizmi

[2] Map: https://www.google.com/search?q=Maps+of+Abbasid+dynasty&tbm=isch&imgil=FtSLUcm4wQCUPM%253A%253BVK6kC-UCrg66qM%253Bhttp%25253A%25252F%25252Fwww.gifex.com%25252Fdetail-en%25252F2010-01-01-11553%25252FThe-Abbasid-Caliphate-7501258.html&source=iu&pf=m&fir=FtSLUcm4wQCUPM%253A%252CVK6kC-UCrg66qM%252C_&usg=__-cFB_JYnW6jr7teNfuaTf8PbpJQ%3D&ved=0ahUKEwi9zfSK1PrUAhVR62MKHXdXDUIQyjcIMA&ei=QVJhWf2oE9HWjwP3rrWQBA&biw=1268&bih=586#imgrc=On0DqH4lq1btpM:

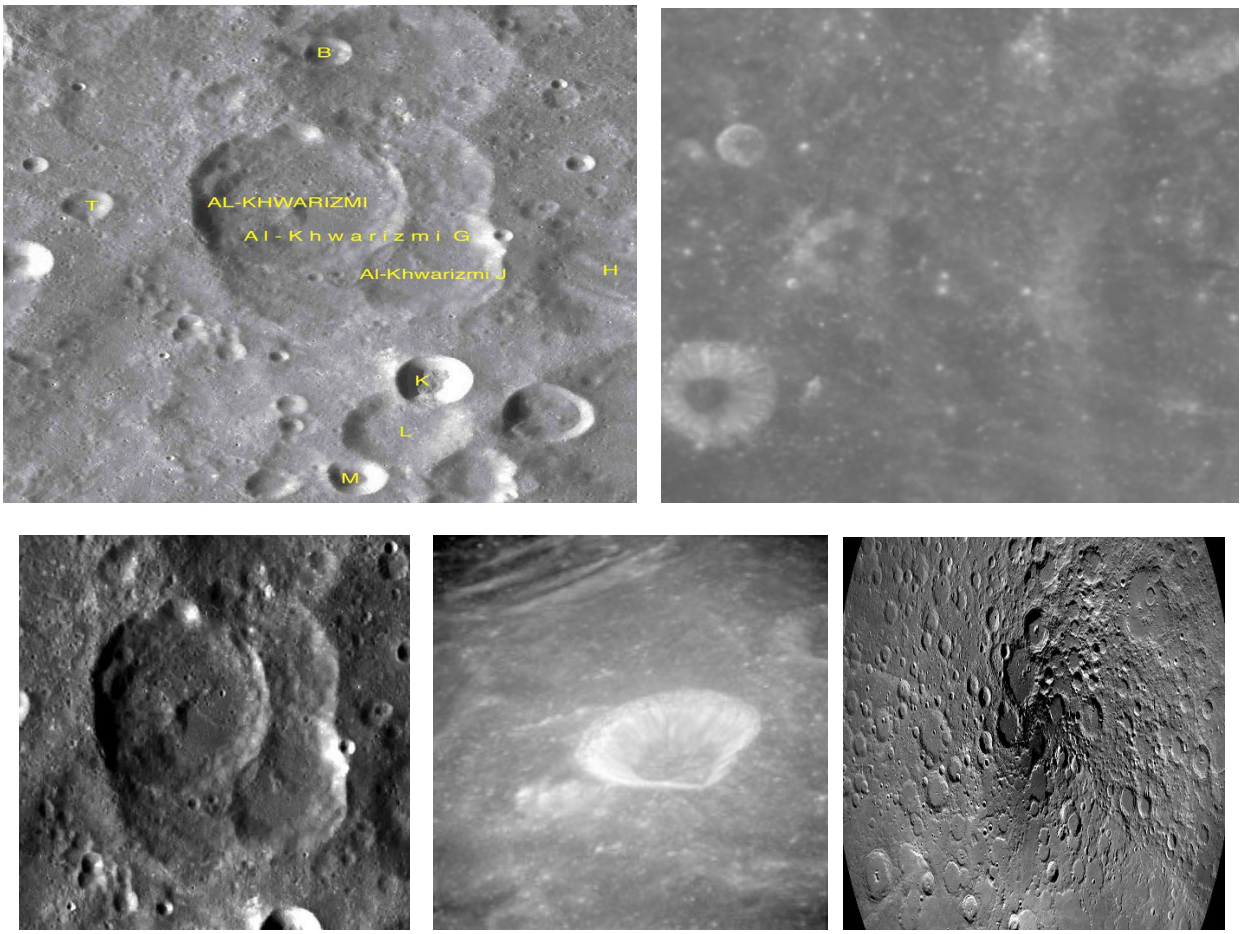


Figure 5.9 Scenes from Khwārizmī's North Moon Crater [7]

[3] M. H. Morgan, Lost History, National Geographic, Washington, DC, 2007, p. 191.

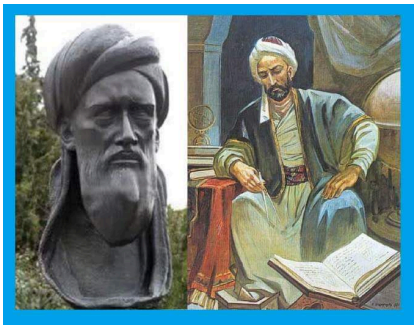
[4] A. R. Haghighat, "The Iranian part in the History of World Civilization," Koomesh Publishers, Tehran, Iran (in Persian), 1999 (ISBN: 978-964-9198-8-5.

[5] https://en.wikipedia.org/wiki/Muhammad_ibn_Musa_al-Khwarizmi

[6] http://www.iranicaonline.org/articles/seleucid-era

[7] https://www.google.com/search?q=Khwarazimi+Moon+crater+photo&tbm=isch&imgil=YpL7uM5Y5L4txmM%253A%253ByVwWEusbDUw4GM%253Bhttps%25253A%25252F%25252Fwww.nasa.gov%25252Fmission_pages%25252FLRO%25252Fmultimedia%25252Ftycho-peak-gal.html&source=iu&pf=m&fir=YpL7uMY5L4txmM%253A%252CyVwWEusbDUw4GM%252C_&usg=__pbP0wMjEvEnWGlQ8pdieBRymADA%3D&ved=0ahUKEwimsaXwtIXVAhUI94MKHQ-qDXUQyjcIPw&ei=7fVmWeaGB4jujwSP1LaoBw&biw=1265&bih=586&dpr=1#tbm=isch&q=Khwarizmi+Moon+crater+photo&imgrc=p3htCYKQW_YSFM:

CHAPTER 6 Razi (First Pediatrician)



6.1 Introduction

In this chapter, the life story and scientific contributions of another great scientist of 9th and 10th Centuries of Persia is given. His name is Rhazes or Zakaria Razi (Persian) or *Mohammad-e Zakariā-ye Rāzi* (Arabic). He was a Persian, polymath, physician, alchemist, chemist, and philosopher and an important figure in the history of medicine.

6.2 Facts on Rhazes [1]

Rhazes	AKA Zakaria Razi, *Zakariā-ye Rāzi*
Born	854 AD
Place of Birth	Rayy, Persia (Today's suburb of Tehran, Iran)
Nationality	Persian (Iranian)
Death	October 15, 925
Place of Death	Rayy, Persia (Today's suburb of Tehran, Iran)
Parents	Zakariya ibn Yahya
Married	Married

6.3 Biographical Sketch

Razi was born in the village of Reyy, Persia during the Abbasid Dynasty (now a city outside of Tehran, Iran) in 854 AD. Figure 6.1 shows the 9th Century map of Persia of the Abbasid Dynasty.

Razi (meaning from city of Rayy) was born in Rayy (modern suburb of Tehran, Iran) located on the *Great Silk Road* that facilitated trade and cultural exchanges between East and West for centuries. Early in his life, he was interested in music and he was able to play "*Oode*" – a string instrument popular in the East. Early in his life, he made a living via lending money to his community [3].

The genius of Razi was apparent from his young age. In the year 865, at 11 years old, there was a Jewish medical doctor who was employed by the Abbasids' Court in Baghdad. The doctor had come from a Jewish family "Merv" who had converted to Islam. His name was Ali Sahl Rabban Al-Tabari. He had learned and trained in the Greek and Persian methods [4].

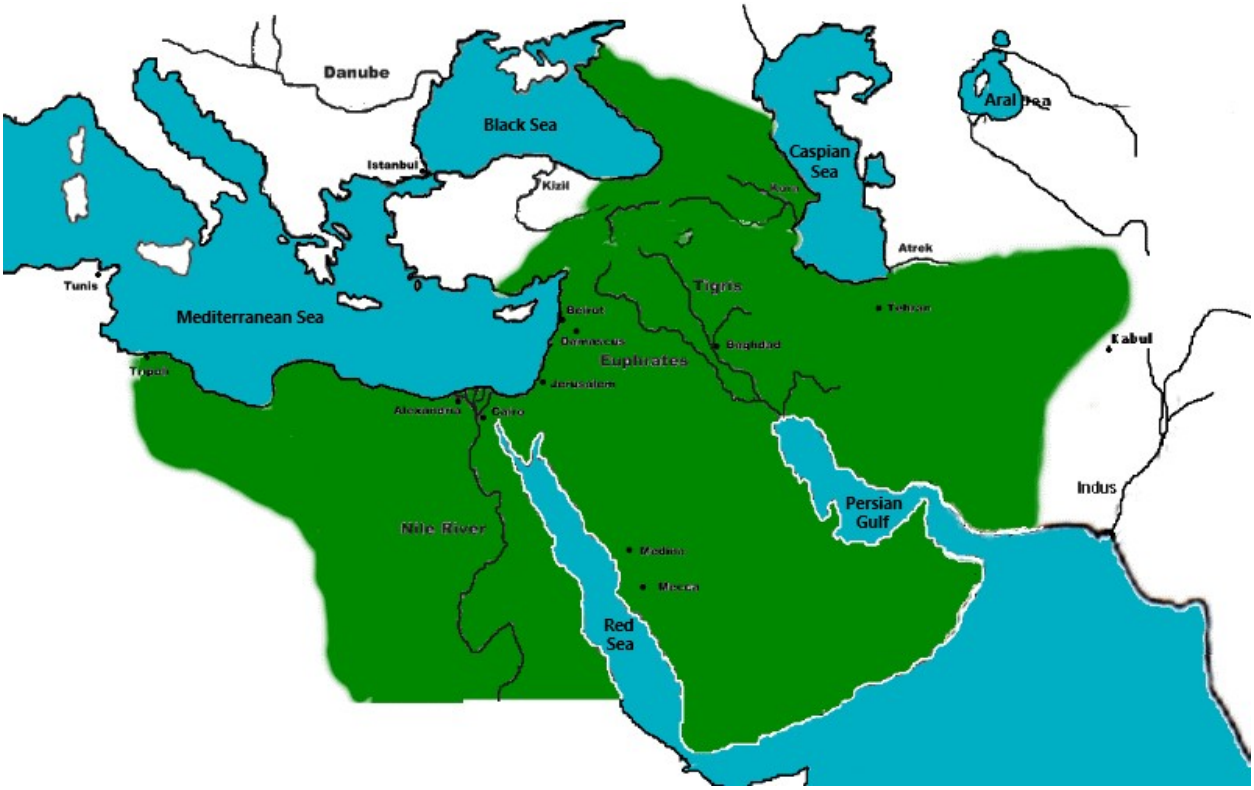


Figure 6.1 Map of Persia during the Abbasid Dynasty (9th[th] Century) [2].

At the time he was 30 years old, he moved to Baghdad where he studied at the "*House of Wisdom*", to enhance his medical knowledge. It was in Baghdad where young Razi met Al-Tabari who immediately became quite impressed by this Persian young man, whose family had been converted from Judism to Islam [4]. After the untimely death of his mentor Al-Tabari, he went back to Rayy to build and direct a local *bemaristan* (royal hospital). This assignment was ordered by the Governor of Rayy Mansur ibn Ishaq. He dedicated two books on medicine to Mansur ibn Ishaq, "*The Spiritual Physic* and the *Al-Mansūrī on Medicine"*. In the late 8[th] Century, Ababsid Ruler Harun al-Rashid invited a physician from Gundishapur (Southwestern Iran) to open a *bemaristan* in Baghdad [4]. In the 9[th] Century, Razi, by then a popular physician was invited by Abbasid's Ruler to go again to Baghdad to establish a new hospital there. There, he used, what is now called the *evidence-based approach* to pick the future hospital's location, Razi suggested having fresh meat hung in various places throughout the city and to build the hospital where meat took the longest to rot [3].

Razi spent the last years of his life back in Rayy, where he was born and grew up. He had contracted an eye disease, (perhaps due to his intense scientific and professional work, or perhaps glaucoma after a bout of cataracts), in which he ended up becoming blind.

Razi was a generous and compassionate man. He often treated his poor patients free of charge. So much so, that he wrote a *treatise*, called "*Who has no physician to attend him*", for promoting that practice. In the twilight of his life around 925 AD, one of his noted disciples wrote a biography of his mentor Razi. After his death, his fame spread from Persia to the Arab world, to Medieval Europe, and even in the 14[th] Century where his medical books were cataloged in a

library at Pererborough Abbey [3]. Figure 6.2 shows the "Colofon-Libro_de Medicina_de_Razi" (Razi's Climax of the Medical Book).

Figure 6.2 Razi's Climax of the Book of Medicine.

6.4 Contributions and Achievements

Razi, as it was mentioned, was a prolific writer with 56 books, among his 200 or so published materials arranging from philosophy, astronomy, chemistry, pharmacy, metaphysics, mathematics, and on to medicine. His scientific and professional works have been translated into Latin and other languages.

In philosophy, he was known for elaborating and identifying errors and shortcomings of the Greek Philosopher Galen [5]. He was known as the Islamic Persian version of Scarates [5]. His key contributions are the following books:

1. *Kitab al-Hawi, al-Kabir, translated as a "Comprehensive Book of Medicine", or in today's published world, perhaps one of the first "Encyclopedias of medicine". In this extensive multi-volume series of books, he emphasized a cure through food and psychological factors [6]. In this book he surveyed early Greek, Syrian, Arabic and Indian medicine. He was among the first physicians to use humorism in distinguishing various diseases like smallpox and measles. Razi is considered the "Father of*

pediatrics", and an ophthalmology pioneer [3]. Figure 6.3 shows Razi examining a child in his clinic.

Figure 6.3 Razi is Examining a Child Patient. He is considered the "Father of Pediatrics".

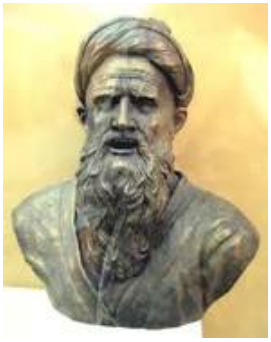
2. *Kitab al-Mansouri, written in honor of Rayy's ruler Mansur Ishaq, which became known as its 12th Century Latin translation as the Gerard of Cremona [5]. Four of two treatises in this book were dedicated to diets, drugs, medicated cosmetics, toxicology, laxatives, antidotes, and remedies of pharmaceutical interests [6].*
3. *Kitab al-Judari wa-l-Hasabah is the first treatise on smallpox, chickenpox, and measles. This book, too, has been translated into many European languages. In this book, he was first to recognize that smallpox and measles are separate diseases. In this book he writes [4]:*

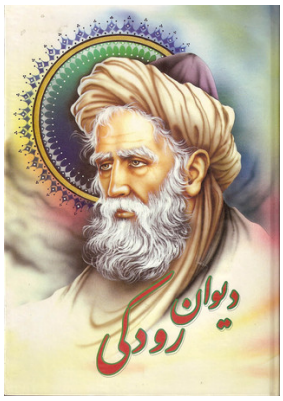
   The eruption of smallpox is preceded by a continued fever, pain in the back, itching in the nose and nightmares during sleep. One experiences a heaviness of the whole body and great restlessness, which expresses itself as a lot of stretching and yawning. At the other hand, pain in the back is more apparent with smallpox than with measles. Although one experiences heat over the whole body, one has an inflamed colon and one shows an overall shining redness, with a pronounced redness of the gums.
4. *Manafi-al-Aghdhiyyah – This is a book on diets and their impacts on health. This book followed the pattern by Galen. Here again, Razi corrected many errors made by Galen [4]. Al-Tabari had noted that Galen's humors theory was based on Hippocrates's humors, while discussing the issue with the young Razi [4]. But after Al-Tabari left the scene, it was Razi who for the first time questioned and corrected Galen's humors theory.*
5. *Man la yahudruhu al-tibb – In this book, Razi was the first to write an account on home medicine for the general public, especially poor people who could not afford to see a physician [5]. Covered in this book are illnesses such as the ear, eye, stomach, headaches, colds, and melancholy, etc. He prescribed the treatments of the time for all these and other diseases in this book.*
6. *He is credited for discovering alcohol and sulfuric acid, among other drugs as a chemist [7].*

References

[1] https://en.wikipedia.org/wiki/Muhammad_ibn_Zakariya_al-Razi#Biography
[2] Map: https://www.google.com/search?q=Map+of+Persia+in+9th+century&tbm=isch&imgil=iFyiIt2E0DMmyM%253A%253BDFrnwcdBNGYZvM%253Bhttps%25253A%25252F%25252Fwww.pinterest.com%25252Fpin%25252F451908143838696219%25252F&source=iu&pf=m&fir=iFyiIt2E0DMmyM%253A%252CDFrnwcdBNGYZvM%252C_&usg=__LMYOVt78fDjTtYU4S9CBGCofkXE%3D&biw=1269&bih=594&ved=0ahUKEwjByrKyo-HUAhUhsFQKHcgPBCcQyjcIOQ&ei=wQNUWYHmE6Hg0gLIn5C4Ag#imgrc=mOCHaV8i1HOV2M:
[3] A. R. Haghighat, "The Iranian part in the History of World Civilization," Koomesh Publishers, Tehran, Iran (in Persian), 1999 (ISBN: 978-964-9198-8-5.
[4] M. H. Morgan, *Lost History*, National Geographic, Washington, DC, 2007, p. 191.
[5] https://www.britannica.com/biography/al-Razi
[6] S. K. Al-Ghazal, "*The Valuable Contributions of al-Razi (Rhazes) in History of Pharmacy*," FSTC, Ltd. UK, http://www.fstc.co.uk
[7] https://www.google.com/search?source=hp&ei=fz-sW4__Kui1tgW3oJa4Cg&q=Rhazes+discovered+alcohol%3F&btnK=Google+Search&oq=Rhazes+discovered+alcohol%3F&gs_l=psy-ab.3...4609.21165..22937...1.0..0.168.2233.28j1.....0....1..gws-wiz.....6..0j35i39j0i67j0i131i67j0i131j0i20i263j0i10j0i22i30j33i160j0i13j0i13i5i30j0i8i13i30j33i10i160j33i21j33i10i21j33i10.YPq0mXGtsRI

CHAPTER 7 Rūdakī (Father of Persian Poetry)





7.1 Introduction

In this chapter the life and contributions of who is known as the "first poet" or "Adam of Poets", of the new Persian language, when the language was transitioned from the old Pahlavi language of the ancient Persian Empires. Rūdakī is considered the" first great literary genius of the Modern Persian language. Rūdakī composed poems in the modern Persian alphabet and is considered a founder of classical Persian literature" [1]. He was born on December 21, 858 AD in Rudak, the old Greater Khorasan (now in Tajikistan). His time was during the Samanid Dynasty (see the map in Figure 7.1). He was known not only as a genius poet but also as a musician, declaimer/reciter, and copyist at the royal court of the Samanid's king. Unfortunately, most of his works have been lost, nor safely kept.

7.2 Facts on Rūdakī [1]

Rūdakī	AKA Abū 'Abd Allāh Ja'far ibn Muḥammad al-Rūdhakī, "Adam of Poets"
Born	December 21, 858 AD
Place of Birth	Rudak, Greater Khorasan, (now Tajikistan)
Nationality	Persian
Death	941 AD
Place of Death	Panjakent, Greater Khorasan (now Tajikistan)

7.3 Biographical Sketch

"As it was mentioned Rūdakī was born in "Rudak (Greater Khorasan), a village located in the Samanid Empire, which is now called Panjakent, located in modern-day Tajikistan. Even though most of his biographers assert that he was completely blind, some early biographers are silent about this, or do not mention him as having been born blind. His accurate knowledge and description of colors, as evident in his poetry, renders this assertion very doubtful" [1].

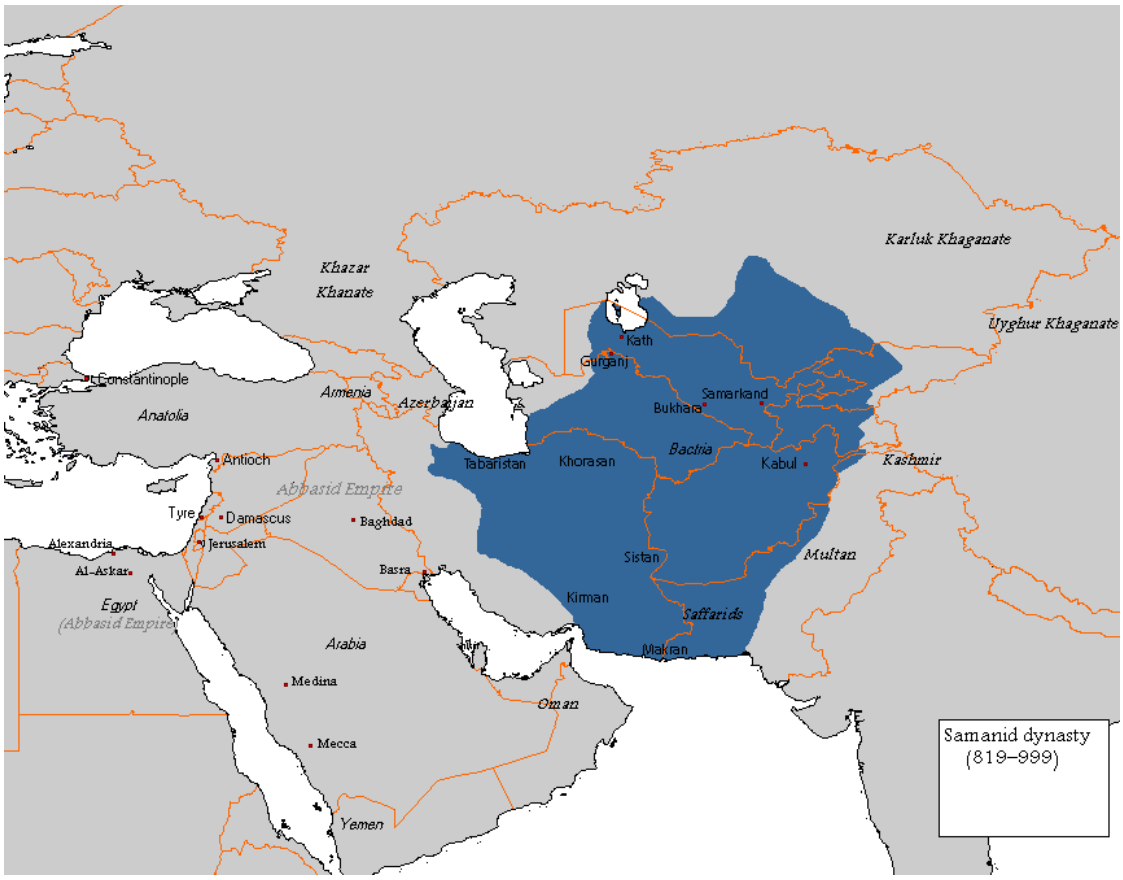


Figure 7.1 Map of the 9th and 10th Century of the Samanid Empire of Persia [2].

At the Court of the Samanids, "his accomplishments reached the ear of Samanid King Nasr II ibn Ahmad, the ruler of Khorasan and Transoxiana, who invited the poet to his court. Rūdakī became his daily companion. Over the years, Rūdakī amassed great wealth and became highly honored. Some feel he deserves the title of "father of Persian literature", or the Adam or the Sultan of poets even though he had various predecessors, because he was the first who impressed upon every form of epic, lyric, and didactic poetry its peculiar stamp and its individual character. He is also said to have been the founder of the *diwan*, which is the typical form of the complete collection of a poet's lyrical compositions in a more or less alphabetical order, which all Persian writers use even today. He was also a very adept singer and player on the *chang* (harp)" [4].

"He became the court poet to the Samanid ruler King Nasr II (914–943) in Bukhara, although he eventually fell out of favor in 937 AD. Towards the end of his life, he lived in poverty, and at the same time his poetic style also gained a touching melancholy [5]. He died in 940/941 AD leaving behind approximately 100,000 couplets, out of which fewer than 1,000 have survived" [5]. Some of his memorial structures are shown in Figure 7.2.

(a) (b) (c)

Figure 7.2 Rūdakī's Memorials: (a) Park in Dushanbeh, Tajikistan, (b) Statue in Istravshan, Tajikistan, and (c) Rūdakī Hall, Tehran, Iran.

7.4 Poetry and Writings

"Pre-Islamic Persian literature consists of religious texts, the most notable of which is the *Avesta,* a collection of liturgic fragments, and the later Pahlavi writing of the Sassanid period. The Islamic conquest of Iran in the 7th century was accompanied by a linguistic infusion: One century later, approximately 50% of the Persian literary lexicon consisted of Arabic terms. As Islam became the dominant theme, Arabic became the literary language, until the emergence of local dynasties in the 10th century Arabic literature, literary works written in the Arabic language. The great body of Arabic literature includes works by Arabic speaking Turks, Persians, Syrians, Egyptians, Indians, Jews, and other Africans and Asians, as well as the Arabs themselves" [6].

"Of the 1,300,000 verses attributed to him [7], only 52 qasidas, ghazals, and rubais survived; of his epic masterpieces we have nothing beyond a few stray lines in native dictionaries. However, the most serious loss is that of his translation of Abdullah Ibn al-Muqaffa's Arabic version of the old Indian fable book, *Kalila and Dimna* (Panchatantra), which he put into a Persian verse at the request of his royal patron. Numerous fragments, however, are preserved in the Persian lexicon of Asadi Tusi (the Lughat al-Furs, ed. P. Horn, Göttingen, 1897). In his qasidas – all of which are devoted to the praise of his sovereign and friend – unequaled models of a refined and delicate taste, very different from the often bombastic compositions of later Persian encomiasts, have survived. His didactic odes and epigrams expressed in well-measured lines a type of Epicurean philosophy of life and human happiness, and more charming still are the purely lyrical pieces that glorify love and wine" [1, 7].

"The first extant Islamic Persian poetry dates to the Samanid state (874–999); the first famous representative of this literature was the poet Rūdakī (d. 940 or 944). To Rūdakī, attributed is the lost *mathnawi* (an epic poem with rhyming couplets), the version of the fables of the *kalila wa dimna* as well as a few *qasidahs* (panegyrics). Other major figures of this period are Abu Shukur of Balkh, who is credited with the introduction of *rubaiyyat,* Persian poetic quatrains; Daqiqi (Chapter 8), a Samanid court poet and a precursor of Firdawsi (Chapter 9); and Baba Tahir Uryan (Chapter 13), author of *rubaiyyat* expressive of pain" [7].

7.5 Death

Rūdakī passed away in 941 and was buried in Panjakent, Greater Khorasan (now Tajikistan). Figure 7.3 shows the tomb of Rūdakī in Tajikistan.

Figure 7.3 Rūdakī's Tomb in Panjrud near Panjakent after Restoration in Tjikistan.

References

[1] https://en.wikipedia.org/wiki/Rudaki

[2] https://en.wikipedia.org/wiki/Samanid_Empire#/media/File:Samanid_dynasty_(819%E2%80%93999).GIF

[3] https://www.britannica.com/biography/Rudaki

[4] M. S. Asimov, C. E. Bosworth, *The Historical, Social and Economic Setting*, Motilal Banarsidass Publ., 1999. "From his early years, Rūdakī's poetic gift, his fine voice and his skilled playing on the *chang* (a harp-like musical instrument) made him popular".

[5] Jump up to:*"Rūdakī | Persian poet". Encyclopedia Britannica. Retrieved 24 March 2019.*

[6] https://charterforcompassion.org/annotated-bibliography/classical-iran

[7] *An invitation to Persian poetry: a bilingual text, Persian-English. Saberi, Reza, 1941- (First ed.). Los Angeles: Ketab Corp. 2006. p. 290. ISBN 1595840907. OCLC 71801236.*

CHAPTER 8 Daqīqī (Poet, Introduced the Shahnameh book, Patriot)

8.1 Introduction

In this chapter, the brief life story and literary contributions of an early prominent Persian poet in 10th century is given. Daqīqī was born as a Zoroastrian and nominally became Moslem in Tus. He was responsible for over 1000 verses that Ferdowsi (Chapter 9) used in his epic literarily book *Shahnameh* (the King's letter). His life was shortened as he was murdered by his own slave.

8.2 Facts on Daqīqī [1]

Daqīqī	AKA Daghighi, Abu Mansur Daqīqī
Born	935 AD
Place of Birth	Tus, Khorasan, Iran, also may be in, Samarkand, Balkh, MarvBukhara
Nationality	Persian
Death	977 AD
Place of Death	Tus, Khorasan, Iran
Notable work	Writing the story of Gushtasp in the *Shahnameh*

8.3 Biographical Sketch

> "Daqīqī was born sometime around 932 AD. Like many other Iranian grandees and scholarly of the early Middle Ages, Daqīqī was most likely born into a family of Iranian landowners (*dehqans*), or at least was descended from such a class. During this period there was a large amount of growth in literature, mostly in poetry. It was under the Iranian Samanid Empire that the Persian literature appeared in Transoxania and was formally recognized. The advancement of an Islamic New Persian literature thus started in Transoxiana and Khorasan instead of Fars, the homeland of the Persians" [1].

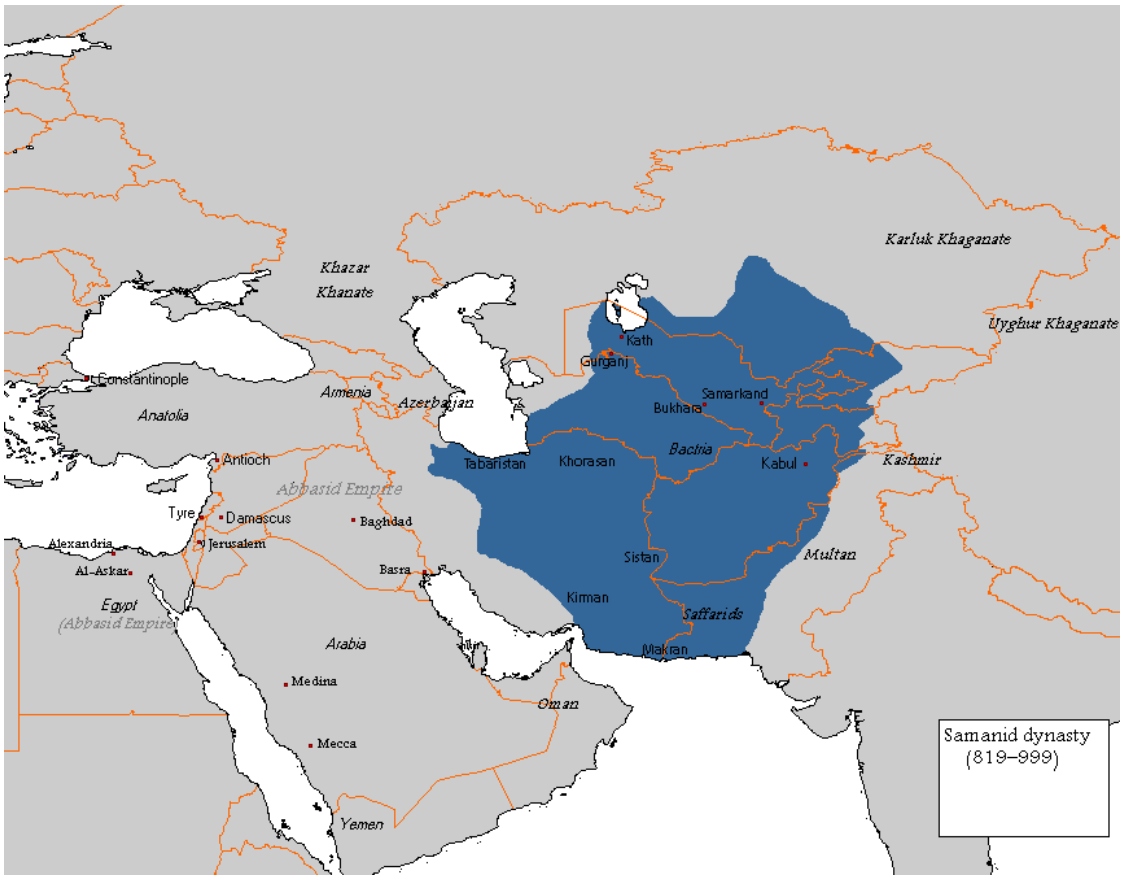


Figure 8.1 Map of the 9th and 10th Century of the Samanid Empire of Persia [2].

"Daqīqī's place of birth is disputed as such, the cities of Bukhara, Samarkand, Balkh, Marv, and Tus have been described as his birthplace; the latter seems more likely. His religious belief is disputed amongst scholars. Although he had a Muslim name, this "was not in itself proof of any religious beliefs, since numerous prominent Iranian scholars and officials converted to Islam during the early Islamic period in order to maintain their means of livelihood but practiced Zoroastrianism in secret" (Tafazzoli). His birthplace, Tus, was at that time a predominantly Shi'ite city, and during the governorship of Abu Mansur Muhammad's it had become the hub of Iranian nationalism. According to the Encyclopedia Iranica, it is thus likely that Daqīqī, possibly like fellow poets and a Tus-native Ferdowsi, was an adherent of Shia Islam. Many Shi'ite Muslims were proud of their ancient Iranian heritage, which resulted in them being described as Qarmatians and Shu'ubis and classified as *Mājūs* (Zoroastrians) and *Zindīq* (Manicheans). Some quotations from Daqīqī's poetic verses, however, show a strong veneration towards Zoroastrianism, which have led to many scholars such as Nöldeke and Shahbazi, which favor a Zoroastrian origin for Daqīqī. In one of Daqīqī's verses, he applauds the Zoroastrian religion as one of the four things most important to him" [1].

8.4 Poetry and Writings

"Daqīqī began his career at the court of the Muhtajid ruler Abu'l Muzaffar ibn Muhammad in Chaghaniyan, and was later invited to the Samanid court by the Samanid

ruler (*amir*) Mansur I (r. 961–976 AD) [4]. Under the Samanids, ancient Iranian legends and heroic traditions were taken in special interest, thus inspiring Daqīqī to write the *Shahnameh* ("The Book of Kings"), a long epic poem based on the history of the Iranians"[1].

"He was, however reportedly murdered by his slave in 977 AD. Only a small part of Shahnameh had been completed, which was about the conflict between Gushtasp and Arjasp. The rapid growth of interest in the ancient Iranian history made Ferdowsi continue the work of Daqīqī, completing the Shahnameh in 994 AD, only a few years before the fall of the Samanid Empire. He later completed a second version of the Shahnameh in 1010 AD, which he presented to the Ghaznavid Sultan Mahmud (r. 998–1030 AD). However, his work was not as appreciated by the Ghaznavids as it was by the Samanids" [1].

"Daqīqī's small part, which included around 1,000 verses, was maintained in the Shahnameh; his technique is more old-fashioned compared to that of Ferdowsi, and also "dry and devoid of the similes and images that are to be found in Ferdowsi's poetry" (Khaleghi-Motlagh) [3]. This was mentioned in the Shahnameh by Ferdowsi, who although admired him, also criticized his poetic style, and considered it inappropriate for the national epic of Iran" [1].

8.5 Death

Daqīqī was murdered by his slave at an early age of 42 in Tus.

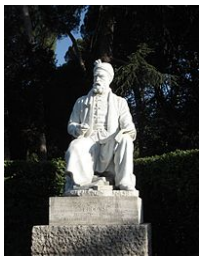
References

[1] https://en.wikipedia.org/wiki/Daqiqi

[2] Map: https://en.wikipedia.org/wiki/Samanid_Empire#/media/File:Samanid_dynasty_(819%E2%80%93999).GIF

[3] Khaleghi-Motlagh, Djalal (1993). "DAQĪQĪ, ABŪ MANṢŪR AḤMAD". Encyclopedia Iranica, Vol. VI, Fasc. 6. pp. 661–662.

CHAPTER 9 Ferdowsi (Epic Poet of Persia, Patriot)



9.1 Introduction

In this chapter, the brief life story and literary contributions of Persia's epic revered poet Abolghasem Ferdowsi. He is perhaps one of the greatest Persian poets as he was responsible in the revival of the Persian language despite the foreign languages and cultures of invaders of the Persian lands of those days and eras. His epic book *Shahnameh*, called "the Book of Kings", was written under the auspices of King Mahmoud Ghaznavi during the 10th Century. It took him 30 years to finish the book. Figure 9.1 shows the map of Persia around Ferdowsi's life span.

> "*The Shahnameh, also transliterated as Shahnama (Persian: pronounced, "The Book of Kings"), is a long epic poem written by the Persian poet Ferdowsi between 977 and 1010 AD and is the national epic of Greater Iran. Consisting of some 50,000 "distichs" or couplets (two-line verses), the Shahnameh is the world's longest epic poem written by a single poet. It tells mainly the mythical and to some extent the historical past of the Persian Empire from the creation of the world until the Islamic conquest of Persia in the 7th century. Modern Iran, Azerbaijan, Afghanistan and the greater region influenced by the Persian culture (such as Georgia, Armenia, Turkey and Dagestan) celebrate this national epic.*
>
> *The work is of central importance in the Persian culture and is regarded as a literary masterpiece, and definitive of the ethno-national cultural identity of modern-day Iran, Afghanistan and Tajikistan[2]. It is also important to the contemporary adherents of Zoroastrianism, in that it traces the historical links between the beginnings of the religion and the death of the last Sassanid ruler of Persia during the Muslim conquest, which brought an end to the Zoroastrian influence in Iran*" [1].

9.2 Facts on Ferdowsi [1]

Ferdowsi	AKA Hakim Abu 'l-Qasim Ferdowsi Tusi
Born	940 AD
Place of Birth	Tus, Khorasan, Persia (In today's Iran), close to city of Nishapur, see Figure 9.1
Nationality	Persian (Iranian)
Death	1020 AD
Place of Death	Tus, Persia (In today's Iran)
Parents	Father: Baha ud-Din Walad, himself a mystic and theologian known as sultan of scholars

Legendary Poem	بسی رنج بردم در این سال سی عجم زنده کردم بدین پارسی "I have struggles these thirty years In order to revive Persia and Parsi language

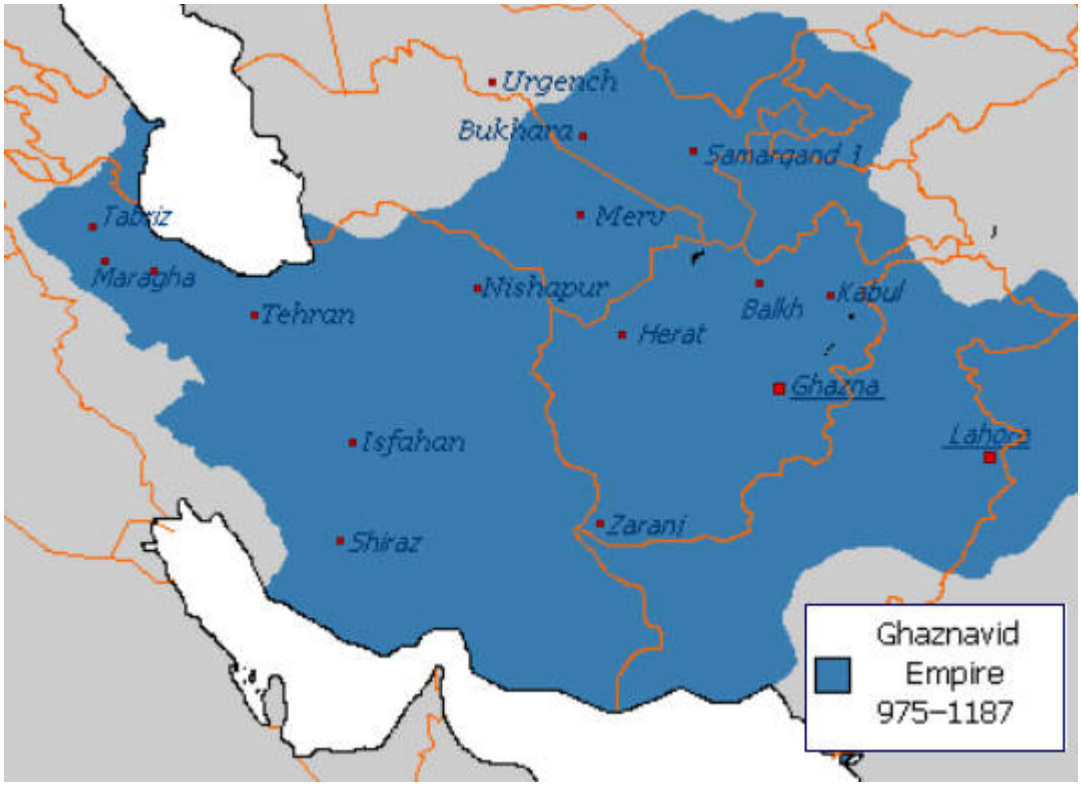


Figure 9.1 Map of the Ghaznavi Empire of Persia (975-1187 AD) [2].

9.3 Biographical Sketch

Ferdowsi was born in 940 AD in the village of Paj near the city of Tus in the Province of Khorasan in present Iran. His father was a farmer owning lands. His wife was from the same village and had a son who passed away early at the age of 37 and mourned that loss in his epic book "*the Shahnameh*" [3]. Ferdowsi's family was among those who had flourished through the Sassanid Dynasty (the last dynasty before the 7th Century Arab invasion). His community, also called "dehghans" in Farsi were patriotic and they believed in preserving "the cultural traditions of Iran, including the legendary tales about its kings" [3].

> "The Muslim conquests of the 7th century had been a watershed in Iranian history, bringing the new religion of Islam, submitting Iranians to the rule of the Arab caliphate, and promoting the Arabic culture and language at the expense of Persian. By the late 9th century, the power of the caliphate had weakened, and the local Iranian dynasties emerged. Ferdowsi grew up in Tus, a city under the control of one of these dynasties, the Samanids, who claimed descent from the Sassanid General Bahram Chobin (whose story Ferdowsi recounts in one of the later sections of the *Shahnameh*)".

Having strong beliefs in the ancient Persian cultures and civilization, the local rulers of Tus at Sassanid's era tried to safeguard the new Persian language against Arab invasion and its cultural influences. The seed of *Shahnameh* – the Book of Kings, was hence formed by the middle of the 10th Century Tus. Ferdowsi was the right candidate for this historical assignment.

Ferdowsi was quite literate about the Persian Literature from the pre-Arab invasion poets Rudaki and Daghigi (Daqīqī) and followed their footsteps [3]. *Shahnameh* was written in Persian when modern Persian was emerging from the middle Pahlavi Persian using very few Arabic words in it [1]. There is no proven record that the original hand-written version of *Shahnameh* survived after his death. It is said that the first complete version of *Shahnameh* was written 200 years after Ferdowsi's death [3]. It is further noted in the records of the *Shahnameh,* that copies of it are different in a way that transcribers and copyeditors of the work replaced some original (no longer common in the time's language) with current words [3].

Figure 9.2 shows three photos regarding the epic works of Ferdowsi. The first photo represents the facade of *Shanameh*, the second photo shows the poet's own description of the goal of the epic work, and the 3rd photo is a typical page of the book.

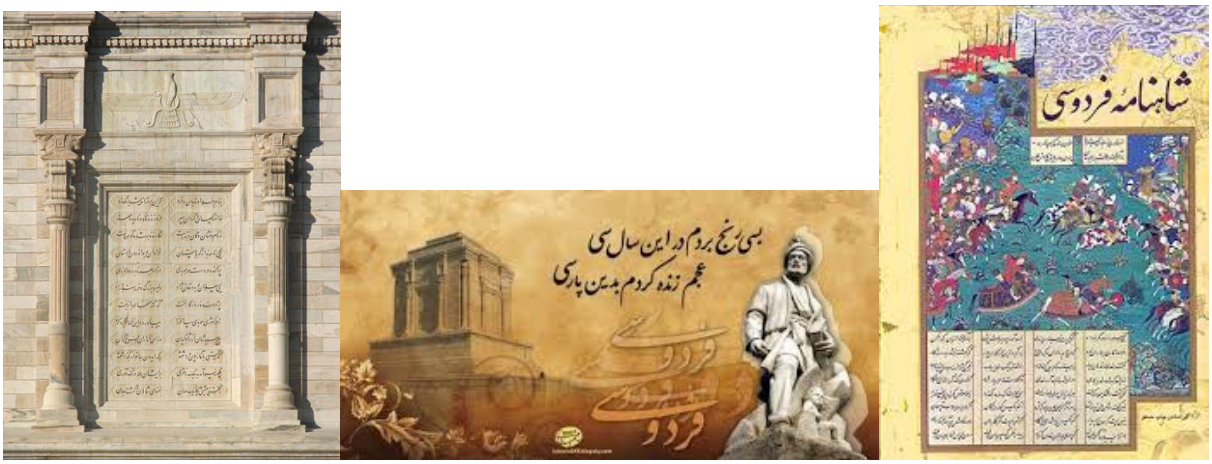


Figure 9.2 A Key Verse of *Shahnameh* (middle photo) Translation, says "I Suffered Thirty Years of Hard Work … to Revive Persia and the Persian Language".

Throughout the ten centuries after Ferdowsi, numerous Persian poets have honored him by referencing to *the Shahnameh*. Here is a poem composed by another genius poet, Saadi (see Chapter 23) [4]:

Figure 9.4 shows the moselium of Ferdowsi in his home City of Tus. Ferdowsi will be forever eternal in not only the history of poetry but also in political history and nationalism.

Ferdowsi exhausted all his resources for thirty years to finish *the Shahnameh*. In those days, very few poets could survive or retain their works without the blessings of the court of the king. During his time, Ghaznavid king was Mahmoud Ghaznavi – a man with no education or knowledge of quality of poetry and no idea of the value of *the Shahnameh*. Ferdowsi avoided this low-value king's blessing, lived, and died poor during the last decade of his life.

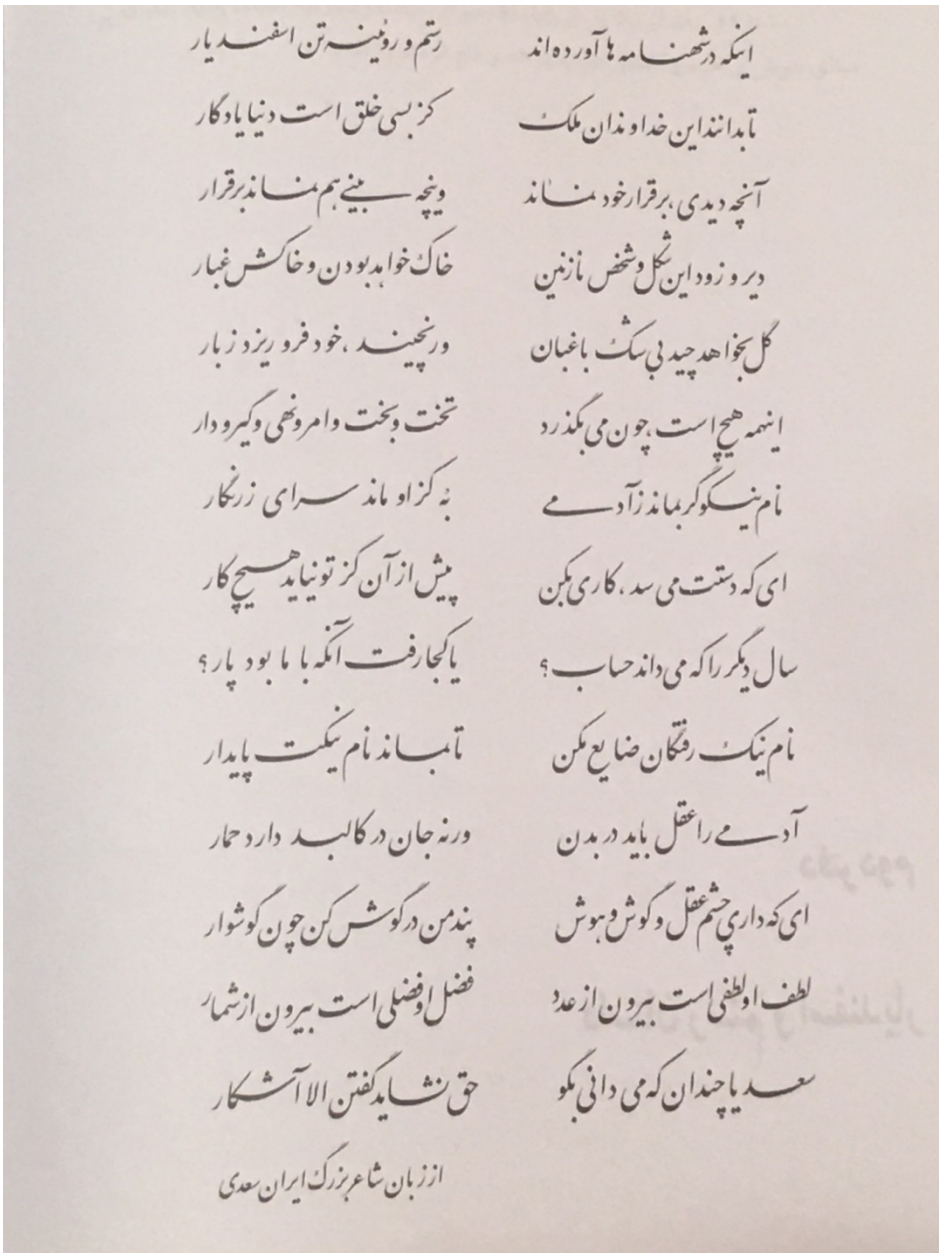


Figure 9.3 Compositions of Saadi's poem for Ferdowsi [4].

Figure 9.4 Two Scenes from Ferdowsi's Tomb in Tus, Khorasan, Iran [2].

References

[1] https://en.wikipedia.org/wiki/Ferdowsi

[2] Map: https://www.google.com/search?q=map+of+Persia+during+Ghaznavid+dynasty&rlz=1C1PRFC_enUS773US773&tbm=isch&source=iu&ictx=1&fir=AiDjjdFBAcQwKM%253A%252CGuND5ARRzruS7M%252C_&usg=__uStD6j3q3v_FzC88RtEl6VftFdk%3D&sa=X&ved=0ahUKEwiVlL2okefXAhVCwYMKHQNDCVkQ9QEIOTAC#imgrc=AiDjjdFBAcQwKM:

[3] http://www.heritageinstitute.com/zoroastrianism/shahnameh/

[4] F. Reza, "Shahnameh: From Legends to Firdowsi's Vision," Etellaat Publishers, Tehran, Iran, 2015.

CHAPTER 10 Farabi (Scientist)

10.1 Introduction

In this chapter, the life story and scientific contributions of a great 10th century scientist of Persia is given. His name is Farabi. He was born in the city of Farab, which in Persian means, "Irrigated lands by diversion of river water".

10.2 Facts on Farabi [1]

Farabi	AKA Abū Naṣr Muḥammad b. Muḥammad Farabi
Born	During 9th Century, exact date is unknown
Place of Birth	Farab on the Jaxartes in greater Khorasan (Today's Kazakhstan)
Nationality	Persian
Death	December 950 or January 951
Place of Death	Damascus (Today in Syria)

10.3 Biographical Sketch

Farabi was born in the city of Farab in greater Khorasan during the 9th Century and lived through the middle of 10th Century Persia during the Persian Kingdom of Mahmud Ghaznavid from 975-1187 AD. Figure 10.1 shows the map during 10th Century. As described in Wikipedia [1] his biographical sketch is quite uncertain as his successors and their followers, or even other scholars did not undertake the task of keeping a precise account of his life and his impact. The only account up to the 12th century about Farabi can be summarized [1].

> "An autobiographical passage by Farabi, is preserved by Ibn Abī Uṣaibiʿa. In this passage, Farabi traces the transmission of the instruction of logic and philosophy from antiquity to his days. Two reports by Al-Masudi, Ibn al-Nadim and Ibn Hawqal as well as by Said Al-Andalusi (d. 1070 AD), who devoted a biography to him." By the 13th Century, Farab was known as Otrar [1]. Figure 10.2 shows the ancient city of Otrar or Farab now in today's Kazakhstan.

Farabi's biological data was not recorded after his death, leading to an uncertainty in his ethnicity and nationality. Wikipedia indicates that "*medieval Arab historian Ibn Abī Uṣaibiʿa (died in 1269)—Farabi's oldest biographer mentions in his ʿOyūn that Farabi's father was of Persian descent. Al-Shahrazūrī who lived around 1288 A.D. has written an early biography and states that Farabi hailed from a Persian family*".

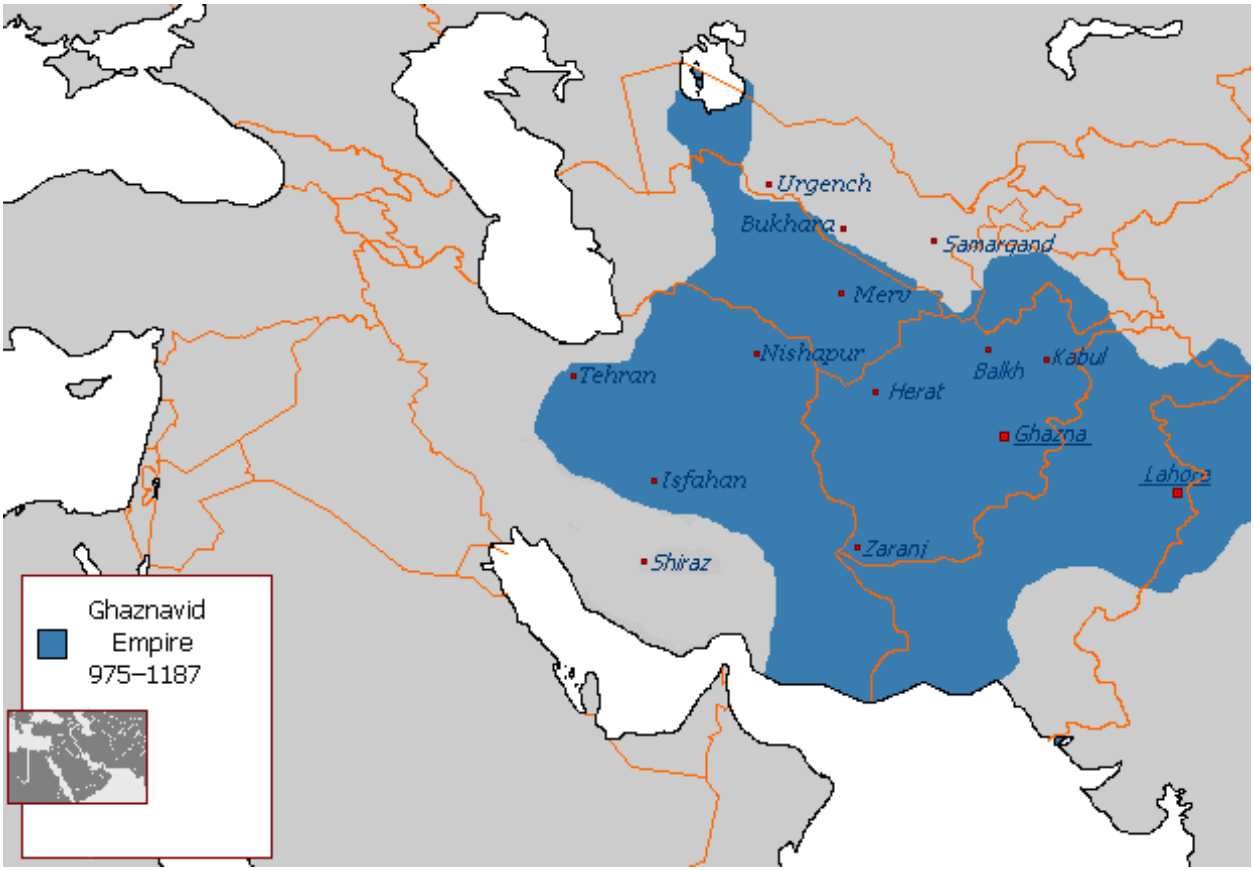


Figure 10.1 Map of the Kingdom of Mahmud Ghaznavi of Persia (975-1187 AD) [2].

Figure 10.2 13th Century City of Otrar (formerly Farab) in Today's Kazakhstan.

10.4 Contributions and Achievements

Farabi has many contributions, ranging from science, philosophy, medicine, music, logic, and sociology, to mathematics. His major interests, however, were:

1. "Philosophy and logic in particular. Such interest explains why he is known as "the second master" (the first one, of course, being Aristotle), and
2. **Music.** His huge *Kitâb al-musiqâ al-kabîr* or the *Great Book of Music* is the most important medieval musical treatise in Islamic lands, which also includes sophisticated philosophical sections" [2].

Enumeration of the sciences: Farabi wrote a book called the *Ihsâ' al-'ulûm*, or *Enumeration of the Sciences* in which he offered alternative themes to Aristotelian sciences. This book was translated into Latin in Medieval time[2]. Later on, different, and more comprehensive translation of this book and others of him appeared in French, German and English. For example, a new German translation has come out: "*Über die Wissenschaften (de scientiis),* the Dominicus Gundissalinus' version (2006) and *Über die Wissenschaften (de scientiis),* the Gerard of Cremona's version (2005a)" [2]. Fârâbî' included some zoological treaties while deeply getting into Aristotle's works.

Language

Farabi first focuses on language, grammar, metrics, etc. His *Kitâb al-Hurûf,* (Book of Letters) or *Particles*, gives much information on his views on language. Farabi view on music is at the service of speech. The last section of the *Great Book of Music* explains how technically to fit music to speech, i.e., poetry in order to enhance the meaning of a text [2].

Final Note: Farabi was living during the Abbasid's time in Persia. He spent the last few years of his life in Baghdad, Iraq at the "House of Wisdom", which was built similar to the Gondishapur Medical Complex, (see Chapter 4), he passed away there and was buried there.

Music

Farabi wrote a book on music titled *Kitab al-Musiqa* (The Book of Music). In it, he presents philosophical principles about music, its cosmic qualities, and its influences. He also wrote a treatise on the *Meanings of the Intellect*, which dealt with music therapy and discussed the therapeutic effects of music on the soul. [1] Figure 10.3 shows drawing of a musical instrument, a "*Shahrud*", from his *book of music* [1].

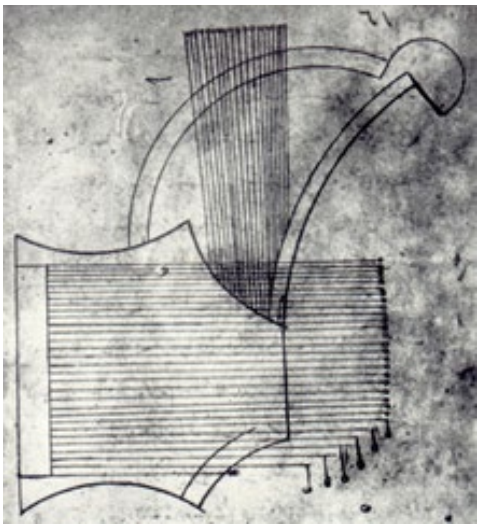


Figure 10.3. Sketch of "*Shahrud*" instrument in Farabi's music book [1]

References

[1] http://en.wikipedia.org/wiki/Farabi

[2] https://plato.stanford.edu/entries/al-farabi/

CHAPTER 11 Biruni (Astronomer, Mathematician)

11.1 Introduction

In this chapter, the life story and scientific contributions of Biruni, another legendary Persian scientist of the 10th and 11th Centuries is given. His name is now put to his birth city of Kath. He grew up in both Kath and Jurjaniyya and by age 17, he calculated the latitude of his birthplace Kath by the sun's maximum altitude observation.

11.2 Facts on Biruni [1]

Biruni	AKA Abu-Reyhan Biruni
Born	15 September 973 AD
Place of Birth	Kath (now called Biruni), Khwarazm or Greater Khorasan (now Kara-Kalpakskaya, Uzbekistan)
Nationality	Persian (Iranian)
Death	13 December 1048 AD
Place of Death	Ghazna, Khorasan Province, Persia (now Ghazni, Afghanistan)

11.3 Biographical Sketch

Abu-Reyhan Biruni was born in the city of Kath, Khwarazm (Arabic name of Greater Khorasan Province in 10th Century Persia) in 973 AD [UK]. The city, now called Biruni lies in Uzbekistan – south of the Aral Sea (see Figure 11.1[2]).

11.3 Contributions and Achievements

Astronomy – Biruni was the first pioneer astronomer who performed experiments related to astronomical phenomena. He realized the existence of the Milky Way galaxy defining it as a collection of numerous nebulous stars, and in Greater Khorasan (Persia), he observed and described the solar eclipse on 8 April 1019 AD, and the lunar eclipse on 17 September 1019 AD, in detail, and gave the exact latitudes of the stars during the lunar eclipse [3, 4]. Figure 11.2 shows the relative alignment of the sun, different phases of the moon and the earth.

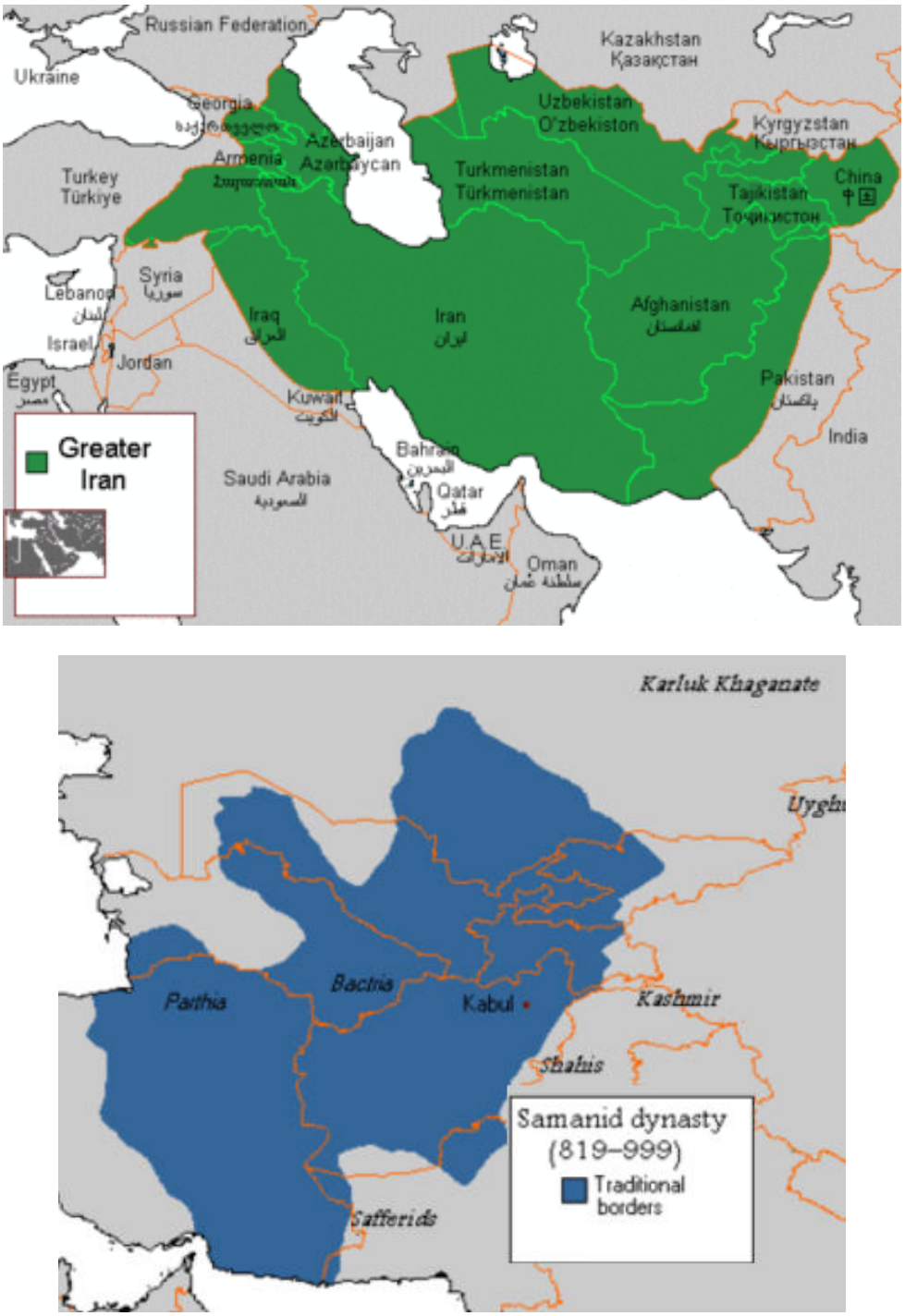


Figure 11.1 Map of Persia during Siljuk (a) and Samanid (b) Dynasties (10th[th] and 11[th] Centuries) [2].

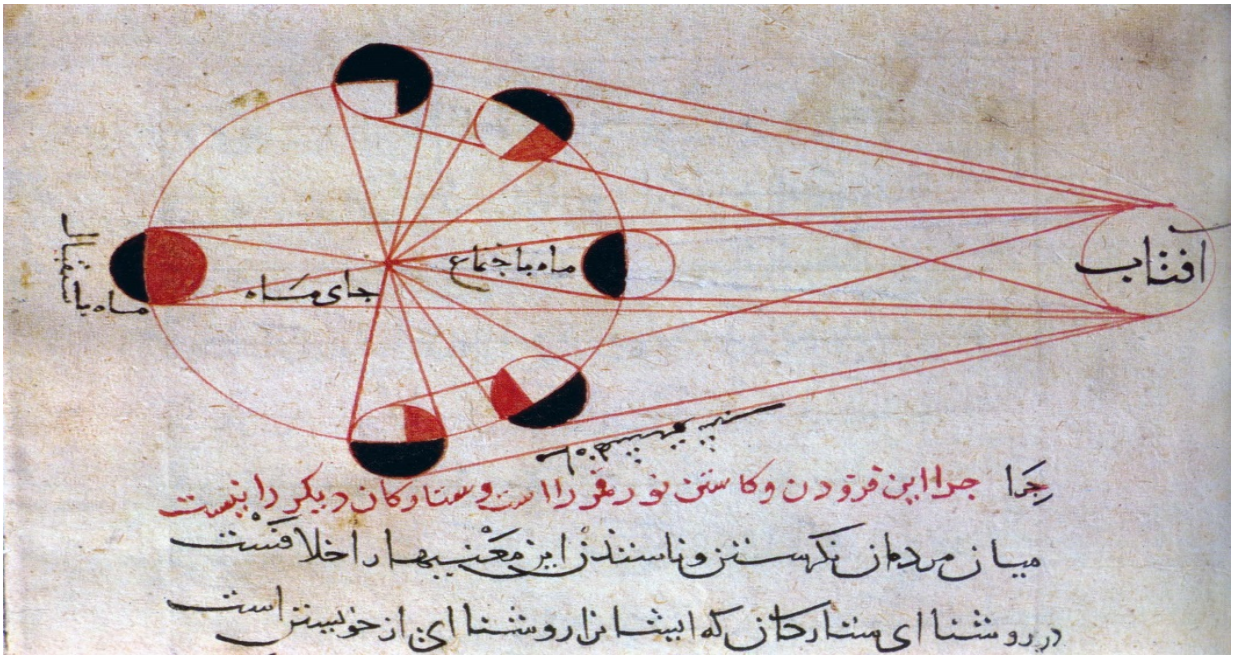


Figure 11.2 A Page of the Astronomy Book of Biruni.
A Description of the Eclipse and Positions of the Sun, and Various Phases of the Moon and the Earth are in Biruni's Astronomy Book [3, 4].

Biruni's Estimate of the Earth's Circumference [5]

Biruni estimated the circumference of the earth through trigonometric relations of mathematics. Consider a mountain lying close to open water like the sea or ocean (see Figure 11.3). He used an Astrolabe to measure the angles from two known points on the beach separated by a known distance *d*, see Figure 11.4 [5].

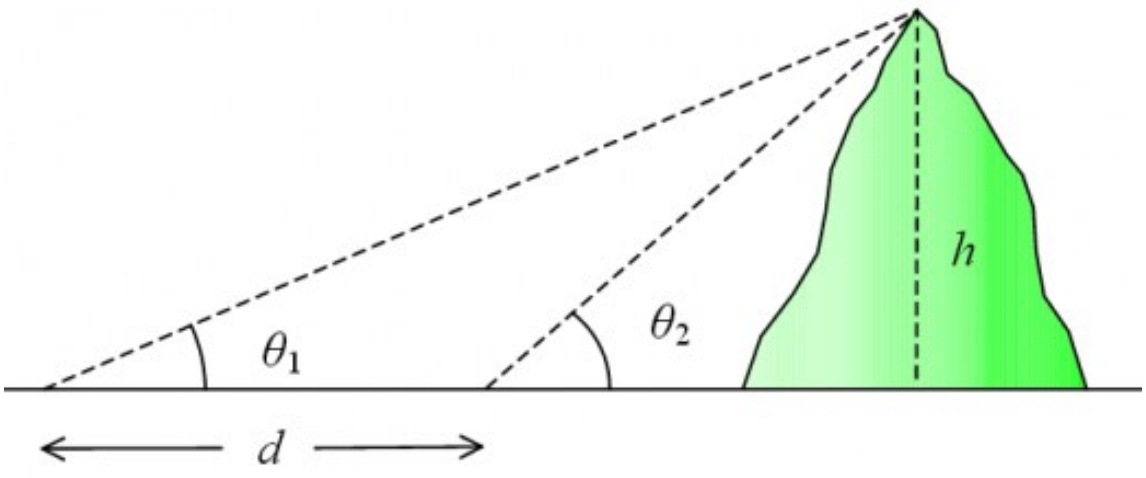


Figure 11.3 Biruni's Angle Measurements from Two Known Points on a Beach to an Overlooking Mountain Summit [5].

He used a large Astrolabe, shown in Figure 11.4 [5].

Figure 11.4 Photo of the Astrolabe that Biruni used to Measure Angles θ_1 and θ_2 in Figure 11.3.

He then used trigonometric relations from his mathematical books, post Khwarizmi's era, to calculate the height of the mountain as:

$$h = [d \tan(\theta_1) \tan(\theta_2)] / [\tan(\theta_2) - \tan(\theta_1)].$$

He then moved to the top of the mountain with the Astrolabe and measured the horizon's line of the sight angle α, see Figure 11.5 [5].

Angle α was about a half degree. The radius of earth can be estimated by the following trigonometric equation [5]:

$$R = [h \cos(\alpha)] / [1 - \cos(\alpha)].$$

The accuracy of his estimate of the Earth's circumstance was within 200 miles of the actual value of 24,902 miles, or less that is 1% of error. His estimate of the radius was 6,3311.725 km or 3,959.828 miles. This represented about 0.22% error.

> "Scholars have criticized his method that these great accuracies are not as claimed. Their points were that a) "Measurements were converted from cubits to modern units to arrive at the quoted answer" [5]. The conversion factors can be ambiguous. b) The physical phenomenon like the refraction may prevent accurate measurements of the angles, including the line of sight angle α. Light passes through layers of air and adds to inaccuracies of such a measurement [5].

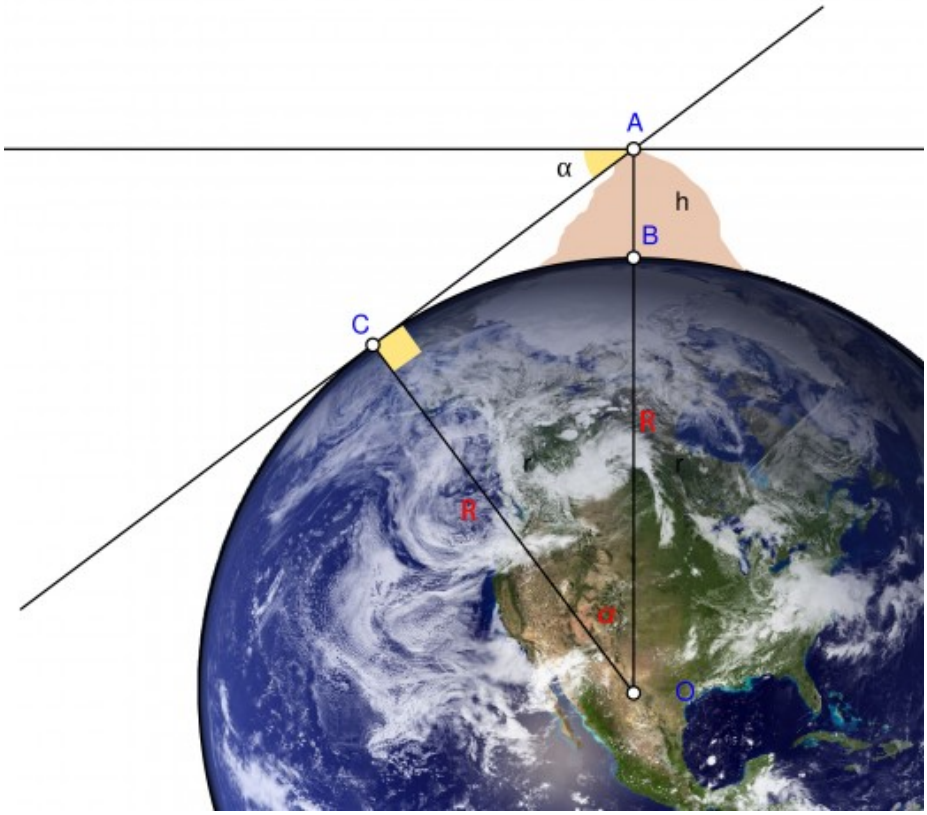


Figure 11.5 Measurement of the Radius of the Earth by Biruni [5].

Figure 11.6 Shows Published Stamps of Many Nations (Iran, Afghanistan and Former Soviet Union) in Honor of Biruni [4].

Figure 11.7 is the tomb of Biruni in today's Afghanistan.

Figure 11.7. Biruni's tomb in Afghanistan.

Final Points: NASA Space agency of the United States has dedicated a North Moon Crater in honor of Biruni, see Figure 11.8.

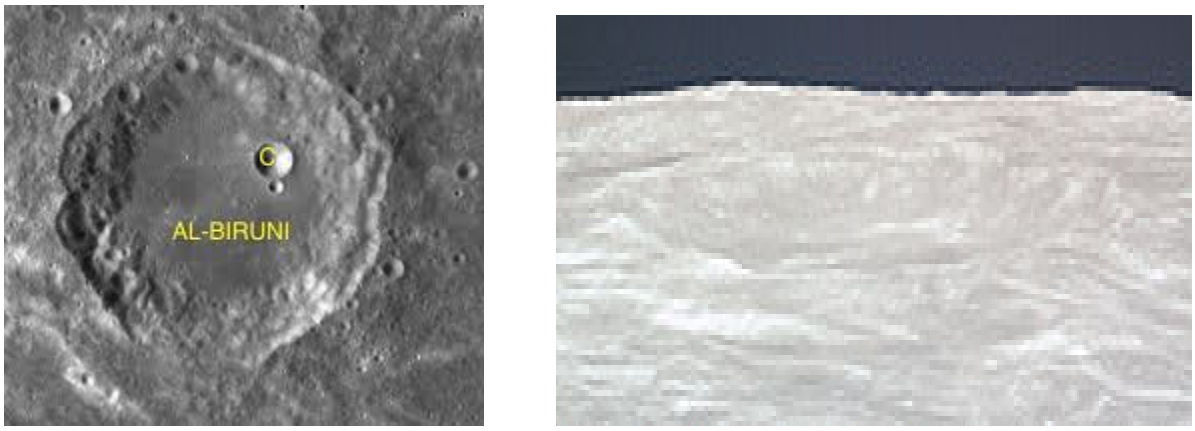


Figure 11.8 Scenes from Biruni's Moon Crater [6].

References

[1] https://owlcation.com/stem/How-to-Determin-the-Radius-of-the-Earth-Al-Birunis-Classic-Experiment

[2] http://www-groups.dcs.st-and.ac.uk/history/Biographies/Al-Biruni.html

[3] Map: https://www.google.com/search?biw=1238&bih=567&tbm=isch&sa=1&q=Map+of+Persia+during+Samanid+Dynasty&oq=Map+of+Persia+during+Samanid+Dynasty&gs_l=psy-ab.12...73811.21508.0.25744.38.37.1.0.0.0.3011.4073.24j11j1j1.37.0....0...1.1.64.psy-ab..0.22.2184...0j0i67k1j0i30k1j0i24k1.6vW1dzm9mz8#imgrc=spBfuevTgyyE1M:

[4] https://en.wikipedia.org/wiki/Al-Biruni

[5] https://themuslimtimes.info/2012/01/01/al-biruni-the-great-pioneer-of-science/

[6] https://owlcation.com/stem/How-to-Determin-the-Radius-of-the-Earth-Al-Birunis-Classic-Experiment

[7] https://en.wikipedia.org/wiki/Al-Biruni_(crater)

CHAPTER 12 Pour Sina (Avicinna, Storied Physician)

12.1 Introduction

In this chapter, the life story, and scientific contributions of the greatest scientists of the 10th and 11th Century of Persia is given. His name is Avicinna and/or Bou Ali Sina (Persian) and Pour Ali Al Hossein ebne Abdullah ibn Sina (Arabic). He is also known as "a man of every 1000 years".

12.2 Facts on Avicinna [1]

Avicinna	AKA Bou Ali Sina, Sheikh-Al-Rayeese, Pour Sina
Born	August, 980 AD
Place of Birth	Village of Afshana, near Bukhara, Persia (Today's Uzbekistan)
Nationality	Persian (Iranian)
Death	June 1037
Place of Death	Hamadan, Persia (Today's Iran)
Parents	Father: Abdullah, Mother: Setareh
Married	Never married

12.3 Biographical Sketch

Avicinna was born in the village of Afshana outside of the ancient city of Bukhara in 10th Century Persia (see Figure 12.1) during the Persian Kingdom of Mahmud Ghaznavid from 975-1187 AD.

His mother Setareh (star in Persian) was from the village of Afshanah near Bukhara and his father Abdullah was from Balkh of the Great Khorasan Province of then and now a city in Afghanistan. Young Ali Sina showed an extreme desire for knowledge, science, and religion. His early education was at his hometown and by the age of ten, he had memorized the entire Quran.

His father, Abdullah, an advocate of the Ismaili section (a 7-Imam Shite section), moved to the Bukhara province from Balkh (now a part of Afghanistan) due to changes in the regional dynasties. Young Ibn Sina showed exceptional intellectual skills, which enabled him to overtake his teachers at the age of fourteen [2]. After a few years he elevated his knowledge of the Muslim Jurisprudence (theory of the Philosophy of Law), Philosophy and Natural Science and studied Logic, Euclid, and the Almeagest, (Ancient Greek 2nd-century Greek-language mathematical and astronomical [*Syntaxis Mathematica*] [3].

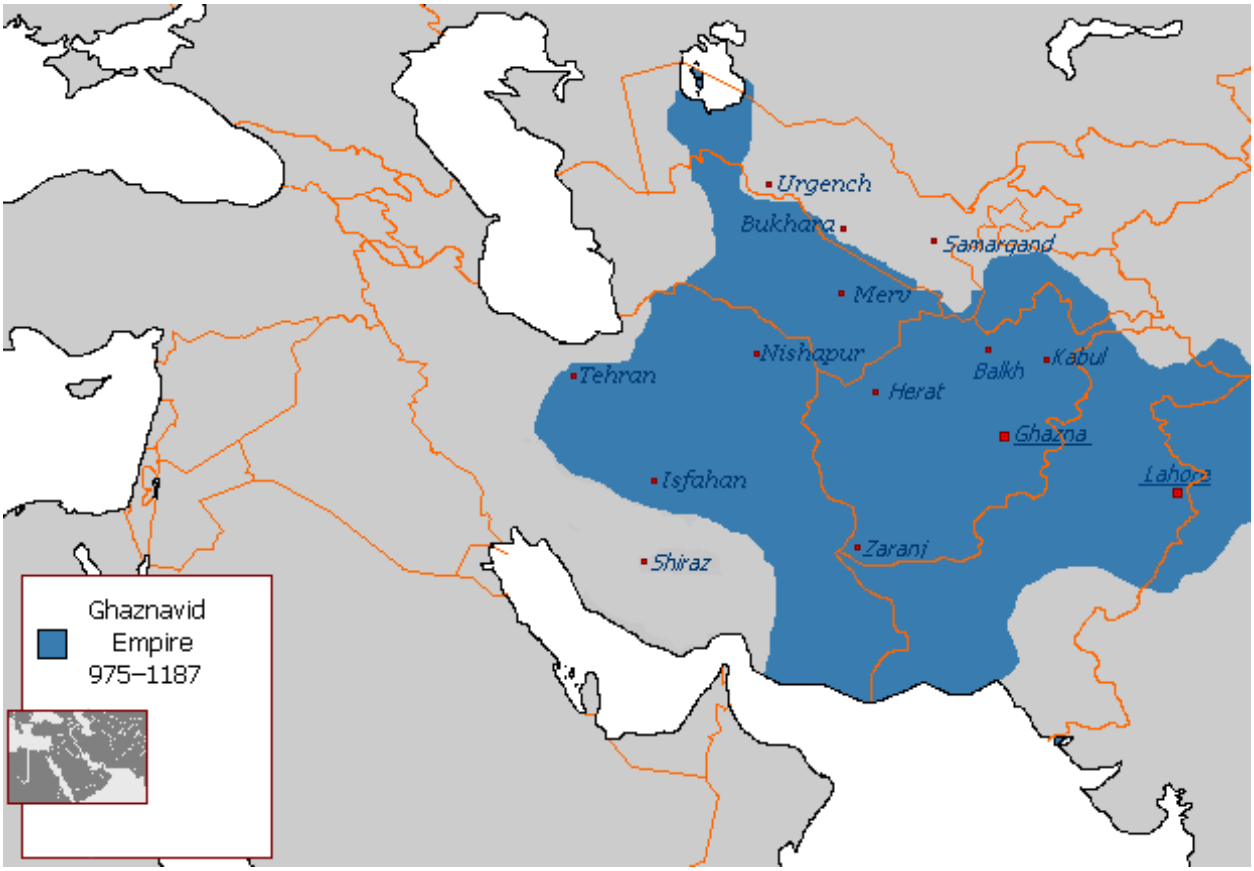


Figure 12.1 Map of the Kingdom of Mahmud Ghaznavi of Persia (975-1187 AD) [2].

When he was still young, Ali Sina was highly perplexed by the work of Aristotle on *Metaphysics* so much so that he, as a young religious man, left all the work and prayed to God to guide him. As a teenager, he had read Aristotle's *Metaphysics* at least 40 times and still had doubts about Aristotle's work, until he bought a short book by the philosopher, Farabi (see Chapter 10) for the 3 Dirhams; he finally found the solutions to his difficulties. *Metaphysics* was the science that attracted Ali Sina to Farabi [4, 5]. He lost his father at the age of 22. Avicinna had an estimated 450 pieces of work 240 recovered and 200 of them in philosophy and 40 in medicine.

Contributions and Achievements

At the age of sixteen he dedicated all his efforts to learn medicine and by the time he was eighteen, he gained the status of a reputed physician. During this time he was also lucky in curing Nooh Ibn Mansoor, the King of Bukhara, of an illness in which all the renowned physicians had given up hope. On this great effort, the King wished to reward him, but the young physician only acquired consent to use his exclusively stocked library of the Samanids [4].

On his father's death, when Sina was twenty-two years old, he left Bukhara and moved to Jurjan near the Caspian Sea where he lectured on logic and astronomy. Here he also met his famous contemporary Raihan Biruni (see Chapter 5). Later he travelled to Ray and then to Hamadan, where he wrote his famous book Al-Qanun fi al-Tibb. Here he also cured Shams al-Daulah, the King of Hamadan, for severe colic.

From Hamadan, he moved to Isfahan, where he finished many of his epic writings. Nevertheless, he continued to travel and due to much mental exertion as well as political chaos, spoilt his health. The last ten or twelve years of his life, he spent in the service of Abu Ja'far 'Ala Addaula, whom he accompanied him as his physician, general literary, and scientific consultant. He died in June 1037 AD and was buried in Hamedan, Iran. He has been quoted for his disciple Juzjani via a unique verse of Bou-Ali Sina:

Avicinna had over 450 pieces of work, but only 240 of them were recovered. Among these, 200 pieces were in philosophy and 40 of them in Medicine.

"I grew so big that no city could hold me", "But my price went so high every buyer sold me".

In Parsi language, it translates as:

"من آنقدر بالا رفتم که هیچ شهر نمی توانست مرا نگاه دارد
لیکن قیمت من آنقدر بالا رفت که هر خریدار مرا فروخت"

Besides his monumental writings, Ali Sina also contributed to mathematics, physics, music, and other fields and even poetry. He explained the concept and application of the "casting out of nines". He made several astronomical observations, and devised a means similar to the venire, to enhance the accuracy of instrumental readings. In physics, his contribution comprised the study of different forms of energy, heat, light and mechanical, and such concepts as force, vacuum, and infinity.

Astronomy and Physics – Ali Sena studied Aristotle's and Euclid's works in logic, metaphysics, and physics at a young age while he still was in the Bukhara area. By the age of 13 he began studying medicine. Upon the request of his friends, however, he concentrated on preparing a collection of "minimal treatment" of basic physics, logic, geometry, and astronomy, the arithmetic need for a calendar, astronomical tables, basic music, and metaphysics [4]. He called the work, *Nejat*, which was essentially a survey of many scientific concepts in response to his friends' request.

Major segments of his scientific innovations and writings were done during his 15 years he spent in Isfahan. With Aristotle's work in his hand, he began formulating his agreements and disagreements and adding his earlier summaries of Euclid' *Elements* and Ptolemy's *Almagest**, all in a manuscript he called the Shifa (cure) [4]. Along the way, he developed Euclid's geometry and added 10 figures to Almagest to provide parallax effects [4].

Almagest, the astronomical manual written about 150 AD by Ptolemy (Claudius Ptolemaeus of Alexandria). It served as the basic guide for Islamic and European astronomers until about the beginning of the 17th century. Its original name was *Mathematike Syntaxis* ("The Mathematical Arrangement"); *Almagest* arose as an Arabic corruption of the Greek word for greatest (*megiste*). It was translated into Arabic about 827 AD and then from Arabic to Latin in the last half of the 12th century. Subsequently, the Greek text circulated widely in Europe, although the Latin translations from Arabic continued to be more influential".

Literature and Linguistic – Pour Ali Sina, while at Ala-al-Dawla's Court, took part in a Friday night literary gathering and deeply contributed to discussions on literature, linguistics, philosophy, and philology (A branch of knowledge dealing with the structure of historical development). Among his notable contributions in this area was a learned piece called "*the*

Arabs' Tongue" [4]. His intelligence, knowledge and council made him a dominant favorite of the Court. *Amir* of Hamadan appointed him as the *wazir* (Minister), a position her served until his death.

His *Shifa (Book of Healing)* book was what one may call the closest to an encyclopedia. The *Shifa* book series contained four books on arithmetic, geometry, metaphysics, astronomy, and even music. It also contained eight books on natural sciences, and nine books on logic [4]. A noted topic missing in the *Shifa* was in fact medicine. In fact, it was Abu-Reyhan Biruni (see Chapter 11) during Bou-Ali's era that created what may be called the first encyclopedia of that time, which covered mathematics, geography, medicine, astronomy, physics, linguistics, history and anthropology [4].

He published several hundreds of books from mathematics, to astronomy, to minerals, to healthcare and medicine, and even has been known to write poetry. However, his biggest contribution is medicine.

Medicine – As it was mentioned before, Ali Sena became interested in medicine at the age of 16 and by the age of 19, he began practicing medicine free. From that young age until the time he lived in Isfahan, he treated numerous people from *Amirs* to ordinary people. He treated himself for many illnesses like headache and treated a tubercular woman with many sugar-rose preserves, perhaps due to the vitamin content [4].

He began creating his seminal masterpiece; '*The Qanun'* (Cannon), even though by then he had lost a lot of his records and writings on medicine and medical treatments. However, Zakaria Raazi (see Chapter 6) with his keen knowledge and experience of hospitals and diseases was more of a clinician [4]. However, the *Cannon*, as a comprehensive coverage of medicine, was well received in the middle ages [4]. The *Cannon* and *Shifa* books were translated into many languages like Latin, Hebrew, etc. in both the Middle East and in medieval Europe. The medical books of Avicinna and the works of Zakaria Raazi (known as Rhazes in the west, see Chapter 6) were the key sources of medical knowledge for 6 centuries [5, 6]. *Cannon* was the only text in medical schools in medieval Europe and elsewhere for years. The Cannon of Medicine has been translated into 19 languages. A new translation of his Cannon, based on the original version in Arabic, was published by Pour-Asab, et al. [7]. Figure 12.2 shows a photo of all 5 volumes of the Cannon of Medicine by Avicinna.

The elements of *Cannon* are in five parts:

a) *Part 1: Nature of the human body, anatomy, physiology and definition of various diseases.*
b) *Part 2: This part deals with simple treatments of many illnesses.*
c) *Part 3: The pathology of 21 human organs constituted the third part.*
d) *Part 4: Symptoms and diagnostics of various diseases are presented in the fourth part of The Cannon.*
e) *Part 5. The fifth and final part is dedicated to drugs, medicines, and pharmacopeia - a manual to help prepare compound medicines [4].*

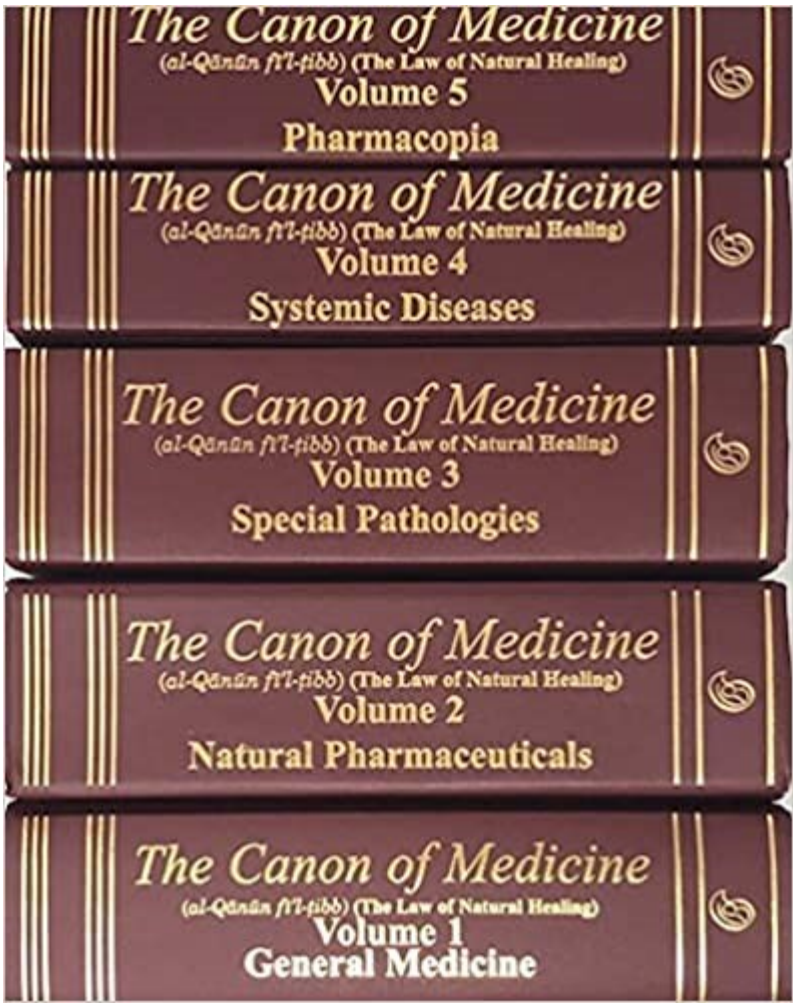


Figure 12.2 Avicinna's Five Volumes of The Cannon of Medicine, Available now.

These 5 parts although originated with Aristotle, it was Avicinna who put them in a formal logical setting and framework for medicine [5]. He had covered numerous causes and effects of body illnesses, from dental diseases to meningitis, to realization that tuberculosis is due to infection, to the cause of rabies, breast cancer, tumors and hydrocele or accumulation of body cavity fluids [5]. Although he will be wrong in many situations, he has been right about some cases which are still valid in the 21st Century [5].

Pour Ali Sina was also aware of psychological disorders through pulse rates due to external stimuli. There was a story of a young man suffering from an unknown disease and came to Ali Sena to be cured. The Master of Medicine recited several places, situations, and states of mind, each time sensing the young man's pulse rate. He concluded that the young man is in love with a lady in a particular city. He guided the young man to go back there and marry her. The young man was hence cured [5].

NASA has also honored Avicinna by naming a Moon Crater in his name (see Figure 12.3).

Figure 12.3 Avicinna Moon Crater [https://en.wikipedia.org/wiki/Avicenna_(crater)].

References

[1] http://www.thefamouspeople.com/profiles/avicenna-4127.php

[2] Map: https://www.google.com/search?q=map+of+Persia+during+Mahmoud+Ghaznavi&rlz=1C2CHNQ_enUS560US571&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwiO1921_oTUAhUo94MKHWIGAkQQsAQILw&biw=1366&bih=662&dpr=1#imgrc=AiDjjdFBAcQwKM

[3] https://en.wikipedia.org/wiki/Almagest

[4] L. E. Goodman, *Avicinna*, Cornell University Press, Sage House, Ithaca, NY, 2006.

[5] M. H. Morgan, *Lost History*, National Geographic, Washington, DC, 2007, p. 191.

[6] A. R. Haghighat, "*The Iranian Part in the History of World Civilization*," Koomesh Publishers, Tehran, Iran (in Persian), 1999 (ISBN: 978-964-9198-8-5.

[7] M. Abu-Asab, H. Amri, and M. S. Micozzi, "*Avicinna's Medicine*," Healing Arts Press, Rochester, VT, USA, 2013.

CHAPTER 13 Baba Taher (Poet)

13.1 Introduction

In this chapter, the brief life story, and literary contributions of a great poet of the 10th and 11th Century AD, Baba Taher is given. He is one of the most famous poets of the Luri and Kurdish Persian literature. His poems in the later time during his life were put into music.

13.2 Facts on Baba Taher [1]

BabaTaher	AKA Baba Taher-e Oryan (The Naked)
Born	10th Century AD
Place of Birth	Hamadan, Iran
Nationality	Persian (Iranian)
Death	1019 AD - 11th Century AD
Place of Death	Hamadan, Iran

13.3 Biographical Sketch

Baba Taher is known as one of the most revered early poets in the Luri and Kurdish Persian literature. Little is known of his life. He was born in a Kurdish Luri family and lived in Hamadan the capital city of the Hamadan Province in Iran. He was known by the name of Baba Taher-e Oryan (the Naked), which suggests that he may have been a wandering dervish. Legend tells us that the poet, an illiterate woodcutter, attended lectures at a religious school, where he was not welcomed by his fellow-students. The dates of his birth and death are unknown. One source indicates that he died in 1019 AD. If this is accurate, it would make Baba Tahir a contemporary of Ferdowsi (Chapter 9) and Avicenna (Chapter 12) and an immediate precursor of Omar Khayyam (Chapter 15). Another source reports that he lived between 1000 and 1055 AD, which is unlikely. It is said that Baba Tahir lived for seventy-five years. Rahat al-sodur of Ravandi, whose work was completed in 1206 AD, describes a meeting between Baba Tahir and the Seljuq conqueror Tughril [3]. At the time when Baba Tahir lived in the 10th century, there were great changes occurring in the development and growth of literature and art. Medieval artists and poets in Persia were greatly respected and valued and had the right to express

their thoughts freely. According to L. P. Elwell-Sutton: "He could be described as the first great poet of Sufi love in Persian literature. In the last two decades his do-baytis (lyrics) have often been put to music".

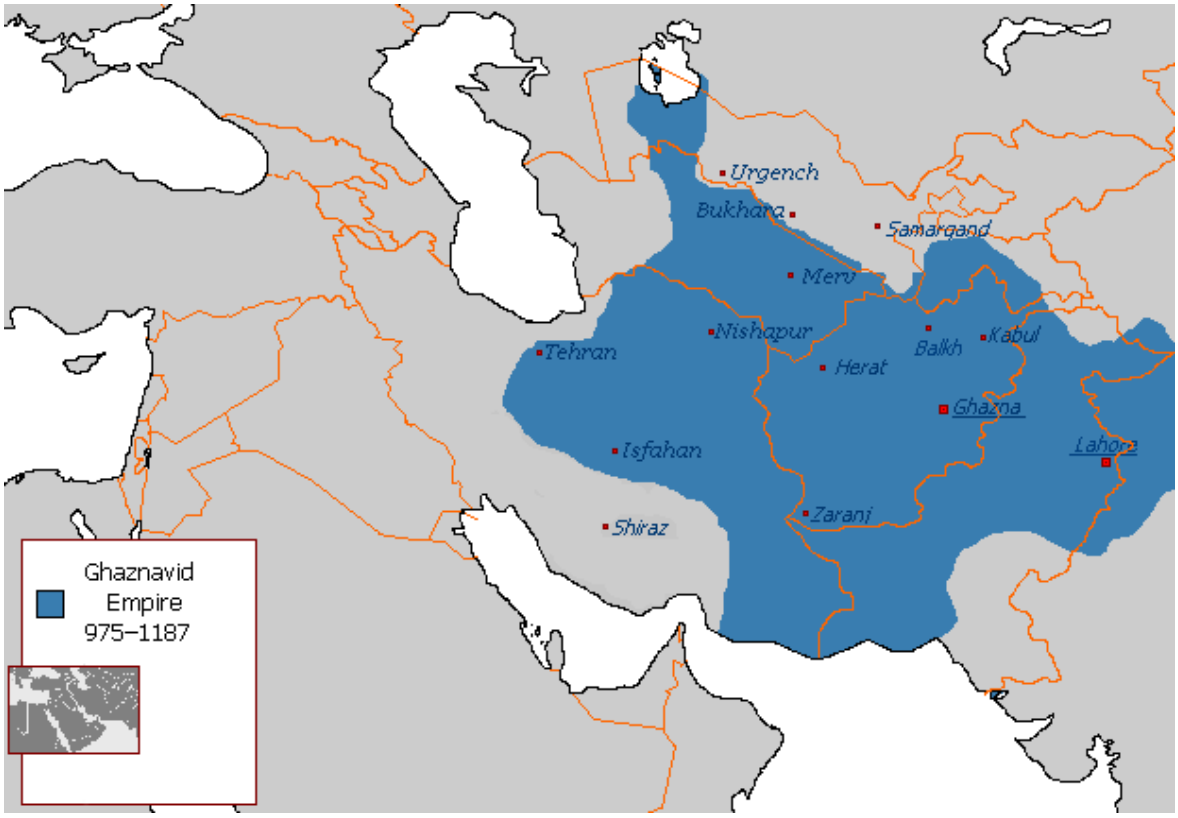


Figure 13.1 Map of the 10th to 12th Century Ghaznavid Empire of Persia [2].

13.4 Poetry and Writings

"Baba Tahir's poems are recited to the present day all over Iran accompanied by the *setar*, the three stringed viol or lute. This style of poetry is known as *Pahlaviat* and it is very ancient. The quatrains of Baba Tahir have a more amorous and mystical connotation rather than philosophical. Many of Baba Tahir's poems are of the *do-baytī* style, a form of Persian quatrains, which some scholars regard as having affinities with Middle Persian verses" [1].

Among his writings, "Attributed to him is a work by the name *Kalemat-e qesaar*, a collection of nearly 400 aphorisms in Arabic, which has been the subject of commentaries, one allegedly by Ayn-al-Qozat Hamadani. An example of such a saying is one where Baba Tahir ties knowledge with gnosis: "Knowledge is the guide to gnosis, and when gnosis has come the vision of knowledge lapses and there remains only the movements of knowledge to gnosis"; "knowledge is the crown of the gnostic, and gnosis is the crown of knowledge"; "whoever witnesses what is decreed by God remains motionless and powerless" [1].

13.5 Tomb

Baba Taher died around 1019 AD and was buried in an old Mausoleum at that time but a new one was constructed for him in 1970 AD. Figure 13.2 shows the old and new Mausoleums of Baba Taher.

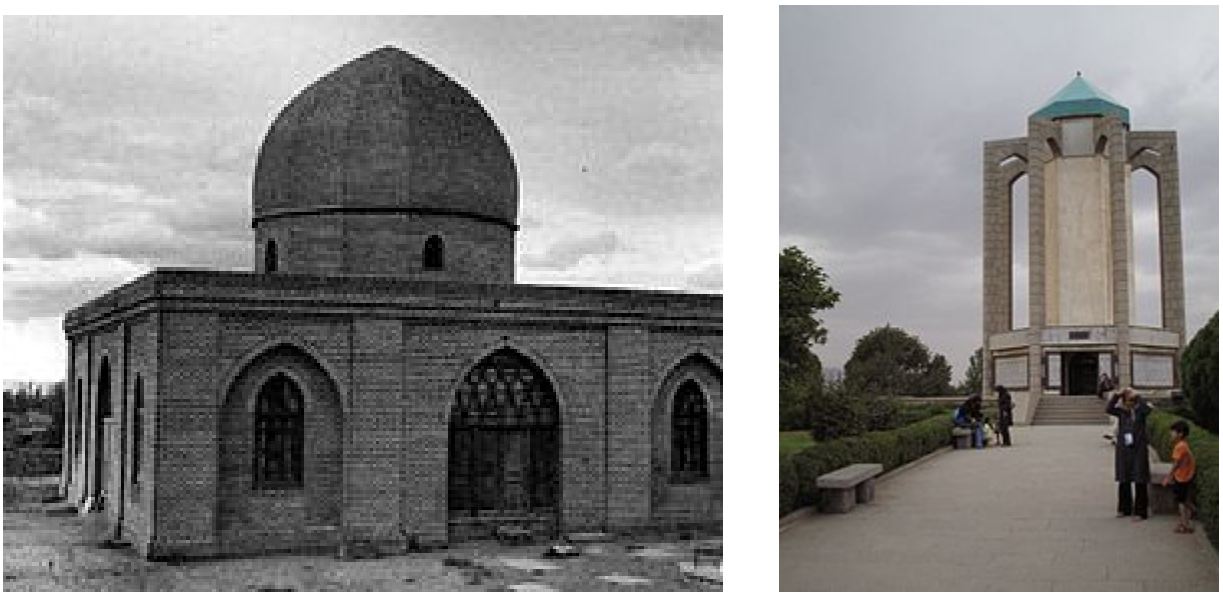


Figure 13.2. Tomb of Baba Taher, Hamadan, Iran.
Shown are the Old and New Mausoleums [1].

References

[1] https://en.wikipedia.org/wiki/Baba_Tahir

[2] Map:
https://www.google.com/search?q=map+of+Persia+during+Mahmoud+Ghaznavi&rlz=1C2CHNQ_enUS560US571&tbm=isch&tbo=u&source=univ&sa=X&ved=0ahUKEwiO1921_oTUAhUo94MKHWIGAkQQsAQILw&biw=1366&bih=662&dpr=1#imgrc=AiDjjdFBAcQwKM

[3] https://en.wikipedia.org/wiki/Tughril

CHAPTER 14 Nasir Khosrow (Scientist and Poet)

14.1 Introduction

In this chapter, the brief life story, and literary contributions of a great 11th century scientist and poet of the Persian heritage, Nasir Khosrow is given. He was born in the Greater Khorasan Province (see Figure 14.1), which at the time included parts of today's Uzbekistan, Tajikistan, Pakistan, Afghanistan, and the present time, the two Khorasan Provinces of Iran.

14.2 Facts on Nasir Khosrow [1]

Nasir Khosrow	AKA Mo'in Hamid ad-Din Nasir ibn Khusraw al-Qubadiani
Born	August 28, 1004
Place of Birth	Qabodiyon, Greater Khorasan (Now in Tajikistan)
Nationality	Persian
Death	1088
Place of Death	Yamgan, Greater Khorasan (Now in Badakhshan Province of Afghanistan)
Major Works	Safarnama, Wajh-i-Din, Zaad al-Musafirin, Sa'datnama, Rawshana-i-nama, Sufi poetry

14.3 Biographical Sketch

> *"Nasir Khusrow* (1004 – 1088 AD) was a Persian poet, philosopher, Isma'ili scholar, traveler and one of the greatest writers in Persian literature. He was born in Qabodiyon, (Qabādiyān), a village in Bactria in the ancient Greater Iranian province of Khorasan, now in modern Tajikistan and died in Yamagan, now in Afghanistan" [1]. He is considered one of the greatest poets and writers in Persian literature. The *Safarnama*, an account of his travels, is his most famous work and remains a required reading in Iran even today.
>
> "He was well versed in the branches of natural sciences, medicine, mathematics, astronomy and astrology, Greek philosophy, and the writings of al-Kindi, al-Farabi and Ibn Sina; and in the interpretation of the Qur'an. He also studied Arabic, Turkish, Greek, the vernacular languages of India and Sindh, and perhaps even Hebrew; and had visited Multan and Lahore, and the splendid Ghaznavid court under Sultan Mahmud, Firdousi's patron. He later chose Merv for his residence, and was the owner of a house and garden there [1].

Figure 14.1 Map of the Greater Khorasan of Persia in the 11th Century [2].

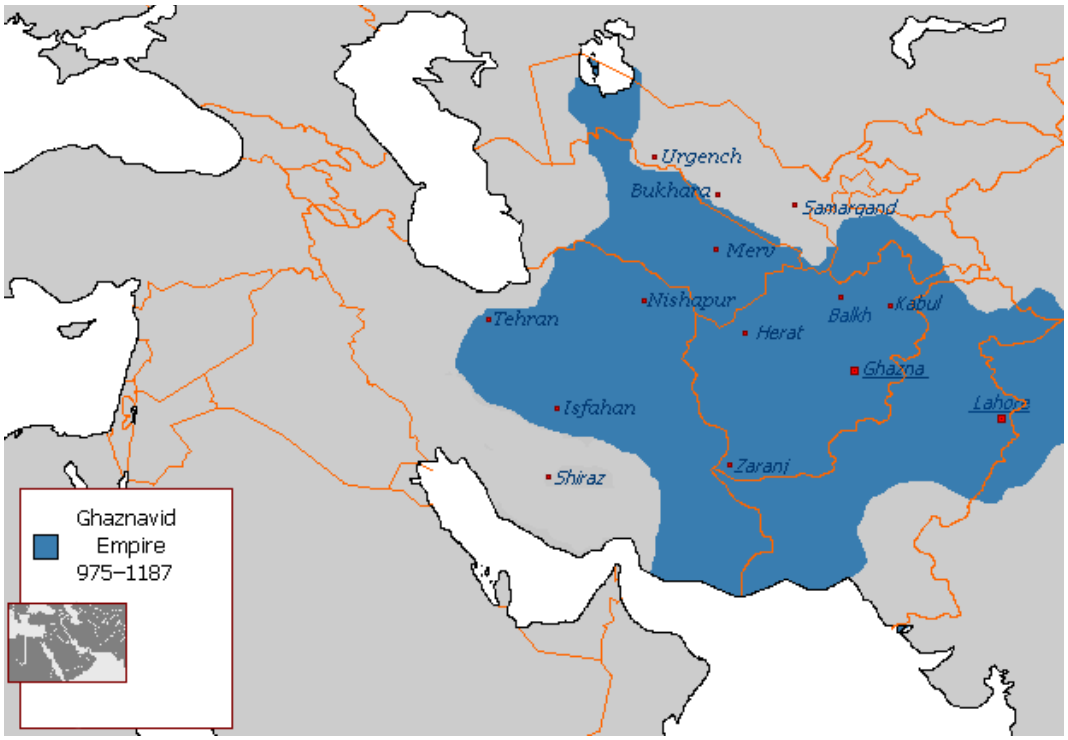


Figure 14.2 Map of the10th to 12th Century of the Ghaznavid Empire of Persia [3].

14.4 Scientific Poetry Works

In mathematics,

> "Nasir Khusraw wrote a book on mathematics, which has now been lost. He states in his other work that he could: "*not find one single scholar throughout all of Khorasan and eastern lands like myself [who] could grapple with the solutions to these problems"*. But he felt it was his responsibility to take the task for readers he would never see, 'those yet to come, in a time yet to come" [1].

In poetry,

> "Most of the lyrical poems in his *Diwan* were composed during his retirement, and their chief topics are an enthusiastic praise of Ali, his descendants, and al-Mustansir in particular, along with passionate outcries against Khorasan and its rulers, who had driven him from his home. It also explores his immense satisfaction with the quiet solitude of Yumgan, and his utter despondency again in seeing himself despised by his former associates and excluded from participation in the glorious contest of life. Scattered through all these alternating outbursts of hope and despair, there are lessons of morality, and solemn warnings against the tricks and perfidy of the world, the vanity of all earthly splendors and greatness, the folly and injustice of men, and the hypocrisy, frivolity and viciousness of fashionable society and princely courts in particular" [1].

In travel,

> "*Safarnama* (The Book of Travels) is his most famous work. He visited dozens of cities in seven years (1046 AD, March 6 – 1052 AD, October 23) and wrote comprehensively about them, including details about colleges, caravanserais, mosques, scientists, kings, the public, the population, the area of the cities, and, of course, his interesting memories. After 1000 years, his *Safarnama* is still readable for Persian-speaking people" [1].

Figure 14.3 shows the route he took to go from his home in today's Tajikistan all the way to Mecca, Egypt, parts of today's Turkey and returned via the northern part of today's Iran back to today's Afghanistan. He died in Badakhshan Province of Afghanistan.

Figure 14.4 shows Nasir-Khosrow's tomb.

References

[1] https://en.wikipedia.org/wiki/Nasir_Khusraw

[2] Map of Greater Khorasan: https://www.google.com/search?q=map+of+greater+Khorasan+of+Persia&tbm=isch&source=iu&ictx=1&fir=4n25SKLQxK88SM%253A%252CcL2whz6BMwXMvM%252C_&usg=AI4_-kRORQgmulU_NdI5xIu9qANV9tldgw&sa=X&ved=2ahUKEwjkx5m82-XdAhUDnq0KHXR0ARMQ9QEwAnoECAEQBg#imgrc=4n25SKLQxK88SM:

[3] https://the.ismaili/our-culture/nasir-khusraw%E2%80%99s-safar-nama-brought-life-digitally-iis-volunteers

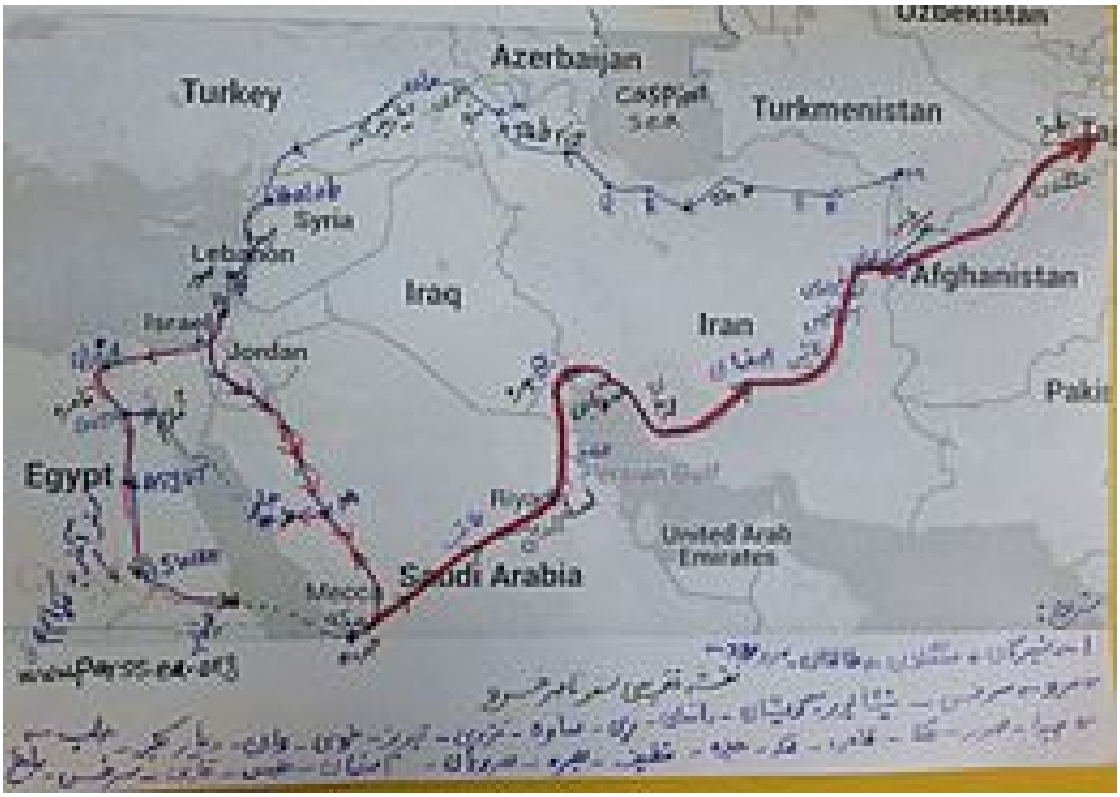
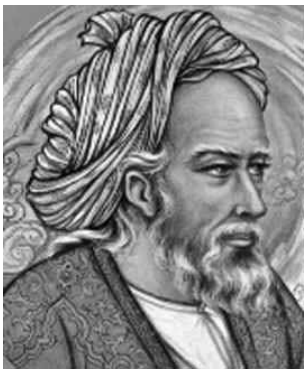
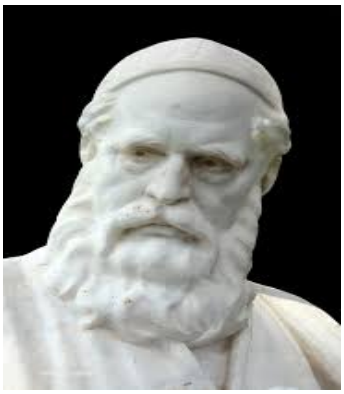


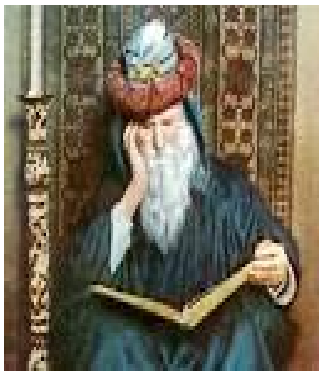
Figure 14.3 The Route of Nasir Khosrow's travels from and to the Greater Khorasan in 11th Century Persia [3].

Figure 14.4 Tomb of Nasir-Khosrow in Afghanistan

CHAPTER 15 Khayyam (Scientist and Poet)







15.1 Introduction

In this chapter, the life story and scientific contributions of another genius Persian scientist who was a mathematician, astronomer, astrologer, physician, and poet of the 11th and 12th Century is given. His full name was Ghiyath al-Din Abu'l-Fath Umar ibn Ibrahim Al-Nishapuri al-Khayyami. Khayyam, in Arabic, which means tentmaker, and is said to be his father's profession. Khayyam, a genius was broad from hard science to literature. The west knows him mostly as a poet due to the 19th Century translation of Englishman Edward Fitzgerald's (31 March 1809 AD – 14 June 1883 AD) poetry works, known as *the Rubaiyat of Omar Khayyam*. There are many flaws in Fitzgerald's translation [1], and subsequently in the 20th and another translation by at least 17 others in English and at least 27 (other than English or Persian –Farsi) languages translations are available [2,3]. Figure 15.1 shows covers of many versions of *Rubaiyat's* translations.

15.2 Facts on Khayyam [2, 3]

Khayyam	Omar Khayyam, Kivan Naishapouri
Born	May 18, 1048 AD
Place of Birth	Nishabour, Persia (Now in Khorasan province of Iran)
Nationality	Persian (Iranian)
Death	December 4, 1131 AD
Place of Death	Nishabour, Persia (Now in Khorasan province of Iran)
Parents	Father: Ibrahim

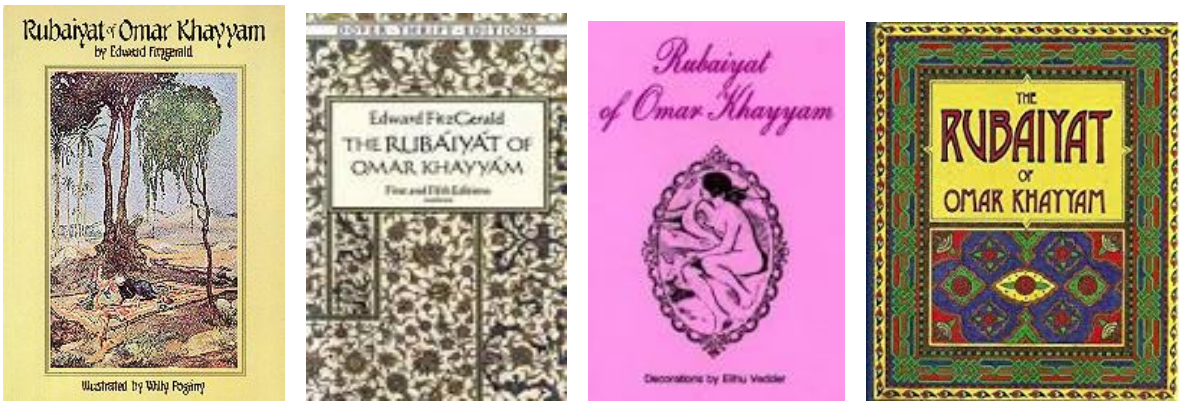


Figure 15.1 Covers of the Many Translations of Omar Khayyam's, *The Rubaiyat* [2, 3].

15.3 Biographical Sketch

Omar Khayyam was born on May 18, 1048 AD in the city of Nishabour, Iran (in the present province of Khorasan) [2]. Persia, at the time, was being ruled by the Seljuq dynasty. Seljuqs were Turk tribesmen who invaded Southwest Asia whose empire included Mesopotamia, Syria, Palestine, and most of Iran [3]. The map of Persia at that time is shown in Figure 15.2 [4]. His birthplace was a way station of the Great Silk Road at that time. Nishabour at that time was a major trading city with its turquoise mines and rivaled Baghdad and Cairo in terms of economic growth [1]. However, Khayyam's father, a tentmaker, was not affluent and the family had difficulty sustaining themselves, especially after the death of his father. During his early years, he was mentored by Mohammad Mansuri and altered by a renowned educator in the Khorasan Province. During the day, he would teach algebra and geometry and in spare time he would be an adviser to Malek Shah I. At night he would gaze towards the stars during the dark skies [5]. He later ventured to the city of Balkh (in today's Afghanistan and birthplace of Zoroaster) and soon thereafter he went to Samraghand (in today's Uzbekistan) upon the invitation of Ulug Beg, one of the regional rulers of the Timurid Dynasty who himself was a scientist, mathematician, and astronomer (see chapter 26). In Samarghand he wrote a book on '*mathematical structure of music'*, or '*Shahrh-i min Kitab al-Musiqi'* [2]. In those centuries, music was considered not as an art, but rather a part of mathematics.

He passed away on December 4, 1131 AD and is buried in his native city of Nishabour, Iran (see Figure 15.2).

15.4 Contributions and Achievements

Mathematics

Khayyam, inspired by Khwarizmi's work on algebra, worked on issues with algebra. He published a book on the subject called '*Treatise on Demonstration of Problems of Algebra'* in 1077 AD. He highlighted the principles of algebra which, later penetrated European institutions. In this book, he laid the foundations of Pascal's triangle with work on the triangular array of bionomical coefficients [5]. In the same year, he finished another book called in Arabic: '*Sharh ma ashkala min musadarat kitab Uqlidis'* or in English '*Explanations of the Difficulties in the*

Postulates of Euclid'. In this book he introduced non-Euclidean geometry, which was not necessarily Khayyam's original intention. [6].

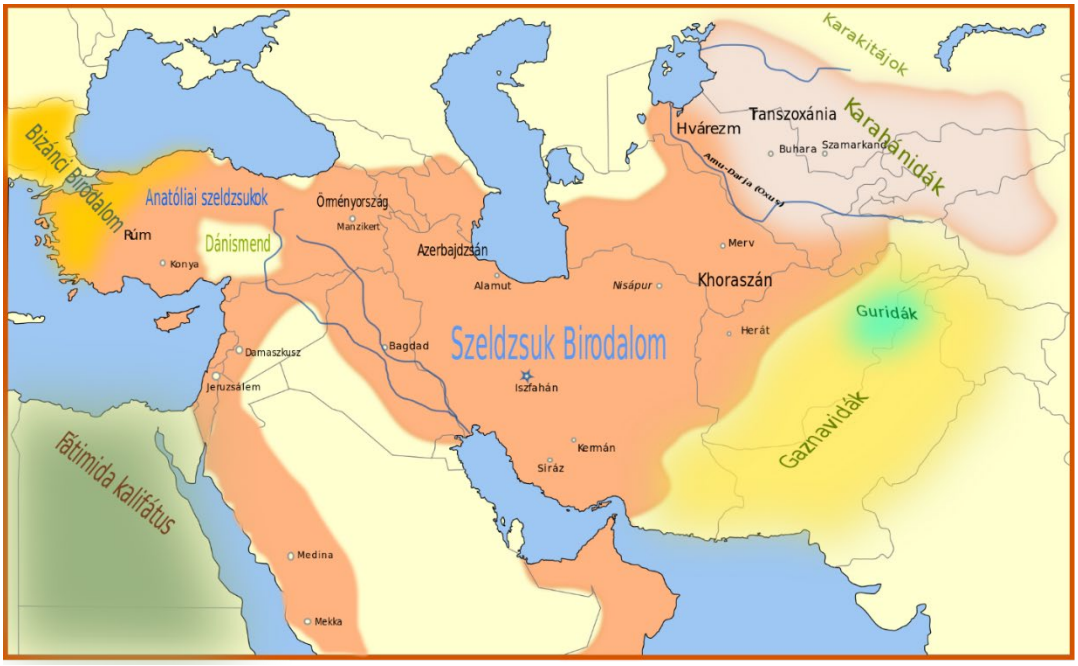


Figure 15.2 Map of Persia during the Seljuq Dynasty (11thth Century) [4].

Figure 15.3 The Mausoleum of Omar Khayyam in Nishabour, Iran [6].

Khayyam, mostly known through his collection of poems, *'the Rubayiat'*, which is among the top 100 mathematicians of the world due to his contributions to mathematics and astronomy [7]. With respect to *the Rubayiat*, there is some uncertainty as to whether all of the quatrains actually come from Omar Khayyam. With respect to his mathematical contributions, it is not clear if he was aware of Khwarizmi's geometric approaches to problems in algebra. However, his work on cubic equations is related to Euclid's *Elements* and Apollonius' *Conics* books [11]. Kent and Muraki [11], have provided a detailed historical account on Khayyam's roots of cubic equations solutions through the seminal work of Oliver Byrene [12]. Based on Euclid's Elements, Byrene's

coverage has established a bridge between Euclid's and Apollonius's works and cubic equations of Khayyam [11].

Consider a cubic equation as $x^3 + ax^2 + bx = c$, where a, b, and c are positive constant coefficients. Figure 15.4 shows Khayyam's cubic problem, as depicted by Byrene. In this manner, x^3, x^2 and x are represented by a cube, a square, and a line, respectively.

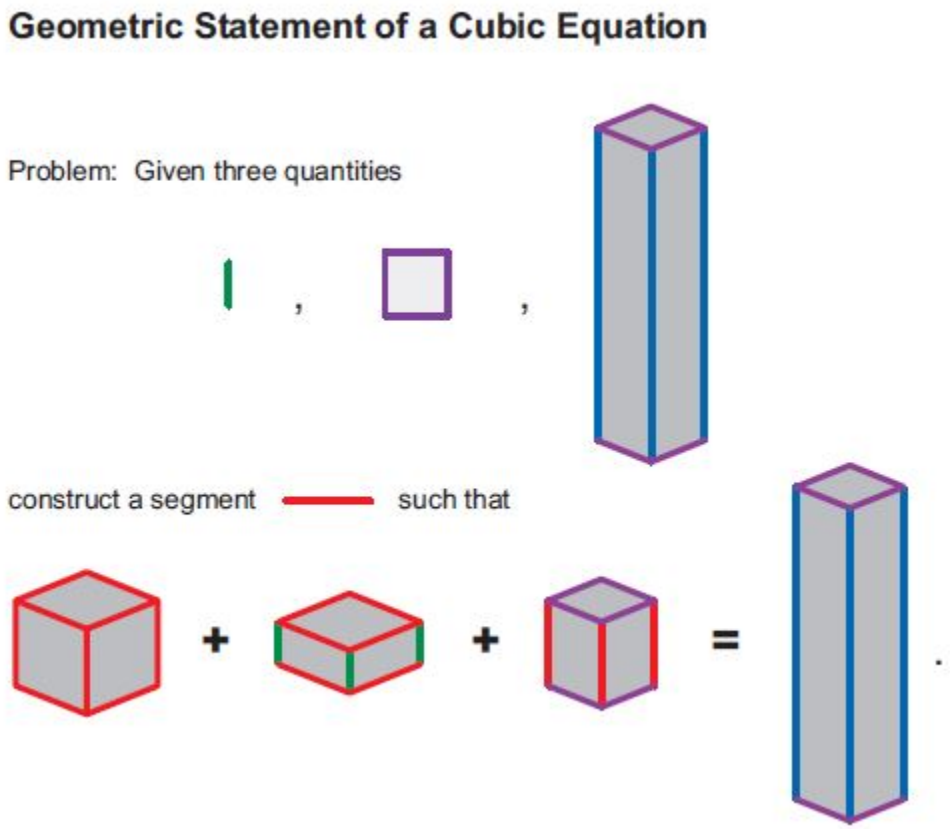


Figure 15.4 Khayyam's Cubic Equation Problem as Described by Byrene's Style [11].

As noted, each term of this equation at Khayyam's time is represented by a cube. The scaling of Figure 15.4 is based on the cubic equation: $x^3 + (8/16)\ x2 + (9/16)\ x = 33/16$. With x = 1[11]. Kent and Muraki [11], have described Khayyam's cubic, as in Figure 15.3, with green, purple, and blue lines. Figure 15.4 represents a proof Khayyam's cubic equation solutions in the style of Byrne [11]. The proof starts by constructing a semi-circle with green-blue as a diameter. Next, through locating the asymptotes for a rectangular hyperbola by a blue endpoint of the diameter [11]. This figure is considered as the Khayyam's proof. The details are once again in Figure 15.4 [11].

Khayyam's geometric solution of the cubic equation can be simplified now that Byrene's clarifications were made in the 19th Century.

Khayyam constructed the parabola $x^2 = y$, a circle (see Figure 15.6) with radius r = 1, and a vertical line going through the intersection of the circle and parabola. The solution of the equation is the horizontal line segment from the origin to the intersection of the x-axis and the vertical line [10]. In this case the solution x = 1.

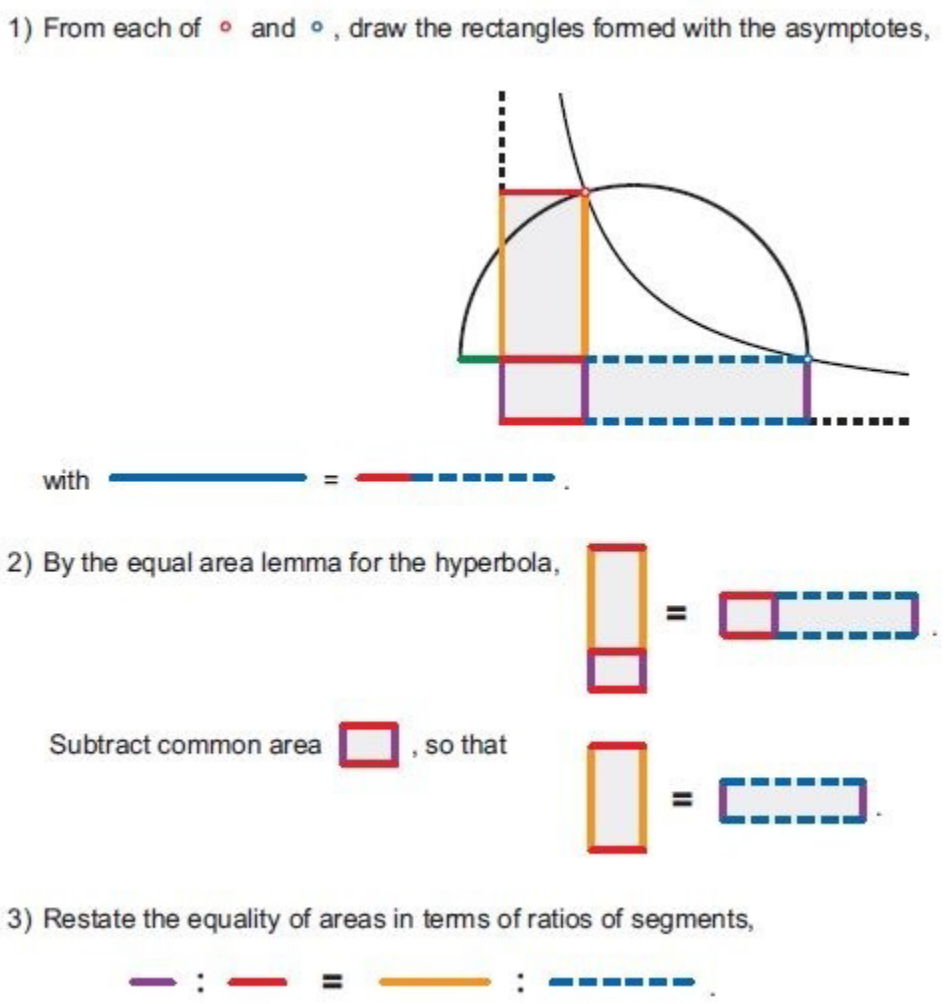


Figure 15.5 Proof of Khayyam's Solution to a Cubic Equation.

Example: Solution of $x^3 + x = 2$

The Rubaiyat

As mentioned above, the first pointing of Fitzgerald's translation, the Rubaiyat of Khayyam was first translated in 1859 AD without much initial success. The book was on sale in some bookstores in London and was not purchased even at one Pence price. One day an editor of a London newspaper picked it up in front of a store and read a few passages. He went inside and purchased a few more and sent them to a key Englishmen of literary and poetry. After that event, the sales went through the roof and up to 17 version of the translation of Fitzgerald was printed.

The key message in the Rubaiyat is for the mankind to maximize their times on earth in happiness and kindness which he analogized it to drinking wine. Below are 4 lines of his poems in Farsi and English, taken from a Persia-printed version of the Rubaiyat in 11 languages [9]. Figure 15.7 shows the cover of this Rubaiyat.

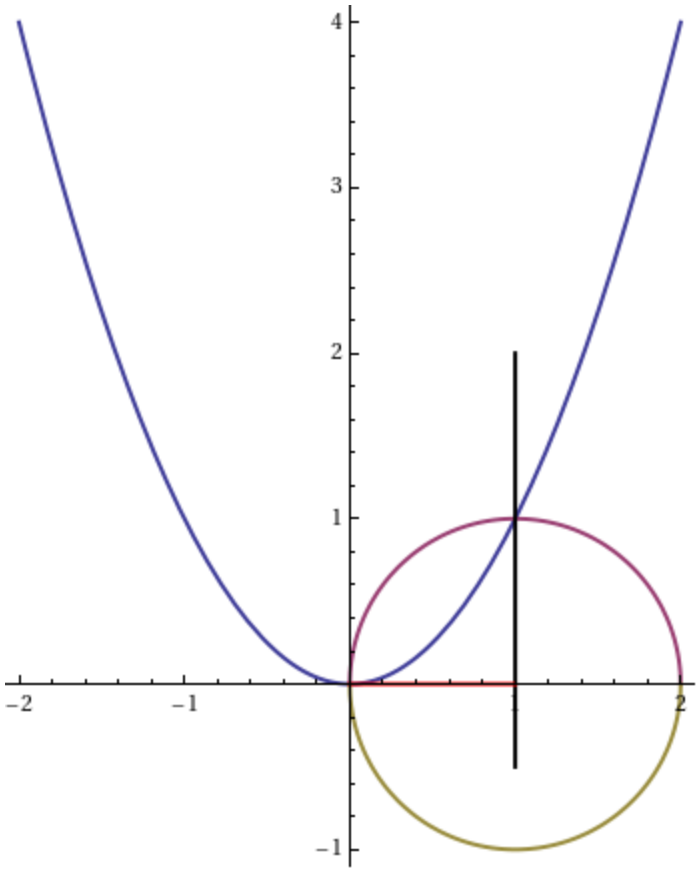
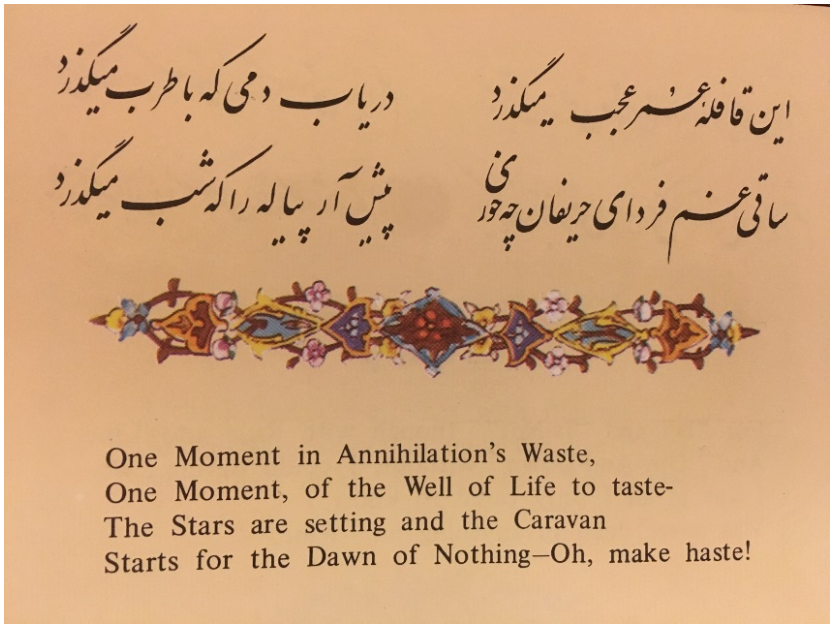


Figure 15.6 Khayyam's Solution of the Cubic Equation $x^3 + x = 2$ [2].

Khayyam's Astronomical Work: The Jalali Calendar

It was mid-11th Century when Seljuk Sultan Jalal – Al-Din Malik Shah of Persia was irritated by the lack of tax collections during the year, as there was no organized calendar for the year. In some years, there was no collection due to the clear knowledge of when the new year began. He ordered an assembly of top astronomers of the time headed by Omar Khayyam to come to the observatory of the capital Isfahan (middle of current Iran). The team, led by Khayyam watched the sky night times and followed the motion of the earth and stars with respect to the Sun. They counted the days and found out that the stars move as clusters in 30 or 31 days. Khayyam's team were observing the Zodiacs' movement every 30-31 days' time allowed them to identify 12 months of the year. The group finished their work in 8 years on March 15, 1079 AD, a week before the Persian New Year Nowruz [10]. His computed length of the calendar year was 365.2429858156. Table 15.1 shows how Khayyam's calculation of the number of days in a year compared with those after his time. It is clear that Khayyam's works without sophisticated computing powers and modern-day tools is remarkably accurate after 10 centuries.

Figure 15.7 The Cover the 1994 Rubaiyat, Published in Tehran, Iran.



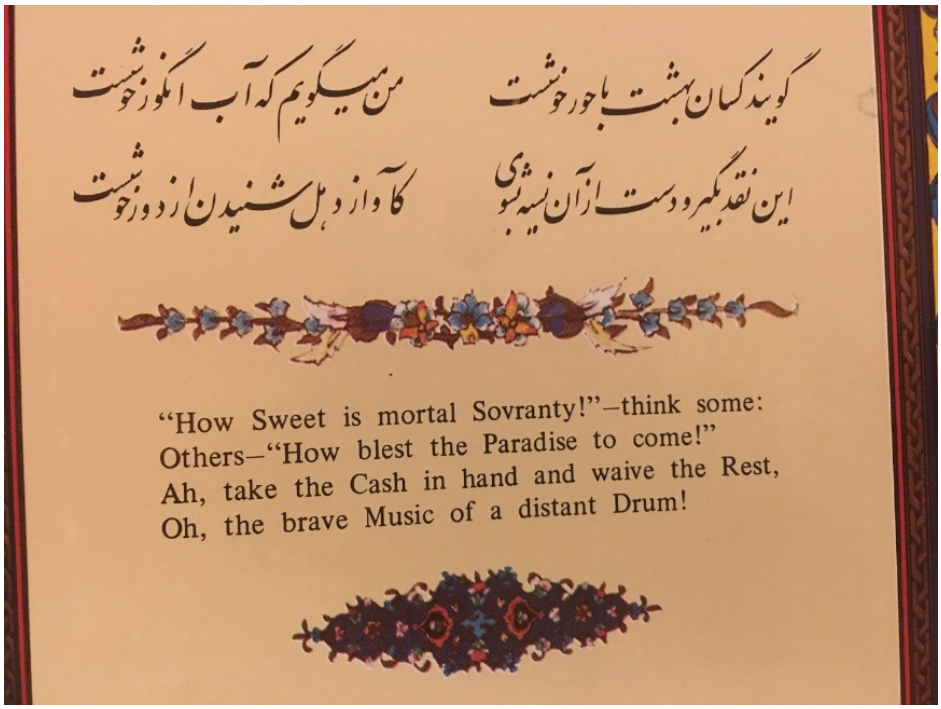


Figure 15.8 Four Lines of Poetry from the Recent Rubaiyat of Figure 15.6.

Table 15.1 Comparison of Khayyam' Calendar Calculation with Three Others [8].

Calendar/Year	Length
Tropical year	365.242190 days (measured by the modern world)
Jalali Calendar	365.24219858156 days (Omar Khayyam)
Gregorian Calendar	365.2425
Justinian Calendar	365.245

NASA has honored Omar Khayyam for his astronomical contributions. Figure 15.9 shows the Moon Crater named after Omar Khayyam by NASA in the USA.

References

[1] M. H. Morgan, Lost History, National Geographic, Washington, DC, 2007, pp. 107-115.

[2] https://en.wikipedia.org/wiki/Omar_Khayyam

[3] https://en.wikipedia.org/wiki/Rubaiyat_of_Omar_Khayyam

[3] http://www-history.mcs.st-and.ac.uk/Biographies/Khayyam.html

[4] Map: https://www.google.com/search?q=map+of+seljuk+dynasty&tbm=isch&imgil=zLi9F44Yxpo4LM%253A%253BudfSF3KO2r7C8M%253Bhttps%25253A%25252F%25252Fen.wikipedia.org%25252Fwiki%25252FSeljuk_Empire&source=iu&pf=m&fir=zLi9F44Yxpo4LM%253A%252CudfSF3KO2r7C8M%252C_&usg=__3tUELyLHH3EzD3nh0Po0G93zL40%3D&biw=1265&bih=586&ved=0ahUKEwi9sZ_ooJHVAhXrsVQKHaiiACkQyjcILQ&ei=gCttWb3xF-vj0gKoxYLIAg#tbm=isch&q=map+of+Persia++11th+century&imgrc=iFyiIt2E0DMmyM:

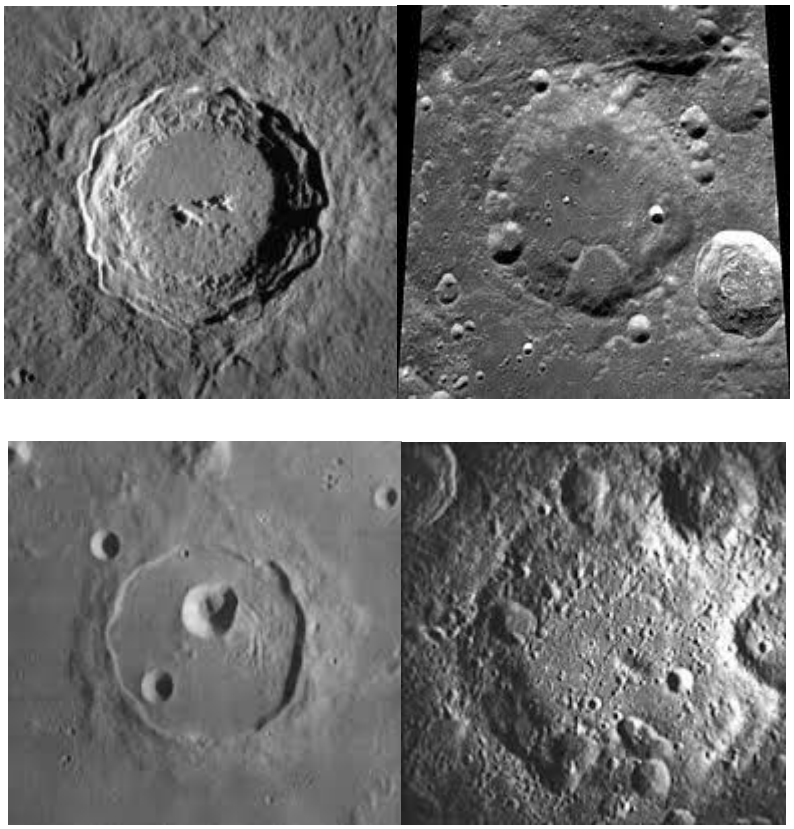


Figure 15.9 The Moon Crater Named after Omar Khayyam by NASA in the USA. [14].

[5] http://www.famous-mathematicians.com/omar-khayyam/

[6] https://www.google.com/search?q=mausoleum+of+omar+khayyam&tbm=isch&imgil=a4h6-P_LDLXjDM%253A%253B4s_xhAc9LR84aM%253Bhttp%25253A%25252F%25252Fvisitiran.info%25252Fmausoleum-of-omar-khayyam-neyshabur%25252F&source=iu&pf=m&fir=a4h6-P_LDLXjDM%253A%252C4s_xhAc9LR84aM%252C_&usg=__Wnim5TZPoYNbVhU4uXCAy-FYhgo%3D&biw=1265&bih=635&ved=0ahUKEwi97eK-npHVAhXqwFQKHcplBHwQyjcINg&ei=ECltWb2lIeqB0wLKy5HgBw#imgrc=FUxSgj30lbXujM:

[7] http://fabpedigree.com/james/mathmen.htm

[8] http://www.forgottenislamichistory.com/2014/03/calculating-the-number-of-days-in-year.html

[9] The Omar Khayyam Rubaiyat (in 11 languages), Peyk-e-Farhand Distribution Center, Tehran, Iran, 1993.

[10] https://en.wikipedia.org/wiki/Jalali_calendar

[11] D. A. Kent and D. J. Muraki, "A geometric solution of a cubic by Omar Khayyam … in which Coloured diagrams are used instead of letters for the greater ease of learners," American Mathematical Monthly, 121:1, May 16, 2015.

[12] O. Byrne, "The Doctrine of Proportion Clearly Developed, on a Comprehensive, Original, and Very Easy System; or, the Fifth Book of Euclid Simplified, ". J. Williams, London, 1841.

[13] https://en.wikipedia.org/wiki/File:Omar_Kayy%C3%A1m_-_Geometric_solution_to_cubic_equation.svg

[14] https://en.wikipedia.org/wiki/Omar_Khayyam_(crater)

CHAPTER 16 Ghazali (Poet)

16.1 Introduction

In this chapter, the brief life story and literary contributions of a deep Persian thinker in Islamic philosophy and poet – Ghazali will be covered. He has a many followers on the Internet nearly 900 years after his passing.

16.2 Facts on Ghazali [1]

Ghazali	Abū Ḥāmid Muḥammad ibn Muḥammad al-Ghazāl
Born	1058 AD
Place of Birth	Tus, Greater Khorasan (Now Tus, Iran)
Nationality	Persian (Iranian)
Death	19 December 1111 AD
Place of Death	Tus, Greater Khorasan (Now Tus, Iran)
Works	Muslim theologian, jurist, philosopher, and mystic

16.3 Biographical Sketch

> "Ghazali has sometimes been referred to by historians as the single most influential Muslim after the Islamic prophet Muhammad. Within Islam he is considered to be a Mujaddid or renewer of the faith, who, according to tradition, appears once every century to restore the faith of the community. His works were so highly acclaimed by his contemporaries that Ghazali was awarded the honorific title *"Proof of Islam"* (Hujjat al-Islam). Others have cited his opposition to certain strands of Islamic philosophy as a detriment to the Islamic scientific progress. Besides his work that successfully changed the course of Islamic philosophy, the early Islamic Neoplatonism was developed on the grounds of Hellenistic philosophy, for example, it was criticized by Ghazali that it never recovered, and he also brought the orthodox Islam of his time in close contact with Sufism. It became increasingly possible for individuals to combine the orthodox theology (*kalam*) and Sufism, while adherents of both camps developed a sense of mutual appreciation that made sweeping condemnation of one by the other increasingly problematic" [1].

Figure 16.1 Map of Siljuk Empire during the 11th and 12th Centuries of Persia [2].

"A posthumous tradition - the authenticity of which has been questioned in a recent scholarship - tells that his father died in poverty and left the young Ghazali and his brother Ahmad in the care of a Sufi. Ghazali's contemporary and first biographer, 'Abd Ghafir Farisi, records merely that Ghazali began to receive instruction in *fiqh* (Islamic jurisprudence) from Ahmad Radhakani, a local teacher. He later studied under Juwayni, the distinguished jurist and theologian "the most outstanding Muslim scholar of his time", in Nishapur, perhaps after a period of study in Gurgan. After Juwayni's death in 1085 AD, Ghazali departed from Nishapur and joined the court of Nizam ol Mulk, the powerful vizier of the Seljuq sultans, which was likely centered in Isfahan (see Figure 16.1). After bestowing upon him the titles of "*Brilliance of the Religion*" and "*Eminence among the Religious Leaders*", Nizam ol Mulk advanced Ghazali in July 1091 AD to the "most prestigious and most challenging" professoriate at that time, in the Nizamiyya madrasa in Baghdad" [1].

"He underwent a spiritual crisis in 1095 AD, and consequently abandoned his career and left Baghdad on the pretext of going on a pilgrimage to Mecca. Making arrangements for his family, he disposed of his wealth and adopted an ascetic lifestyle. After some time in Damascus and Jerusalem, with a visit to Medina and Mecca in 1096 AD, he returned to Tus to spend the next several years in '*uzla* (seclusion). This seclusion consisted in abstaining from teaching at state-sponsored institutions, he continued to publish, and receive visitors, teach in the *zawiya* (private madrasa) and *khanqah* (Sufi monastery) that he had built"[1].

"Fakhr ol Mulk, the grand vizier to Ahmad Sanjar, pressed Ghazali to return to the Nizamiyya in Nishapur; Ghazali reluctantly capitulated in 1106 AD, fearing (rightly) that he and his teachings would meet with resistance and controversy. He later returned to

Tus, and declined an invitation in 1110 AD from the grand vizier of Muhammad I to return to Baghdad. He died on the 18 December 1111 AD. According to 'Abd Ghafir Farisi he had several daughters, but no sons" [1].

16.4 Works and Contributions

"Ghazali contributed significantly to the development of a systematic view of *Sufism* and to its integration and acceptance in mainstream Islam. As a scholar of orthodox Islam, he belonged to the Shafi'i school of Islamic *jurisprudence* and to the Asharite school of theology. Ghazali received many titles such as *Sharaf-ul-Aʾimma*, *Zayn-ud-dīn*, and *Ḥujjat-ul-Islām*"[1].

"He is viewed as the key member of the influential Asharite school of early Muslim philosophy and as the most important refuter of *Mutazilites*. However, he chose a slightly different position in comparison with the *Asharites*; his beliefs and thoughts differ, in some aspects, from the orthodox Asharite school" [1].

Ghazali wrote more than 70 books on the sciences, Islamic philosophy and Sufism.

Incoherence of the Philosophers

His 11th century book entitled '*The Incoherence of the Philosophers'* marks a major turn in Islamic epistemology. The encounter with skepticism led al-Ghazali to embrace a form of theological *occasionalism*, or the belief that all causal events and interactions are not the product of material conjunctions but rather the immediate and present Will of God.

The *Incoherence* also marked a turning point in Islamic philosophy in its vehement rejections of Aristotle and Plato. The book took aim at the *falasifa*, a loosely defined group of Islamic philosophers from the 8th through 11th centuries (most notable among them Avicenna (see Chapter 12) and Farabi (see Chapter 10) who drew intellectually upon the Ancient Greeks. Ghazali bitterly denounced Aristotle, Socrates and other Greek writers as non-believers and labeled those who employed their methods and ideas as corrupters of the Islamic faith" [1].

The following is a short list of his major works [1]:

Theology

- *al-Munqidh min al-dalal* (Rescuer from Error)
- *Hujjat al-Haq* (Proof of the Truth)
- *al-Iqtisad fil-i`tiqad* (Median in Belief)
- *al-maqsad al-asna fi sharah asma' Allahu al-husna* (The best means in explaining Allah's Beautiful Names)
- *Jawahir al-Qur'an wa duraruh* (Jewels of the Qur'an and its Pearls)
- *Fayasl al-tafriqa bayn al-Islam wa-l-zandaqa* (The Criterion of Distinction between Islam and Clandestine Unbelief)
- *Mishkat al-Anwar* (The Niche for Lights, a commentary on the Verse of Light)
- *Tafsir al-yaqut al-ta'wil*

Sufism

- *Mizan al-'amal* (Criterion of Action)
- *Ihya' ulum al-din*, "Revival of Religious Sciences"
- *Bidayat al-hidayah* (Beginning of Guidance)
- Kimiya-yi sa'ādat (The Alchemy of Happiness) [a résumé of Ihya'ul ulum, in Persian]
- *Nasihat al-muluk* (Counseling Kings) [in Persian]
- *al-Munqidh min al-dalal* (Rescuer from Error)
- *Minhaj al-'Abidin* (Methodology for the Worshipers)

Philosophy

- *Maqasid al falasifa* (Aims of Philosophers) [written in the beginning of his life, in favour of philosophy and presenting the basic theories in Philosophy, mostly influenced by Avicenna's works]
- *Tahafut al-Falasifa* (The Incoherence of the Philosophers), [in this book he refutes the Greek Philosophy aiming at Avicenna and Al-Farabi; and of which Ibn Rushd wrote his famous refutation *Tahafut al-tahafut* (The Incoherence of the Incoherence)*Miyar al-Ilm fi fan al-Mantiq* (Criterion of Knowledge in the Art of Logic)
- *Mihak al-Nazar fi al-mantiq* (Touchstone of Reasoning in Logic)
- *al-Qistas al-mustaqim* (The Correct Balance)

Jurisprudence

- *Fatawy al-Ghazali* (Verdicts of al-Ghazali)
- *Al-wasit fi al-mathab* (The medium [digest] in the Jurisprudential school)
- *Kitab tahzib al-Isul* (Prunning on Legal Theory)
- *al-Mustasfa fi 'ilm al-isul* (The Clarified in Legal Theory)
- *Asas al-Qiyas* (Foundation of Analogical reasoning)

Works in Persian

> "Ghazali wrote most of his works in Arabic and few in Persian. His most important Persian work is the '*Kīmyāyé Sa'ādat' (The Alchemy of Happiness). It is Ghazali's own Persian version of* Ihya'ul ulumuddin *(The Revival of Religious Sciences) in Arabic but a shorter work. It is one of the most outstanding works of 11th-century-Persian literature. The book was published several times in Tehran by the edition of Hussain Khadev-jam, a renown Iranian scholar. It is translated in English, Arabic, Turkish, Urdu and other languages.*

Apart from Kimya, the most celebrated of Ghazali's works in Persian is '*Nasīhatul Mulūk*'(The Counseling Kings), written most probably for Sultan Ahmad Sanjar ibn Malekshah. In the edition published by Jalāluddīn Humāyī, the book consists of two parts of which only the first can reliably be attributed to Ghazali. The language and the contents of some passages are similar to the Kimyaye Sa'adat. The second part differs considerably in content and style from the well-known writings of Ghazali. It contains the stories of pre-Islamic kings of Persia, especially those

of Anoshervān. Nasihatul Muluk, and was early translated to Arabic under the title of *al-Tibr al-masbuk fi nasihat al-muluk* (The Forged Sword in Counseling Kings).

Zād-e Ākherat (Provision for the hereafter) is an important Persian book of Ghazali but gained less scholarly attention. The greater part of it consists of the Persian translation of one of his Arabic books, *Bedāyat al-Hedāya* (Beginning of Guidance). It contains in addition the same contents as the Kīmyāyé Sa'ādat. The book was most probably written during the last years of his life. Its manuscripts are in Kabul (Library of the Department of Press) and in Leiden.

Pand-nāma (Book of Counsel) is another book of advice and probably attributed to Sultan Sanjar. The introduction to the book relates that Ghazali wrote the book in response to a certain king who had asked him for advice. **Ay farzand** (O son!) is a short book of counsel that Ghazali wrote for one of his students. The book was early translated to Arabic entitled *ayyuhal walad*. His other Persian work is the **Hamāqāti ahli ibāhat** or **Raddi ebāhīyya** (Condemnation of antinomians), which is his *fatwa* in Persian illustrated with Quranic verses and Hadiths"[1].

Faza'ilul al-anam min rasa'ili hujjat al-Islam is the collection of letters in Persian that Ghazali wrote in response to the kings, ministers, jurists and some of his friends after he returned to Khorasan. The collection was gathered by one of his grandchildren after his death, under five sections/chapters. The longest letter is the response to objections raised against some of his statements in *Mishkat al-Anwar* (The Niche of Light) and *al-Munqidh min al-dalal* (Rescuer from Error). The first letter is the one, which Ghazali wrote to Sultan Sanjar presenting his excuse for teaching in Nizamiyya of Nishapur; followed by Ghazali's speech in the court of Sultan Sanjar. Ghazali makes an impressive speech when he was taken to the king's court in Nishapur in 1106 AD, giving very influential counsels, asking the sultan once again for excusing him from teaching in Nizamiyya. The sultan was so impressed that he ordered Ghazali to write down his speech so that it would be sent to all of the ulemas of Khorasan and Iraq[1].

16.5 Some Covers of his Books and Words of Advice

As it was mentioned earlier, he wrote over 70 books on various topics. Below is a partial listing of both.

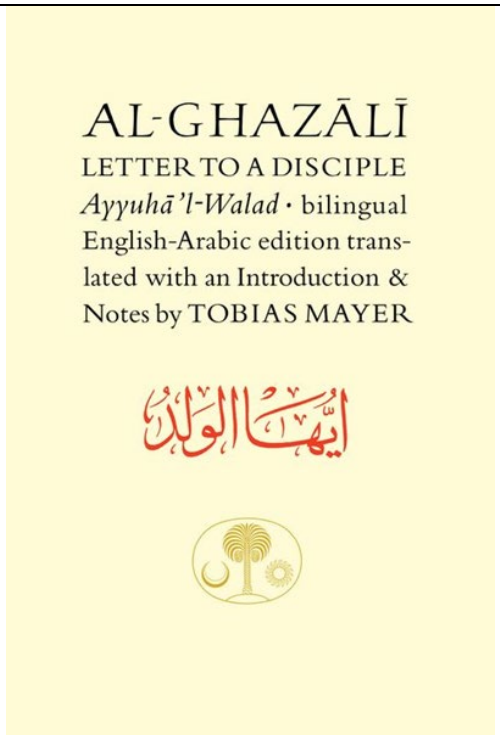
16.6 Death of Ghazali

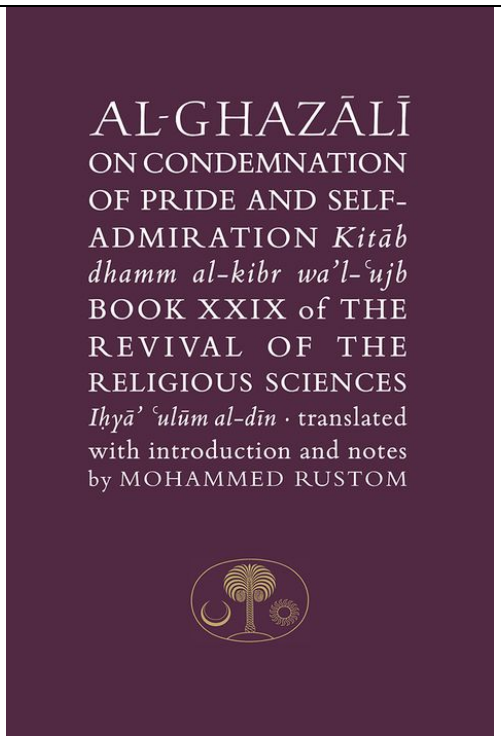
Mohammad Ghazali died in Tus, Persia (Iran today) in December 1111 AD. His tomb is believed to be in the entrance of Haruniyah (see Figure 16.3), where Harun al-Rashid (March 17, 763 AD - March 24, 809 AD, Tous, Iran), Abbasi's 5th Caliphe (Khalifeh) has been buried.

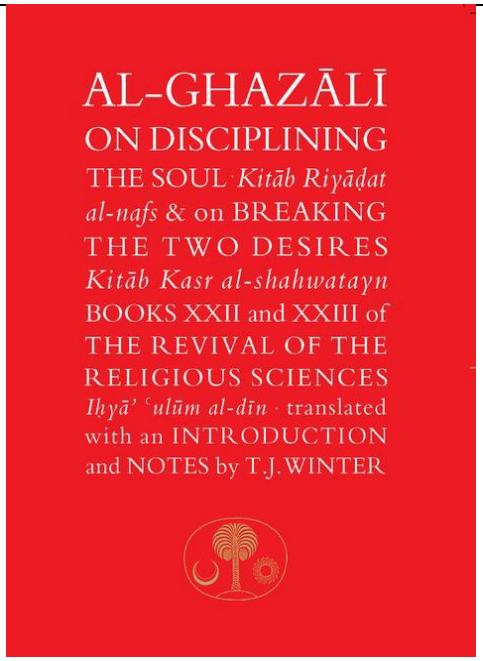
16. 7 Bonus Section – Ahmad Ghazali

Ahmad Ghazālī, also known as **Majd al-Dīn Abū al-Fotuḥ.** Aḥmad Ghazālī, was the younger brother of Mohammad Ghazali. He was a Persian mystic, writer, and eloquent preacher (c. 1061–1123 AD or 1126 AD). He is best known in the history of Sufism for his ideas on love, expressed primarily in the celebrated work entitled *Sawāneḥ* [3].

He primarily educated in jurisprudence in Tus. He turned to Sufism while still young becoming the first pupil of Abu Bakr Nassaj Tusi (died 1094 AD) and then of Abu Ali Farmadi (died 1084 AD). He was advanced in Sufism by 1095 AD, and his brother, Abū Ḥāmid asked him to teach in his place in the Nezamiya of Baghdad and assume responsibility during his planned absence [3].


AL-GHAZĀLĪ
LETTER TO A DISCIPLE
Ayyuhā 'l-Walad · bilingual English-Arabic edition translated with an Introduction & Notes by TOBIAS MAYER
أيها الولد


AL-GHAZĀLĪ
ON CONDEMNATION OF PRIDE AND SELF-ADMIRATION *Kitāb dhamm al-kibr wa'l-ʿujb*
BOOK XXIX of THE REVIVAL OF THE RELIGIOUS SCIENCES
Iḥyā' ʿulūm al-dīn · translated with introduction and notes by MOHAMMED RUSTOM


AL-GHAZĀLĪ
ON DISCIPLINING THE SOUL *Kitāb Riyāḍat al-nafs* & on BREAKING THE TWO DESIRES *Kitāb Kasr al-shahwatayn*
BOOKS XXII and XXIII of THE REVIVAL OF THE RELIGIOUS SCIENCES
Iḥyā' ʿulūm al-dīn · translated with an INTRODUCTION and NOTES by T.J. WINTER

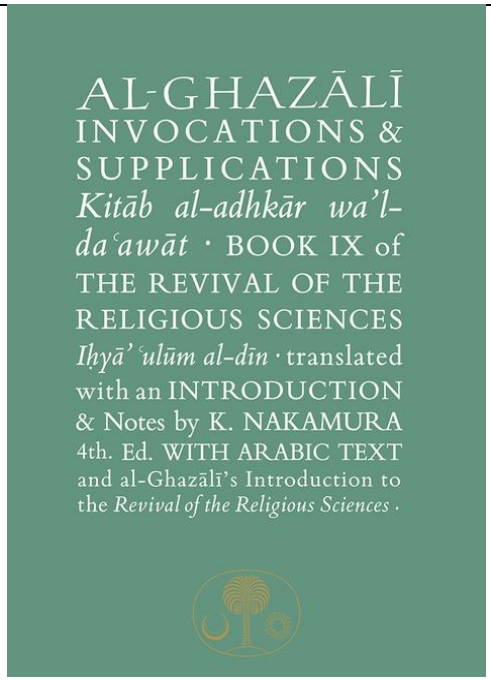

AL-GHAZĀLĪ
INVOCATIONS & SUPPLICATIONS *Kitāb al-adhkār wa'l-daʿawāt* · BOOK IX of THE REVIVAL OF THE RELIGIOUS SCIENCES
Iḥyā' ʿulūm al-dīn · translated with an INTRODUCTION & Notes by K. NAKAMURA
4th. Ed. WITH ARABIC TEXT and al-Ghazālī's Introduction to the *Revival of the Religious Sciences*

Figure 16.2. A Few Cover Pages and Advices of Ghazali.

Figure 16.3. The Haruniyah, Tomb of Islamic Khalif Harun Al-Rashid. Ghazali's Tomb is believed to be in the Entrance of this Mausoleum (Tus, Iran) [1].

Ahmad Ghazālī's thought, centered as it was on the idea of love, and left a profound mark on the development of Persian mystical literature, especially poetry celebrating love. Many of the topoi (*maẓāmīn*) used by later poets such as ʿAṭṭār, Saʿdī, ʿIrāqī, and Ḥāfeẓ, to name but a few, can be traced to his works, particularly the *Sawāneḥ* [3].

Among his predecessors, he was influenced most strongly by Ḥallāj, and he made his idea of essential love the basis of his own thoughts. His belief was that all created beauty is an emanation of divine beauty was likewise Hallajian or neo-Platonic in origin. Since God is both absolute beauty and the lover of all phenomenal beauty. Ahmad Ghazālī maintained that to adore any object of beauty is to participate in a divine act of love. Hence the practice of *naẓar-bāzī* or *šāhed-bāzī*, gazing on young and beautiful faces, a practice for which he became notorious [3].

Ahmad Ghazālī travelled extensively in the capacity of both the Sufi master and a popular preacher. He visited Nishapur, Maragheh, Hamadan and Isfahan (all in Iran today). He initiated and trained eminent masters of Sufism including Ayn Quzat Hamadani, and Abu al-Najib Suhrawardi. The latter was the founder of the Suhrawardiyya Order and its derivatives such as the Kubrawiyya, Mevlevi and Niʾmatullāhī orders[3].

He died in Qazvin in 1123 or 1126 AD and is buried there.

Ahmad Ghazali's Works [3]

- *Sawāneḥ*, a little book written around 1114 AD and is comprised of some 77 short chapters. It was innovative in form, for at a time when Persian Sufi authors used only prose. Ghazālī had the recourse to verse in order to illustrate in metaphorical fashion the themes he expounded more technically in the prose sections of his work.
- *Risālat al-ṭayr* (or *al-ṭuyūr)* (*Epistle of the Birds*): In this work Ghazālī employs the metaphor of a bird and its journey to speak of the spiritual path to illumination in God. This work set a precedent for the *Conference of the Birds* by Attar of Nishapur.

- *Al-tajrīd fī kalimat al-tawḥīd*, a theological and mystical interpretation of the basic testimony of Islam, *Lā ilāha illā Allāh*, which reflects his adherence to the Ashʿarite school of theology.
- *Baḥr al-maḥabba fī asrār al-mawadda*, a Sufi commentary on *Sūrat Yūsuf* (Koran 12); and an abridgment of his brother's *Iḥyāʾ ʿulūm al-dīn*, a work he himself taught.
- *Bawāriq al-ilmāʾ fī l-radd ʻalā man yuḥarrim al-samāʾ*, a description and justification of the Sufi Sama ritual and apology for the compatibility of music and Islam [2].

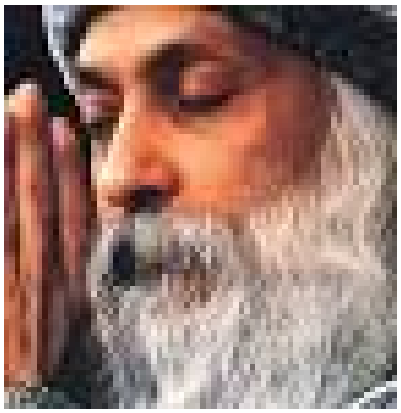
References

[1] https://en.wikipedia.org/wiki/Al-Ghazali

[2] Map: https://www.google.com/search?sa=G&hl=en&q=map+of+the+seljuk+empire&tbm=isch&tbs=simg:CAQSlgEJKN_1pjKIfLyQaigELEKjU2AQaBAgVCAsMCxCwjKcIGmEKXwgDEiezA8UH1gjGB9IIwQfNB9gJTMkHnDnzPvs_18j71PvA--D7lP_1E-9CIaMIdRahE_1lwBorLEgisxuleurrdySPxBG82A8K4CnI8F9h4LKG1uLZgAQdhBJSp31diAEDAsQjq7-CBoKCggIARIEPDuiXww&ved=0ahUKEwiPl4DnuPjdAhVIF6wKHQ4TBbcQwg4IKigA&biw=1266&bih=502#imgrc=buhSSJzNlR40cM:

[3] https://en.wikipedia.org/wiki/Ahmad_Ghazali

CHAPTER 17 Sanai (Poet)



17.1 Introduction

In this chapter, the brief life story and literary contributions of another Persian Sufi Poet is briefly given. His name is Sanai.

17.2 Facts on Sanai [1]

Sanai	AKA Hakim Abul-Majd Majdūd ibn Ādam Sanā'ī Ghaznavi
Born	1080 AD
Place of Birth	Ghazni, Greater Khorasan (Now Afghanistan)
Nationality	Persian
Death	1131 AD
Place of Death	Ghazni, Greater Khorasan (Now Afghanistan)
Genri	Sufi poetry, Wisdom Literature
Books	*The Walled Garden of Truth, The Enclosed Garden of the Truth*
Influenced	Rumi (See Chapter 22)

17.3 Biographical Sketch

> "SANĀʾI, Majdud b. Ādam Ḡaznavi, Persian poet, celebrated especially on the account of his homiletic poetry and his great influence on the development of mystical literature (born and died in Ghazna, ca. 1087/1130 AD, for further details see below). He normally used 'Sanāʾi' as a pen name in his poems but occasionally he used his first name Majdud, or Majdud-e Sanāʾi for the same purpose. His usual pen name may have been derived from Sanāʾ-al-Mella (the Splendor of the Community), one of the honorific epithets of the Ghaznavid Sultan Masʿud III b. Ebrāhim (r. 1099-1115 AD), although the poet's precise relationship to his court remains unclear. In some of the oldest manuscripts of his works the *konya* Abu'l-Majd is mentioned but it is uncertain whether this was already added to his name during his lifetime. Other honorifics are undoubtedly the posthumous additions, for instance *Ḥakim* (the Wise), a common epithet for learned poets, and *Ḵātam al-šoʿarā* (Seal of the Poets), echoing the famous epithet "Seal of the Prophets" of the Prophet Mohammad" [3].

Figure 17.1 Map of 10th to 12th Century Ghaznavid Empire of Persia [2].

The most famous anecdote relates a confrontation with a radical ascetic nicknamed "drinker of dregs" (*lāyḵvār*) whom he met one night when he was on his way to the Ghaznavid palace to present a panegyric to the Sultan. The rebuke by this destitute drunk, who was lingering on the ash heap of a public bath, affected Sanāʾi so deeply that he at once abandoned his career as a court poet and embarked upon the path of Sufism. This famous story has often been interpreted as marking a radical change in the poet's life, which could explain the striking contrast between secular and religious elements in his work. Despite the lack of a coherent narrative of Sanāʾi's life, there are enough references to the historical context in his poems to allow a reconstruction of his biography in its broad outlines. This data points to a division of his biography into three periods, the first and last were spent in his native Ghazna. During the middle period he lived in Khorasan, apparently wandering from one city to another.

17.4 Poetry and Writings

Sanai wrote enormous quantities of mystical verses, of which *The Walled Garden of Truth* or *The Hadiqat al Haqiqa,* which is his master work and the first Persian mystical epic of Sufism. Dedicated to Bahram Shah [Bahram-Shah (full name: *Yamin ad-Dawlah wa Amin al-Milla Abul-Muzaffar Bahram-Shah*) (1084 – 1157 AD) was Sultan of the Ghaznavid empire from 25 February 1117 to 1157 AD], and the work expresses the poet's ideas on God, love, philosophy and reason" [3]. Figure 17.2 represents Sanai's honoring of Ferdowsi's Shahnameh.

17.5 Death of Sanai

Sanai's tomb in Ghazna is marked by a structure erected in modern times and has for centuries been a place of pilgrimage. Among the famous pilgrims to his grave were the Mughal prince Dārā Šokōh (d. 1659 AD) and the great Indian poet Muhammad Iqbal, who wrote about his visit in 1936 in his poem *Mosāfer* (the traveler). Also in the 1930's, the Persian poet and scholar

Malek-al-šoʿarāʾ Bahār inserted in his prison poem *Kārnāma-ye zendān,* (a Prison Memoir) the account of a dream in which he had an encounter with Sanāʾi and expressed his indebtedness to him as one of the greatest didactic poets of the past. (for further references to the sources used for this biographical sketch, see de Bruijn, 1983, in particular, Chapters 4-6) [4]. His tomb is in Ghazna Afghanistan [6]. His mausoleum is shown in Figure 17.3 in Ghazna of Greater Khorasan [6].

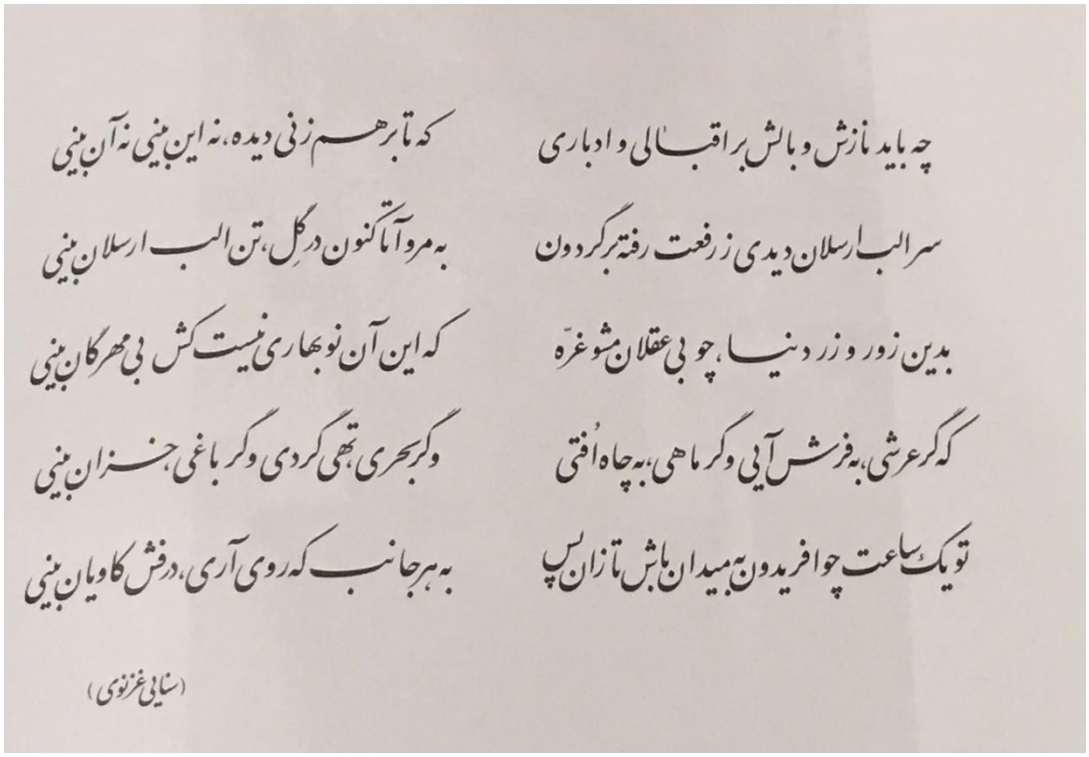


Figure 17.2. Sanai's Poems in Honor of Ferdowsi's Masterpiece Shahnameh [5].

Figure 17.3. The Tomb of Hakim Sanai in Ghazna, Greater Khorasan (Today Afghanistan) [6].

References

[1] https://www.google.com/search?source=hp&ei=B8LLW4jqEOShggfFqKuYBQ&q=hakim+sanai+persian+poet&oq=sanai+Persian+poet&gs_l=psy-ab.1.1.0j0i22i30l2.2012.7584..11942...0.0..0.649.2615.8j10j5-1.....0....1..gws-wiz.....0..35i39j0i131j0i67j0i131i67j0i10j0i3j0i22i10i30.5a8XHrCM5NQ

[2] Map: https://www.google.com/search?sa=G&hl=en&q=map+of+the+seljuk+empire&tbm=isch&tbs=simg:CAQSlgEJKN_1pjKIfLyQaigELEKjU2AQaBAgVCAsMCxCwjKcIGmEKXwgDEiezA8UH1gjGB9IIwQfNB9gJTMkHnDnzPvs_18j71PvA--D7lP_1E-9CIaMIdRahE_1lwBorLEgisxuleurrdySPxBG82A8K4CnI8F9h4LKG1uLZgAQdhBJSp31diAEDAsQjq7-CBoKCggIARIEPDuiXww&ved=0ahUKEwiPl4DnuPjdAhVIF6wKHQ4TBbcQwg4IKigA&biw=1266&bih=502#imgrc=buhSSJzNlR40cM:

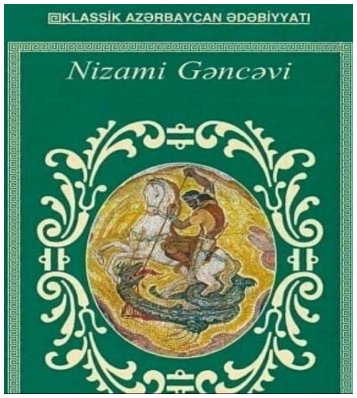
[3] http://www.iranicaonline.org/articles/sanai-poet

[4] https://en.wikipedia.org/wiki/Sanai

[5] F. Reza, "Shahnameh: From Legends to Firdowsi's Vision," Etellaat Publishers, Tehran, Iran, 2015.

[6] https://www.google.com/search?q=Sanai++poet+tomb+in+Ghazna&tbm=isch&tbo=u&source=univ&sa=X&ved=2ahUKEwj-xM3arKTeAhUCneAKHQ_-BE4QsAR6BAgEEAE&biw=1280&bih=610

CHAPTER 18 Nezāmi Ganjavi (Poet)



18.1 Introduction

In this chapter, the brief life story, and literary contributions of another great Persian Azari poet, Nezāmi Ganjavi will be presented. Nezāmi Ganjavi is considered the greatest romantic epic poet in Persian literature, who brought a colloquial and realistic style to the Persian epic. His heritage is widely appreciated and shared in Persian speaking nations like Afghanistan, Azerbaijan, Iran, the Kurdistan region and Tajikistan [1].

18.2 Facts on Nezami Ganjavi [1]

Nezāmi	Jamal ad-Dīn Abū Muḥammad Ilyās ibn-Yūsuf ibn-Zakkī
Born	1141 AD
Place of Birth	Ganja, Persia (Now Azerbaijan)
Nationality	Persian, Azari
Death	1209 AD
Place of Death	Ganja, Persia (Now Azerbaijan)

18.3 Biographical Sketch

> "His personal name was Ilyas and his chosen pen-name was Nezāmi (also spelled as Nizami and Neẓāmi). He was born of an urban background in Ganja (Seljuq empire), now Azerbaijan) and is believed to have spent his whole life in South Caucasus. According to De Blois, Ganja was a city, which at that time had predominantly an Iranian population. The Armenian historian, Kirakos Gandzaketsi (c. 1200 – 1271 AD) mentioned that: "This city was densely populated with Iranians and a small number of Christians". Because Nezāmi was not a court poet, he does not appear in the annals of the dynasties. Tazkerehs, which are the compilations of literary memoirs that include maxims of the great poets along with biographical information and a commentary of styles refer to him briefly. Much of this material in these Tazkerehs are based on legends, anecdotes, and hearsays. Consequently, few facts are known about Nezāmi's life, the only source being his own work, which does not provide much information on his personal life" [1].

"Nezāmi was married three times. His first wife was a Kipchak slave girl, which was sent to him by Fakhr al-Din Bahramshah, the ruler of Darband, as part of a larger gift. According to Iraj Bashiri, she became Nezāmi's "most beloved" wife. His only son *Mohammad* was from this wife. She died after "*Khosrow and Shirin*" was completed. Mohammad was seven at the time. Nezāmi mentions his son again in *Layli and Majnun* adding that now this son is 14 years old and the "apple of my eye". In "*Haft Peykar*" (Seven Beauties), he also mentions and advises his son about taking more responsibility as the father was growing more frail" [1].

Figure 18.1 Map of 10th to 12th Century Ghaznavid Empire of Persia [2].

18.4 Education, Poetry and Writings

18.4.1 Education

"Nezāmi was not a philosopher in the sense of Avicenna (Chapter 6) or an expositor of theoretical Sufism in the sense of Ibn 'Arabi. However, he is regarded as a philosopher and gnostic who mastered various fields of Islamic thoughts, which he synthesized in a way that brings to mind the traditions of later Hakims such as Qutb al-Din Shirazi.

Often referred to by the honorific Hakim ("the Sage"), Nezāmi is both a learned poet and master of a lyrical and sensuous style. About Nezāmi's prodigious learning there is no doubt. Poets were expected to be well versed in many subjects but Nezāmi seems to have been exceptionally so. His poems show that not only he was fully acquainted with Arabic and Persian literatures with oral and written popular and local traditions, and was also familiar with such diverse fields as mathematics, astronomy, astrology, alchemy, medicine, botany, Koranic exegesis, Islamic theory and law, Iranian myths and legends, history, ethics, philosophy and esoteric thought, music, and visual arts. His strong character, social sensibility, and knowledge of oral and written historical records, as well as his rich Persian cultural heritage unite pre-Islamic and Islamic Iran into the creation of

a new standard of literary achievement. Being a product of the Iranian culture of the time, he not only created a bridge between pre-Islamic and Islamic Iran but also between Iran and the whole ancient world" [1].

18.4.2 Influences and literary scene

"The recent discovery and publication of the anthology titled *Nozhat al-Majales* contains Persian language quatrains from Nezāmi and 115 other poets from the northwestern Iran (Arrān, Šarvān, Azerbaijan; including 24 poets from Ganja alone) during the same era. Unlike other parts of Persia, where the poets mostly belonged to higher echelons of society such as scholars, bureaucrats, and secretaries, a good number of poets in the northwestern areas rose from among the common people with working-class backgrounds, and they frequently used colloquial expressions in their poetry. Accordingly, the book demonstrates the social conditions at the time, reflecting the full spread of Persian language and the culture in the region, which is evidence by the common use of spoken idioms in poems and the professions of many of the poets. The influence of the northwestern Pahlavi language, for example, which had been the spoken dialect of the region, is clearly observed in the poems contained in this anthology. However, at the same time, the Caucasus region was entertaining a unique mixture of ethnic cultures. Khaqani's mother was a Nestorian Christian, Mojir Baylqani's mother was an Armenian, and Nezāmi's mother was a Kurd. Their works reflect the cultural and linguistic diversity of the region.

By the end of the 10th century, Persian literature became widespread from the eastern Mediterranean to the banks of the Indus. The earliest extant example of Persian poetry from the area is that of Qatran Tabrizi (1009–1072 AD) who served in the courts of the Shaddadid and Rawadid dynasties. Qatran Tabrizi, is credited with what some scholars in the last century have termed as the founder of the "Azerbaijan" or "Trans-Cacausian" school or "Tabriz School" or "Shirvan School" or "Arranian Style" of Persian poetry. This school produced a distinctive style of poetry in Persian, which contrasted with "Khurasani" ("Eastern") style in its rhetorical sophistication, its innovative use of the metaphor, its use of technical terminology and Christian imagery, the presence of Persian archaism while borrowing from Arabic vocabulary, as well as new concepts. Other sources including the Encyclopedia of Islam and traditional Iranian literary sources have used the term "'Iraqi" style for the Persian poetry of Nezāmi" [1].

"The influence of Neẓāmi's work on the subsequent development of Persian literature has been enormous and the Khamsa became a pattern that was emulated in later Persian poetry (and also in other Islamic literatures). The legacy of Nezāmi is widely felt in the Islamic world and his poetry has influenced the development of Persian, Arabic, Turkish, Kurdish and Urdu poetry amongst many other languages" [1]. "In the Persian miniature, the stories in Nezāmi's poems alongside those of Ferdowsi's *Shahnama* (Chapter 4) have been frequently illustrated in literary works" [1].

Nezāmi has several famous literary works, which have survived in Persian literature for over 1000 years. These are Khosrow o Shirin, Layli o Majnun, Eskandar Nameh, and Haft Paykar [1]

Khosrow o Shirin

"A story of pre-Islamic Persian origin, which is found in the great epico-historical poems of Shahnameh and is based on a true story that was further romanticized by Persian poets. The story chosen by Nezāmi, was commissioned and dedicated to the Seljuk Sultan Toghril II, the Atabek Muhammad ibn Eldiguz Jahan Pahlavan and his brother Qizil Arslan. It contains about 6,500 distiches in length, the story depicts the love of Sassanian Khosrow II Parviz towards his Armenian princess Shirin". "Khusrow and Shirin" recounts the story of King Khosrow's courtship of Princess Shirin, and vanquishing of his love-rival, Farhad. The story has a complex structure with several genres exploited simultaneously; and contains many verbal exchanges and letters, all imbued with lyrical intensity. Khosrow endures long journeys, physical and spiritual, before returning to Shirin, his true love. They are eventually married but eventually Khosrow is killed by his son and Shirin commits suicide over the body of her murdered husband. Pure and selfless love is represented here embodied in the figure of Farhad, secretly in love with Shirin, who finally falls victim to the king's ire and jealousy" [1].

Layli o Majnun

"A story of Arabic origin, which was later absorbed and embellished by the Persians. The poem of 4,600 distich's was dedicated, in 1192 AD, to Abu al-Muzaffar Shirvanshah, who claimed descent from the Sassanid King, whose exploits are reflected in Nezāmi's "Seven Beauties" (Haft Paykar). The poem is based on the popular Arab legend of ill-starred lovers: The poet Qays falls in love with his cousin Layla but is prevented from marrying her by Layla's father. Layla's father forbids contact with Qays and Qays becomes obsessed and starts signing of his love for Layla in public. The obsession becomes so severe that he sees and evaluates everything in terms of Layla; hence his sobriquet "the possessed" (Majnun). Realizing that he cannot obtain union even when other people intercede for him, he leaves society and roams naked in the desert among the beasts. However the image of Layla was so ingrained in him that he cannot eat or sleep. His only activity becomes composing poetry of longing for Layla. Meanwhile, Layla is married against her will but she guards her virginity by resisting the advances of her husband. Arranging a secret meeting with Majnun, they meet but have no physical contact. Rather they recite poetry to each other from a distance. Layla's husband dies eventually, which removes the legal obstacles to a licit union. However, Majnun is so focused on the ideal picture of Layla in his mind that he had fled to the desert. Layla dies out of grief and is buried in her bridal dress. Hearing this news, Majun rushes to her grave where he instantly dies. They are buried side by side and their graves becomes a site of pilgrimage. Someone dreams that in Paradise they are united and live as a king and queen. Nezāmi composed his romance at the request of the Shirvanshah Akhsatan. Initially, he doubted that this simple story about the agony and pain of an Arab boy wandering in rough mountains and burning deserts would be a suitable subject for royal court poetry and his cultured audience.-It was his son who persuaded him to undertake the project, saying: "wherever tales of love are read, this will add spice to them". Nezāmi used many Arabic anecdotes in the story but also adds a strong Persian flavor to the legend. He adapted the disconnected stories about Majnun to fit the requirement of a Persian romance" [1].

Eskandar-nameh "The Book of Alexander"

"The Romance of Alexander the Great" contains 10,500 distiches. There are differences of opinion on whether this was Nezāmi's last epic or the *Haft Paykar*. The names of its dedicatees are uncertain but the ruler of Ahar, Nosart al-Din Bishkin b. Mohammad has been mentioned. The story is based on Islamic myths developed about Alexander the Great, which derive from Qur'anic references to the Dhu'l-Qarnayn as well as from the Greek Alexander romance of Pseudo-Callisthenes. It consists of two books, Sharaf-Nama and Iqbal-nameh. The poem narrates the three stages in Alexander's life: First as the conqueror of the world; then as a seeker after knowledge, gaining enough wisdom to acknowledge his own ignorance; and finally as a prophet, traveling once again across the world, from west to east, and south to north to proclaim his monotheistic creed to the world at large. The Sharaf-nama discusses the birth of Alexander, his succession to the throne of Rum (Greece), his wars against Africans who invaded Egypt, his conquest of Persia and his marriage to the daughter of Darius. The episode also discusses Alexander's pilgrimage to Mecca, his stay in the Caucasus and his visit to Queen Nushaba of Barda' and her court of Amazons. Alexander conquers India, China and the land of the Rus. The Sharafnama concludes with Alexander's unsuccessful search for the water of immortal life" [1].

Haft Paykar "The Seven Beauties" (also called Bahram-Nama)

"A pre-Islamic story of Persian origin was dedicated to the ruler of Maragha, 'Ala' Al-Din korp Arslan. It is the story of Bahram V, the Sassanid king, who is born to Yazdegerd after twenty years of childlessness and supplication to Ahura Mazda for a child. The Haft Paykar is a romanticized biography of the Sasanian Persian empire ruler Bahram Gur. His adventurous life had already been treated by Ferdowsi in the Shahnama, to which fact Nezāmi eludes to a number of times. In general, his method is to omit those episodes that the earlier poet had treated, or to touch on them only very briefly, and to concentrate on new material. The poet starts by giving an account of the birth of Bahram Gur and his upbringing in the court of Arab King No'man and his fabled palace Khwarnaq. Bahram whose upbringing is entrusted to Nom'man becomes a formidable huntsman. While wandering through the fabled palace, he discovers a locked room, which contains a depiction of seven princesses: hence the name Haft Paykar (seven beauties). Each of these princesses is from seven different climes (traditional Zoroastrian-Islamic division of the Earth) and he falls in love with them. His father Yazdegerd I passes away and Bahram returns to Persia to claim his throne from pretenders. After some episodes he is recognized as King and rescues the Persians from a famine. Once the country is stable, the King searches for the seven princesses and wins them as his brides. His architect is ordered to construct seven domes for each of his new brides. The architect tells him that each of the seven climes is ruled by one of the seven planets (classical planetary system of Zoroastrian-Islamic world) and advises him to assure good fortune by adorning each dome with the color that is associated with each clime and planet. Bahram is skeptical but follows the advice of the architect. The princesses take up residence in the splendid pavilions. On each visit, the king visits the princesses on successive days of the week; on Saturday the Indian princess, who is governed by Saturn and so on. The princesses names are Furak (Nurak), the daughter of the Rajah of India, as beautiful as the moon; Yaghma

Naz, the daughter of the Khaqan of the Turks; Naz Pari, the daughter of the king of Khwarazm; Nasrin Nush, the daughter of the king of the Slavs; Azarbin (Azareyon), the daughter of the king of Morocco; Humay, the daughter of the Roman Caesar; and Diroste (wholesome), a beautiful Iranian princess from the House of Kay Ka'us. Each princess relates to the king a story matching the mood of her respective color. These seven beautifully constructed, highly sensuous stories occupy about half of the whole poem. While the king is busy with the seven brides, his evil minister seizes power in the realm. Bahram Gur discovers that the affairs of Persia are in disarray, the treasury is empty and the neighboring rulers are posed to invade. He clears his mind first by going hunting. After returning from hunting, he sees a suspended dog from a tree. The owner of the dog, who was a shepherd, tells the story of how his faithful watchdog had betrayed his flock to a she-wolf in return for sexual favors.−He starts investigating the corrupt minister and from the multitude of complaints, he selects seven who tell him the injustice they have suffered. The minister is subsequently put to death and Bahram Gur restores justice and orders the seven pleasure-domes to be converted to fire temples for the pleasure of God. Bahram then goes hunting for the last time but mysteriously disappears. As a pun on words, while trying to hunt the wild ass (*gūr*) he instead finds his tomb (*gūr*)" [1].

18.4.3 Final Points

Nezāmi was born in Ganja, Persia in 1141 AD, which until 80 year ago was part of Iran. He loved Iran and the following verses justifies this issue:

همه عالم تن است و ایران دل
نیست گوینده زین قیاس خجل
چون که ایران دل زمین باشد
دل زتن به بود یقین باشد
زان ولایت که مهتران دارند
بهترین جای بهتران دارند

In English, it reads as follows:

"The whole world is a body and Iran is its heart

There is nobody who can deny this assertion

As Iran being heart of the earth

Heart is better than body for certain

Such province that are greatest"

They have the best place among the best"

Some of the photos from Nezāmi's poetry are shown in Figure 18.2.

(a) Khosrou o Shirin

(b) Haft Paykar

(c) Majnun

Figure 18.2. Photos of Most from Books by Nezāmi Ganjavi.

(a) *Khusrau stands on either side of the canal built to supply Shirin with the milk of goats and cows, taken from the Khamseh of Nizami [1].*

(b) *Practice Makes Perfect* from a Haft Paykar of Nizami. Brooklyn Museum. (NY) [1].

(c) Salīm conversing with Majnun in the desert. Nizami's text illustrated with a miniature painting from a late 16th-century Indian book [1].

Figure 18.3 shows Nezāmi's Mausoleum in Ganja, Azerbaijan (part of Persia in the 12th Century) and Nezāmi's Museum of Azerbaijani Literature in Baku, Azerbaijan [1].

(a) Mausoleum in Ganja

(b) Nezāmi's Museum in Baku, Azerbaijan

Figure 18.3. The Mausoleum and Museum of Nezāmi Ganjavi.

References

[1] https://en.wikipedia.org/wiki/Nizami_Ganjavi

[2] Map: https://www.google.com/search?sa=G&hl=en&q=map+of+the+seljuk+empire&tbm=isch&tbs=simg:CAQSlgEJKN_1pjKIfLyQaigELEKjU2AQaBAgVCAsMCxCwjKcIGmEKXwgDEiezA8UH1gjGB9IIwQfNB9gJTMkHnDnzPvs_18j71PvA--D7lP_1E-9CIaMIdRahE_1lwBorLEgisxuleurrdySPxBG82A8K4CnI8F9h4LKG1uLZgAQdhBJSp31diAEDAsQjq7-

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CHAPTER 19 Khāqānī (Poet)

19.1 Introduction

In this chapter, the brief life story and literary contributions of yet another Persian poet of Azari heritage, Khāqānī will be presented.

19.2 Khāqānī [1, 2]

Khagani	AKA Afẓal al-Dīn Bādil Ibrāhīm ibn ʿAlī Khāqānī Shīrvānī
Born	1106 AD
Place of Birth	Shīrvān, Seljuq Persian empire (Now Azerbaijan)
Nationality	Persian (Azari)
Death	1190 AD
Place of Death	Tabriz, Persia (Now Iran)
Importance	Brilliant court poems, satires, and epigrams.

19.3 Biographical Sketch

"Khāqānī, in full Afẓal al-Dīn Bādil Ibrāhīm ibn ʿAlī Khāqānī Shīrvānī, (born *c.* 1106 AD, Shīrvān, Seljuq Persian empire (now Azerbaijan)—died *c.* 1190 AD, Tabrīz, Iran) is a Persian poet, whose importance rests mainly on his brilliant court poems, satires, and epigrams. His father was a carpenter and a Muslim and his mother was of Nestorian Christian origin. Brought up in poverty, he was fortunate to be educated by his uncle. As a young man he composed lyrics under the name of Ḥaqāʾīqī ("Seeker of Truth"). He then gained entry into the court of the ruler of Shīrvān, the *khāqān,* Manūchehr, from whom he took his pen name, Khāqānī.

Embittered by personal disputes and court intrigues, he set out on the pilgrimage to Mecca in 1156/57 AD, after which, he composed one of his greatest works, a *masnavī* (long poem in rhyming couplets), the *Tuḥfat al-ʿIrāqayn* ("Gift of the Two Iraqs"). It consists of five parts and is essentially a description of the poet's travels.

Figure 19.1 Map of 12th Century Seljuk Dynasty Empire of Persia [2].

Returning to the court, Khāqānī was imprisoned for reasons that are not clear. His sufferings moved him to write a *ḥabsīyah* ("jail ballad"), considered one of the finest of its kind. In 1171 AD he made another pilgrimage to Mecca, after which, he returned to the court of Shīrvān with patron, Manūchehr's son, Akhsatan. After the deaths of his son and wife in 1175 AD, he made another pilgrimage and then settled in the city of Tabrīz, writing much of the poetry in his divan. In addition to the obscure nature of his style, which renders his work difficult for the average reader, Khāqānī filled his poems with Christian imagery, one of the few Persian poets to have done so" [2].

19.4 Poetry and Writings

As mentioned, Khāqānī travelled to Mecca and Iraq three separate times and also visited other places, such as, "Tagh-e-Kasra", a Sassanid'd Dyanasty of the Persian Empire during the reign of Shahpour I (or Khosru I). Figure 19.2 shows Khāqānī's poems after visiting this impressive structure. The photos of the remains of this historic structure are shown in Figure 19.3. This ruin was a 3rd to 6th Century Knowledge Complex, e.g. a university and a learning center, which was frequented by pre-Islamic scientists to confer with each other. After the Arab invasion, the complex was turned into a mosque for a period of time.

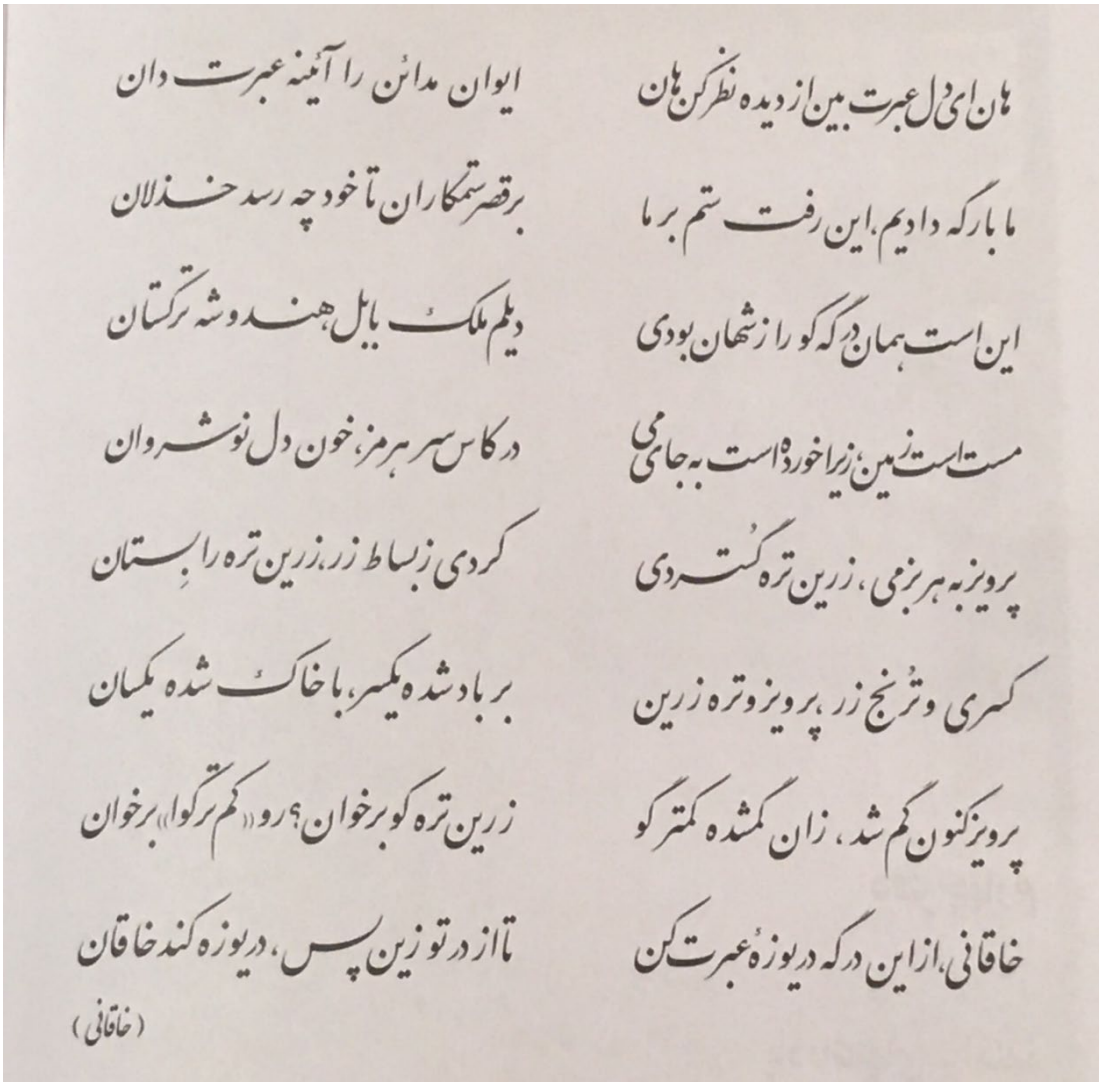


Figure 19.2 Khāqānī's famous poem about the fate of Ivan-e-Madaen (Capital of Sasanids' Empire), whose remains are shown in Figure 19.3.

19.5 Death of Khāqānī

Khāqānī passed away at the age of 84, in 1190 AD at his new home in Tabriz, Iran. Figure 19.4 shows The Tomb of Poets.

References

[1] https://www.britannica.com/biography/Khaqani

[2] https://en.wikipedia.org/wiki/Khaqani

Figure 19.3 A Few Scenes from the Remains of Ivan-e-Madaen (North of Today's Baghdad, Iraq, also Known as "Tagh e Kasra") from the Rein of Sassanid Dynasty King Shapur I.

Figure 19.4. The Tomb of Poets, Including Khagani in Tabriz, Iran [5].

[3] Map: https://images.search.yahoo.com/yhs/search?p=map+of+seljuk+persian+empire+map&fr=yhs-mozilla-004&hspart=mozilla&hsimp=yhs-004&imgurl=http%3A%2F%2Fshoebat.com%2Fwp-content%2Fuploads%2F2015%2F11%2Fseljuk_map.jpg#id=2&iurl=http%3A%2F%2Fshoebat.com%2Fwp-content%2Fuploads%2F2015%2F11%2Fseljuk_map.jpg&action=click

[4] https://encyclopedia2.thefreedictionary.com/Khagani

[5] https://www.google.com/search?tbm=isch&sa=1&ei=1b0NXPDBAc3etQXKq7SwAQ&q=Mauseloeum+of+Popet+Khagani+in+Tabriz+Iran&oq=Mauseloeum+of+Popet+Khagani+in+Tabriz+Iran&gs_l=img.12...21886.35436..39480...0.0..0.72.2547.42.....1....1..gws-wiz-img.....0j0i67j0i10j0i30j0i10i24.jzn2laNmw6c

CHAPTER 20 Attar (Sufi Poet)

20.1 Introduction

In this chapter, the brief life story and literary contributions of another great poet of the 12th Century AD, Attar of Nishaspur or Nishabour in the Khorasan Province of Iran. He was a great Sufi poet who was inspired by master Sufi Poet, Moulana Rumi. His work also inspired other great poets of Persia like Ferdowsi, Sanai, and Hafez.

20.2 Facts on Attar [1]

Attar	AKA Farīd al-Dīn Abū Ḥamīd bin Abū Bakr Ibrāhīm
Born	1145 or 1142 AD
Place of Birth	Nishapur, Iran
Nationality	Persian
Death	1220 AD
Place of Death	Nishapur, Iran (Murdered by the Mongol invaders)
Pen name	Farīd ud-Dīn
Influences by	Ferdowsi, Sanai, Khwaja Abdullah Ansari, Mansur Al-Hallaj, Abu-Sa'id Abul-Khayr, Bayazid Bastami
Influenced	Rumi, Hafez, Jami, Ali-Shir Nava'i and many other later Sufi Poets

20.3 Biographical Sketch

Information about Attar's life is rare and scarce. He is mentioned by only two of his contemporaries, `Awfi and Tusi (see chapter 15). However, all sources confirm that he was from Nishaspur, a major city of medieval Greater Khorasan (now located in the northeast of Iran), and was a poet of the Seljuk period.

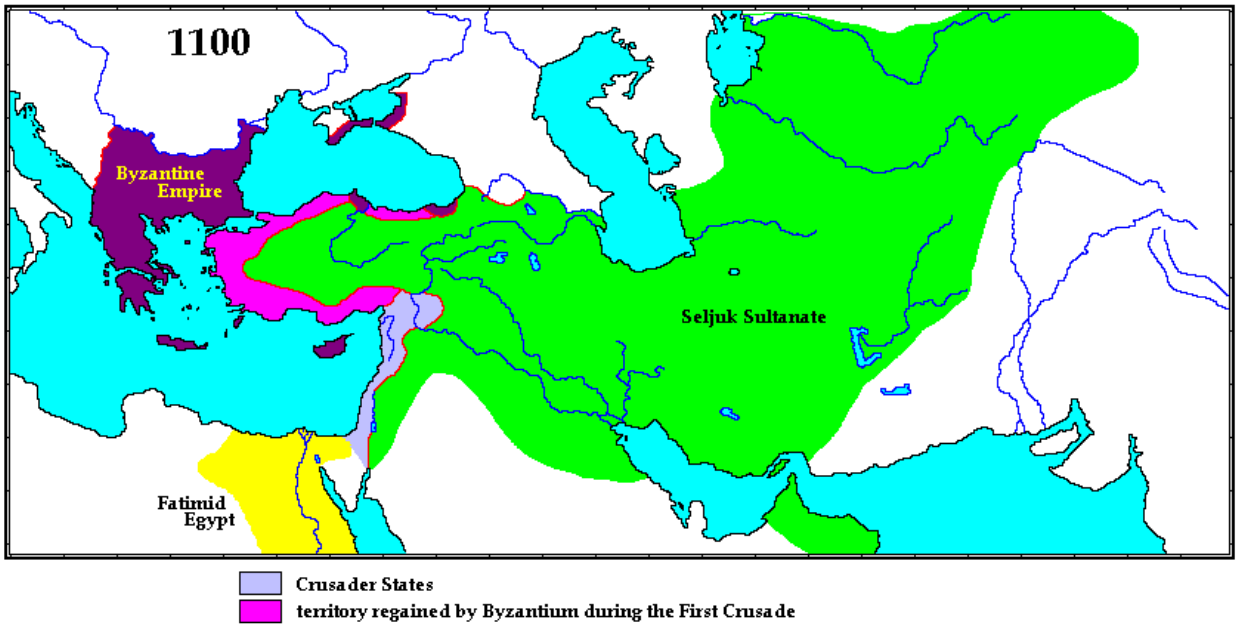


Figure 20.1 Map of 12th Century Empire of Persia Saljuks [2].

"According to Reinert: *It seems that he was not well known as a poet in his own lifetime, except at his home town,* and *his greatness as a mystic, a poet, and a master of narrative was not discovered until the 15th century.* At the same time, the mystic Persian poet Rumi has mentioned: "Attar was the spirit, Sanai his eyes twain, And in time thereafter, Came we in their train" and mentions in another poem: "Attar has traversed the seven cities of Love, We are still at the turn of one street" [1].

"Attar was probably the son of a prosperous chemist, receiving an excellent education in various fields. While his works say little else about his life, they tell us that he practiced the profession of pharmacy and personally attended to a very large number of customers. The people he helped in the pharmacy used to confide their troubles in `Attar and this affected him deeply. Eventually, he abandoned his pharmacy store and traveled widely to Baghdad, Basra, Kufa, Mecca, Medina, Damascus, Khwarizm, Turkistan, and India, meeting with Sufi Shaykhs, and returned promoting Sufi ideas".

"Attar composed at least 45,000 *distich*'s (couplets) and many brilliant prose works [3], and his greatest work is the "well-known *Manṭeq al-ṭayr* (*The Conference of the Birds*). This is an allegorical poem describing the quest of the birds (i.e., Sufis) for the mythical Sīmorgh, or Phoenix, whom they wish to make their king (i.e., God). In the final scene, the birds that have survived the journey, and approached the throne contemplating their reflections in the mirror like countenance of the Sīmorgh, only to realize that they and the Sīmorgh are one" [3].

"Other important works of this prolific poet include the *Elāhī-nāma* (*The Ilahī-nāma or Book of God*) and the *Mosībat-nāma* ("Book of Affliction"), both of which are mystical allegories similar in structure and form to *Manṭeq al-ṭayr*; the *Dīvān* ("Collected Poems"); and the famous prose work *Tadhkerat al-Awlīyā'*, an invaluable source of information on the early Sufis (abridged Eng. trans., *Muslim Saints and Mystics*). From

the point of view of ideas, literary themes, and style, ʿAṭṭār's influence was strongly felt not only in Persian literature but also in other Islamic literatures"[3].

(a) Mausoleum of Attar *(b) Statue* *(c) Funeral scene of Attar*

Figure 20.2 The Tomb of Attar, Nishapour, Iran.

Attar was murdered by the Mongol's invaders in 1220 AD. His Mausoleum and a scene of his funeral are shown in Figure 20.2.

References

[1] https://en.wikipedia.org/wiki/Attar_of_Nishapur

[2] Map: https://www.google.com/search?q=12th+century+map+of+Persia&tbm=isch&source=iu&ictx=1&fir=lowHk79PXAdzVM%253A%252Cm_NCjRXxYMWtSM%252C_&usg=__DuNRcJ7aNTzmhVrWVHaLIPb_4-w%3D&sa=X&ved=0ahUKEwjpwIGSvIXZAhVGRK0KHVwkBwUQ9QEIMTAE#imgrc=sCUE1JwBzdfkJM:

[3] https://www.britannica.com/biography/Farid-al-Din-Attar

CHAPTER 21 Nasir Tūsī (Astronomer, Mathematician, Philosopher)

21.1 Introduction

In this chapter, the life story and scientific contributions of another legendary Persian scientist of the beginning of the 13th Century is presented. His name was Khawaja Muhammad ibn Muhammad ibn Hasan Tūsī. He contributed to physics, logic, philosophy, mathematics, medicine, and astronomy.

21.2 Facts on Tūsī [1]

Tūsī	Khawaja Muhammad ibn Muhammad ibn Hasan Tūsī, Khajeh Nasir Tūsī
Born	February 17, 1201 AD
Place of Birth	Close to City of Gum, Persia (Now in Iran).
Nationality	Persian (Iranian)
Death	June 22, 1274 AD
Place of Death	Kazemain, Iraq
Parents	Unknown
Religion	Indication is that as a youth he was a Zoroastrian and converted to Islam later on

21.3 Biographical Sketch

Tūsī was born in the city of Tus (Greater Khorasan Province in 13th Century Persia) in 1201 AD (see Figure 21.1, [2]). He studied the Koran in Tus and Hamadan at an early age. He also studied logic, philosophy, mathematics, medicine, and astronomy. He lost his father at an early age but he persuaded the path of learning and knowledge based on his late father's wishes. As a young scholar he moved to Nishapur to study philosophy and mathematics. While in Nishapur, he met the legendary Sufi master poet Attar who was later killed by Mongol invaders. Later he studied mathematics and astronomy with Kamel al-din Yunus (1942) in Mosul (now in Iraq). When the armies of Genghis Khan of Mongols swept his homeland, he was captured by the Islmailis and with protection from various kingdoms or strongholds, eventually joined the court of Hulagu Khan (grandson of Genghis Khan) whose capital was Maragheh (currently in northwest Iran).

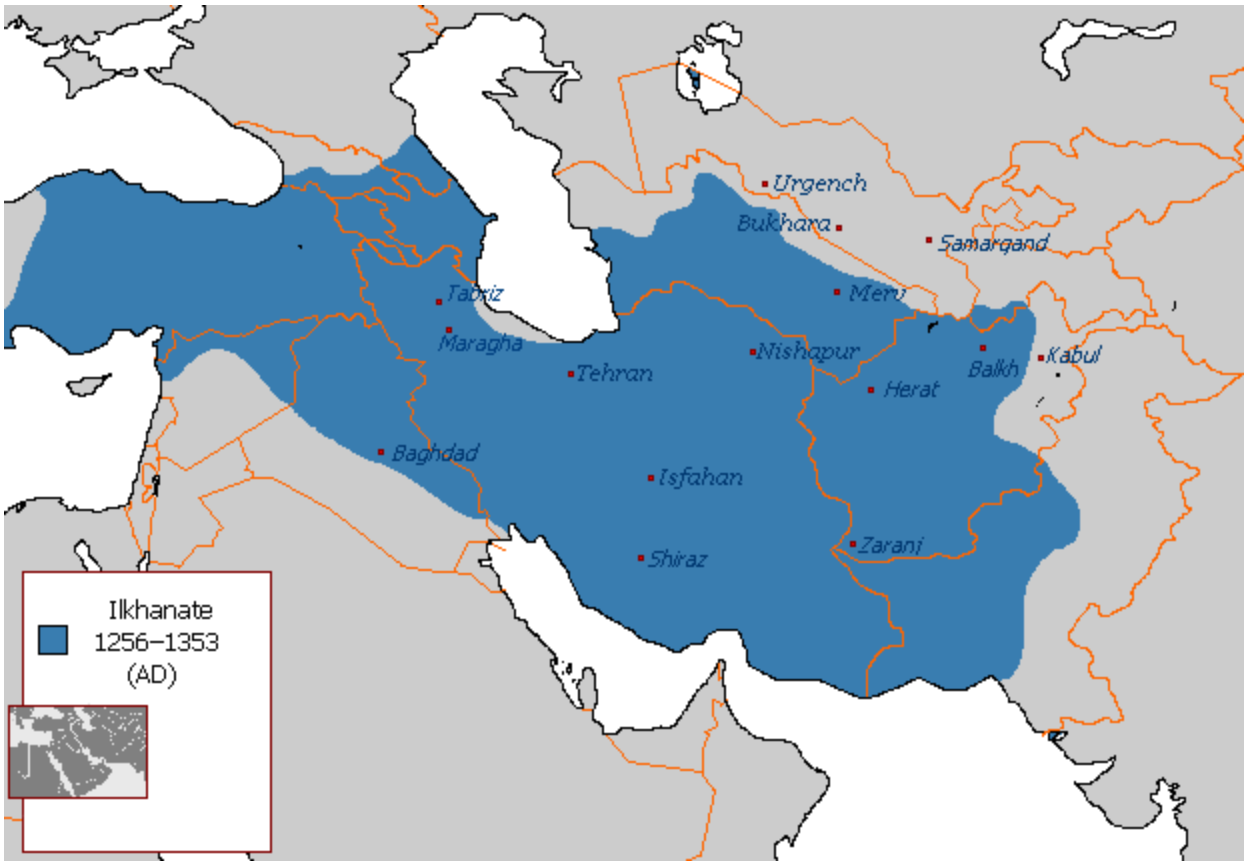


Figure 21.1 Map of the Persia Empire (13th[th] and 14[th] Centuries) [2].

21.4 Contributions and Achievements

Tūsī has 150 pieces of published work, over 25 of them in Persian, a few in Turkish and the rest in Arabic (popular language at that time). His key works are described below [3].

- *Kitāb al-Shakl al-qattā* - Book on the complete quadrilateral. A five volume summary of trigonometry.
- *Akhlaq-i-Naseri* – A work on ethics.
- *al-Risalah al-Asturlabiyah* – A Treatise on astrolabe.
- *Zij-i ilkhani* (*Ilkhanic Tables*) – A major astronomical treatise, completed in 1272 AD.
- *Al-Tadhkirah fi'ilm al-hay'ah* – A memoir on the science of astronomy. Many commentaries were written about this work called Sharh al-Tadhkirah (A Commentary on al-Tadhkirah) - Commentaries were written by Abd al-Ali ibn Muhammad ibn al-Husayn al-Birjandi and by Nazzam Nishapuri.
- *sharh al-isharat* - (*Commentary on Avicenna's Isharat*).
- *Awsaf al-Ashraf* - a short mystical-ethical work in Persian.
- *Tajrīd al-iʿtiqād* (Summation of Belief) – A commentary on Shia doctrines.

Maragheh Observatory

One of the key contributions of Tūsī in astronomy is in the construction of an observatory in 1259 AD in Maragheh (Eastern Province of Azerbaijan, Iran). Maragheh was the capital of Hulegu Khan (1217-1265 AD) and it was Tūsī who convinced him to establish an observatory at that time. Figure 21.2 shows the ruins of the observatory and its current building in Maragheh, Iran. During the planning and construction stages of the observatory, Tūsī, in his book: Zij-i-ilkhani (*Ilkhanic Tables*), created accurate Planetary Moments tables to calculate the positions of the planets and the name of stars [3]. His planetary model was the most advanced one at the time. It was used all the time until the heliocentric model of Nicolaus Copernicus [4], (Copernicus was the 16th Century Renaissance era Polish mathematician and astronomer who modeled the universe that placed the Sun rather than the Earth at the Universe's center).

Tūsī invented a geometrical technique called a Tūsī Couple, which generates linear motion from the sum of two circular motions [3, 5]. Figure 21.3 shows the Tūsī-Couple concept. The Tūsī couple is a mathematical device in which a small circle rotates inside a larger circle twice the diameter of the smaller circle. Rotations of the circles cause a point on the circumference of the smaller circle to oscillate back and forth in linear motion along a diameter of the larger circle. The couple was first proposed by the 13th-century Persian astronomer and mathematician Nasir al-Din al-Tūsī in his 1247 *Tahrir al-Majisti (Commentary on the Almagest)* as a solution for the latitudinal motion of inferior planets, and later used extensively as a substitute for the equant introduced over a thousand years earlier in Ptolemy's Almagest [3, 5].

Tūsī writes that "The Milky Way, i.e. the galaxy, is made up of a very large number of small tightly clustered stars, which, on account of their concentration and smallness, seem to be cloudy particles, because of this, it was likened to milk in color [5]. Tūsī also calculated the value for the annual precession of the equinoxes and contributed to the construction and usage of some astronomical instruments including the astrolabe.

(a) *(b)*

Figure 21.2 Maragheh, Iran Observatory (a) Ruins of the Original Observatory and (b) Current Observatory [6].

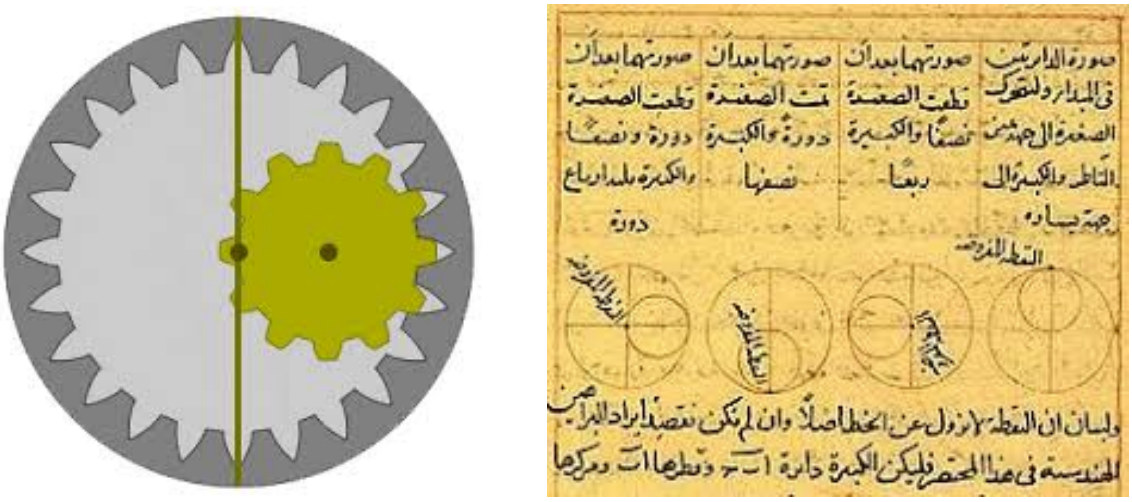


Figure 21.3 Tūsī's "Tūsī-Couple" Concept used for the Maragheh, Iran Observatory [5].

Later on, based on Maragheh observatory other ones were built in Samarkand (150 years later, now in Uzbekistan), Istanbul, Turkey, and Jaipur, India.

Biology

Tūsī in his book *"Akhlaq-i-Nasri"* presented a fundamental theory of the evolution of species. He conjectured that the universe once consisted of equal and similar elements. He pointed out that these elements, due to internal contradictions, some elements developed faster than others [7]. He then noted that these evolutions resulted in minerals, then plants, then animals, and finally humans [3]. He wrote below [7]:

> "Animals are higher than plants, because they are able to move consciously, go after food, find and eat useful things. [7] There are many differences between the animal and plant species, [7] First of all, the animal kingdom is more complicated. Besides, reason is the most beneficial feature of animals. Owing to reason, they can learn new things and adapt to new, non-inherent abilities. For example, the trained horse or hunting falcon is at a higher point of development in the animal world. The first steps of human perfection begins from here".

He further explained how humans evolved from animals, consider the following [3]:

> *"Such humans [probably anthropoid apes] lived in Western Sudan and other distant corners of the world. They are close to animals by their habits, deeds and behavior [8]. The human has features that distinguish him from other creatures but he has other features that unite him with the animal world, vegetable kingdom or even with the inanimate bodies. Before [the creation of humans], all differences between organisms were of natural origin. The next step will be associated with spiritual perfection, will, observation and knowledge. [8] All these facts prove that the human being is placed on the middle step of the evolutionary stairway. According to his inherent nature, the human is related to the lower beings, and only with the help of his will can he reach the higher development level".*

These conjectures and findings of Tūsī were brought up 6 centuries before Jean-Baptist Lamurck (1744-1829 AD) and Charles Darwin and Alfred Russel Wallace in 1859. [6].

Chemistry and Physics

In chemistry and physics, Tūsī stated a version of the law of conservation of mass. He wrote that a body of matter is able to change but is not able to disappear: "A body of matter cannot disappear completely. It only changes its form, condition, composition, color and other properties and turns into a different complex or elementary matter [3].

Logic

Tūsī was a supporter of Avicenna (Chapter 12) logic, and wrote the following commentary of Avicenna's theory of absolute proposition [3]:

> "What spurred him to this was that in the assertoric syllogistic Aristotle and others sometimes used contradictories of absolute propositions on the assumption that they are absolute; and that was why so many decided that absolutes did contradict absolutes. When Avicenna had shown this to be wrong, he wanted to give a way of construing those examples from Aristotle"[3].

Mathematics

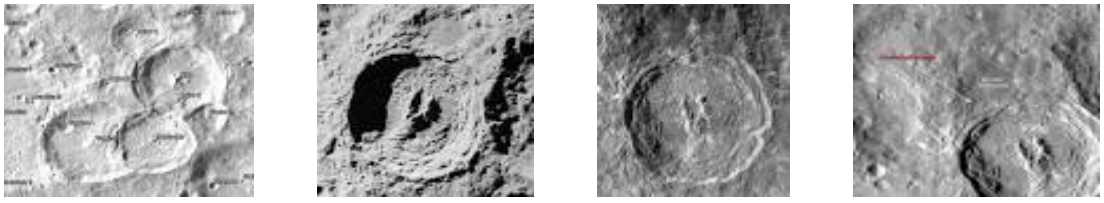
Recall from Biruni's chapter (Chapter 11) that trigonometry was used in astronomical calculations. Tūsī was the first to write a book solely on trigonometry. Tūsī, in his "*Treatise on the Quadrilateral"*, gave an extensive exposition of spherical trigonometry, distinct from astronomy. It was in the works of Al-Tūsī that trigonometry achieved the status of an independent branch of pure mathematics distinct from astronomy, to which it had been linked for so long.—He was the first to list the six distinct cases of a right triangle in spherical trigonometry [3].

Civil Service

Tūsī served as minister (wizir) to the 2nd generation Mongol ruler, Hulakuh Khan (grandson of Ghengis Khan). Nasir advised the Mongol ruler to take on the last Abbasid' rule in Baghdad and hence helped ended 507 years of rule by the Abbasids' Empire.

Final Points

NASA – Space agency of the United States has dedicated Nasireddin - a lunar impact crater that lies in the rugged terrain in the southern part of the Moon's near side. This crater overlaps two older formations, intruding into the crater Miller to the north and Huggins to the west [9].



Moon Crater in Honor of K. N. Tūsī [10].

References

[1] https://www.google.com/#q=bio+of+Khwarizmi

[2] Map: https://www.google.com/search?q=Maps+of+Abbasid+dynasty&tbm=isch&imgil=FtSLUcm4wQCUPM%253A%253BVK6kC-UCrg66qM%253Bhttp%25253A%25252F%25252Fwww.gifex.com%25252Fdetail-en%25252F2010-01-01-11553%25252FThe-Abbasid-Caliphate-7501258.html&source=iu&pf=m&fir=FtSLUcm4wQCUPM%253A%252CVK6kC-UCrg66qM%252C_&usg=__-cFB_JYnW6jr7teNfuaTf8PbpJQ%3D&ved=0ahUKEwi9zfSK1PrUAhVR62MKHXdXDUIQyjcIMA&ei=QVJhWf2oE9HWjwP3rrWQBA&biw=1268&bih=586#imgrc=On0DqH4lq1btpM:

[3] https://en.wikipedia.org/wiki/Muhammad_ibn_Musa_al-Khwarizmi

[4] https://www.britannica.com/biography/Nicolaus-Copernicus

[5] https://en.wikipedia.org/wiki/Tusi_couple

[6] Ragep, Jamil, Nasir al-Din Tusi's Memoir on Astronomy (al-Tadhkira fi `ilm al-hay' a) Edition, Translation, Commentary and Introduction. 2 vols. Sources in the History of Mathematics and Physical Sciences. New York: Springer-Verlag, 1993. pp. 129.

[7] http://www.iranreview.org/content/Documents/Maragheh_Observatory.htm

[8] http://www.sciencepub.net/report/report0210/09_3507report0210_64_69.pdf

[9] https://www.google.com/search?source=hp&ei=1GzzWdywDcm_jwSIo7vYBQ&q=history+of+evolution&oq=history+of+evolution&gs_l=psy-ab.12..0l10.5448.11294.0.16602.20.20.0.0.0.0.260.2787.2j15j3.20.0....0...1.1.64.psy-ab..0.20.2781...0i131k1.0.u4V-TiRAy9k

[10] https://www.google.com/search?ei=zkZtW4SmH4TP8AOE-byQBA&q=Tusi+moon+crater&oq=Tusi+moon+crater&gs_l=psy-ab.12..33i21k1.32836.40244.0.44462.16.16.0.0.0.0.205.2607.0j15j1.16.0....0...1c.1.64.psy-ab..0.13.2171...0j0i67k1j0i131i67k1j0i131k1j35i39k1j0i20i264k1j33i160k1.0.yjgbzo1dOSk

CHAPTER 22 Moulānā Rumi (Legendry Persian Sufi Poet)

22.1 Introduction

In this chapter, the brief life story and literary contributions of one of the greatest Sufi poets of all time from the 13th Century, Moulānā Jalal-edin Balkhi is given. He was one of the most famous poets of Persian literature. He published two seminal books of poetry called "*Matnavi* or *Maṭnawīye* and Dīwān". His poems are often full of advice for the global community. He has millions of followers across the globe due to his spiritual vision to humanity and eternity. At the age of 12, his father and family left Balkh to avoid the curse of the Mongol's who were coming fast from the East. After several years on the road, the family resided in Konya of the Anatolian peninsula. "the Anatolian peninsula, which had belonged to the Byzantine, or eastern Roman empire, had only relatively recently been conquered by Muslims and even when it came to be controlled by Turkish Muslim rulers, it was still known to Arabs, Persians and Turks as the geographical area of Rum' [1].

22.2 Facts on Moulānā [1]

Moulānā Rumi	Mawlānā Jalāl ad-Dīn Muḥammad Balkhī
Born	1207 AD
Place of Birth	Balkh, Khorasan (In today's Afghanistan)
Nationality	Persian (Iranian)
Death	17 December 1273 AD
Place of Death	Konya, Sultanate of Rum (In today's Turkey)
Parents	Father: Baha ud-Din Walad, himself a mystic and theologian known as sultan of scholars
Married	Yes
Sons	Sultan Veled, Allaedin
Influences by	Attar and Sanai. According to his son Sultan Valad, Rumi is said to say: "Aṭṭār was the soul and Sanāʾi was his two eyes".

22.3 Biographical Sketch

Persia has, for thousands of centuries, followed the path of guidance and knowledge. The way to reach these goals. the first steps are: "*Mitra"* (light and wisdom) and "*Anahita*" (water and birth) [3]. These two factors have helped move their existence forward in spite of many foreign invasions.

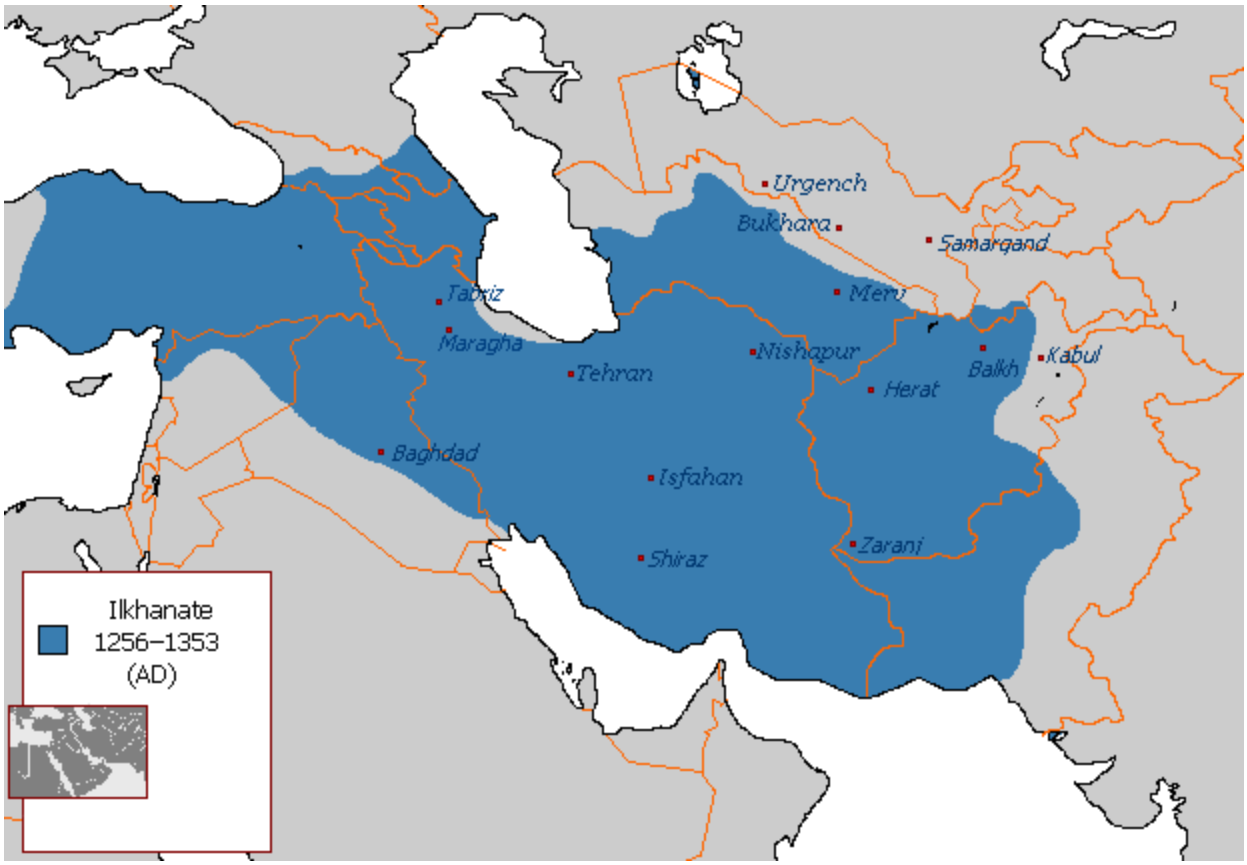


Figure 22.1 Map of the Persian Empire (1256 – 1353 AD) [2].

Rumi's birthplace, Balkh was a well-known city of two Buddhist monks in the Greater Khorasan (now Afghanistan), *Trapusa* and *Bahalika*, who were disciples of Buddha [1]. Balkh was the center of politics, economics, culture, and civilization whose inhabitants were seekers and keepers of knowledge. However, Balkh lost a lot of status among great cities of that time after the vicious invasion of the Mongols [3].

Moulānā's father was Baha ud-Din Walad, himself a mystic and theologian known as the sultan of scholars. In his early years, his mentor was his father's friend, Sayyid Burhaneddin. First they went to Mecca and performed their religious duties. They made their way to Damascus where they lived for a while. Upon the death of Rumi's father, Bahaudin, his friend Sayyid Burhaneddin living back in Balkh took upon himself to go to Konya and help mentor young Rumi, now at the age of 25 [3]. During those years, Rumi spent 4 years in Aleppo and Damascus, and studied with some of greatest religious minds of that time. Soon, his first mentor, recognized his mentee, Jalaledin was becoming a deep thinker and a philosopher, left Konya back to Balkh. However, before that, he told Jalaledin: "I am such a lion myself and we are not both needed here and that is why I want to go. Furthermore, a great friend will come to you, and you will be each other's mirror" [3]. The great friend was Shams of Tabriz (currently in the Province of East Azerbaijan, Iran). At the age of 37, Moulānā Rumi met Shams – a wondering man moving from place to place without a stable residence. Shams left his home at an early age from Khorasan and moved to Iraq, Syria and Konya to find Rumi. It was after meeting Shams that Moulānā became a superb poet, spontaneously composing ghazals, being collected in a book

called, the Divan-a-Kabir [3]. Rumi saw in Shams as himself. His association with Shams took 10 years. Shams approach to or treating Rumi's students was harsh. Students were dismayed that a distinguished philosopher with stature of Rumi is following a wondering homeless like Shams. Shams disappeared twice during this period, once he was found in Damascus by Rumi's son Sultan Veled and brought back to Konya. The relationship between Rumi and Shams was beginning to be somewhat nerve racking for the Rumi family. It is rumored that the second disappearance of Shams was his final and he was killed. Moulānā Rumi had developed a deep spiritual friendship with Husameddin Chelebi, who had suggested to him to bring all his spiritual poems and writings on paper. Moulānā smiled and brought a document showing the first 18 pages of his future masterpiece, the "Mathnawi". This book begins with these versus:

Mathnawi was recited by Rumi and Chelebi wrote each segment and Rumi proofed the writings later on. Rumi was reciting so fast at times that Chelebi could not keep up [4]. Rumi's tradition has not been neither Eastern nor Western but somewhere in between. All his works were written in the native language, Persian (Farsi), as he was a native Persian. Rumi is a gift to humanity.

Rumi's poems are truly spiritual and visionary. He, in his poems, has forecasted significant technical breakthroughs. It is amazing that over 800 years ago Rumi's poems addressed discoveries such as gravity, quantum physics, nuclear physics, dielectrics, philosophy, astronomy, and many other scientific facts [5].

Consider the following poems:

- *Mathnawi*'s gazals were recited by Rumi and Chelebi wrote each segment. The masterpiece begins with this verse:

بشنو از نی چون حکایت میکند

از جدایی ها شکایت میکند

Listen to the reed and the tale it tells, how it sings of separation

- **Re Sunlight, Spinning Galaxies and Forces of Gravity:**

آسمان گوید زمین را مرحبا

باتوام چون آهن و آهن ربا

*"The sky hails the Earth *** I am with you as the iron is with the magnet"*

این چراغ شمس کو روشن بود

نه از فتیل و پنبه و روغن بود

سقف گردون کو چنین دایم بود

نه از طناب و استنی قایم بود

"The burning light of the sun. Is not from burning oil and the wick.

Our spinning galaxy, which is so continuous. Is not constructed on columns and fastened by wires".

In 1687 Isaac Newton discovered the gravitational forces by observing an apple falling from a tree. Over 450 years earlier, Rumi recited the above verses [4].

Moreover, he had predicted a nuclear explosion, consider these poems:

Rumi in his celebrated masterpiece *Mathnav*i book (starting with verse 4580) predicted a nuclear explosion:

آفتابی در یکی ذره نهان

ناگهان آن ذره بگشاید دهان

ذره ذره گردد افلاك و زمین

پیش آن خورشید چو جست از کمین

"Inside of each particle is a hidden sun. Suddenly that particle opens its mouth.

The galaxies and the Earth become shattered. In front of that sun when it comes out of hiding".

Or in verse 2502

اینت خورشیدی نهان در ذره

شیر نر در پوستین بره

"*There is a sun hidden in a particle. The male lion in lamb's clothing".*

Samaa - A Divine Outreach

Rumi preached that all religions are one [4]. He preached and taught at his Madrassa (see Figure 22.2) in Konya and will become a living saint. He developed a habit of spinning around a pillar in his home to search for a mystic divine. This dance-style practice, called ***Samaa***, has survived over 800 years [5]. Samaa introduced a special divine via dancing and singing with symbolic attire, see Figure 22.2. Samaa is a Sufi ritual containing singing, dancing, playing instruments, recitation of poetry, prayer, and wearing symbolic attire. The symbolism of Samaa is a representation of "a mystical journey of man's spiritual ascent through mind and love to perfection" [1]. Rumi resembled Samaa as a private trip to Ka'aba – a pilgrimage to Mecca [1].

Rumi died on December 17, 1273 AD in Konya, Turkey. Figure 22.3 shows photos of his old school and his shrine in Konya. The 3rd photo shows tombs of his father Bahaeddin, himself and his son Sultan Veled. Also shown in the figure are pages of the Mathnavi – his masterpiece of Persian poetry.

References

[1] http://en.wikipedia.org/wiki/Rumi

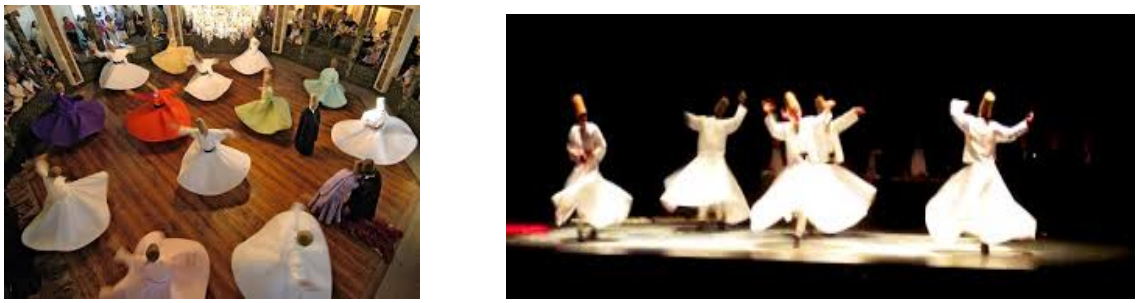


Figure 22.2 Photos of the Samaa dance that Rumi used to Reach a Divine Stage.

Figure 22.3. Three Tombs of Rumi's, his father and his oldest son's and Pages of Mathnavi Book in Konya, Turkey
(shown grave of Rumi, his father and his son with actual hoods on the graves).

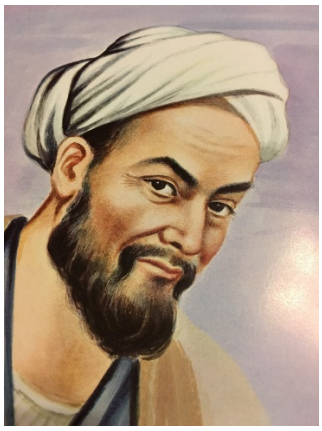
[2] Photos: https://www.google.com/search?q=photos+of+Moulana+Rumi&tbm=isch&imgil=XBB6HG0FYGQqbM%253A%253BlXpWAO7WLfMBXM%253Bhttps%25253A%25252F%25252Fwww.youtube.com%25252Fwatch%25253Fv%2525253DBa7kfCcwpJ4&source=iu&pf=m&fir=XBB6HG0FYGQqbM%253A%252ClXpWAO7WLfMBXM%252C_&usg=__c4WWKlI1xytBtNsPMgLnYeq5D4U%3D&biw=1239&bih=554&ved=0ahUKEwjdgo6ZvafWAhUG5CYKHWu7CbgQyjcIPw&ei=6-27WZ3hMYbImwHr9qbACw#imgrc=XBB6HG0FYGQqbM

[3] S. Bayani, *"Blow of Two Hundred Believes: About Moulana Jalalle-din Rumi*", Jaamee Publishers, Tehran, Iran, 2005 (In Persian), ISBN 964-7468-71-7.

[4] https://sufism.org/origins/rumi/rumi-excerpts/rumi-daylight-tr-by-kabir-camille-helminski-excerpts-2

[5] M. M. Naini, "Mysteries of the Universe and Rum's Discoveries," Universal Vision and Research, Delray Beach, FL, ISBN 0-9714600-0-0, 2002.

CHAPTER 23 Saadi (Humanist Poet, "Shakespeare of the East")



23.1 Introduction

In this chapter, the brief life story and literary contributions of another great poet of the 13th Century, Saadi Shirazi is given. He is one of the most famous poets of Persian literature. He published two seminal books of poetry called the "*Bustan*" (The Orchard) and the "*Gulestan*" (The Rose Garden). His poems are often full of advice for the global community. He travelled over 30 years, in part to get away from the onslaught of the Mongols, and learned a lot about other nations.

23.2 Facts on Saadi [1]

Saadi	AKA Abū-Muhammad Muslih al-Dīn bin Abdallāh Shīrāzī
Born	1210 AD
Place of Birth	Shiraz, Iran
Nationality	Persian (Iranian)
Death	1291AD
Place of Death	Shiraz, Iran
Parents	Unknown, but lost his father at a very young age.
Married	Married

23.3 Biographical Sketch

Saadi was born in the city of Shiraz, Iran in 1210 AD during the Khwarezmid (1190-1220 AD) and Ayyubid dynasty (1171-1341 AD) of the Kurdish origin, (see Figure 23.1). He is not only famous in Persian-speaking countries but has been quoted in western sources as well. He is recognized for the quality of his writings and for the depth of his social and moral thoughts. Saadi is widely recognized as one of the greatest poets of classical literary tradition [2]. Saadi was a world traveler of his time in search of knowledge and security. Due to the Mongol invasion of the Greater Khorasan (Khwarazm) and other parts of Persia, he wandered and

traveled for thirty years. His works indicate that he travelled to Egypt, Syria (Damascus), Anatolia (Adana and near Konya in today's Turkey), and to Iraq (Basra) [1]. During these 30-years of wandering, he was captured by Crusaders at Acre (in today's Lebanon), where he was a slave for 7 years with hard labor. He was released alter when Mamluks (slave army of the Abbasid Caliphate) paid a ransom for his release among many others. He also went to Jerusalem and later on to Mecca and Medina. He may also had visited some Persian Gulf nations like Oman.

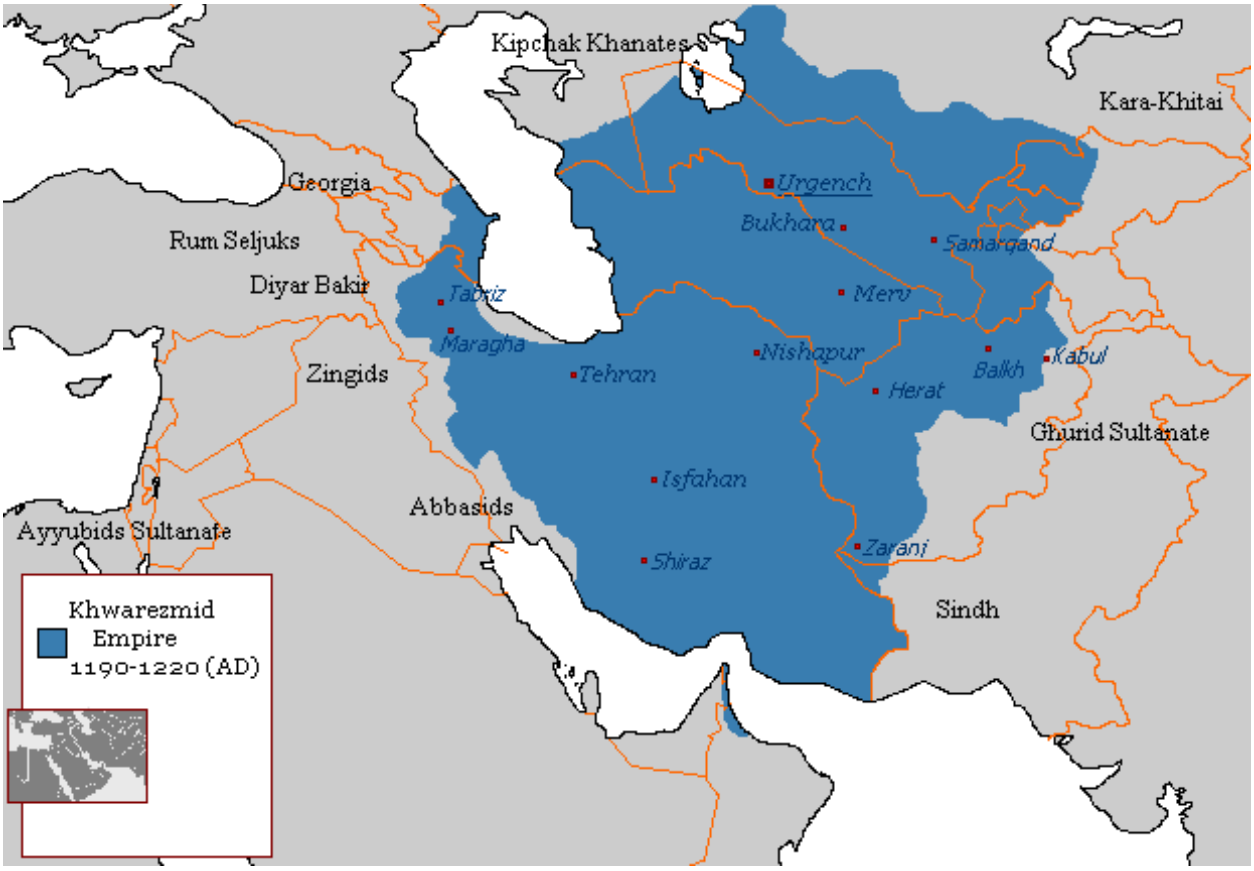


Figure 23.1 Map of the Khwarezmid Empire of Persia (1190-1220 AD) [2].

"He finally goes back to Persia where he meets his childhood companions in Isfahan and other cities. At Khorasan, Saadi befriends a Turkic Emir named Tughral. Saadi joins him and his men on their journey to Sindh (a Province of today's Pakistan) where he meets Pir Puttur, a follower of the Persian Sufi grand master Shaikh Usman Marvandvi (1117-1274 AD). He also refers in his writings about his travels with the Turkic Amir Tughral in Sindh (Pakistan across the Indus and Thar), India (especially Somnath, where he encounters Brahmans), and Central Asia (where he meets the survivors of the Mongol invasion in Khwarezm). Tughral hires Hindu sentinels and later enters the service of the wealthy Delhi Sultanate, and Saadi is invited to Delhi and later visits the Vizier of Gujarat. During his stay in Gujarat, Saadi learns more about the Hindus and visits the large temple of Somnath, from which he flees due to an unpleasant encounter with the Brahmans [2]. Saadi returns to Shiraz before 1257 AD / 655 AH (the year he finished composition of his book Bustan)"

He returned to his native beloved city – Shiraz around 1258 AD. At this time he may have been in his forties. Shiraz, at the time, was ruled under Atabak Abubakr Sa'd ibn Zangy (1231-1260 AD), the "Salghurid ruler of Fars". The city was enjoying a relative calm and sense of stability compared to where he had traveled. He was welcomed by the Ruler, Zangi, and the City of Shiraz embraced him. In gratitude, Saadi praised the ruler in the beginning pages of his "*Bustan*" book [1].

23.4 Contributions and Achievements

As mentioned, before, his two outstanding books of poetry were "*Bustan*" (The Orchard) and "*Gulestan*" (The Rose Garden).

Figure 23.2 Photos from Saadi's books. (a) Saadi in a Rose garden, from a Mughal manuscript of his work *Gulistan*, c. 1645 (b) The first page of *Bustan*, from a Mughal manuscript.

Saadi was not only a great poet; he was also a philosopher with a great deal of advice. His famed poems on helping our fellow mankind when he/she is suffering has been inscribed on the walls of the United Nations. The said poems:

In Persian:

بنی آدم اعضای یک پیکرند
که در آفرینش ز یک گوهرند
چو عضوی به درد آورد روزگار
دگر عضو ها را نماند قرار

تو کز محنت دیگران بی غمی
نشاید که نامت نهند آدمی

A simpler translation:

The sons of Adam are limbs of each other,
Having been created of one essence.
When the calamity of time affects one limb
The other limbs cannot remain at rest.
If you have no sympathy for the troubles of others,
You are unworthy to be called by the name of a Human.

Figure 23.3 shows the said poem in his literary book *Gulestan* and viewed at the United Nation in New York City.

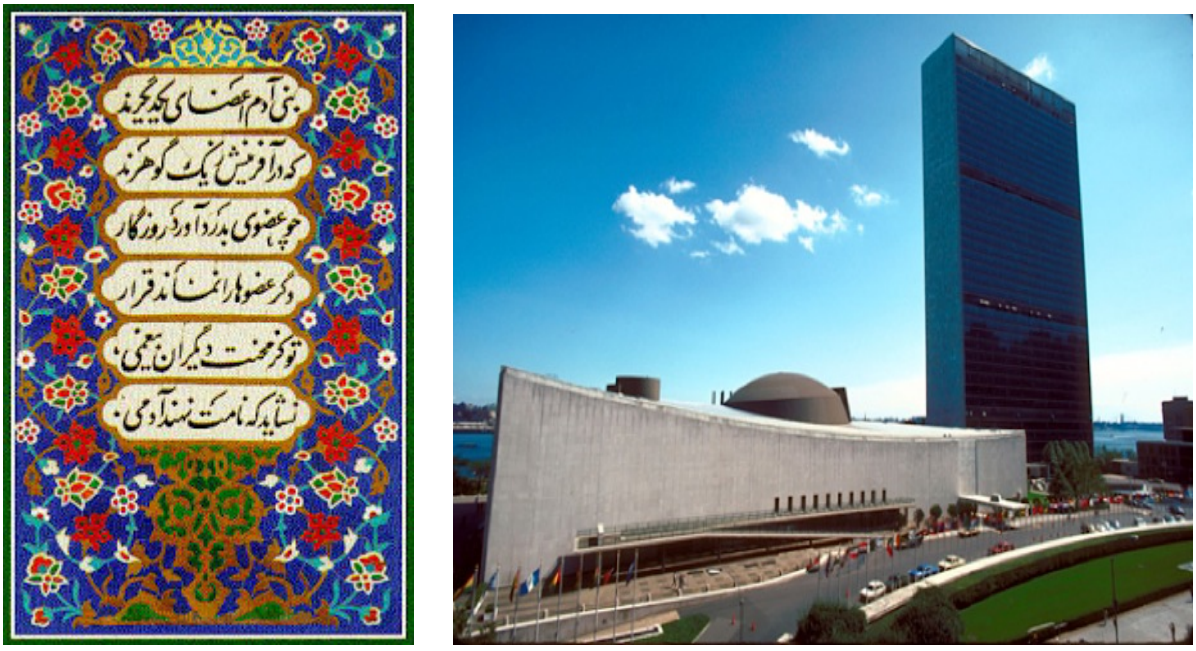


Figure 23.3. Three Poems of Taking Care of Our Mankind Inscribed on the Walls of the United Nations [3].

Some of Saadi's advice to mankind asides from the above are shown below:

"An enemy to whom you show kindness becomes your friend, excepting lust, the indulgence of, which increases its enmity".

"The rose and then thorn and sorrow and gladness are linked together".

"The best loved by God are those that are rich yet have the humility of the poor and have the magnanimity of the rich".

"Whatever makers an impression on the heart seems lovely in the eye".

"He who is slave to his stomach, seldom worships God".

"I fear God and next to God, I mostly fear them fear Him not".

Saadi died in 1291 AD in Shiraz. His tomb in Shiraz is shown in Figure 23.4 [4].

Figure 23.4. Three Scenes from Saadi's Tomb in Shiraz, Iran [4].

References

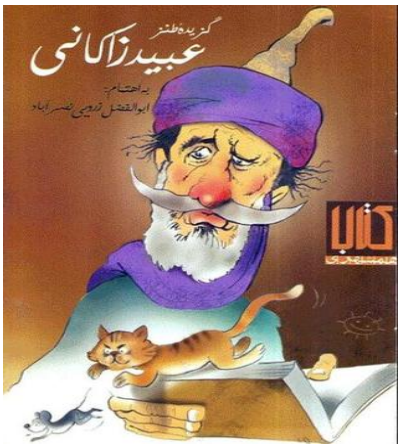
[1] http://en.wikipedia.org/wiki/Saadi_Shirazi

[2] Map: https://www.google.com/search?q=map+of+Persian+Ayyubid+dynasty+%281171-1341%29&tbm=isch&source=iu&ictx=1&fir=q1uz1yci38jgZM%253A%252CSA3egsWq0HKCVM%252C_&usg=AI4_-kTCY944lil7xKGKwAdShLI4ZvHfNA&sa=X&ved=2ahUKEwiT46SZvpTfAhVDRa0KHUAwBsMQ9QEwA3oECAQQBg#imgrc=DxibcFmta3WnsM:

[3] http://www.zaufishan.co.uk/2011/09/iranian-poetry-bani-adam-inscribed-on.html

[4] https://www.google.com/search?tbm=isch&sa=1&ei=sPMNXMj6Kc_2swXYnLm4Dg&q=tomb+of+poet+Saadi&oq=tomb+of+poet+Saadi&gs_l=img.12...255217413.255223891..255226615...0.0..0.89.1195.18.....1....1..gws-wiz-img.....0j0i67.W_ycz7kUutY

CHAPTER 24 Zakani (Persia's First Satirist Poet)



24.1 Introduction

In this chapter, the brief life story and literary contributions of another poet and satirist of the 14th Century, Ubaid Zakani, who was born in 1300 AD in the City of Qazvin, Iran. Even though he was from Qazvin, he studied in Shiraz under the best masters of his day, but eventually moved back to his native town. He however preferred Shiraz to Qazvin, as he was current to both Saadi and Hafez. He was also a court poet in Shiraz for *Shah Abu Ishaq*, where a young Hafez was present as well.

24.2 Facts on Zakani [1]

Zakani	AKA Ubaid Zakani, Obeid-e-Zakani
Born	1300 AD
Place of Birth	Qazvin, Iran
Nationality	Persian
Death	1371 AD
Place of Death	Qazvin, Iran
Concurrent	Saadi and Hafez

24.3 Biographical Sketch

> "While pursuing his studies in Shiraz Ubaid became one of the most accomplished men of letters and learning of his time, acquiring complete proficiency in every art, and compiling books and treatises on them. He subsequently returned to Qazvin, where he had the honor of being appointed to a judgeship and was chosen as the tutor and teacher of sundry young gentlemen. At that time the Turks in Persia had left no prohibited or vicious act undone, and the character of the Persian people, by reasons of association and intercourse with them, had become so changed and corrupted that Ubaid, disgusted at the contemplation thereof, sought by every means to make known and bring home to them the true conditions of affairs. Therefore, as an example of the corrupt morals of the age and its people, he composed the treatise known as the *Akhlaq-i Ashraf* "Ethics of the

Aristocracy", which was not intended as mere ribaldry but as a satire containing serious reflections and wise warnings. So, likewise, in order to depict the level of intelligence and degree of knowledge of the leading men of Qazwin each one of whom was a mass of stupidity and ignorance, he included in his *Risala-i Dilqusha* "Joyous Treatise" many anecdotes of which each contains a lesson for persons of discernment" [1].

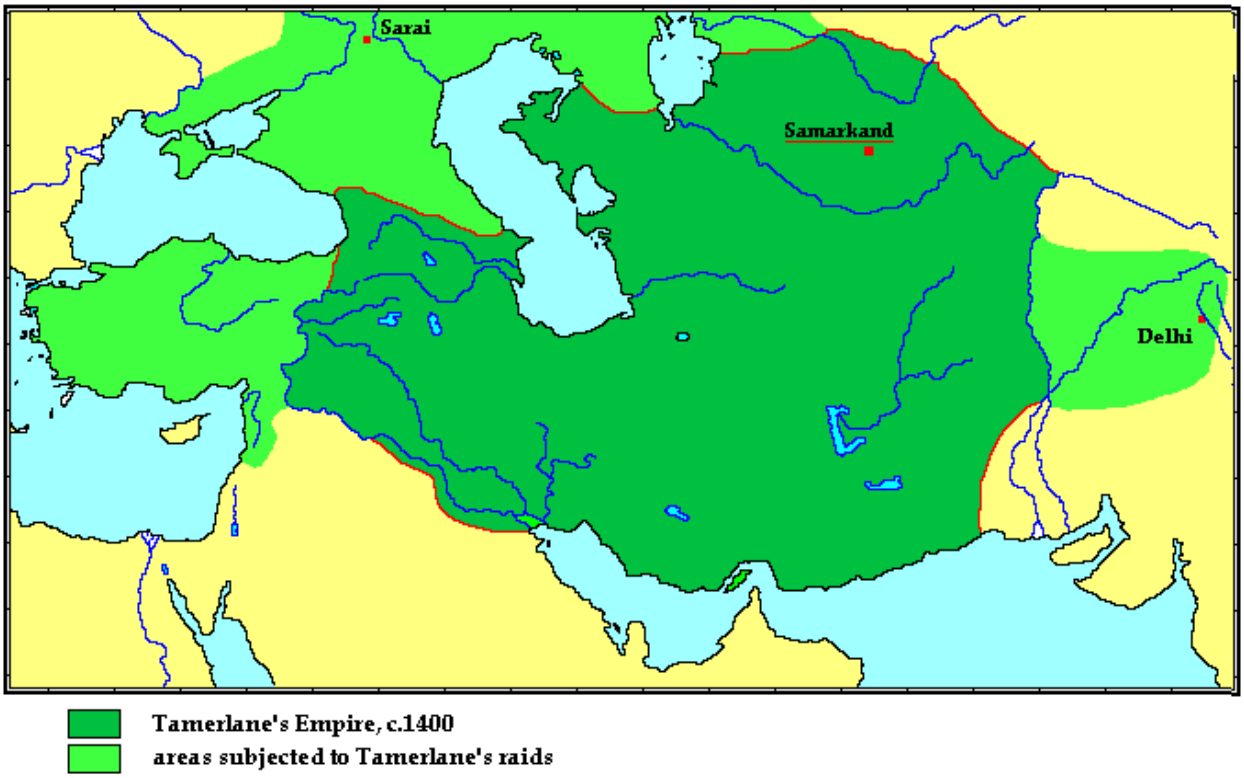


Figure 24.1 Map of 13th to 14th Century Tamerlane Empire of Persia [2].

24.4 Poetry and Writings

"As a measure of his accomplishments, experience, learning and worldly wisdom, his *Risala-i-Sad* "Tract of a Hundred Counsels" and his *Ta'rifat* "Definitions" are sufficient proof. Moreover, he composed a treatise *Ilm-i-Ma'ni u Bayan* "Rhetoric", which he desired to present to the King. The courtiers and favorites, however, told him that the King had no need for such rubbish. Then he composed a fine panegyric, which he desired to recite but they informed him that the King did not like to be mocked with the lies, exaggerations, and fulsome flattery of poets. Thereupon 'Ubayd-i-Zakani said, 'In that case I, too, will pursue the path of impudence, so that by these means I may obtain access to the King's most intimate society, and may become one of his courtiers and favorites', which he accordingly did. Then he began recklessly to utter the most shameless sayings and the most unseemly and extravagant jests, whereby he obtained innumerable gifts and presents, which none dared to pose and contend with him. Thus, 'Ubayd-i-Zakani a serious writer, a moralist and a panegyrist was compelled by circumstances to become a ribald satirist. The most striking feature of the serious poems of 'Ubayd-i-Zakani is the constant references to Fars and its capital, Shiraz, which evidently held the affection of

the poet far more than his native city of Qazvin" [1]. One of his books is shown below in Figure 24.2.

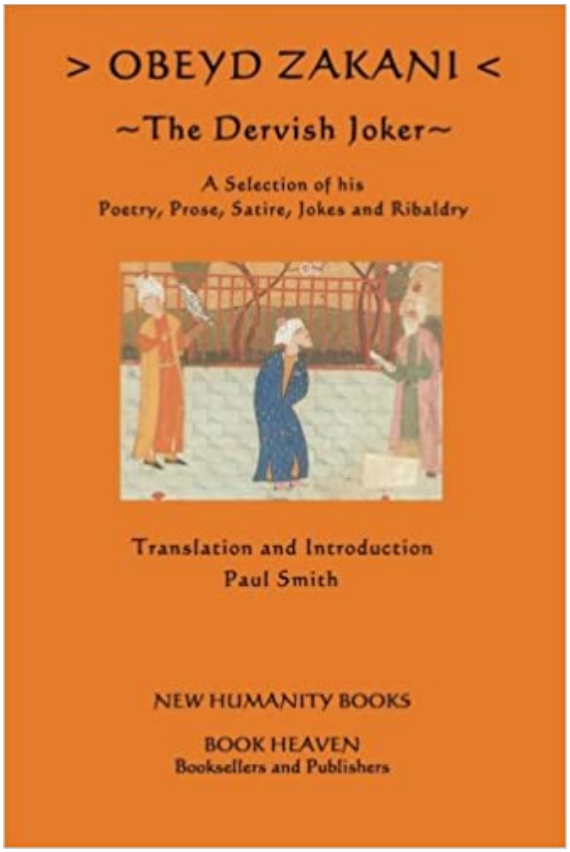


Figure 24.2 The Cover of One of Ubaid Zakani's Books.

24.5 Death

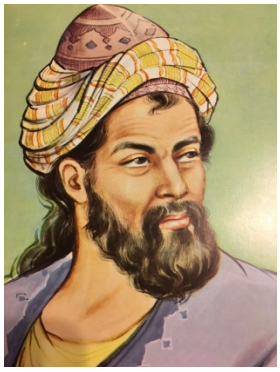
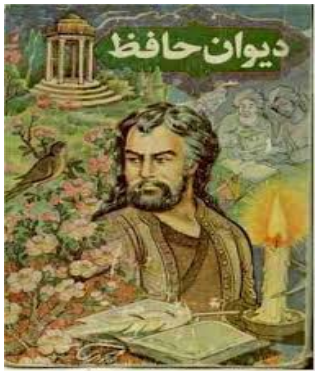
He died in 1371 AD in Qazvin, Iran. His poetry is still considered one of the first satirist in the Persian Literature.

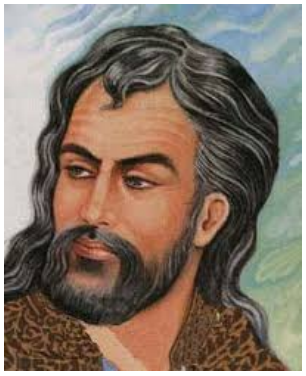
References

[1] https://en.wikipedia.org/wiki/Ubayd_Zakani

[2] Map https://www.google.com/search?q=map+of+map+of+Tamerlane+1400+empire&tbm=isch&source=iu&ictx=1&fir=2ErRM6bwFoq4AM%253A%252C5i5uqhqXRCjXOM%252C_&usg=AI4_-kRtbCGqQdNuNnSsJzWxT2R44aonLA&sa=X&ved=2ahUKEwiO8JmlhKPfAhVMMqwKHbetA_gQ9QEwAnoECAQQCA#imgrc=wVMHjPxeEQcqhM:

CHAPTER 25 Hafez (Persia's First National Metaphoric Poet)



25.1 Introduction

In this chapter, the brief life story and literary contributions of another great poet of 14th Century AD, Hafez of Shiraz is given. He is one of the most famous poets of Persian literature. He published a 'Divan', which was used by Persian speaking communities for centuries after him. His poems often describe what the future may come for one. He is said to have a sense of *Lesson-el-Gheib*, meaning the poet who predicts the future in his poems. For that reason, his 'Divan has been used for centuries to tell one's fortune. His poems bring results of fortune to its readers. He is loved by all Parsi-speaking people, and is considered a national poet of Iran or the Parsi Language and no just one from Shiraz.

25.2 Facts on Hafez [1]

Hafez	AKA Khwaje Shams ud-Din Mohammed Hafiz-e Shirazi
Born	1315 or 1320, or 1325 AD
Place of Birth	Shiraz, Iran
Nationality	Persian (Iranian)
Death	1388 or 1389 or 1390 AD
Place of Death	Shiraz, Iran
Parents	Father, Baha-ud-Din
Married	Married, Love of his life a beautiful woman called Shakhe-e-Nabat

25.3 Biographical Sketch

Hafez's birth and death years are not certain in the literature [3]. He "lauded the joys of love and wine but also targeted religious hypocrisy". At an early age, he had memorized the holy Koran by listening to his father's recitations. He also memorized many works of his hero, Saadi, as well as Attar, Rumi, and Nizami. He chose the name Hafez for the rest of his life.

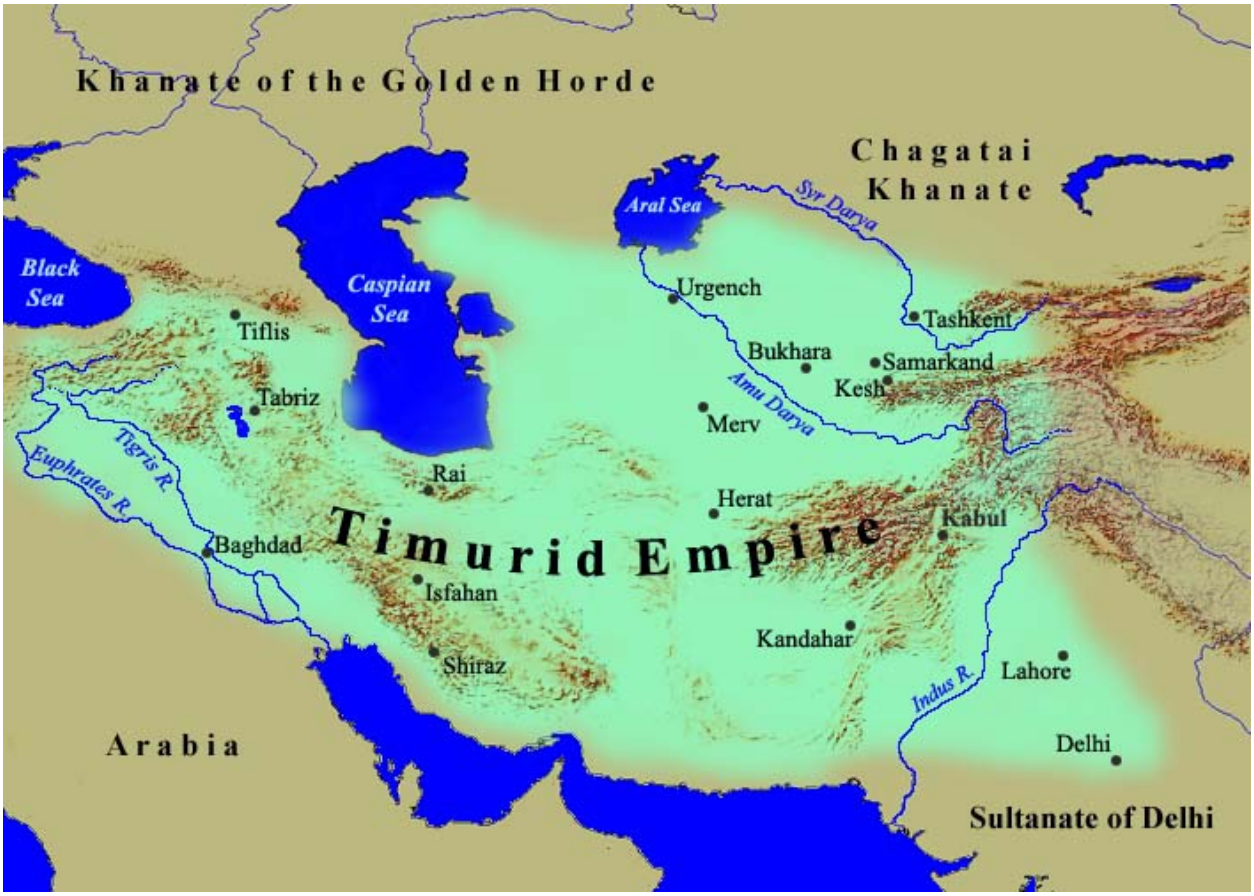


Figure 25.1 Map of the 13th Century Empire of Persia [2].

Hafez is a beloved poet among Persian-speaking populations. His Divan is available in numerous homes of this population. "His life and poems have been the subject of much analysis, commentary and interpretation, influencing post-14th century Persian writing more than any other author" [3]. His ghazels deals with wine, taverns and love, all presenting the ecstasy of (joyful excitement), and freedom from restraint, whether in an actual worldly release or in the voice of the lover speaking of divine love. Persian speaking nationals love to ask for their "fortune" or "fale-e hafez", and frequent usage of his poems in Persian music is well recoded in literature [3].

Hafez is well known for his poetry and less on his intellectual and political contributions. He was outspoken about the hypocrisy of religious and the ruling establishment of his lifetime.

Hafez's work was appreciated some 4 centuries after his death in Europe led by the renowned German Poet, Goethe [2]. He wrote a series of 12 books collectively, called the "*West–Eastern Diwan"* between 1814 and 1819 AD, the year when it was first published. It was inspired by Goethe's correspondence with Marianne von Willemer and the translation of Hafez' poems by the orientalist Joseph von Hammer [2]. An expanded version was printed in 1827. It is part of Goethe's late work and the last great cycle of poetry that he wrote. Figure 25.2 shows a photo of one of Goethe's book series and a monument in Weimar, Germany in Hafez's honor.

Figure 25.2 A Photo Cover of Goethe and his West–östlicher Divan and Monument in Weimar, Germany in Honor of Hafez.

Figure 25.3 shows Hafez's stature on Hafez Street in Tehran. Iran. [2]

Figure 25.3. A statue of Hafez on Hafez Street in Tehran, Iran.

25.4 Important Events about Hafez

Here are some highlights of Hafez's life.

- "He had memorized the Koran by listening to his father's recitations. He also had memorized many of the works of his hero's, Saadi (Chapter 23), as well as Attar (another poet in Shiraz), Rumi (Chapter 22) and Nizami (Ganjavi Chapter 18)" "[1]. *Teen years.*
- "His father who was a coal merchant died, leaving him and his mother with much debt. Hafiz and his mother went to live with his uncle (also called Saadi). He left day school to work in a drapery shop and later in a bakery" [1]. *Teen years.*

- "While still working at the bakery, Hafiz delivered bread to the wealthy quarter of town and saw Shakh-e Nabat, a young woman of incredible beauty. Many of his poems are addressed to Shakh-e Nabat" [1]. *Age 21.*
- "In pursuit of reaching his beloved, Hafiz kept a forty day and night vigil at the tomb of Baba Kuhi. After successfully attaining this, he met Attar (another poet in Shiraz) and became his disciple*"* [1]. *Early twenties to early thirties.*
- "Hafez became a poet of the court of Abu Ishak and gained much fame and influence in Shiraz. This was the phase of the "Spiritual Romanticism" in his poetry" [1]. *Age 33.*
- "Mubariz Muzaffar captured Shiraz, and among his various deeds, he ousted Hafiz from his position of teacher of Koranic studies at the college. At that time, he wrote protest poems" [1]. *Age 38.*
- "Shah Shuja took his tyrant father as prisoner, and re-instated Hafiz as a teacher at the college. He began his phase of subtle spirituality in his poetry" [1]. *Early forties.*
- "Falling out of favor with Shah Shuja" [1]. *Age 48.*
- "Hafiz fled Shiraz for his safety, and went into self-imposed exile in Isfahan. His poems mainly talk of his longing for Shiraz, for Shakh-e Nabat, and for his spiritual Master, Attar (not the famous Farid-uddin Attar of Neishabour - who predates Hafiz by a couple of centuries - but the lesser known Attar of Shiraz)" [1]. *Age 52.*
- "By invitation of Shah Shuja, he ended his exile and returned to Shiraz. He was re-instated to his post at the College" [1]. *Age 60.*
- "Longing to be united with his Creator, he began a forty day and night vigil by sitting in a circle that he had drawn himself" [1]. *Age 60.*
- "On the morning of the fortieth day of his vigil, which was also on the fortieth anniversary of meeting his Master, Attar, he went to his Master, and upon drinking a cup of wine that Attar gave him, he attained Cosmic Consciousness or God-Realization" [1]. *Sixties.*
- "In this phase, up to the age of 69 when he died, he composed more than half of his ghazals, and continued to teach his small circle of disciples. His poetry at this time, talked with the authority of a Master who is united with God" [1]. *Sixties.*

Poetry: Divan-e-Hafiz

- "Some 500 ghazals, 42 Rubaiyees, and a few Ghaseedeh's, were composed over a period of 50 years. Hafiz only composed when he was divinely inspired, and therefore he averaged only about 10 Ghazals per year. His focus was to write poetry worthy of the Beloved" [1].

Compiler of the Divan.

- "Hafiz did not compile his poetry. Mohammad Golandaam, who also wrote a preface to his compilation, completed it in 813 A.H or 1410 AD some 21-22 years after Hafiz's death. In addition, another person who compiled Hafiz's poetry was one of his young

disciples, Sayyid Kasim-e Anvar, who collected 569 Ghazals attributed to Hafiz. He died in 1431 ADl, some 42-43 years after Hafiz's death" [1].

Hafez passed away in the late 14th Century. Exact date is not available. It is reported as one of these years; 1388, 1389 or 1390 AD. Figure 25.4 shows Hafez's mausoleum in Shiraz, Iran. His tomb is often visited by thousands of visitors, domestic and international to Shiraz and Iran.

Figure 25.4 TheTomb of Hafez in Shiraz, Iran.

References

[1] Hafizhttp://www.hafizonlove.com/bio/

[2] https://en.wikipedia.org/wiki/West%E2%80%93%C3%B6stlicher_Divan

[3] https://en.wikipedia.org/wiki/Hafez

[4] Tombs link
https://www.google.com/search?source=hp&ei=Nr8kWrGnLYq0jgSP7pXwCw&q=tomb+photos+of+Hafez&oq=tomb+photos+of+Hafez&gs_l=psy-ab.12..0i22i30k1.33140.39594.0.44761.21.20.0.0.0.0.148.2067.3j15.25.0....0...1c.1.64.psy-ab..3.25.2050.0..0j46j0i131k1j0i131i46k1j46i131k1j0i46k1j0i10k1j0i22i10i30k1j33i22i29i30k1.0.SeEsLBjkMh4

CHAPTER 26 Ulugh Beg (Scientist, Sultan)

26.1 Introduction

In this chapter, a brief life story, and scientific and political contributions of a 14th Century ruler of the Timurid Persian Empire, Ulugh Beg (Grandson of the founding Emperor, Tamerlane), a scientist (mathematician and astronomer).

26.2 Facts on Ulugh Beg [1]

Ulugh Beg	AKA Sultan Ulugh Beg
Born	March 22, 1394
Place of Birth	Zanjan, Iran
Nationality	Iranian, Turk
Death	October 27, 1449
Place of Death	Samarkand, Greater Khorasan (Now in Uzbekistan)
Grandfather	Tamerlane, Founder of Timurian

26.3 Biographical Sketch

Ulugh Beg was born on March 22, 1394 (Persian New Year) in Sultaniyeh, Persia (Now Zanjan, Iran), and a city in today's northwest Iran. He passed away on October 27, 1449 in Samarkand (Capital of Timurid) in today's Uzbekistan. He was a very unique ruler, since he was very keen in scientific innovations at the same time he acted as the Sultan of a great segment of the then Persian Empire, i.e. Uzbekistan. He ruled Uzbekistan, Tajikistan, Turkmenistan, Kyrgyzstan, southern Kazakhstan and most of Afghanistan from 1411 to 1449. His name, a moniker, translates as a "Great Ruler" [1]. His name was the Turkic equivalent of Perso-Arabic "Amir-e Kabir". The latter was also given to the 19th Century prime minster, Mirza Taghi Khan Farahani (1807-1952), better known as Amir Kabir, also known by the titles of Atabak and Amir-e Nezam; chief minister to Naser al-Din Shah Qajar for the first three years of his reign and one of the most capable and innovative figures to appear in the whole Qajar period [3]. Ulugh Beg's real name was *Mīrzā (Sultan) Mohammad Tāraghay bin Shāhrukh*. He was an accomplished mathematician (trigonometry and spherical geometry) and in astronomy. He built an Observatory based on the one built by K. Nasir Tusi (see Chapter 21) in Maragheh, Iran, see Figure 26.2.

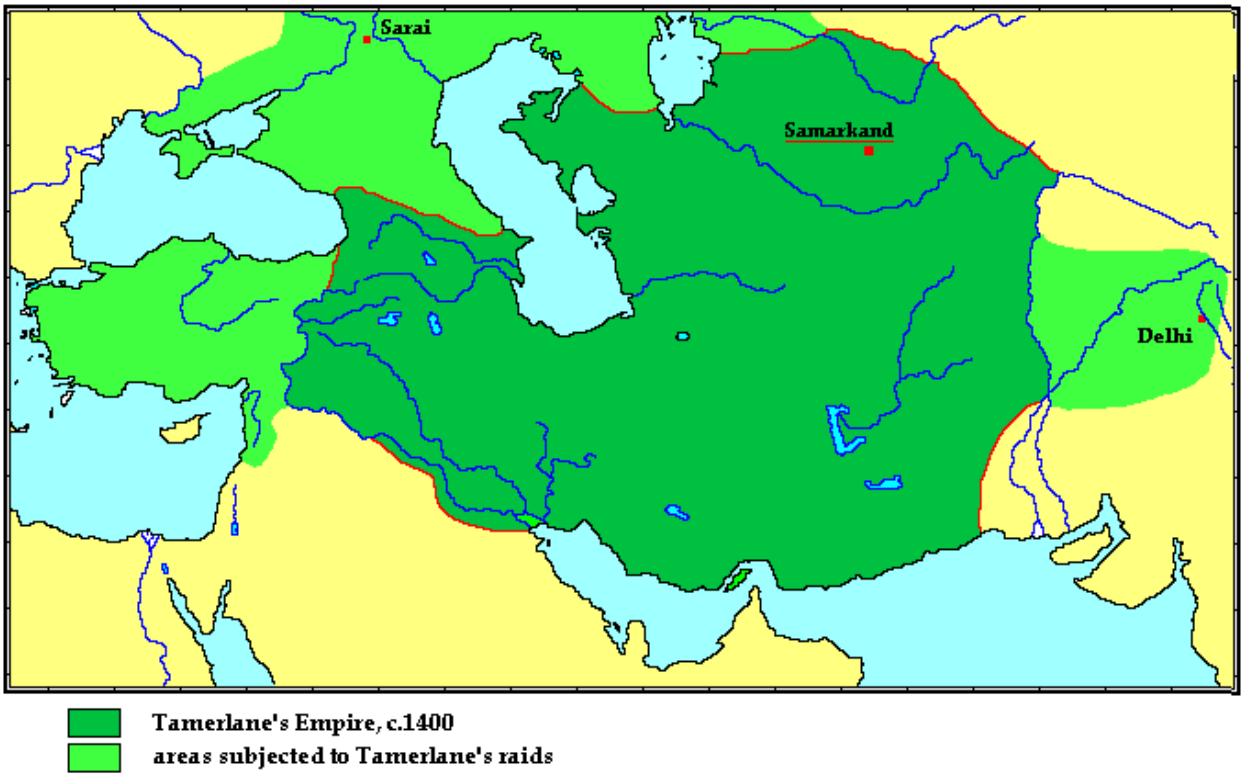


Figure 26.1 Map of the 14th – 15th Century Empire of Persia [2].

"He was a grandson of the great conqueror, Timur (Tamerlane) (1336–1405), and the oldest son of Shah Rukh, both of whom came from the Turkicized Barlas tribe of Transoxiana (now Uzbekistan). His mother was a noblewoman, named Goharshad, daughter of the representative Turkic of the tribal aristocracy Giyasitdin Tarhan. Ulugh Beg was born in Sultaniyeh in Persia during Timur's invasion. As a child he wandered through a substantial part of the Middle East and India as his grandfather expanded his conquests in those areas. After Timur's death, however, and the accession of Ulugh Beg's father to much of the Timurid Empire, he settled in Samarkand, which had been Timur's capital. After Shāhrukh moved the capital to Herat (in modern Afghanistan), at sixteen-years-old, Ulugh Beg became the governor in Samarkand in 1409. In 1411, he became the sovereign ruler of the whole Mavarannahr khanate"[1].

Figure 26.2 Ulugh Beg Observatory in Samarkand, Timurid Empire (In today's Uzbekistan) [4].

26.4 Contributions

He built the Ulugh Beg Madrasah (1417–1420, see Figure 26.3) in Samarkand and Bukhara, transforming the cities into cultural centers of learning in Central Asia. He was also a mathematician of the 15th century Albeit. His mental aptitude was perseverance rather than any unusual endowment of intellect.

Figure 26.3 Ulugh Beg Madrasah in Samarkand, Timurid Empire (In today's Uzbekistan) [4].

In science

> "The teenaged ruler set out to turn the city into an intellectual center for the empire. Between 1417 and 1420, he built a *madrasa* ("university" or "institute") on the Registan Square in Samarkand (currently in Uzbekistan), and he invited numerous Islamic astronomers and mathematicians to study there. The *madrasa* building still survives today. Ulugh Beg's most famous pupil in astronomy was Ali Qushchi (died in 1474). He was also famous in the fields of medicine and poetry. He used to debate with other poets about contemporary social issues. He liked to debate in a poetic style, called "Bahribayt" among local poets. According to the medical book "Mashkovskiy", which is in the Russian language, Ulugh Beg discovered a mixture of alcohol with garlic, apparently preserving it to help treat conditions like diarrhea, headache, stomachache and intestinal illnesses. He also offered advice for newly married couples, which indicated recipes containing nuts, dried apricot, dried grapes, etc. He claimed these to be useful to increase men`s virility. This recipe has been given in Ibn Sina`s books also" [1].

In astronomy

> "His own particular interests concentrated on astronomy, and, in 1428, he built an enormous observatory, called the *Gurkhani Zij*, similar to Tycho Brahe's later Uraniborg as well as Taqi al-Din's observatory in Istanbul. Lacking telescopes to work with, he increased his accuracy by increasing the length of his sextant; the so-called *Fakhri* sextant, which had a radius of about 36 meters (118 feet) and the optical separability of 180" (seconds of arc). Using it, he compiled the 1437 *Zij-i-Sultani* of 994 stars, generally considered the greatest star catalogue between those of Ptolemy and Brahe, a work that stands alongside Abd al-Rahman al-Sufi's '*Book of Fixed Stars'*. The serious errors, which he found in previous Arabian star catalogues (many of which had simply updated Ptolemy's work, adding the effect of precession to the longitudes) induced him to

> redetermine the positions of 992 fixed stars, to which he added 27 stars from Abd al-Rahman al-Sufi's catalogue '*Book of Fixed Stars'* from the year 964, which were too far south for observation from Samarkand. This catalogue, one of the most original of the Middle Ages, was first edited by Thomas Hyde at Oxford in 1665 under the title of *Tabulae longitudinis et latitudinis stellarum fixarum ex observatione Ulugbeighi* and reprinted in 1767 by G. Sharpe. More recent editions are those by Francis Baily in 1843 in *vol. xiii* of the *Memoirs of the Royal Astronomical Society* and by Edward Ball Knobel in *Ulugh Beg's Catalogue of Stars, Revised from all Persian Manuscripts Existing in Great Britain, with a Vocabulary of Persian and Arabic Words* (1917)".

Inspired by Khayyam's work on Jalalli Calendar (See Chapter 15), in 1437, Ulugh Beg determined the length of the sidereal year as 365.2570370... = $365^d\ 6^h\ 10^m\ 8^s$ (an error of +58 seconds). In his measurements over the course of many years he used a 50 m high gnomon. This value was improved by 28 seconds in 1525 by Nicolaus Copernicus, who appealed to the estimation of Thabit ibn Qurra (826–901), which had an error of +2 seconds. However, Ulugh Beg later measured another more precise value of tropical year as $365^d\ 5^h\ 49^m\ 15^s$, which has an error of +25 seconds, making it more accurate than Copernicus's estimate, which had an error of +30 seconds. Ulugh Beg also determined the Earth's axial tilt as 23°30'17" in the sexagesimal system of degrees, minutes and seconds of arc, which in decimal notation converts to 23.5047 degrees" [1].

It is noted here that in the Samarkand's science museum, there was a story that noted Astronomer and mathematician Omar Khayyam (see Chapter 15) had spent over a year in Samarkand during his prime. It is possible that Khayyam later, who passed away 263 years earlier, also inspired some of Ulugh Beg's interest in astronomy.

In mathematics

> "Ulugh Beg wrote accurate trigonometric tables of sine and tangent values correct to at least eight decimal places [1].

26.5 Death

> "Ulugh Beg's scientific expertise was not matched by his skills in governance. When he heard of the death of his father Shahrukh Mirza, Ulugh Beg went to Balkh, where he heard that his nephew Ala-ud-Daulah Mirza bin Baysonqor, son of Ulugh's brother Baysonqor, had claimed the empireship of the Timurid Empire in Herat. Consequently, Ulugh Beg marched against Ala-ud-Daulah and met him in battle at Murghab. Having won this battle, Ulugh Beg advanced toward Herat and massacred its people in 1448 but Ala-ud-Daulah's brother Mirza Abul-Qasim Babur bin Baysonqor came to his aid, defeating Ulugh Beg. Ulugh Beg retreated to Balkh, where he found that its governor, his oldest son Abdal-Latif Mirza, had rebelled against him. Another civil war ensued. Within two years, he was beheaded by the order of his own eldest son while on his way to Mecca. Eventually, his reputation was rehabilitated by his nephew, Abdallah Mirza (1450–1451), who placed Ulugh Beg's remains in the mausoleum of Timur in Samarkand, where they were found by archeologists in 1941"[1].

Ulugh Beg's Mausoleum along with his grandfather, Tamerlane, in Samarkand is shown in Figure 26.4 [4].

Figure 26.4. Mausoleum of Ulugh Beg Showing his Grave next to his Grandfather Tamerlane in Samarkand.

References

[1] https://en.wikipedia.org/wiki/Ulugh_Beg

[2] Map: https://www.google.com/search?q=map+of+map+of+Tamerlane+1400+empire&tbm=isch&source=iu&ictx=1&fir=2ErRM6bwFoq4AM%253A%252C5i5uqhqXRCjXOM%252C_&usg=AI4_-kRtbCGqQdNuNnSsJzWxT2R44aonLA&sa=X&ved=2ahUKEwiO8JmlhKPfAhVMMqwKHbetA_gQ9QEwAnoECAQQCA#imgrc=wVMHjPxeEQcqhM:

[3] https://en.wikipedia.org/wiki/Amir_Kabir

[4] Photos: https://www.google.com/search?tbm=isch&sa=1&ei=2ewSXNWHAoS-tQXxha24Cg&q=Ulugh+Beg+masuleum+&oq=Ulugh+Beg+masuleum+&gs_l=img.12...231573.242361..245785...1.0..0.133.1319.19j1.....1....1..gws-wiz-img.....0j0i67j0i24j0i10i24j0i5i30j0i30j0i8i30.0EitaPLzDv0

CHAPTER 27 Jāmī (Poet)

27.1 Introduction

In this chapter, the brief life story, and literary contributions of another great poet of Persia, Nur ad-Dīn Abd ar-Rahmān Jāmī, or in brief Jāmī. He is considered to be the last Sufi poet of Persia. While in Herat, Jāmī held an important position at the Timurid court, involved in the era's politics, economics, philosophy, and religious.

27.2 Facts on Jaami [1]

Jaami	AKA Mawlanā Nūr al-Dīn 'Abd al-Rahmān or Abd-Al-Rahmān Nur-Al-Din Muhammad Dashti, Jāmī
Born	November 7, 1414
Place of Birth	Greater Khorasan, (Now Minaret of Jāmī, Afghanistan)
Nationality	Persian
Death	November 9, 1492
Place of Death	Herat, Afghanistan
Influenced by	Nizami Ganjavi, Sanai, Ibn Arabi

27.3 Biographical Sketch

"Jaami was a 15th century Persian poet and theologian from the school of Ibn Arabi. A great scholar and mystical man, Jaami also composed lyrics and idylls and was a respected historian. Jaami was born in August 1414 and most accounts put his place of birth as Jam, which is now known as the Ghor Province in Afghanistan. An alternative place of birth is a small hamlet called, Karjerd in Khorasan, though Jam seems most likely. While Jaami was still a young boy, his father took the family to the much bigger city of Herat where Jaami received an excellent education, studying mathematics, science, Arabic literature and Peripateticism (Greek philosophy). When he began writing he took the name Dashti at first, because his father originated from Dasht. He soon changed it to Jaami though, in honor of his own birthplace. He was keen to complete his studies in scientific subjects so a move to Samarkand was advised, this being acknowledged as the best place to be in the Muslim world for that purpose. He became a Sufi, following the Naqshbandi Sufi Order, and set out on a grand pilgrimage, which would enhance his reputation across the whole Persian territories. He became a Sufi

shaykh (or sheikh) in 1453 and set about teaching that there is a clear distinction between two types of the Sufi faith. These are now called the prophetic and mystic spirit. He was an extremely pious man and devoted his life to Sufism. He claimed to have had a dream as a young man, which told him that he had to take God into his life and become his faithful companion. He followed the Sufi Sa'd-alDin Kasgari closely and their bond became ever closer when Jaami married Kasgari's granddaughter. They had four children but three died in infancy. Alongside his all-important devotions he managed to write some eighty seven books and letters covering religious and scientific subjects. Some were written in prose style and others in verse. Remarkably he wrote a manual including accurate calculations and advanced scientific drawings on the irrigation system of Herat and it is still used for reference today. As a poet he was inspired by the ghazals written by another Persian sufi poet called, Hafiz. A "ghazal" is a form of poetry, which includes a refrain and rhyming couplets. Each line shares the same meter" [1].

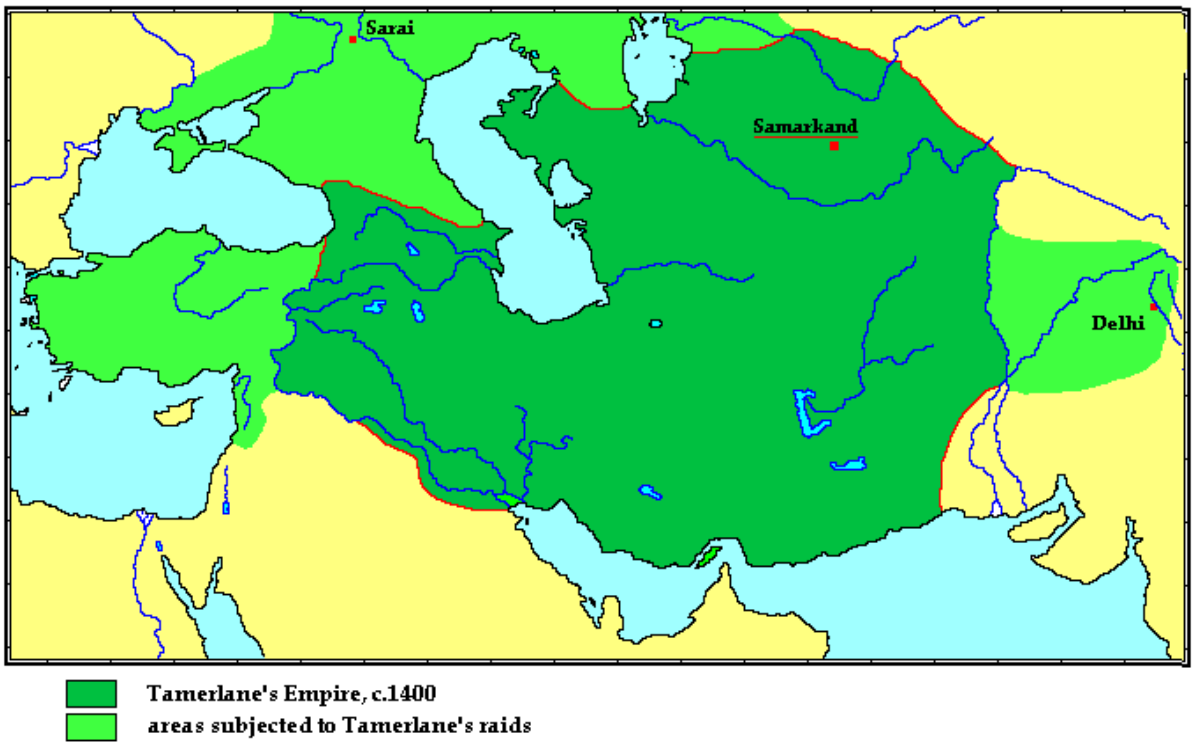


Figure 27.1 Map of 14th – 15th Century Empire of Persia [2].

27.4 Poetry and Writings

One of Jaami's most famous collections of poems is called the '*Seven Thrones'*, which features different stories including one about a prince who has a carnal attraction to his wet nurse. It was not unusual in those times for a deeply religious man to write about such an explicitly sexual subject using allegorical symbolism. His overriding philosophy though was that man should seek love first. This was emphasized by the story of a pupil who came to Jaami asking to be taught and having never loved anyone in his life up to that point. His advice to the student was: *"Go and love first, then come to me and I will show you the way".*

As mentioned before, shortly after his birth, the family moved to Herat. In Herat, he was able to study Peripateticism, mathematics, Persian literature, natural sciences, Arabic language, logic, rhetoric, and Islamic philosophy at the Nizamiyyah University.

> "Afterwards, he went to Samarkand, the most important center of scientific studies in the Muslim world and completed his studies there. He embarked on a pilgrimage that greatly enhanced his reputation and further solidified his importance through the Persian world. Jaami had a brother called Molana Mohammad, who was, apparently a learned man and a master in music, and Jaami has a poem lamenting his death. Jaami fathered four sons but three of them died before reaching their first year. The surviving son was called Zia-ol-din Yusef and Jaami wrote his *Baharestan* for this son" [1].

Figure 27.2 shows three of Jaami's books [3]. Jaami passed away on November 9, 1492 in Herat, Greater Khorasan (now in Afghanistan). Figure 27.3 shows the mausoleum of Jaami I Herat [4].

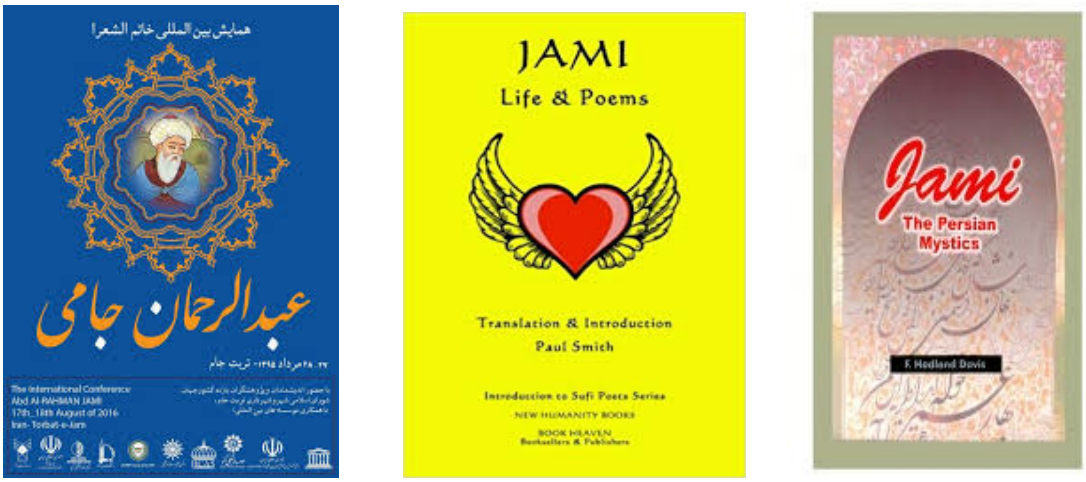


Figure 27.3 The Three Books of Jaami [3].

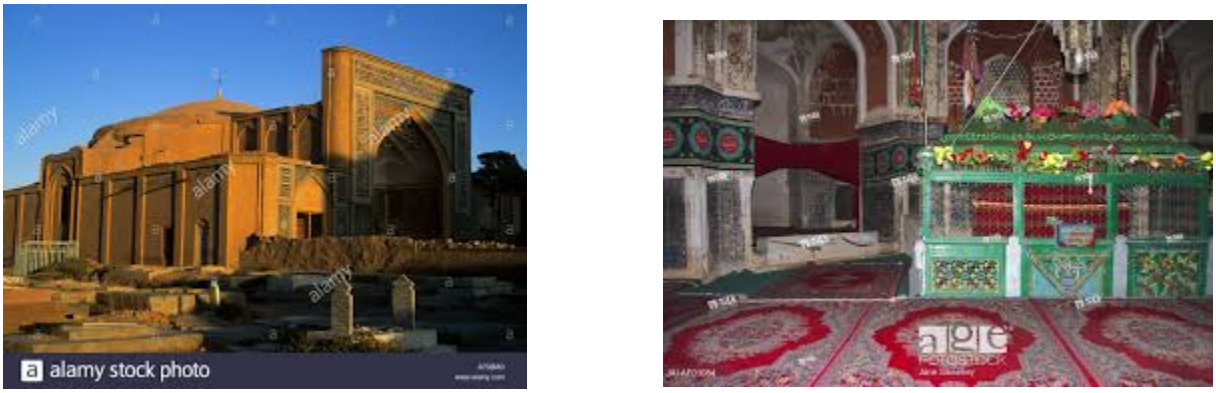


Figure 27.3 The Mausoleum of Jaami in Herat, Afghanistan [4].

References

[1] https://en.wikipedia.org/wiki/Jami

[2] Map: https://www.google.com/search?q=map+of+map+of+Tamerlane+1400+empire&tbm=isch&sour

ce=iu&ictx=1&fir=2ErRM6bwFoq4AM%253A%252C5i5uqhqXRCjXOM%252C_&usg=AI4_-kRtbCGqQdNuNnSsJzWxT2R44aonLA&sa=X&ved=2ahUKEwiO8JmlhKPfAhVMMqwKHbetA_gQ9QEwAnoECAQQCA#imgrc=wVMHjPxeEQcqhM:

[3] Photos: https://www.google.com/search?q=photos+of+Persian+poet+Jami&tbm=isch&source=iu&ictx=1&fir=VZzVghgVg9Ia2M%253A%252CBXJmr9oxneMlDM%252C_&usg=AI4_-kS7iwK-bRlz7k4-nrhyyuFhQvb5AQ&sa=X&ved=2ahUKEwjVw47KwKjfAhVQT6wKHTn0A0IQ9QEwA3oECAUQCg#imgrc=VZzVghgVg9Ia2M:

[4] https://www.google.com/search?tbm=isch&sa=1&ei=a4kZXM2YHIOAsQWfy5aQBg&q=mausoleum+of+poet+Jami+in+Herat+Afghanistan&oq=mausoleum+of+poet+Jami+in+Herat+Afghanistan&gs_l=img.12...6607174.6627771..6631847...1.0..1.94.2955.46.....1....1..gws-wiz-img.....0j0i67j35i39j0i5i30j0i8i30j0i24.Q5p8vD-KzQs#imgrc=ep9AK5_4cffVuM:

CHAPTER 28 Sheikh-Bahaei (Scientist, Architect)

28.1 Introductionw

In this chapter, the brief life story and literary contributions of a 15th - 17th Century Iranian scientist and architect, Sheikh-Bahaei, who was born during the Ottoman Empire in today's Turkey.

28.2 Facts on Sheikh-Bahaei [1]

Sheikh-Bahaei	AKA Bahāʾ al-Dīn al-ʿĀmilī, Shaykh-i Bahāʾī
Born	February 18, 1547 AD
Place of Birth	Baalbek near Jabal ʿĀmil, Ottoman Empire (present-day Lebanon)
Nationality	Persian, Iranian
Death	September 1, 1621 AD
Place of Death	Isfahan, Iran
Works	Mathematic Architecture and Philosophy

28.3 Biographical Sketch

> "Bahāʾ al-Dīn Muḥammad ibn Ḥusayn al-ʿĀmilī (also known as Sheikh Baha'i, Persian) was an Arab-Iranian Shia Islamic scholar, philosopher, architect, mathematician, astronomer and poet who lived in the late 16th and early 17th centuries in Safavid Iran. He was born in Baalbek, Ottoman Syria (present-day Lebanon) but immigrated in his childhood to Safavid, Iran with the rest of his family. He was one of the earliest astronomers in the Islamic world to suggest the possibility of the Earth's movement prior to the spread of the Copernican theory. He is considered one of the main co-founders of the Isfahan School of Islamic Philosophy. In later years, he became one of the teachers of Mulla Sadra" [1].

Figure 28.1 Map of the 16th to 17th Century Safavid Empire of Persia [2].

28.4 Poetry and Writings

"He wrote over 100 treatises and books in different topics, in Arabic and Persian. Several architectural and engineering designs are attributed to him but none can be substantiated with sources. These may have included the Naqsh-e Jahan Square and Charbagh Avenue in Isfahan (see Figure 28.2)". He is buried in Imam Reza's shrine in Mashad in Iran [1]. Figure 28.3 shows Imam Reza's Shrine in Mashhad, Iran and his grave inside the Shrine is shown in Figure 28.4.

Figure 28.2 Safavid Dynasty Architecture possibly Designed by Sheikh-Bahaei in Isfahan, Iran.

Figure 28.3 The Shrine of Imam Reza, in Mashhad, Iran.

Figure 28.4 The Tomb of Sheikh-Bahaei, Mashhad, Iran.

References

[1] https://en.wikipedia.org/wiki/Baha%27_al-din_al-%27Amili

[2] Map: https://www.themaparchive.com/safavid-empire-c-1630.html

CHAPTER 29 Mullah-Sadra (Philosopher)

29.1 Introduction

In this chapter, the brief life story and literary contributions of a Persian philosopher of 16th and 17th Century Persia, Mullah-Sadra from Shiraz, Iran.

29.2 Facts on Mullah-Sadra [1]

Mullah-Sadra	AKA Ṣadr ad-Dīn Muḥammad Shīrāzī
Born	1571 or 1572
Place of Birth	Shiraz, Iran
Nationality	Persian
Death	1640
Place of Death	Basra (Now in Iraq)
Tomb	Shiraz, Iran

29.3 Biographical Sketch

> "Mulla Sadra was born in Shiraz, Iran to a notable family of court officials in 1571 or 1572. In Mulla Sadra's time, the Safavid dynasty governed over Iran. Safavid kings granted independence to the Fars Province, which was ruled by the King's brother, Mulla Sadra's father, Khwajah Ibrahim Qavami, who was a knowledgeable and extremely faithful politician. As the ruler of the vast region of the Fars Province, Khwajah was rich and held a high position. He had no children but after much prayer and supplication, God gave him a son, whom the family named, Muhammad but called his Sadra. Years later, Sadra was nicknamed "Mulla," that is, "great scientist". Sadra was Khwajah's only child and at that time it was customary that the children of aristocrats were educated by private teachers in their own palace. Sadra was intelligent, strict, energetic, studious, and a curious boy and mastered all the lessons related to Persian and Arabic literature, as well as the art of calligraphy, during a short time. Following old traditions of his time, and before the age of puberty, he also learned horse riding, hunting, and fighting techniques, mathematics, astronomy, some medicine, jurisprudence, and Islamic law. However, he was mainly attracted to philosophy and particularly to mystical philosophy and gnosis".

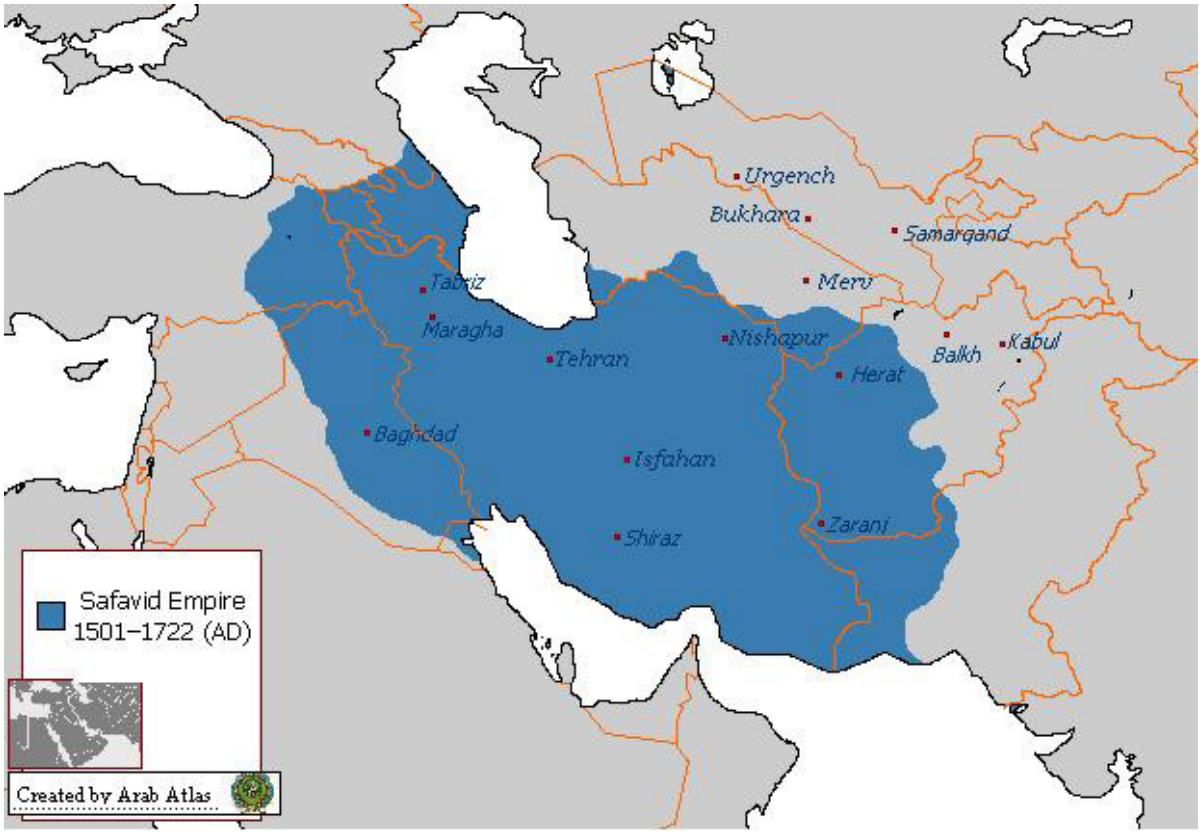


Figure 29.1 Map of the 16th – 17th Centuries Safavid Dynasty Empire of Persia [2].

In 1591, Mulla Sadra moved to Qazvin (then Safavid's capital) then, in 1597, to Isfahan (new Safavid capital) to pursue a traditional and institutional education in philosophy, theology, Hadith, and hermeneutics. At that time, each city was a successive capital of the Safavid dynasty and the center of Twelver Shi'ite seminaries. Sadra's teachers included Mir Damad and Baha' ad-Din al-`Amili.

Mulla Sadra brought "a new philosophical insight in dealing with the nature of reality" and created "a major transition from essentialism to existentialism" in Islamic philosophy, [3] although his existentialism should not be too readily compared to Western existentialism. His was a question of existentialist cosmology as it pertained to God, and thus differs considerably from the individual, moral, and/or social, questions at the heart of Russian, French, German, or American Existentialism.

Mulla Sadra's philosophy ambitiously synthesized Avicennism, Shahab al-Din Suhrawardi's Illuminationist philosophy, Ibn Arabi's Sufi metaphysics, and the theology of the Ash'ari school and Twelvers. His main work is 'The Transcendent Philosophy of the Four Journeys of the Intellect', or simply the Four Journeys [1].

29.4 Works and Writings

Existentialism

"According to Mulla Sadra, "existence precedes the essence and is thus principal since something has to exist first and then have an essence". It is notable that for Mulla Sadra

this was an issue that applied specifically to God and God's position in the universe, especially in the context of reconciling God's position in the Qur'an with the Greek-influenced cosmological philosophies of Islam's Golden Era.

Mulla Sadra's metaphysics gives priority to existence over essence (i.e., quiddity). That is to say, essences are variable and are determined according to existential "intensity" (to use Henry Corbin's definition). Thus, essences are not immutable. The advantage to this schema is that it is acceptable to the fundamental statements of the Qur'an, even as it does not necessarily undermine any previous Islamic philosopher's Aristotelian or Platonic foundations.

Indeed, Mulla Sadra provides immutability only to God, while intrinsically linking essence and existence to each other, and to God's power over existence. In so doing, he provided for God's authority over all things while also solving the problem of God's knowledge of particulars, including those that are evil, without being inherently responsible for them — even as God's authority over the existence of things that provides the framework for evil to exist. This clever solution provides for freedom of will, God's supremacy, the infiniteness of God's knowledge, the existence of evil, and definitions of existence and essence that leave the two inextricably linked insofar as humans are concerned but fundamentally separate insofar as God is concerned.

Perhaps most importantly, the primacy of existence provides the capacity for God's judgement without God being directly, or indirectly, affected by the evil being judged. God does not need to possess sin to know sin; God is able to judge the intensity of sin as God perceives existence.

One result of Sadra's existentialism is "The unity of the intellect and the intelligible" (Arabic: Ittihad al-Aaqil wa l-Maqul. As Henry Corbin describes:

All the levels of the modes of being and perception are governed by the same law of unity, which at the level of the intelligible world is the unity of intellection, of the intelligizing subject, and of the Form intelligized — the same unity as that of love, lover and beloved. Within this perspective we can perceive what Sadra meant by the unitive union of the human soul, in the supreme awareness of its acts of knowledge, with the active Intelligence, which is the Holy Spirit. It is never a question of an arithmetical unity but of an intelligible unity permitting the reciprocity, which allows us to understand that, in the soul, which it metamorphoses, the Form—or Idea—intelligized by the active Intelligence is a Form, which intelligizes itself, and that as a result the active Intelligence or Holy Spirit intelligizes itself in the soul's act of intellection. Reciprocally, the soul, as a Form intelligizing itself, intelligizes itself as a Form intelligized by the active Intelligence" [1].

Substantial motion

Another central concept of Mulla Sadra's philosophy is the theory of "substantial motion" (Arabic:al-harakat al-jawhariyyah), which is "based on the premise that everything in the order of nature, including celestial spheres, undergoes substantial change and transformation as a result of the self-flow (sarayan al-wujud) and penetration of being (fayd), which gives every concrete individual entity its share of being. In contrast to Aristotle and Avicenna who had accepted change only in four categories, i.e., quantity (kamm), quality (kayf), position (wad') and place ('ayn), Sadra defines change as an all-

pervasive reality running through the entire cosmos including the category of substance (jawhar)" [1].

Existence as reality

"Mulla Sadra held the view that Reality is Existence. He believed that an essence was by itself a general notion, and therefore and does not, in reality, exist. To paraphrase Fazlur Rahman on Mulla Sadra's Existential Cosmology: Existence is the one and only reality. Existence and reality are therefore identical. Existence is the all-comprehensive reality and there is nothing outside of it. Essences, which are negative require some sort of reality and therefore exist. Existence therefore cannot be denied. Therefore, existence cannot be negated. As Existence cannot be negated, it is self-evident that Existence is God. God should not be searched for in the realm of existence but is the basis of all existence. Reality in Arabic is "Al-Haq", and is stated in the Qur'an as one of the Names of God" [1].

Additional Insight

"Mullah Sadra is said to be is arguably the most significant Islamic philosopher after Avicenna (see Chapter 12). Best known as Mulla Sadra, he was later given the title of Sadr al-Muta'allihin (Master of the theosists) for his approach to philosophy that combined an interest in theology and drew upon insights from mystical intuition. He played a major role in intellectual life during the revitalization of philosophy under Safavid Shah 'Abbas I (1588–1629 AD). Later on, in life he was the most important teacher at the philosophical seminary known as Madrasa-yi Khan in his hometown of Shiraz. He moved first to Qazvin in 1591 and then to Isfahan in 1597, successive capitals of the Safavid empire, to pursue his study of philosophy, theology, the prophetic tradition, and Qur'anic hermeneutics and exegesis. He overlapped with the Iranian scientist and architect Sheikh-Bahei (see Chapter 28). Shaeikh Baha'i who was the leading jurist in Isfahan during the reign of Shah Abbas has quoted some narrations of the Imams and wrote that he did so at the bequest of his "illustrious and most excellent, intelligent and witty and pure son Sadra" Similarly, in a note Mir Damad referred to Sadra as his spiritual son. In 1630, AD, Mulla Sadra moved permanently to his hometown at the request of (possibly his former student) Imamquli Khan, the extremely powerful governor-general of Sadra's home province Fars and son of the celebrated Georgian military commander, Allahvirdi Khan" [3].

Final Comment

For a while, Mullah Sadra was exiled in a village near the city of Qum, Iran due to his political views about corruption and religious writings. The following verses in Parsi indicate his dismay for corruption and false believers. These comments landed him house arrest in Qum by order of the Safavid King [4].

مردان رحمت که سر معنی دانند
از دیده کوته نظران پنهانند

این طرفه تر آنکه حق را بشناخت
مؤمن شدو خلق کافرش می دانند [4]

The English translation is as follows:

Men of mercy who learned secret of life
They are hidden away from the shortsighted ones

This way is for those who recognize justice
He became believer and people called him infidel

Figure 29.3 shows while inside his house on forced exile [1].

Figure 29.2 The House of Mullah Sadra near Qum, Iran when the Safavid King exiled him [1].

In 1964 AD on his way to Mecca, he passed away in Basra (now a city south of Iraq). He was initially buried there; however, later his body was transferred to his hometown Shiraz.

References

[1] https://en.wikipedia.org/wiki/Mulla_Sadra

[2] Map: https://iranpoliticsclub.net/maps/maps09/index.htm

[3] https://plato.stanford.edu/entries/mulla-sadra/

[4] A. D. Haghighat, "The Iranian Part in the History of the World Civilization," Koomesh Publishers, Tehran, Iran, 1999.

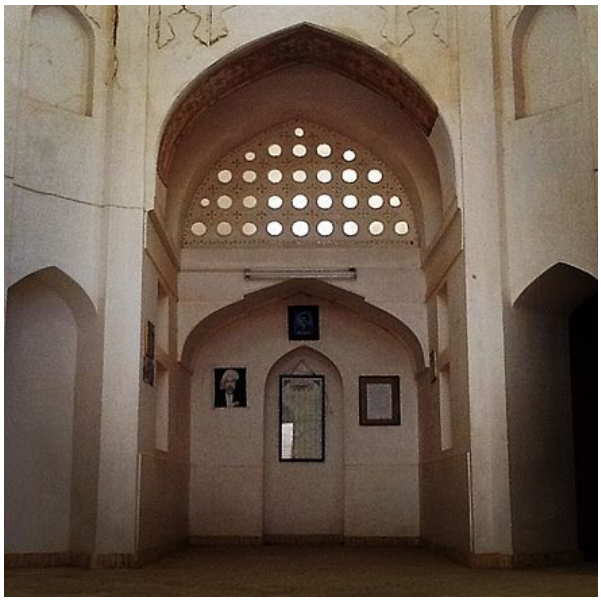
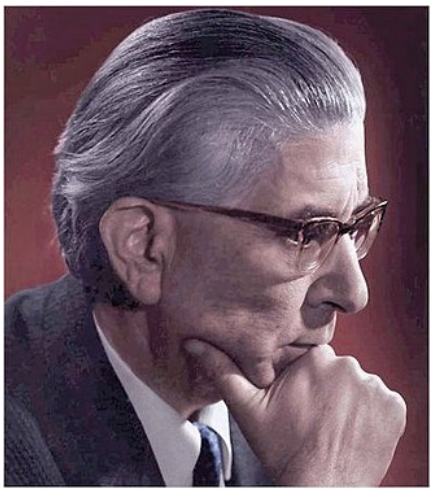
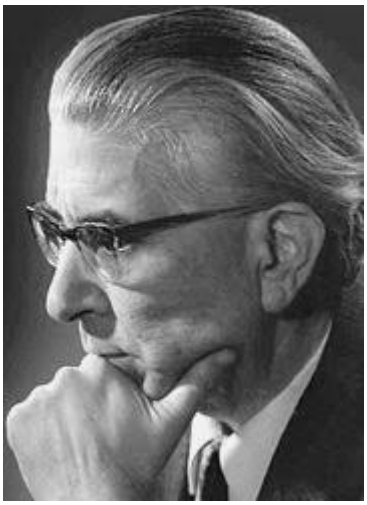


Figure 29.3 The Inside View of Mullah Sadra's House with a Painted Portrait Hanging on the Wall [1].

CHAPTER 30 Hashtroodi (Mathematician)





30.1 Introduction

In this chapter, the brief life story and literary contributions of a 20th Century Iranian mathematician, Mohsen Hashtroodi is given.

30.2 Facts on Hashtroodi [1]

Hashtroodi	AKA Mohsen Hashtroodi, Hashtroodi
Born	January 13, 1908
Place of Birth	Tabriz, Iran
Nationality	Iranian
Death	September 4, 1976
Place of Death	Tehran, Iran
Almni	Dar ol-Fonoon, Tehran, Élie Cartan, France

30.3 Biographical Sketch

"Mohsen Hashtroodi was an Iranian mathematician. His father, Shaikh Esmāeel Mojtahed was an advisor to Shaikh Mohammad Khiābāni, who played a significant role in the establishment of the parliamentary democracy in Iran during and after the Iranian Constitutional Revolution. He studied at the élite school of *Dar ol-Fonoon* in Tehran and graduated in 1925. He obtained his doctoral degree in mathematics in 1936 as a student of Élie Cartan in France. His doctoral dissertation (entitled *Sur les espaces d'éléments à connexion projective normale*) was on differential geometry. By significantly generalizing the work of Cartan to the case of hypersurfaces in $\mathbb{R}^n$, he constructed a projective connection used in studying systems of differential equations known as the *Hachtroudi Connection*. His subsequent research involved using intrinsically defined affine and Weylian connections to study the invariants of differential systems relative to different groups of transformations [1].

Hashtroodi attended Sirus and Aghdasieh primary schools in Tehran and subsequently studied at the élite school of Dar ol-Fonoon, also in Tehran, from where he graduated in 1925.

Career

He obtained his doctoral degree in mathematics in 1936 as a student of Élie Cartan in France. His doctoral dissertation, entitled "Sur les espaces d"éléments à connexion projective normale", was on differential geometry. He was a Distinguished Professor at University of Tabriz and University of Tehran. One of the Prizes of Iranian Mathematical Society is named after Professor Hashtroodi. Mohsen Hashtroodi married Robāb Modiri in 1944. Hashtroodi is buried in the Behesht-e Zahra cemetery in Tehran [2].

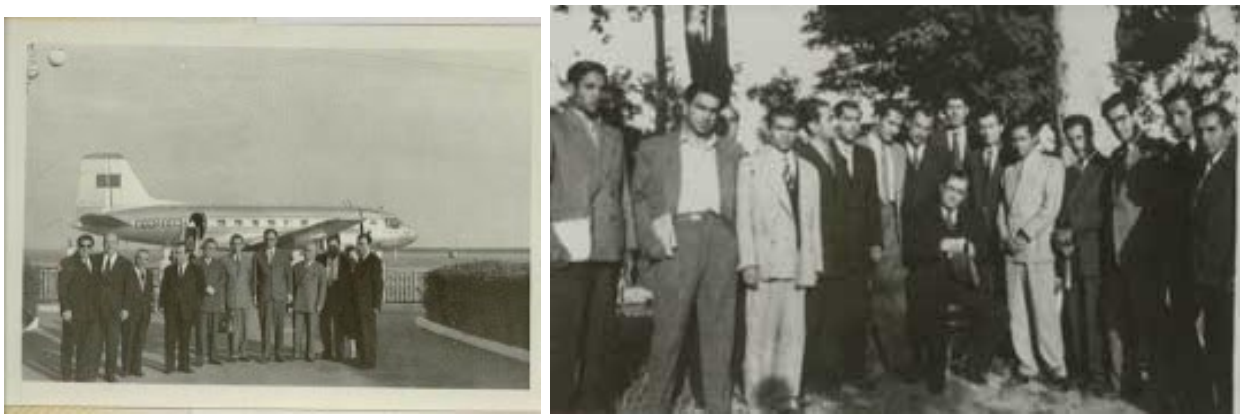


Figure 30.1 Hashtroodi and his Team Arrive at the Moscow Airport with a group photo (Seated is Hashtroodi) in 1935.

Reminiscences of the International Congresses of Mathematicians (ICM): Moscow, Russia (1935).

“This congress was the last international congress of mathematicians before the World War II. One night after finishing the session of differential geometry and topology, the late Cartan (Élie Cartan) and Schouten (who is now the president of Amsterdam mathematics center) and Hermann Weyl and a group of researchers in tensor calculus and connection theory negotiated and discussed. Alleys in Moscow in the vicinity of the Kremlin almost all lead to the Kremlin. The late Weyl propounded this question that: “Is there a geometrical measure that all geodesics (the shortest distance, here it should be pointed out that in all measure spaces, geodesics and straight lines do not coincide with each other, namely, between two points, there exist a straight line and a shortest curve that are distinct) are centralized”. That night, after separation of this group, Schouten overnight found this connection that at present in his name in Russia it is known as the Schouten connection. Strangely, in western countries this connection is called sometimes as the Moscow connection. The author of these lines determined intimate properties of this connection about 15 years ago. At the same period, André Lichnerowicz, the professor at the Collége de France, proved also that among point spaces (spaces, which are introduced just with a point not with a point and a line nor a point and a plane), the only space that are connected to nonholonomic analytical mechanics, is the same semi-symmetric Schouten connection. This connection is called the semi-symmetric since the torsion of space and is determined by a vector

just by using a main tensor (this space is obviously not a usual space, namely, it has curvature and torsion of space and is related to transportation of the origin of coordinates). Such as this issue has happened in many congresses that a problem has been posed in a session of a field or even out of that and overnight, it has been solved by one of mighty mathematician" [3]. Figure 30.1 shows the delegation accompanying Hashroodin arriving in Moscow and taking a group photo, while attending an international mathematics conference in 1935.

Reminiscences of International Congresses of Mathematicians (ICM): Nice-France (1970)

> "Hashtroudi was requested and he submitted some of his own reminiscences of the international congresses of mathematicians (ICM) that would be in the scope of magazine readers, in order to publish in the magazine. The organization of the international congresses of mathematicians that holds meetings in various countries once every four-years and dates back to two centuries ago. In these congresses, representatives of universities from various countries and mathematicians who are personally inclined, take part. Typically, a few numbers of eminent mathematicians take part according to the invitation of the host country. During the World Wars, these congresses did not hold meetings, and before World War II, the last congress, which was held, was ICM-1935 in Moscow. This year it will be also held in Moscow. In each congress, a one-hour lecture is considered for prominent mathematicians that will give a lecture about the general progress of mathematics. The other participants could give a quarter-lecture and present their new theories, however, possibly discussion about some of these theories takes a number of congress sessions. "I have taken part in all of the congresses after the war and I have been invited in most of them, just in Stockholm congress, though I was invited, I could not take part in it, since I was in Moscow on that time". To speak about the official talks of congresses is wearisome for magazine readers. Some of memoirs are about circumstance that has happened in the margin of each congress: In Nice congress, the international congress of Latin mathematicians, Marchoux was the honorary president, in the closing ceremony, a number of participants' relatives have gone to a night dancing party. There, one of mathematicians' wife and an artist disputed and finally the brother of a mentioned lady and the manager of club had quarreled. A journalist of a newspaper who had sought for such opportunity, had taken several photos of this incident and it was anticipated that the next day the happening had been reflected with a thousand embellishments and foliage in a newspaper to become a disgrace for congress. Marchoux asked me to interfere and somehow quiet it; in Nice according to the policy of tourist attraction, they respect foreigners and in particular, journalists, abstain to insert and publish something that makes them resentment. Marchaux and I met the journalist and convinced him with so deceits and eventually I could take his camera and blacken all photographic films. Journalist, who did not want to be taken a task by a manager of a newspaper, complained to me but just requested the compensation of a damaged film roll and the incident was finished here. In this congress, when Arnaud Denjoy who was rather old in this congress and was one of great professors at Sorbonne University and was also my professor, wanted to lecture, we all applauded him but just as he wanted to continue his lecture, a number of youth began again to applaud and wanted to impede his speech. By the way, some of his friends and I tried to conciliate the meeting and he with a high indignant voice that trembled, ended his lecture. Indeed, Arnodangoux had worked on some subjects in concerning to modern mathematics in old age and this had not been at

all acceptable for the youth. They were illiberal youth who deemed that the way is closed for old, whereas Élie Cartan also argued the theory of isotropic spaces in the age of eighty years. By the way, in that meeting, I and some others wanted to soothe him and declared him that they are young, we were also young and sometimes naughty. He said with the same indignant tone, "you were at all not so, since youth passes but maliciousness remains" [3].

Death

Hashtroodi passed away on September 4, 1976 in Tehran and was buried in Behesht-Zahra Cemetery. Figure 30.2 shows his tomb.

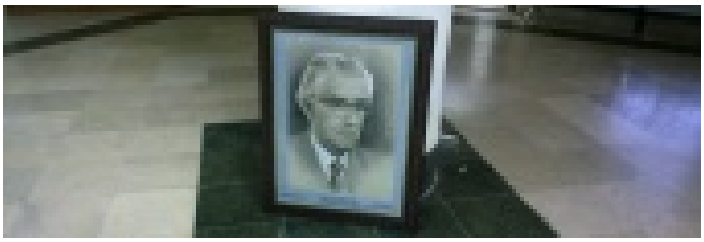


Figure 30.2 The Tomb of Hashtroodi in Tehran, Iran [3].

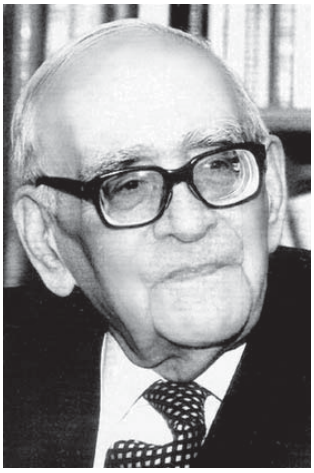
References

[1] https://en.wikipedia.org/wiki/Mohsen_Hashtroodi

[2] https://prabook.com/web/mohsen.hashtroodi/2084850

[3] http://mohsenhashtroudi.blogspot.com/

CHAPTER 31 Hesabi (Engineer, Scientist, Nuclear Physicist, Politician)



31.1 Introduction

In this chapter, the brief life story and literary contributions of another 20th Century nuclear scientist, electrical engineer, and public servant as minister (Cabinet of Mohammad Mossadegh) and a Senator during late Mohammad Reza Shah of Iran [1]. He is Dr. Mahmoud Hesabi, educated in Lebanon and France [2, 3].

31.2 Facts on Hesabi [1]

Hesabi	AKA Mahmoud Hesabi, Mahmoud khan Mirza Hesabi, Minister and Senator
Born	February 23, 1903
Place of Birth	Tehran, Iran
Nationality	Iranian
Death	September 3, 1992
Place of Death	Geneva, Switzerland, buried in Taftresh, Iran
Alumni	American University of Beirut, Sorbonne, École Superieure d'Electricité
Founder	Physics University of Iran

31.3 Biographical Sketch

"Hesabi was born in Tehran to the family of Abbas and Goharshad Hesabi. His family's hometown is Tafresh, Markazi province, Iran [4]. At the age of four, his family moved to Beirut where the young Hesabi attended a primary school. When WWI began, he was still in school, and when his school closed due to the War, he continued his studies at home. In 1922, he earned a degree in road engineering from the American University of Beirut. After briefly working for the Ministry of Roads in Beirut, Hesabi travelled to Paris for further education, he was awarded a degree in electrical engineering at the École

Superieure d'Electricité and later a doctorate degree in 1927. In Paris, he worked with Aime Cotton (A French physicist known for his studies of the interaction of light with chiral molecules) [5].

He memorized the Quran and Divans of Hafez (see Chapter 25). He had also studied Boustan, Golestan of Saadi (see Chapter 23), Shahnameh of Ferdowsi (see Chapter 9), and Masnavi of Rumi (see Chapter 22) Divans. Hesabi was very well familiar with poetry and traditional music of Iran and classical music of the West. He was skilled at playing the violin and piano. He achieved success in several sports fields, like achieving a Lifeguard certification in swimming in adolescence in Beirut. He was appointed as a Senator in Iran in the first three senates of Iran. He also served as the Minister of Education under Prime Minister Mohammad Mossadegh (see Perspective of Mossadegh) during 1951 to 1952 [6].

"In Tehran, Hesabi was affiliated with the University of Tehran and organized the science and engineering faculties of the university, he was a teacher of Alenush Terian while studying at the university [7]. In June 1951, Hesabi was appointed to a three-man provincial board of the Iranian oil company, the designated successor of the Anglo-Iranian Oil Company. In December 1951, he replaced Karim Sanjaby as education minister [1]. Between 1961 and 1969, Hesabi was Iran's representative on the Scientific and Technical Subcommittee, United Nations Committee on the Peaceful Uses of Outer Space" [1].

31.4 Education

He received the following degrees, which is quite impressive for the time he was in higher institutions and universities:

- Bachelor of Literature from the American University of Beirut,
- Bachelor of Civil Engineering from the French University of Beirut,
- Bachelor of mathematics, astronomy, and biology from American University of Beirut,
- Bachelor of Electrical Engineering from the Faculty of Electrical Engineering of Paris,
- Bachelor of Mining Engineering from Mines Paris Tech of Paris,
- Doctoral degree in physics from the Sorbonne University in Paris, France [6].

31.5 Scientific and Administrative Activities

- The first technical mapping and specialized of Iran country (Bandar Lengeh way to the Bushehr)
- The first modern road construction and scientific of Iran (The way of Tehran to Shemshak)
- Established the first nomadic schools of Iran
- Established the excellent normal school (higher learning institution)
- Making the first radio of Iran
- Launched the first transmitting antenna in Iran
- Launched the first Seismology Centre in Iran

- Launched first Atomic Reactor of Atomic Energy Organization of Iran
- Launched the first radiology device in Iran
- Calculated and determined the official time of Iran
- Established the first private hospital in Iran, named Goharshad Hospital
- Created forums of the Persian language and being in the establishment of Iranian Academy
- Compiling the constitution of Tehran University
- Established Technical Faculty of Tehran University
- Established Faculty of Science in Tehran University
- Established Supreme Council of Intellectual Property
- Played a key role in introducing Lens of Applied Optics in Faculty of Science in Tehran University
- Established acoustic section in the university and measuring the distances of Iranian music steps via scientific method
- Established the Association of Iranian Music and Center of Music Researches
- Established a new educational program for elementary and high school
- Established Tehran University Geophysics Institute
- Established f Atomic Research Center of Tehran University
- Established the Atomic Energy Organization of Iran
- Established the first modern observatory in Iran
- Established the Modern Center of Chase Satellites in Shiraz
- Participation in the establishment of the Asadabad Center in Hamadan Telecommunications
- Established the Space Research Committee in Iran
- Creating the first Meteorological stations of Iran (The building of high learning institution in gallery of Tehran University.)
- Established the constitution of the National Institute of Standards
- Established regulations Iran textile mills and a treatise on how government support growth of this industry
- Established industrial research unit of Saqdaea (Research and Technology in electronics, physics, optics physics, artificial intelligence)
- Launched the first hydro-electric power station in the country
- Created the first experimental workshops in Applied Sciences in Iran
- Created the first basic science laboratories in Iran
- Establish Saqdaea industrial research unit

- Formed and chaired of Research Committee in Iran 11981.

31.6 Awards and Honors

- 1349- Received the title of "Distinguished Professor of Tehran University
- 1365- Conducting of conferences annual Physics in 1365 in Iran in honor of Mahmoud Hesabi
- French medal of Legion of Honor in France, (see Figure 31.1)

Figure 31.1. Medal Ceremony of French Legion of Honor for Hesabi

31.7 Some Publication of Hesabi

Hesabi M. (1947). "Continuous Particles". Proceedings of the National Academy of Sciences of the United States of America. **33** (6): 189-194. Bibcode: 1947PNAS...33...189H. DOI: 10.1073/pnas.33.6.189. PMC 1079021. PMID 16588741.

Hesabi M. (May 1948). "Theoretical Evidence for the Existence of a Light-Charged Particle of Mass Greater than That of the Electron". Phys. Rev. **73** (9=): 1128. Bibcode: 1948PhRv...73.1128H. DOI:10.1103/PhysRev.73.1128.

31.8 Death

Hesabi passed away in Geneva, Switzerland and his body was put to rest in Tafresh, Iran (His home city) and was buried there in 1992.

References

[1] Jump up to: "Iran Bank Fights Drain on Exchange: Opening of Credit Abroad for Imports Suspended in Step to Protect Currency". *New York Times*. New York. December 5, 1951.

[2] https://en.wikipedia.org/wiki/Mahmoud_Hessabi

[3] Alexander, Yonah; Nanes, Allan S. (1980). *The United States and Iran: A Documentary History*. Aletheia Books. p. 244. ISBN 9780890933787.

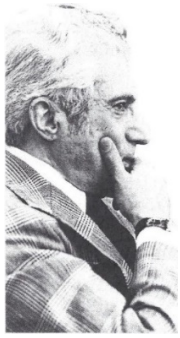
[4] "Iranian Personalities: Professor Mahmoud Hesabi". *Iran Chamber Society.*

[5] Tarikhi, Parviz (2014). The Iranian Space Endeavor: Ambitions and Reality. Springer. p. 47.

[6] https://www.welcometoiran.com/mahmoud-hesabi/

[7] Talebian, Mohammad; Talebian, Ehsan (2012). "Alenush Terian: The Iranian Solar Mother". *Physics in Perspective*. 14 (2): 239–241. Bibcode: 2012PhP 14..239T. DOI: 10.1007/s00016-012-0085-x.

CHAPTER 32 Reza (Engineer, Literary Man, Diplomat)



32.1 Introduction

In this chapter, the life story, of a pioneer of our current time is presented. He is Fazzlollah "Faz" Reza. As a young student in Rasht, Iran, he was equally talented in Persian Literature and science. Before he entered the School of Engineering (Daneshkadeh Fanni) at the University of Tehran, he wrote a book on the "*Discoveries of the Universe*" during his year at the University of Tehran. He is the first electrical engineer from Iran that graduated from the University Of Tehran School Of Engineering in 1939 [1].

32.2 Facts on Reza

Reza	Fazlollah (Faz) Reza
Born	January 1, 1915
Place of Birth	Rasht, Iran
Nationality	Persian (Iranian)
Death	November 19, 2019
Place of Death	Ottawa, ONT, Canada
Occupation	Engineer, Scientist, and Literary man

32.3 Biographical Sketch

Faz Reza was born on January 1, 1915 in Rasht, Iran in a religious family. During his childhood he was interested in literature and Persian poetry as well as scientific concepts in physics, astronomy, etc. He graduated from the Faculty of Engineering of the University of Tehran in 1938, receiving a bachelor's degree in electrical engineering. He received a master's in electrical engineering from the Columbia University in 1946 and the Ph.D from the Polytechnic University of New York (now New York University Tandon School of Engineering) in 1950. He is a Fellow of the IEEE (Institute of Electrical and Electronic Engineering) and AAAS (American Association for Advancement of Science) for his contribution to network and information theory. He is an honorary member of the Academy of Persian Language and Literature and has written and spoken extensively on classical Persian poetry.

He has worked at the Massachusetts Institute of Technology (1951-1955), Syracuse University (1955-1968), and he has had short-term stays at many institutions such as the University of Colorado (summers of 1962 and 1988), Swiss Feral Institute of Technology (1962), Royal Technical University of Copenhagen (1963), the Institute of Henri Poincare, Paris, France as a Visiting Professor, 1965, Universite de Paris, Sorbonne, France (While Iran's Ambassador to UNESCO, Professor, (1969-1974). Dept. of Physics, Paris VII, University, Paris France, McGill University, Montreal, Canada, (While Ambassador to Canada (1975-1978) and continued to this date, 1989). An Honorary and Adjunct Professor, Concordia University, Montreal, Canada, Visiting and Adjunct Professor, (1979-2000). Fazlollah Reza has taught at Tehran University (1940-1944) at the beginning of his career, and years later was Chancellor of two major Iranian Universities; University of Technology (formerly Aryamehr, now Sharif), and Tehran University, (the leading university of Iran, with a student body of over 20,000 and a teaching faculty of over 2000).

32.4 Contributions and Awards

Reza is a unique individual of recent times. On one hand, he is a superb electrical engineering with knowledge of Persian culture. Reza is a pioneer in information theory, electric circuits, and an authority on Persian Poetry, especially with respect to the life and works of Persian Epic Poet, Abolghasem Ferdowsi. (see Chapter 9). He has scientific papers on Communication, System, and Circuit Theories, Applied Mathematics, and many books on Persian literature on Ferdowsi's Shahnama.and he has written some of the earliest solid books in electric circuits and networks, linear spaces, information theory, and other topics.

His desire to be a great man of science and literature began in 1940. While still in Tehran, he wrote his first book under the title of "**Secrets of the Universe**". That book was published in 1942, shortly before he moved to New York to study electrical engineering at Columbia University for his master's degree. In 2015 a new edition of this book was printed in Tehran. Figure 32.1 shows a photo of the new edition's front cover in Parsi. This book was somewhat ahead of its time in mid-20th century Iran. This book opened a window on the science of modern physics to the Universe [2].

Figure 32.1. Cover of Reza's new edition book on "Secrets of the Universe"

- Proceedings of the Institute of Electronics and Electrical Engineers IEEE Transactions on Circuits and Systems
- IEEE Spectrum
- Proceedings of AlEE and IRE
- Proceedings of the Institute of Electrical Engineers, U.K. Archiv for Elektronik Und Ubertragungstechnik Canadian Electrical Engineering Journal
- The Journal of the Franklin Institute
- MIT Quarterly Progress Report of Research Laboratory of Electronics Proceedings of American Mathematical Society
- Bulletin of the American Mathematical Society
- Journal of Mathematics and Physics
- Society for Industrial and Applied Mathematics, SIAM Review Zeitschrift for Angewandte Mathematick und Physik, Journal of Applied
- Physics Comptes Rendus de l'Academle des Sciences, Paris

32.5 Honors and Awards

- Fellow of the Institute of Electrical and Electronics Engineers, 1962. "For contributions to Circuit Theory and Information Theory".
- Fellow of the American Association for the Advancement of Science; 1975. Honorary Professorship from Polytechnic University of New York, USA, 1975.
- New York Academy of Science (life member).
- Honorary Adjunct Professor of the Faculty of Engineering of Carleton University in Ottawa, 1976.
- Honorary Professorship from McGill University, Montreal, Canada, 1978.
- Member of several scientific and cultural societies, including the American Mathematical Society (emeritus), the Society for Industrial and Applied Mathematics, and Sigma Xi.
- Member of the Board of Governors: International Council for Computer Communications.
- Member of the Advisory Board, *International Journal of Computer and Electrical Engineering.*
- Honored by the Government of Pakistan (IQBAL) Centennial Medal. Honorary member of the Atomic Energy Centre of Iran.
- Honors and awards at several different occasions by the Government of Iran
- Honored by the Queen Elizabeth II, 2016

In 1991 the author organized a 2-day conference in honor of Professor Reza at UCLA campus in Los Angeles. Day one was electrical engineering and day two was literature and especially with

respect to Pars' Epic Ferdowsi's "Shahnameh" Figure 32.2 shows the cover of its proceedings and title page with his signature and monogram.

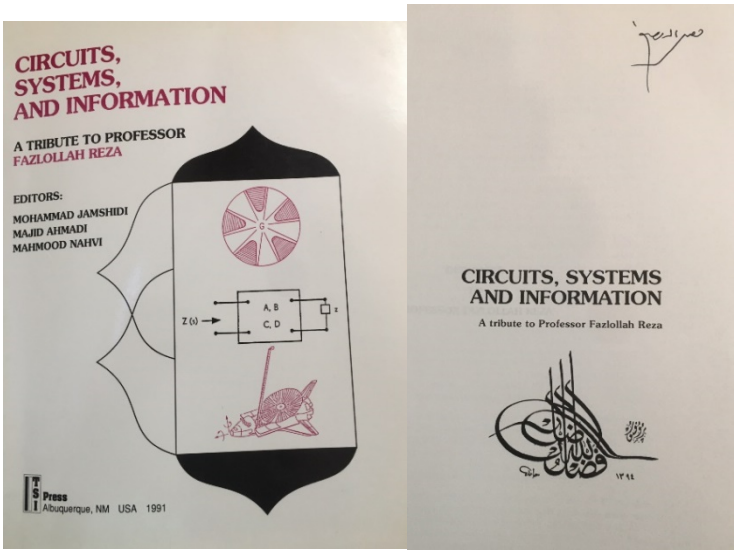


Figure 32.2 Cover of and title page of proceedings of 1991 conference in honor of Reza.[3]

Final Note

A unique characteristic of Fazlollah (Faz) Reza was that he was not just a scientist, mathematician, and electrical engineer but a man of literature and poetry as well as a diplomat. On two occasions, he represented his country, Iran as ambassador: Five year in Paris, France as Iran' Ambassador at UNESCO and for 8 years as Iran Ambassador in Canada. His love for Shahnameh was deep and focused. At the age of 100 he published a book in Persian, called the "*Shahnameh – National Identity",* whose cover is shown in Figure 32.3. This book was the last published work of Reza. Figure 32.4 displays the message Raza gave to the Iranian people before his death.

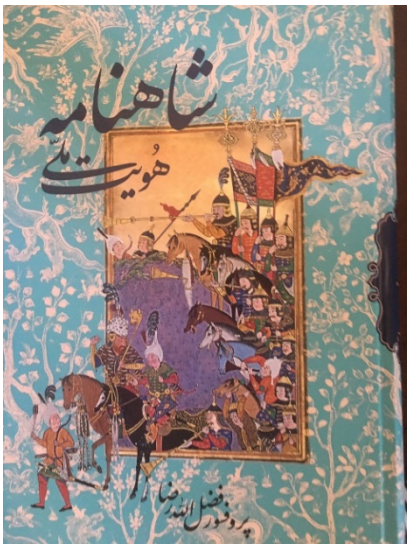


Figure 32.3 Cover of Reza's 2015 Book "*Shahnameh National Identity"*.

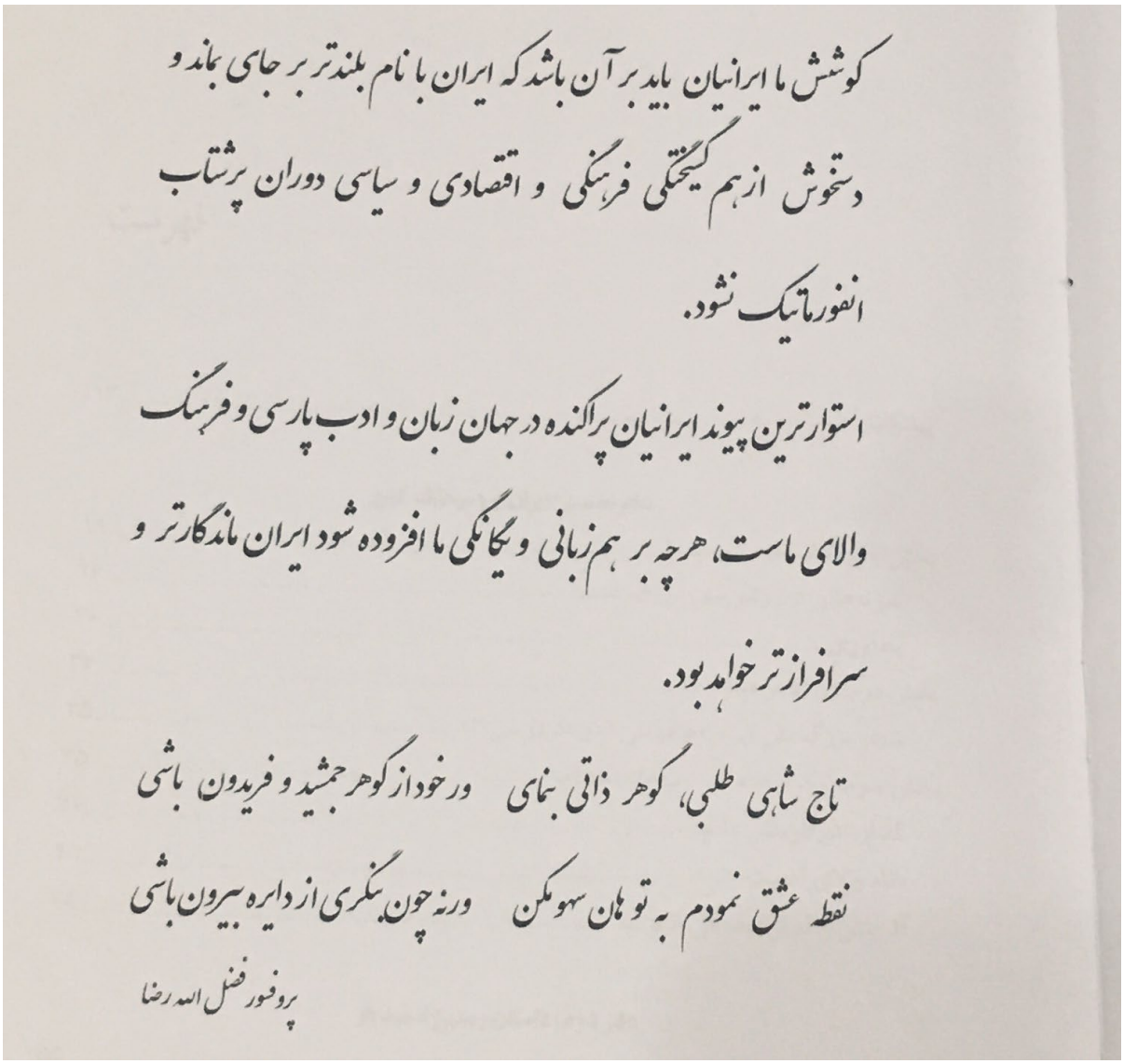

کوشش ما ایرانیان باید بر آن باشد که ایران با نام بلندتر بر جای بماند و
دستخوش از هم گسیختگی فرهنگی و اقتصادی و سیاسی دوران پرشتاب
انفورماتیک نشود.
استوارترین پیوند ایرانیان پراکنده در جهان زبان و ادب پارسی و فرهنگ
والای ماست، هرچه بر هم زبانی و یگانگی ما افزوده شود ایران ماندگارتر و
سرافرازتر خواهد بود.
تاج شاهی طلبی، گوهر ذاتی بنمای ور خود از گوهر جمشید و فریدون باشی
نقطه عشق نمودم به تو هان سهو مکن ورنه چون پرگری از دایره بیرون باشی
پروفسور فضل الله رضا

Figure 32.4. Reza's message to the Iranian people Before his Passing [4].

On August 39, 2015, two friends from Concordia University and I went to Ottawa to visit him and honor him at his 100th birthday. Figure 32.5 shows memorable photos with him. I was honored to have him autograph the book to my wife Jila Jamshidi and myself.

References

[1] https://en.wikipedia.org/wiki/Fazlollah_Reza

[2] F. Reza, Secrets of the Universe, Isfahan House of Mathematics Publishers, ISBN 964-96045-5-3, Isfahan, Ira, 2015 (In Parsi)

[3] M. Jamshidi, M. Ahmad, and M. Nahvi, (eds.) *Circuits, Systems, and Information*, TSI Press, Albuquerque, NM, 1991.

[4] F. Reza, "Shahnameh: From Legends to Firdowsi's Vision," Etellaat Publishers, Tehran, Iran, 2015.

Figure 32.5. At a Private Birthday Party in Professor Reza's Ottawa Home. From Left to Right: Professor Aghdam, Author (Jamshidi), Professor Reza and Professor Khorasani.

CHAPTER 33 Zadeh (Engineer, Scientist, Logician, Trailblazer, "Father of Fuzzy Logic")

33.1 Introduction

In this chapter, the life story and scientific contributions of another genius Persian scientist of the 20th and 21st Centuries, who was a logician, mathematician, electrical engineer, and a visionary in computing science, Lotfi Asghar Zadeh.

33.2 Facts on Zadeh [1]

Zadeh	AKA Lotfollah Asgharzadeh, Lotfi, "Father of Fuzzy Logic"
Born	February 5, 1921
Place of Birth	Baku, Azerbaijan, USSR (Formerly part of Persia)
Nationality	Persian (Iranian), part Azari, part Russian, American
Death	September 6, 2017, His remains were buried in Baku, Azerbaijan
Place of Death	Berkeley, CA. USA
Family	Wife Fay. Daughter Stella and Son Norman Zede

33.3 Biographical Sketch [2]

> "Zadeh was born in Baku, Azerbaijan Soviet Socialist Republic, as Lotfi Askerzadeh, to an Iranian Azerbaijani father from Ardabil, Rahim Askerzadeh, who was a journalist on assignment from Iran, and a Russian Jewish mother, also an Iranian citizen, Fanya Korenman, who was a pediatrician from Odessa. The Soviet government at this time courted foreign correspondents, and the family lived well while in Baku. Zadeh attended elementary school for three years there, which he said, "school had a significant and long-lasting influence on my thinking and my way of looking at things".

In 1931, when Zadeh was ten years old, his family moved to Tehran, Iran, his father's homeland. Zadeh enrolled in the Jordan American School, later on called the Alborz College, which was a Presbyterian missionary school, where he was educated for the next eight years, and where he met his future wife, Fay Zadeh. Fay was one of the two daughters in her Latvian family of Jewish heritage who had moved to Tehran to escape Adolf Hitler's regime. Lotfi says that he was "deeply influenced" by the "extremely decent, fine, honest and helpful" missionaries from the United States who ran the college. "To me they represented the best that you could find in the United States – people from the Midwest with strong roots. They were really 'Good Samaritans'

– willing to give of themselves for the benefit of others. Therefore, this kind of attitude influenced me deeply. It also instilled in me a deep desire to live in the United States". During this time, Zadeh was awarded several patents.

Despite being more fluent in Russian than in Persian, Zadeh sat for the national university exams and placed third in the entire country. As a student, he ranked first in his class in his first two years. In 1942, he graduated from the University of Tehran with a degree in electrical engineering, one of only three students in that field to graduate that year, due to the turmoil created by World War II, when the United States, Britain and the Soviet Union invaded Iran, whose ruler, Reza Shah, was pro-German. Over 30,000 American soldiers were based there, and Zadeh worked for and with his father, who did business with the US Army as a contractor for hardware and building materials.

In 1943, Zadeh decided to immigrate to the United States, and traveled to Philadelphia by way of Cairo after months of delay waiting for the proper papers or for the right ship to appear. He arrived in mid-1944, and entered the Massachusetts Institute of Technology (MIT) as a graduate student later that year. While in the United States, he changed his name to Lotfi Asker Zadeh.

He received an MS degree in electrical engineering from MIT in 1946, and then applied to Columbia University, as his parents had settled in New York City. Columbia admitted him as a doctoral student, and offered him an instructorship as well. He received his Ph.D. in electrical engineering from Columbia in 1949, and became an assistant professor the next year" [1].

Zadeh taught for ten years at Columbia, was promoted to full professor in 1957, and taught at the University of California, Berkeley from 1959 on. He published his seminal work on fuzzy sets in 1965, in which he detailed the mathematics of fuzzy set theory. In 1973, he proposed his theory of fuzzy logic. Fuzzy systems and related applications are subject to thousands of patents worldwide.

33.4 Select Publications and contributions [3]

- 1949 He developed frequency-domain based on time-varying networks
- 1950 Extended Wiener's theory of prediction with J. J. Ragazzini
- 1952 Introduced and formulated z transform with J J. Ragazzini. It is noted that the s-z domain transformation developed earlier by Horowitz and by Eli Jury when, the latter was a Ph.D. student at Columbia.
- 1953 He developed the theory of nonlinear filters
- 1956 He formulated the problem of system identification
- 1963 He initiated a state-space approach to the analysis of linear systems with C. A. Desoer
- 1965 Initiated the theory of fuzzy sets
- 1965. "Fuzzy sets". *Information and Control*. 1965; 8: 338–353.
- 1965. "Fuzzy sets and systems". In: Fox J, editor. *System Theory*. Brooklyn, NY: Polytechnic Press, 1965: 29–39.

- 1972. "A fuzzy-set-theoretical interpretation of linguistic hedges". *Journal of Cybernetics* 1972; 2: 4–34.
- 1973. "Outline of a new approach to the analysis of complex systems and decision processes". *IEEE Trans. Systems, Man and Cybernetics*, 1973; 3: 28–44.
- 1974. "Fuzzy logic and its application to approximate reasoning". In: *Information Processing* 74, Proc. IFIP Congr. 1974 (3), pp. 591–594.
- 1975. "Fuzzy logic and approximate reasoning". *Synthese*, 1975; 30: 407–428.
- 1975. "Calculus of fuzzy restrictions". In: Zadeh LA, Fu KS, Tanaka K, Shimura M, editors. *Fuzzy Sets and their Applications to Cognitive and Decision Processes*. New York: Academic Press, 1975: 1–39.
- 1975. "The concept of a linguistic variable and its application to approximate reasoning", I-III, *Information Sciences* 8 (1975) 199–251, 301–357; 9 (1976) 43–80.
- 1978 He developed possibility theory
- 1979 He developed the theory of approximate reasoning
- 1985 He developed the theory of usuality and commonsense reasoning
- 1986 He developed test-score semantics
- 1088 He developed dispositional logic
- 1991 He initiated calculi of fuzzy rules, fuzzy graphs, and fuzzy probabilities; developed soft computing
- 1996 He developed the method of computing with words
- 1997 He developed the theory of fuzzy information granulation
- 2002. "From computing with numbers to computing with words — from manipulation of measurements to manipulation of perceptions". *International Journal of Applied Math and Computer Science*, pp. 307–324, vol. 12, no. 3, 2002.
- 2012. Computing With Words. Principal Concepts and Ideas. Berlin: Springer, 2012.
- 2011. "A Note on Z-numbers, "Information Sciences, 181:14, 2923-2932 (also patented)

A complete list of publications is on the website: http://www.cs.berkeley.edu/~zadeh/

33.5 Honors and Awards

- IEEE Education Medal; 1973
- IEEE Richard W. Hamming Medal, for "seminal contributions to information science and systems, including the conceptualization of fuzzy sets"; 1992
- American Society of Mechanical Engineers Rufus Oldenburger Medal; 1993.
- Honorary Professorship from the Azerbaijan State Oil Academy; 1993
- IEEE Medal of Honor, for "pioneering development of fuzzy logic and its many diverse applications"; 1995

- American Automatic Control Council's Richard E. Bellman Control Heritage Award; 1998.
- ACM Allen Newell Award; 2001
- Outstanding Contribution Award, Web Intelligence Consortium (WIC), Halifax, Canada, 2003.
- Wall of Fame, Heinz Nixdorf Museums Forum (HNF), Paderborn, Germany, 2004.
- V. Kaufmann Prize and Gold Medal, International Association for Fuzzy-Set Management and Economy (SIGEF), Barcelona, Spain, Nov. 15, 2004.
- J. Keith Brimacombe IPMM Award in recognition of his development of fuzzy set theory and fuzzy logic, 2005.
- Benjamin Franklin Medal in Electrical Engineering from The Franklin Institute in Philadelphia, for inventing and developing the field of "fuzzy logic"; 2009
- Induction into the IEEE Intelligent Systems' AI's Hall of Fame, 2011, "for his work on soft computing, fuzzy logic, and neural-net theory".
- BBVA Foundation Frontiers of Knowledge Award in the category of Information and Communication Technologies (ICT), Spain, 2012.
- Honorary Doctor Degrees from over 30 nations in all continents.
- Medal of Honor, World Automation Congress, "For lasting contributions in soft computing," Puerto Rico, 2016.

33.6 Personal Life

Lotfi Zadeh was a great deep thinker with lasting contributions for years and decades to come. From personal viewpoint and family issues, he did not spend as much time with them as he probably should have. No one paid more a price to this than his beloved wife Fay Zadeh. Figure 33.1 shows photos of Lotfi with his family.

His charming, sacrificing and patient wife Fay was one of keys to his success. In 1998, she wrote a book, entitled, "*My Life and Travels with the Father of Fuzzy Logic*", TSI Press, Albuquerque, NM, which was translated into Russian and Azari in Baku. In that book, she expressed all the wonderful and some not so wonderful events during her time with Lotfi. They were married for 71 years. Figure 33.1 shows the Zadeh family portrait. In Figure 33.2 the cover and autographed title page by Fay Zadeh's book.

Figure 33.3 shows the cover of first book on MIQ (Machine Intelligence Quotient) with the author of this book as one of his co-authors [4].

Final comment: The 1965 seminal paper on *fuzzy sets* has all-time record citations since they were tracked – near 74,000 citations (see Figure 33.4, Lotfi's citations as of July 7, 2019).

Figure 33.1. Lotfi Zadeh with his Wife Fay Zadeh, Their Daughter Stella and Son Norman Zedeh.

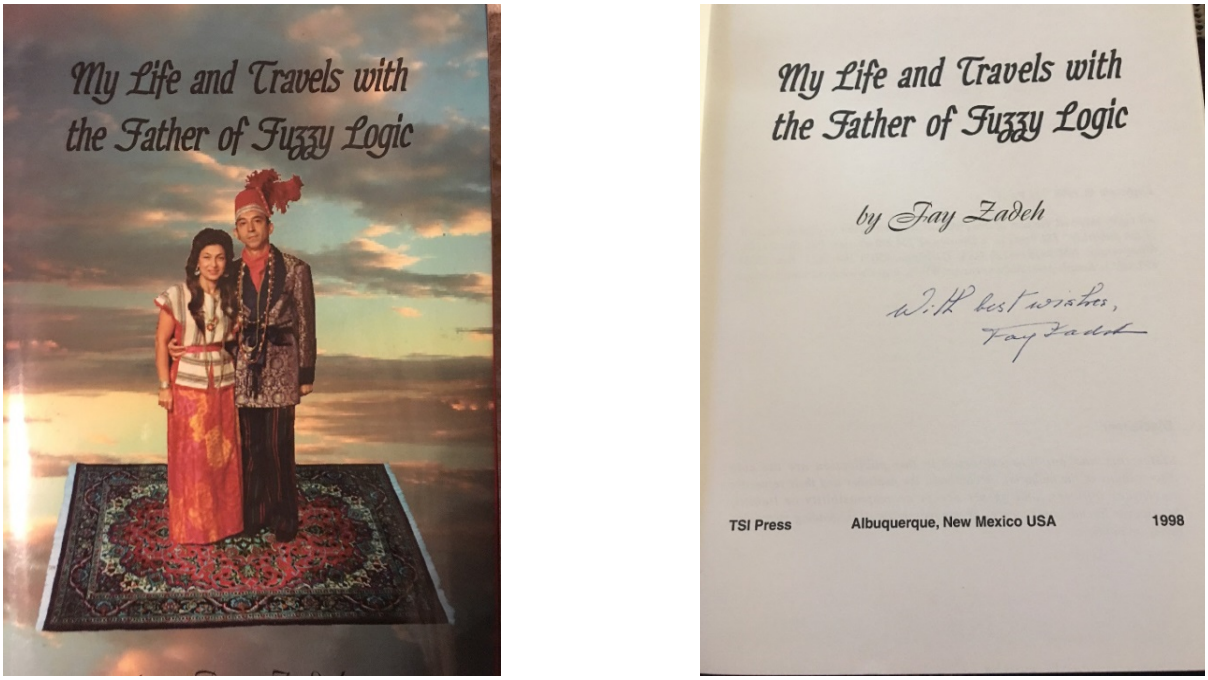


Figure 33.2. Cover of Fay Zadeh's Book and the Signed Copy of Her Book's Title Page to the Author.

References

[1] https://en.wikipedia.org/wiki/Lotfi_A._Zadeh

[2] https://www.google.com/search?source=hp&ei=Ew9NWqKpAYHAjwS9hIq4DQ&q=biography+of+lotfi+zadeh&oq=biography+of+lotfi+zadeh&gs_l=psy-ab.12..33i160k1.2684.203669.0.206638.26.21.0.4.4.0.258.2268.4j11j2.18.0....0...1c.1.64.psy-ab..4.21.2303.0..0j0i131k1j0i22i30k1j33i22i29i30k1.88.D2VSBBHF-sI

[3] F. Zadeh, "*My Life and Travels with the Father of Fuzzy Logic*," TSI Press, Albuquerque, NM 1998.

[4] M. Jamshidi, A. Title, L. A. Zadeh, and S. Boverie, "*Applications of Fuzzy Logic – Towards High Machine Intelligence Quotient*, Saddle River, NJ, Prentice Hall, 1997.

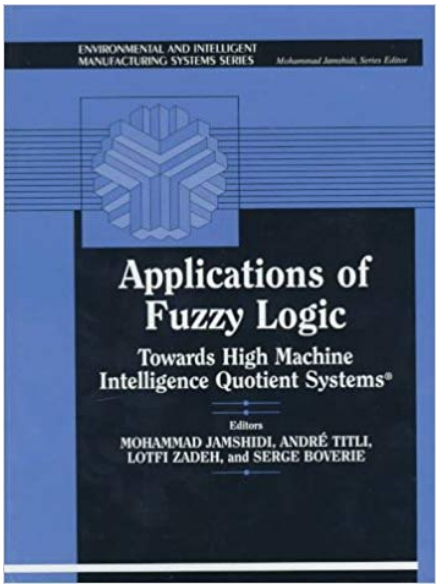


Figure 33.3. Cover of Lotfi Zadeh's Book and Author on MIQ and a 2014 Photo in Zadeh's Home with the Author.

Fuzzy sets (1965 paper) 114,124 citations

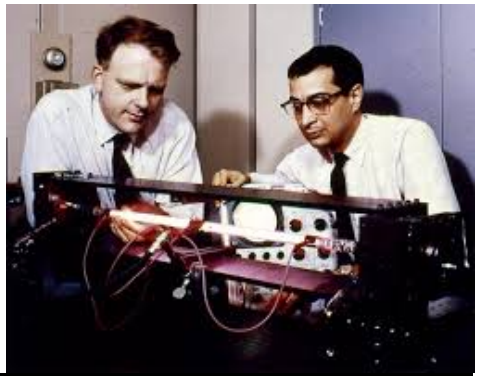
L. A. Zadeh

Information and control 8 (3), 338-353

	All	**Since 2015**
Citations	246843	80040
h-index	113	68
i10-index	385	191

Figure 33.4. Lotfi Zadeh's 1965 "Fuzzy Sets" Paper and Overall Citations as of July 7, 2020.

CHAPTER 34 Javan (Physicist and Co-Inventor of HeNe Laser)



34.1 Introduction

In this chapter, the life story and scientific contributions of another Persian genius scientist of the 20th and 21st Centuries, who was a physicist, photonic expert and co-inventor of the HeNe Gas Laser, Ali Javan. He was an Iranian physicist and inventor at MIT (Massachusetts Institute of Technology). His main contributions to science have been in the fields of quantum physics and spectroscopy. He co-invented the gas laser in 1960, with William R. Bennett. In 2007, Javan ranked Number 12 on The Daily Telegraph's list of the "Top 100 Living Geniuses" [1].

34.2 Facts on Javan [2]

Javan	Ali Javan, Co-Inventor of He-Ne Laser
Born	December 26, 1926
Place of Birth	Tehran, Iran
Nationality	Azari, Persian, American
Death	September 12, 2016
Place of Death	Los Angeles, CA, USA
Family	Wife: Marjorie, and two daughters, Lila and Maia.
Interest	Art, Music (Especially Mozart), Museum, the outdoors, fine food, and more
Genius	He was number 12 on *the Daily Telegraphs* Newspaper, 100 living Geniuses of 20th Century

34.3 Biographical Sketch [2,3]

Ali Javan was born in Tehran, Iran to Azari parents from Tabriz. He started his schooling at a Zoroastrian conducted school. He graduated from the Alborz High School, and started his university studies at the School of Science at the University of Tehran for a year. During a health-related visit to New York in 1948, he attended some graduate courses at Columbia University and decided to stay in the USA. He received his Ph.D. in 1954 under his thesis advisor Charles Townes (later on a Nobel Laureate in Physics) without having received a

bachelor's or master's degree. In 1955, Javan held a position as a Post-Doctoral in the Radiation Laboratory and worked with Townes on the atomic clock research, and used the microwave atom beam spectrometer to study the hyperfine structure of atoms like copper and thallium.

In 1957, he published a paper on the theory of a three-level maser, and his discovery of the stimulated Raman Effect that a Stokes-shifted Raman transition can produce amplification without requiring a population inversion. The effect was the precursor of a class of effects known as Lasers without Inversion, or the LWI effect. He joined Bell Telephone Laboratories in 1958 shortly after he conceived the working principle of his gas discharge Helium Neon laser, and subsequently submitted his paper for publication, which was reviewed by Samuel Goudsmit in 1960.

At MIT in the early 1960s, Ali Javan started a research project aimed at extending microwave frequency-measuring techniques into the infrared. He introduced the concept of an optical antenna of several wavelengths long, which enables the near-complete confinement of an incident optical field coupled to it and forming the antenna in nanoscale. For the first time an antenna was used to receive light and to transmit it to an infinitesimal receiving structure at its tip, observable only with an electron microscope. The antenna responded to the infrared laser light and generated current vibrating at the frequencies of the incident beams. It would send electrons streaming into the oxide layer, which offers resistance, converting the AC signals to DC and enerating a beat that can be observed electronically. Using this method Javan developed the first absolutely accurate measurement of the speed of light.

Javan carried out the first demonstration of the optical heterodyne beats with lasers in 1961. Another major experiment was his observation of the detuning dip called the Lamb dip while scanning the frequency of a single-mode laser across the Doppler-broadened gain profile. In 1964 Javan and Townes devised experiments using lasers to test special relativity including a variant of the Michelson-Morley ether drift experiment to study the anisotropy of space.

In 1966, Ali Javan and Theodore Maiman split a cash award presented to them by President Lyndon B. Johnson honoring their work. In 1971, he became the director of the Symposium on Laser Physics, which was held on the campus of University of Isfahan (Iran).

Javan first worked at the Massachusetts Institute of Technology as an associate professor of physics in 1961 and has remained Francis Wright Davis Professor Emeritus of physics since 1964. He continued researching into the area of "optical electronics", which envisions scaling electronic elements in such a way that they would be capable of handling frequencies as high as visible optical radiation frequencies.

Javan died on September 12, 2016 (in Los Angeles). He is survived by his wife, Marjorie, and by their two daughters, Lila and Maia.

Ali Javan was number 12 on *the Daily Telegraphs* Newspaper, 100 living Geniuses of the 20th Century in the company of such notables like Nelson Mandela, Stephen Hawking, Steven Spielberg, Bill Gates, Richard Bronson, Steven Wozniak, and George Lucas [4].

Honors

- Member of Sigma Xi
- National Academy of Sciences Fellow

- American Academy of Arts and Sciences Fellow
- 1962 - Stuart Ballantine Medal of the Franklin Institute for "*conception and development of the first continuous optical laser which utilized Neon and Helium*"
- 1966 - Fanny and John Hertz Foundation Medal
- 1966 - Guggenheim Foundation Fellowship
- 1975 - Frederic Ives Medal of the Optical Society of America
- 1979 - Humboldt Foundation Fellowship
- 1983 - Founding Fellow of The World Academy of Science (TWAS)
- 1993 - Albert Einstein World Award of Science of the World Cultural Council
- 2006 - Inducted into the National Inventors Hall of Fame
- 2011 - SPIE Fellow
- 2012 - First member of Eurasian Academy

34.4 Contributions and Achievements

Javan has made lasting contributions to and spectroscopy. He has had numerous seminal publications:

1. Javan, Ali. *"MIT Dissertation and Thesis Advisees". MIT. Retrieved 30 October 2017.*
2. Javan, A. *Theory of a 3-Level Maser*, Physical Review, 1957
3. Javan, A. *Transitions a Plusieurs Quanta Et Amplification Maser Dans Les Systemes a Deux Niveaux, Journal De Physique Et Le Radium, 1958*
4. Javan, Herriott and Bennett, *Population Inversion and Continuous Optical Maser Oscillation in a Gas Discharge Containing a He-Ne Mixture*, *Physical Review Letters*, 1961
5. Javan, Ali. "Measurement of the Frequency of Light". *Annals of the New York Academy of Sciences* (February 1969)
6. Javan, Ballik, *Frequency Characteristics of a Continuous-Wave He-Ne Optical Maser*, Journal of the Optical Society of America (1962)
7. Jaseja, Javan, Murray, Townes, *Test of Special Relativity or of Isotropy of Space by Use of Infrared Masers*, *Physical Review a-General Physics* (1964)
8. *http://www.laserfocusworld.com/articles/2016/09/photonics-community-loses-hene-pioneer-ali-javan.html*

Figure 34.1 shows Bell Laboratories researchers and former Nobel Laureate Townes student Ali Javan with Laboratory peers, which invented a continuously operating Helium-Neon (HeNe) Gas Laser [5].

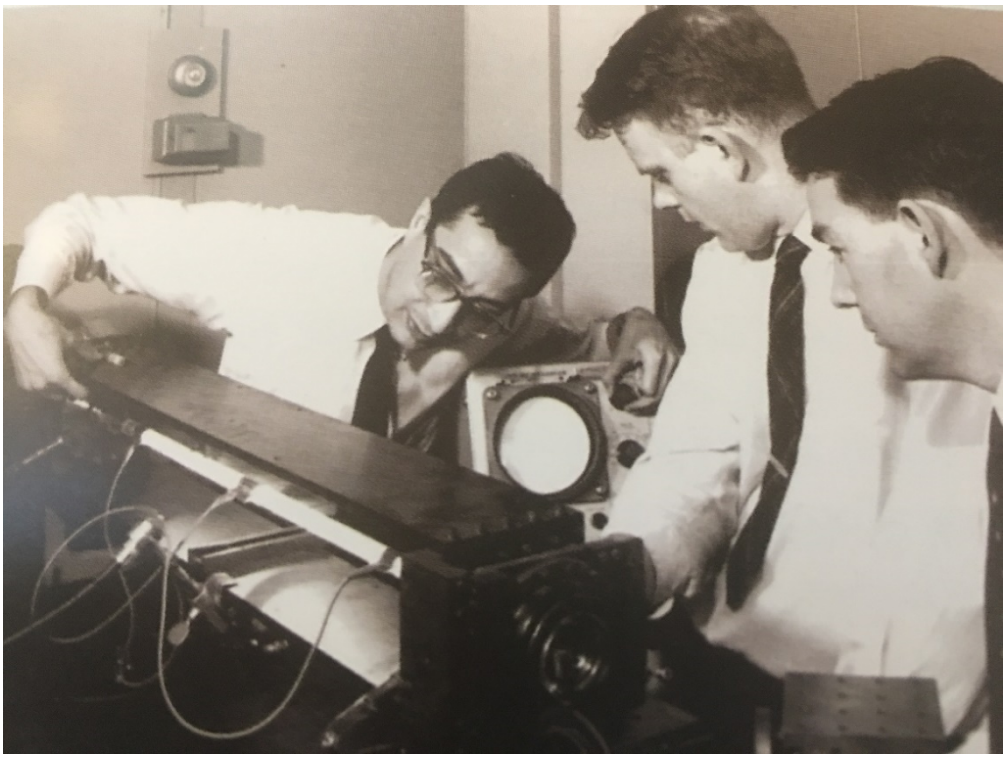


Figure 34.1 Ali Javan's Invention of the HeNe Gas Laser at Bell Laboratories on Monday December 12, 1960 at 4:20 PM during a Snowstorm in Murray Hills, NJ.

Figure 34.2 shows Javan at the occasion of the 50th birthday of the HeNe Laser, with a group of his peers at the inauguration of Willis E. Lamb Award for Laser Science and Quantum Optics.

Figure 34.2. Prof. Javan, his Daughter (Maia), and Guests at a Dinner Party in Honor of Ali Javan on the Occasion of the 50th birthday of the HeNe Laser (1st Lased at Bell Telephone Laboratory on December 12, 1960) at the Sheraton Commander Hotel, Cambridge MA on December 12th, 2010.

Figure 34.3 shows a group photo during the Inauguration of the Willis E. Lamb Award for Laser Science and Quantum Optics in 1998.

Figure 34.3. Inauguration of the Willis E. Lamb Award for Laser Science and Quantum Optics in 1998. (Left to Right: Ali Javan, Paul Mandel, Marlan Scully, Willis Lamb, and Olga Kocharovskaya).

Figure 34.4 shows Javan at the LaserFest Kick-off Program at the National Museum of American History in Washington DC on February 12th, 2010.

Figure 34.4. Prof. Javan at the LaserFest Kick-off Program at the National Museum of American History in Washington DC on February 12th, 2010 (From the left: Erich Ippen, Kumar Patel, Tingye Li, Ali Javan, 12th United States Secretary of Energy and Nobel Laureate Steven Chu, James Gordon and John Hall).

Poem by Physicist Marlan Scully (an accomplished laser physicist at Texas A&M University) for Ali Javan.

ODE TO ALI FOREVER JAVAN:

To the East we owe so much
Algebra, art, alfalfa, and such

And to that list we surely must add
This Columbia walk-in, a brilliant young lad

Appearing one day, clear French he did speak
So Prof. Townes they sent him to seek

It was a time when giants walked the earth
And Columbia oh Columbia to Javan gave birth

'Twas there the maser Townes did push
Ignoring the jibing of Rabi and Kush

And out of that caldron comes our young Persian
Of molecules and masers - Total Immersion

Well did he master the theory of masers
Knew how to handle quantum state phasors

Early foresaw masers without inversion
But on to gas lasers, no time for diversion

The way was rocky- road not clear
But bravely he struggled encouraged by Kastler

Eureka said he "Neon's a good sign"
Just mix it with helium and let the light shine

Thus causing the atoms with Rabi to flip
And thanks to Herr Doppler, a pretty Lamb Dip

In Doppler's profile many holes he did burn
Gleaning new physics- and much he did learn

There's fat holes and thin holes, herald Feld and Javan
To spectra and lasers a new era did dawn

From Bio-science to Astronomy
A shiny new toy is the "HeeNee"

Of medals and kudos he got the works
From Ballentine and Ives to his Fanny Hertz

So the clan has gathered-Texas, Japan and the USA
To just admire you Ali, on this fun day

From all of us Ali,
Thanks for being you
Marlan Scully 12/12/2010
Professor Emeritus, Texas A&M University

References

[1] https://www.google.com/search?source=hp&ei=hdckWsWMGoe9jwT2qID4BA&q=biography+of+Ali+Javan&oq=biography+of+Ali+Javan&gs_l=psy-ab.12..33i22i29i30k1.1382.14515.0.16819.25.20.1.3.3.0.127.1852.16j4.20.0....0...1c.1.64.psy-ab..1.24.1905.0..0j0i131k1j0i10k1j0i22i30k1j0i22i10i30k1.0.OMYtAbeA0Lg

[2] https://en.wikipedia.org/wiki/Ali_Javan

[3] http://alijavan.mit.edu/WPP61Bio.htm

[4] http://www.telegraph.co.uk/news/uknews/1567544/Top-100-living-geniuses.html

[5] G. Constable and R. Somerville, *A Century of Innovations*, Joseph Henry Press, Washington, DC, 2003.

CHAPTER 35 Mirzakhani (Mathematician, Fields Medalist)

35.1 Introduction

In this chapter, the life story and scientific contributions of another Persian genius scientist of the 20th and 21st Centuries, who was a mathematician and who provided several contributions to the theory of moduli spaces of Riemann (1826-1866) surfaces [1].

35.2 Facts on Mirzakhani [2]

Mirzakhani	Maryam Mirzakhani
Born	May 3, 1977
Place of Birth	Tehran, Iran
Nationality	Persian (Iran)
Death	July 14, 2017
Place of Death	Stanford. CA. USA
Family	Husband, Jan Vondrák, and their daughter, Anahita

35.3 Biographical Sketch [2]

Mirzakhani was born on 3 May 1977 in Tehran, Iran. Her father Ahmad was an electrical engineer. She attended the Farzanegan School in Tehran, which was part of the National Organization for Development of Exceptional Talents (NODET). In 1994, Mirzakhani achieved the gold medal level in the International Mathematical Olympiad, the first female Iranian student to do so. In the 1995 International Mathematical Olympiad, she became the first Iranian student to achieve a perfect score and to win two gold medals.

She obtained her BS in mathematics in 1999 from the Sharif University of Technology. She then went to the United States for graduate work, earning her Ph.D. in 2004 from Harvard University, where she worked under the supervision of the Fields Medalist, Professor Curtis T. McMullen of Harvard University. At Harvard she is said to have been "distinguished by determination and relentless questioning", despite not being a native English-speaker. She used to take her class notes in Persian.

Honors

- Gold medal. International Mathematical Olympiad (Hong Kong 1994)
- Gold medal. International Mathematical Olympiad (Canada 1995)

- IPM Fellowship, Tehran, Iran, 1995–1999
- Merit fellowship Harvard University, 2003
- Harvard Junior Fellowship Harvard University, 2003
- Clay Mathematics Institute Research Fellow 2004
- AMS Blumenthal Award 2009
- Invited to talk at the International Congress of Mathematicians in 2010, on the topic of "Topology and Dynamical Systems & ODE"
- The 2013 AMS Ruth Lyttle Satter Prize in Mathematics. "Presented every two years by the American Mathematical Society, the Satter Prize recognizes an outstanding contribution to mathematics research by a woman in the preceding six years. The prize was awarded on 10 January 2013, at the Joint Mathematics Meetings in San Diego"
- Simons Investigator Award 2013
- Named one of *Nature* magazine's ten "people who mattered" of 2014
- Clay Research Award 2014[
- Plenary speaker at the International Congress of Mathematicians (ICM 2014)
- Fields Medal 2014 (AKA Nobel Prize for Mathematics)
- Elected foreign associate to the French Academy of Sciences in 2015

35.4 Contributions and Achievements

Mirzakhani made several contributions to the theory of moduli spaces of Riemann (1826-1866) surfaces. In her early work, Mirzakhani discovered a formula expressing the volume of the moduli space of surfaces of type (g, n) with given boundary lengths as a polynomial in those lengths [2, 3]. She solved the proposed Riemann's problems 150+ after they were proposed. Figure 35.1 shows the geometrical shapes where her work has solved their volumes calculation and a photo of Riemann.

Final Comment – Inopportune Passing

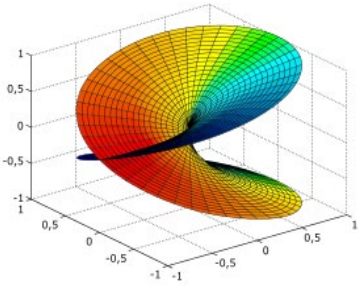
In 2013, Mirzakhani was diagnosed with breast cancer. In 2016, the cancer spread to her bones and liver, and she died on 14 July 2017 at the age of 40 at Stanford Hospital in Stanford, California. She achieved in eighteen years (1999-2017) more in mathematics than a typical scientist did in a lifetime.

References

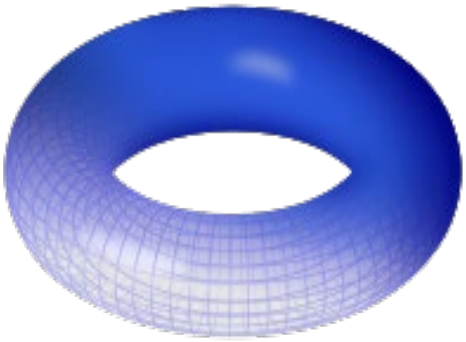
[1] https://en.wikipedia.org/wiki/Riemannian_geometry

[2] http://www-history.mcs.st-andrews.ac.uk/Biographies/Mirzakhani.html

[3] https://en.wikipedia.org/wiki/Maryam_Mirzakhani



Riemann Surface

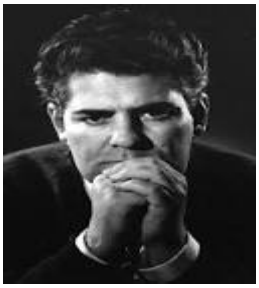
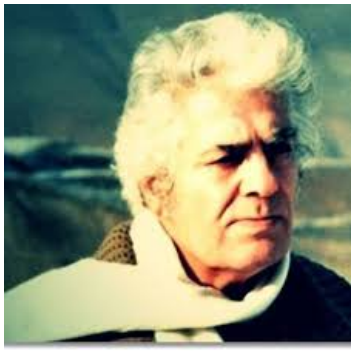
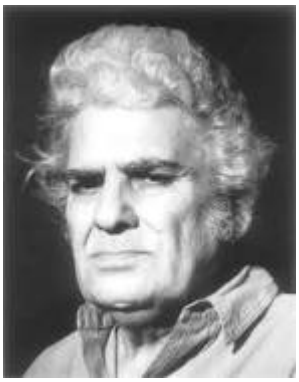
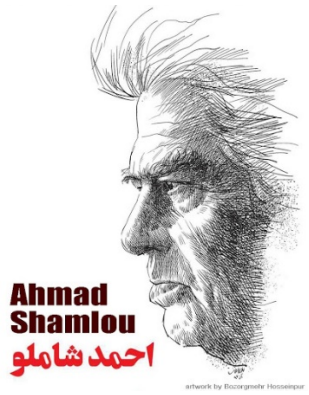


Torus

Bernhard Riemann

Figure 35.1 Shows the Geometrical Shapes where Mirzakhani's Work Solved their Volumes Calculation and a Photo of Riemann.

Chapter 36 Shamlou (Poet, Writer, Journalist)

36.1 Introduction

This chapter describes the life and contribution of Shamlou who was a legendary poet of the current era during the 20th and 21st Centuries in Iran.

36.2 Facts on Shamlou [1]

Shamlou	Ahmad Shamlou
Born	December 12, 1925
Place of Birth	Tehran, Iran
Nationality	Iranian
Death	July 23, 2000
Place of Death	Dehkadeh-ye Taleqani, Iran
Buried	Emamzadeh Taher, Karaj, Iran

36.3 Biographical Sketch

"Ahmad Shamlou, also known under his pen name A. Bamdad, was born to Haydar Shamlou and Kowkab Araqi, an army family, on December 12, 1925, in Tehran, Iran. Ahmad was the second child and the only son in a family of six children. In the manner of many children who grow up in families with military parents, he received his early education in various towns, including Khash and Zahedan in southeast Iran, and Mashhad in the northeast, and Rasht in the north. Shamlou's childhood and adolescent were neither privileged nor easy and home was not an environment that could foster his sensitivities and he often found solace in solitude. Moving with his family from one town to the next proved a hurdle to Shamlou's education. By 1941, his high school education still incomplete, he left Birjand (in the northeast Province of Khorasan) for Tehran. He intended to attend the German-established Tehran Technical School (now known as Amir Kabir Technical University), one of the best secondary schools of that period and learn

> the German language. He was admitted to this school on the condition that he be demoted two years. Soon in 1942, he and the rest of the family once again left Tehran to move for Gorgan (on the eastern coast of the Caspian Sea). In 1945, he made a final attempt at completing his high school degree in Urumieh, but he failed" [1].

He was an Iranian poet, writer, and journalist. Shamlou was arguably the most influential poet of modern Iran. His initial poetry was influenced by and in the tradition of Nima Youshij. He was considered as one of the pioneers of modern Persian poetry and has had the greatest influence, after Nima Youshij, on Iranian poets of his era. Shamlou's poetry is complex, yet his imagery, which contributes significantly to the intensity of his poems, is accessible. As the base, he uses the traditional imagery familiar to his Iranian audience through the works of Persian masters like Hafiz (Chapter 25) and Omar Khayyám (Chapter 15). For infrastructure and impact, he uses a kind of everyday imagery in which personified oxymoronic elements are spiked with an unreal combination of the abstract and the concrete thus far unprecedented in Persian poetry, which distressed some of the admirers of more traditional poetry.

Shamlou has translated extensively from French to Persian and his own works are translated into a number of languages. He has also written a number of plays, edited the works of major classical Persian poets, especially Hafiz. His thirteen-volume Ketab-e Koucheh (The Book of Alley) is a major contribution in understanding the Iranian folklore beliefs and language. He also wrote fiction and screenplays, contributing to children's literature, and journalism.

36.4 Contributions by Years (In Brief)

1957

He rose to fame from his next volume of poetry, 'Fresh Air', published in 1957. Zia Movahed, poet and philosopher commented: "Anyone who reads Fresh Air today can see that this language, this texture, is different from anything else [1].

1960's

In 1960, a new collection of his poems, 'The Garden of Mirrors', was released. In 1961, he became editor-in-chief of the Ketab-e-Hafte, a magazine that changes the tradition and language of literary journalism in Iran. In 1962 his translations of 'André Gide' and 'Robert Merle' were published. Two collections of poetry were published in 1964: 'Ayda in the Mirror' and 'Moment and Eternity'. In 1967, he became editor-in-chief of the Khusheh. His new translation of 'Erskine Caldwell' was published, and he participated in the formation of the Union of Iranian Writers and gave several poetry readings at Iranian universities. In 1968, he began his study of Hafiz, the classical grand poet of the Persian language; translated García Lorca's poems and Song of Solomon from the Old Testament; organized a week of poetry reading for established and new Iranian poets, which was very well received [1].

1970's

In 1970, 'Blossoming in the Mist' was published. He also directed a few documentary films for television and published several short stories for children. In 1971, he redid some of his earlier translations. In 1972, he taught Persian literature at Tehran University. Several audio cassettes were released of Shamlou reciting other classical and modern poets' work. He obtained

membership in the Iranian Academy of Language. He published several new translations and wrote a few film scripts. In 1973, two new collections, 'Abraham in Fire and the Doors' and the 'Great China Wall', were released, along with several new translations. "The Song of Abraham in Fire" in the collection, 'Abraham in Fire' is one of the most well-crafted and famous contemporary Persian poems written by Ahmad Shamlou. Shamlou connects his poem to the collective consciousness of the whole world, presenting characters of the hero and even the social scapegoat rather in a curious way as we read about the case of a man who sacrifices himself for land and love and, yet, who is betrayed by others due to their ignorance and biases. In 1975, he published his work and study of Hafiz (Chapter 25). In 1976, he travelled to the United States and gave poetry readings in many cities. He participated in the San Francisco Poetry Festival before returning to Iran. In 1977, he published his new poem, 'Dagger on the Plate'. He left Iran in protest of the Shah's regime and stayed in the United States for a year, giving lectures at American universities.

In 1978, he left the United States for Britain to act as the editor-in-chief for a new publication called Iranshahr; he resigned after 12 issues and returned to Iran just after the advent of the revolution. He rejoined the Union of Iranian Writers and began publishing a new periodical, Ketab-e Jom'e to great success. 1978 was a highly active year in his life, and he published many poems and translations, as well as giving numerous lectures and readings. He was also elected to the membership of the Writer's Union's leadership. Year 1979 was also a year of intense activity. The first and second volumes of 'The Book of Alley' went to print. He was also re-elected as member of the Writer's Union's leadership [1].

1980's and 1990's

> "Starting in 1980, owing to the harsh political situation in his country, he led a rather secluded life that would last for the next eight years, working with Ayda on 'The Book Of Alley', as well as many other literary endeavors, including a translation of 'And Quiet Flows The Don' by Mikhail Sholokhov. In 1984 he was nominated for the Nobel Prize in Literature. In 1988 he was invited by Interlit, the World Literary Congress. He toured Europe giving many lectures and readings. His complete collection of poems was printed in Germany, and he returned to Iran. In 1990 he toured the United States. The Human Rights and The Fund For Free Expression presented him with their annual award. Several works were published on his poetry and his overall literary contribution. In 1991 he toured Europe again and returned to Iran for another four years of intensive work. That same year, he won the Freedom of Expression Award given by the New York–based Human Rights Watch. in 1992, his work 'Sacred Words' appeared in Armenian and English. In 1995, he finished the translation of 'And Quiet Flows The Don'. There was a special gathering in Toronto of Iranian writers and critics to discuss Shamlou's contribution to Persian poetry. His 'Aurora!' was also published in Spanish" [1].

Awards

Shamlou received the following awards:

- Forooghe Farrokhzad Prize, 1973,
- Freedom of Expression Award given by Human Rights Watch, 1990,

- Stig Dagerman Prize, 1999, and
- Free Word Award given by the Poets of All Nations in Netherlands, 2000 [1].

36.4 Death

> "Suffering from several illnesses at the same time, Shamlou's physical condition deteriorated in 1996. He underwent several operations and in 1997 his right foot was amputated due to severe diabetic problems. He died on Sunday, July 23, 2000 at his home in Dehkadeh-ye Taleqani, Iran, close to Karaj, Iran due to complications from his diabetes. On July 27, thousands took part in Ahmad Shamlou's funeral. He was buried in Emamzadeh Taher, Karaj" [1].

Among numerous poetic works he left behind, Figure 36.1 shows one such segment.

9 poems by Ahmad Shamlou (1925-2000)
Translated by Niloufar Talebi © 2015
Winner of the 2015 National Endowment for the Arts Translation Fellowship
published on the occasion of Shamlou's 90th birthday
December 12, 2015

Nocturnal

If it's beautiful in vain, night
then why is it beautiful,
night
for whom is it beautiful?—

Night
and its uncurved river of stars
that passes coldly.

And which memory
do long-haired mourners
on both banks of the river
grieve
with the breathtaking ode of toads
when each dawn
is pierced
with a chorus
of twelve shots?

If it's beautiful in vain, night
then for whom is it beautiful, night
why is it beautiful, night?

(From *Abraham in Flames*, 1971)
Niloufar Talebi © 2015

شبانه

اگر که بیهده زیباست شب
برای چه زیباست
شب
برای که زیباست؟—

شب و
رود بی انحنای ستارگان
که سرد می گذرد.

و سوگواران درازگیسو
بر دو جانب رود
یادآورد کدام خاطره را
با قصیده ی نفس گیر غوکان
تعزیتی می کنند
به هنگامی که هر سپیده
به صدای هم آواز دوازده گلوله
سوراخ
می شود؟

اگر که بیهده زیباست شب
برای که زیباست شب
برای چه زیباست؟

ابراهیم در آتش ۱۳۵۰

Ahmad Shamlou English translations by **Niloufar Talebi © 2015**

Figure 36.1. A Segment of Vast Poems of Shamlou, Translated by Niloufar Talebi [2].

References

[1] https://en.wikipedia.org/wiki/Ahmad_Shamlou

[2] https://www.poemsearcher.com/topic/shamlou#&gid=1&pid=4

CHAPTER 37 Nasr (Metaphysicist, Islamic Philosopher)

37.1 Introduction

In this chapter, the brief life story and literary contributions of Hussein Nasr, a contemporary philosopher during the 20th and 21st Centuries in Iran are given.

37.2 Facts on Nasr [1]

AKA	Hussein Nasr, Seyyed Hossein Nasr
Born	April 7, 1933
Place of Birth	Tehran, Iran
Nationality	Iranian
Expertise and speeches	Philosophy, religion, spirituality, music, art, architecture, science, literature, civilizational dialogues, and the natural environment
Alumni	Massachusetts Institute of Technology, Harvard University

37.3 Biographical Sketch

"Nasr was born in 1933 in south-central Tehran to Seyyed Valiallah, who was a physician to the Persian royal family, and one of the founders of modern education in Iran. He wrote many essays, which remain in manuscript form, some of which have been assembled by Nasr into a book called the '*Danish wa Akhlaq'* (''Knowledge and Ethics''). His parents were originally from Kashan. He is the father of American academic Vali Nasr (an Iranian-American academic and author specializing in the Middle East and the Islamic world. He served as Dean of the Johns Hopkins School of Advanced International Studies). His educational life is very outstanding. He went to Firuz Bahram High School in Tehran before being sent to the United States for education at thirteen. In the US, Nasr first attended the Peddie School in Hightstown, New Jersey, graduating in 1950 as the valedictorian of his class and also winner of the Wyclifte Award. A scholarship offered by MIT in physics made him the first Iranian undergraduate to attend that university. There, he also began studying under Giorgio de Santillana and others in various other branches such as metaphysics and philosophy. During his studies there he

became acquainted with the works of the Traditionalist authority Frithj of Schuon. This school of thought has shaped Nasr's life and thinking ever since. Nasr had been a disciple of Frithj of Schuon for over fifty years and his works are based on the doctrine and the viewpoints of the perennial philosophy. After receiving an MIT SB degree in physics in 1954, Nasr obtained a master's degree in geology and geophysics in 1956, and went on to pursue his Ph.D. degree in the history of science and learning at Harvard University. He planned to write his dissertation under the supervision of George Sarton, but Sarton died before he could begin his dissertation work and so he wrote his dissertation under the direction of I. Bernard Cohen, Hamilton Gibb, and Harry Wolfson. At the age of twenty-five, Nasr graduated with a Ph.D. from Harvard and completed his first book, '*Science and Civilization in Islam'*. This book was a direct tribute to the *Science and Civilization in China*. Nasr was himself following for the Islamic civilization, "although he was working single-handedly, a twenty-five-year-old scholar, he had a whole group working with him at Cambridge". His doctoral dissertation entitled "Conceptions of the Nature in Islamic Thought" was published in 1964 by Harvard University Press as *An Introduction to Islamic Cosmological Doctrines*. Apart from mastering Arabic he was initially taught in his childhood, during his student years, Nasr also learned different languages, namely French (he could read Guénon and Schuon in the text), Greek, Latin, Italian, Spanish and German (mainly to work on Hegel for his Ph.D. thesis)" [1].

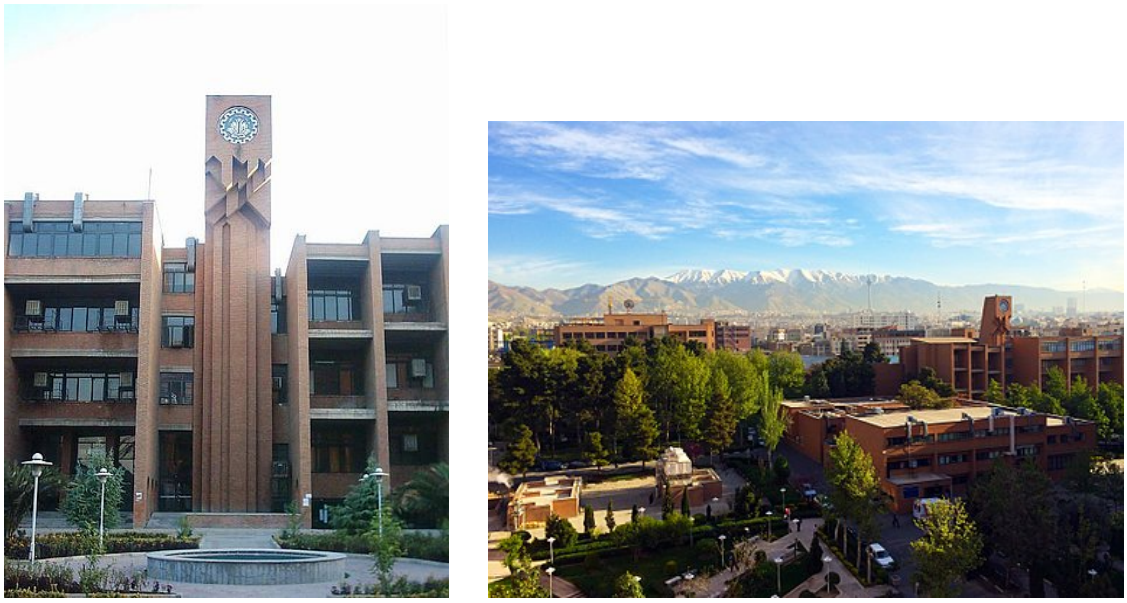


Figure 37.1 Two Views of the Sharif University of Technology [2].

37.4 Academic Career

Back to Iran

"Nasr began his teaching career in 1955 when he was still a young doctoral student at Harvard University. After Harvard, Nasr returned to Iran as a professor at the University of Tehran, and served as the President of Aryamehr University (now Sharif University of Technology, see Figure 37.1) from 1972 to 1975. Nasr was appointed as personal secretary to Farah Pahlavi, Empress of Iran, as Head of the Empress's Private Bureau. In

1974 she commissioned him to establish and lead the Imperial Iranian Academy of Philosophy (now the Institute for Research in Philosophy), the first academic institution to be conducted in accordance with the intellectual principles of the Traditionalist School. During that time, Nasr, Tabataba'i, William Chittick, Peter Lamborn Wilson, Kenneth Morgan, Sachiko Murata, Toshihiko Izutsu, and Henry Corbin held various philosophical discourses. The book *Shi'ite Islam* was one product of this period." [1]

Back to the West

"Upon his return to the west, Nasr took up positions at University of Edinburgh, Temple University, and since 1984 has been at The George Washington University where he is now an Emeritus University Professor of Islamic Studies. Nasr helped with the planning and expansion of Islamic and Iranian studies academic programs in several universities such as Princeton, the University of Utah, and the University of Southern California. He was an advisor for the award-winning, PBS-broadcast documentary *Muhammad: Legacy of a Prophet* (2002), produced by Unity Productions Foundation" [1].

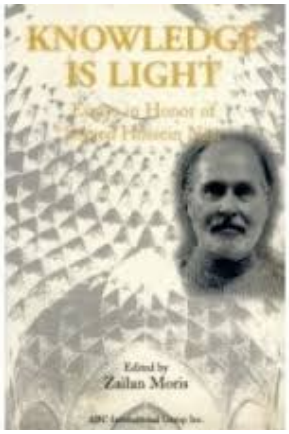
Awards and Honors

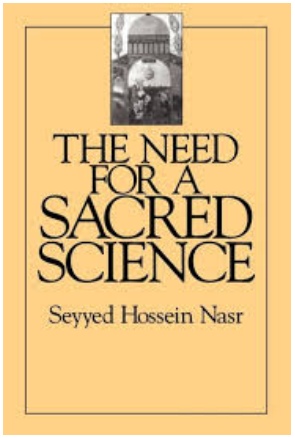
In the year 2000, a volume was devoted to him in the Library of Living Philosophers.

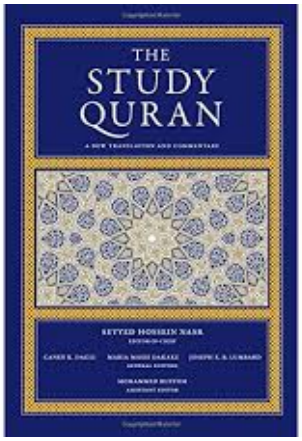
- Templeton Religion and Science Award (1999).
- First Muslim and first non-Western scholar to deliver the prestigious Gifford Lectures.
- Honorary Doctor from the Faculty of Theology of Uppsala University, Sweden (1977) [1].

Publications

Nasr has been a prolific author touching on key issues and topics in timely manner. Figure 37.2 shows 6 of his many books [3].







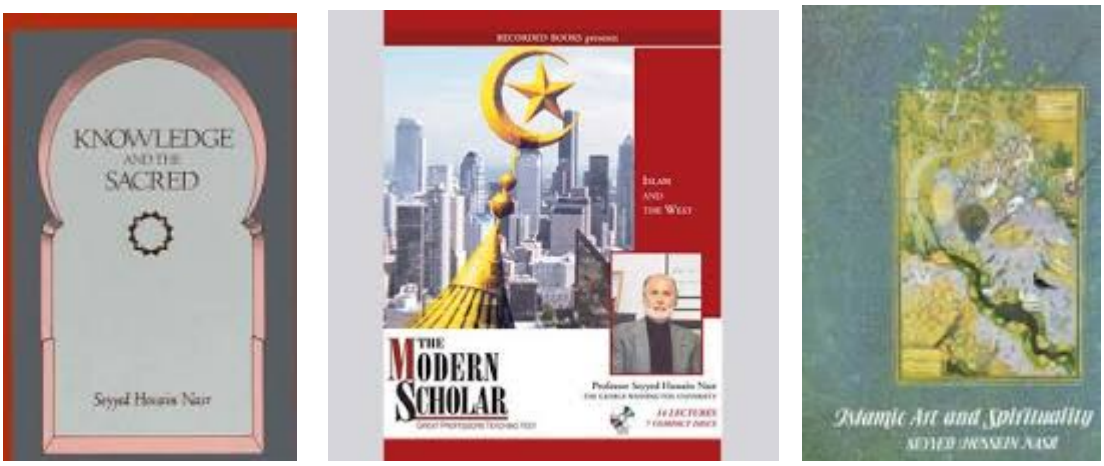


Figure 37.2. Six samples of books published by Nasr [1].

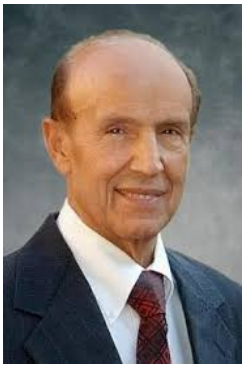
References

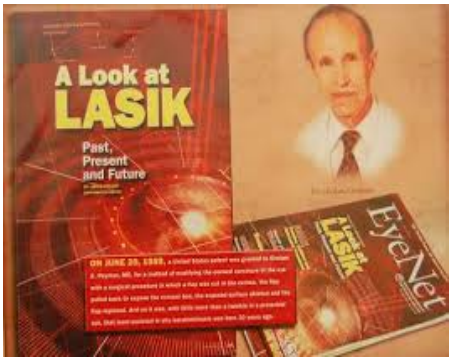
[1] https://en.wikipedia.org/wiki/Seyyed_Hossein_Nasr

[2] http://www.parstimes.com/history/dr_mojtahedi.html

[3] https://www.google.com/search?sxsrf=ALeKk013ZSTDJXtEiDfdck1f1OZ4ggyHKQ%3A1597878593436&source=hp&ei=QbE9X4qmF4SGtQWfsYegDw&q=books+by+Hossein+Nasr&oq=books+by+Hossein+Nasr&gs_lcp=CgZwc3ktYWIQDDIGCAAQFhAeOgoILhDqAhAnEJMCOgcIIxDqAhAnOgcILhDqAhAnOgQIIxAnOgsILhCxAxDHARCjAjoICC4QsQMQgwE6CAguEMcBEK8BOggIABCxAxCDAToICC4QxwEQowI6AggAOgUIABCxAzoFCC4QsQM6DgguELEDEIMBEMcBEKMCOgIILjoOCC4QsQMQxwEQowIQkwI6CAgAEBYQChAeULQ4WJF0YPiIAWgCcAB4AIABlwGIAa8QkgEEMTIuOZgBAKABAaoBB2d3cy13aXqwAQo&sclient=psy-ab&ved=0ahUKEwjKys_PsajrAhUEQ60KHZ_YAfQQ4dUDCAk

CHAPTER 38 Peyman (Ophthalmologist, Inventor of LASIK, Pioneer)





38.1 Introduction

In this chapter, the life and contribution of Peyman, an ophthalmologist who invented LASIK surgery a vision correction procedure designed to allow people to see clearly without glasses during 20th and 21st Centuries in USA.

38.2 Facts on Peyman [1]

Peyman	AKA: Gholam A. Peyman
Born	1937
Place of Birth	Shiraz, Iran
Nationality	Iranian, American
Known For	Inventor of LASIK Eye Surgery, LASIK stands for "Laser-Assisted In-Situ Keratomileusis"
Alumni	University of Freiburg, Germany
Patents	Over 200 US patents since 1989 [1]
Institutions	University of Essen (Germany), UCLA, University of Illinois at Chicago, Tulane University, Louisiana State University, University of Arizona

38.3 Biographical Sketch

"Peyman was born in Shiraz, Iran in 1937. At the age of 19 (1956), he moved to Germany to begin his medical studies. He received his MD at the University of Freiburg in 1962. He completed his internship at St. Johannes Hospital in Duisburg, Germany in 1964 and at Passaic General Hospital in Passaic, New Jersey in 1965. Peyman completed his residency in ophthalmology and a retina fellowship at the University of Essen, Essen Germany, in 1969 and an additional postdoctoral fellowship in retina at the Jules Stein Eye Institute, UCLA School of Medicine in Los Angeles in 1971. Peyman held the position of assistant professor of ophthalmology at the UCLA School of Medicine from 1971 and served as associate professor and then professor of ophthalmology and ocular oncology at the Illinois Eye and Ear Infirmary, University of Illinois at Chicago during

1971-1987. Peyman held a joint appointment at the School of Medicine also at the Neuroscience Center of Excellence at the Louisiana State University Medical University Medical Center in New Orleans during 1987-2000. During 1998-2000 Peyman held the Prince Abdul Aziz Bin Ahmed Bin Abdul Aziz Al Saud Chair in Retinal Diseases. During 2000-2006, Peyman served as professor of ophthalmology, ocular oncology and co-director, of the Vitreo-Retinal Service, Tulane University School of Medicine in New Orleans.

During 2006-2007 he was professor of ophthalmology at the University of Arizona, Tucson, with a cross appointment at the University of Arizona College of Optical Sciences. He has been an emeritus professor of ophthalmology at Tulane University since 2009.

Peyman is currently professor of basic medical sciences at the University of Arizona College of Medicine - Phoenix & Optical engineering at the University of Arizona in Tucson. Peyman was awarded in 2013, an honoree doctorate degree from the National University of Cordoba in Argentina" [1].

38.4 Invention of LASIK and its Improvements

"At the Illinois Eye and Ear Infirmary, Peyman, because of his interest in the effects of lasers on tissues in the eye, began evaluating the potential use of a CO2 laser to modify corneal refraction in rabbits. No prior study had existed on this concept. The laser was applied to the surface of the cornea using different patterns. This laser created significant scarring. His conclusions at that time were: 1) One has to wait for the development of an ablative laser and 2) one should not ablate the surface of the cornea but, instead, the ablation should take place under a flap in order to prevent scarring, pain and other undesirable sequelae. Peyman published the first article on this subject in 1980 [1].

In late 1982, he read an article from IBM Laboratories, published in *Laser Focus*, describing the photo-ablative properties of an excimer laser on organic material. This was very exciting information, but, unfortunately, Peyman did not have access to this laser, which at the time was new and very expensive. By 1985 and beyond, many investigators were interested in ablating the corneal surface. However, because of his previous experience with the CO2 laser, Peyman wanted to avoid surface ablation in order to prevent potential corneal scarring and the pain associated with the removal of the corneal epithelium, necessary to expose the surface of the cornea. Therefore, in July 1985, he applied for a patent that described a method of modifying corneal refractive errors using laser ablation under a corneal flap. This US patent was accepted after two revisions and issued in June 1989. Peyman performed several experimental studies evaluating the effect of various excimer lasers in collaboration with Physics Department of the University of Helsinki, Finland. Since he had purchased an Erb-Yag laser in the U.S., he evaluated the concept using this laser *in vivo* in rabbits and primate eyes and described the creation of a hinged corneal flap to enable the ablation to be performed on the exposed corneal bed, thus reducing the potential for postoperative scarring and pain.

Always aware of the potential limitations of his invention, Peyman devoted considerable time and effort in subsequent years to ameliorating them. To improve the risk/benefit considerations of the LASIK procedure, he invented in 2004 and patented a broad range of ablative and non-ablative inlays to be placed under the surgically created corneal flap (US Patent 6,702,807). These inlays offered many potential advantages over the standard

LASIK technique, the most significant of which is that the inlay procedure is reversible [1].

However, their ablation was not predictable. In October 2009 Peyman invented and applied for a patent on a method of preventing corneal implant rejection, which was approved in 2017 (US Patent 9,681,942). It consisted of forming a Lasik flap in the cornea, raising the flap, inserting a lamellar cornea under the flap to overlie the exposed stromal tissue. The inlay is ablated with wave front guided excimer laser, to correct the refractive errors of the eye. Then by applying, a cross-linking solution to the inlay and stromal tissue of the cornea, replacing the corneal flap and cross linking the inlay with UV radiation, killing the cellular elements in the inlay and its surrounding cornea, preventing cellular migration in the inlay and its rejection or encapsulation by the host corneal cells. This new procedure is now called the "Mesoick" (Meso means Inside, Implant, Crosslinking Keratomileusis (US Patent 9,037,033). This creates an immune privileged cell free space that does not initiate an immune response to an implant. A synthetic, cross-linked organic or polymeric lens can be implanted in the corneal pocket to compensate for the patient's refractive error. The implant can be exchanged, as the eye grows or refractive need dictates" [1].

38.5 Honors and awards [1]

Among other awards and honors, Peyman has received the

- *National Medal of Technology and Innovation (2012) and bestowed on him by former US President Barak Obama*
- *The Waring Medal of the Journal of Refractive Surgery (2008)*
- *The American Academy of Ophthalmology's Lifetime Achievement Award (2008)*
- *He was named a fellow of the National Academy of Inventors in 2013.*

"Throughout his career, Dr. Peyman was a superb teacher of medical students, residents, and fellows. He was a doctor's doctor. He was respected by his colleagues and treasured by his patients for his warm and caring manner. Dr. Peyman's academic work, innovations, research, and the professional training of over 200 fellows from all over the world, have directly and indirectly saved the sight of millions of people" [2].

"Peyman's inquiring mind, coupled with his keen interest in engineering and pharmacology along with his in-depth background and experience in ophthalmology resulted, in over a 40-year period, in a remarkable range of novel devices, improvements in surgical methods and revolutionary new treatment methods and modalities such as intraocular drug delivery, vitrectomy, resection of intraocular tumors and refractive surgery, etc. His scientific publications exceeds 850 peer reviewed publications and 10 books" [3].

Figure 38.2 shows Peyman with his eye examination station at his clinic.

Figure 38.1 Peyman at his Eye Examination Station [1].

References

[1] https://en.wikipedia.org/wiki/Gholam_A._Peyman

[2] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3306077/

[3] https://medicine.tulane.edu/departments/ophthalmology/faculty/gholam-peyman-md

Chapter 39 Farhadi (Film Director, Winner of 2 Academy Awards)

39.1 Introduction

In this chapter, the brief life and literary contributions of Farhadi who is an Iranian film director and screenwriter during 20th and 21st Centuries in Iran.

39.2 Facts on Farhadi [1]

Farhadi	Asghar Farhadi
Born	May 7, 1972
Place of Birth	Homayoon Shahr, Isfahan Province, Imperial State of Iran
Nationality	Iranian
Known for	Film director and screenwriter
Notable work	*About Elly* (2009), *A Separation* (2011),*The Past* (2013) *The Salesman* (2016), and *Everybody Knows* (2018)

39.3 Biographical Sketch

> "Asghar Farhadi was born May 7, 1972 in Homayoon Shahr, Isfahan, Iran. He is an Iranian film director and screenwriter. Farhadi has received two Oscars for Best Foreign Language Film for his films *A Separation* (2012) and *The Salesman* (2016), making him one of the few directors worldwide who have won the Academy Award for Best Foreign Language Film twice. In 2012, he was included on the annual *Time* 100 list of the most influential people in the world. He is a graduate of theatre, with a BA in Dramatic Arts and MA in Stage Direction from the University of Tehran and Tarbiat Modares University, respectively".

Early Films

At the start of his career, Farhadi made numerous short 8mm and 16mm films in the Isfahan branch of the Iranian Young Cinema Society, before moving on to writing plays and screenplays for IRIB. He also directed such TV series as *A Tale of a City* and co-wrote the screenplay for Ebrahim Hatamikia's *Low Heights*. In 2003, Farhadi made his feature film debut with *Dancing in*

the Dust. He followed with *The Beautiful City,* released in 2004. His third film, *Fireworks Wednesday*, won the Gold Hugo at the 2006 Chicago International Film Festival.

Awards and Nominations

Farhadi, at a relatively young age, has had a legendary career. By 2018, he was nominated thirty eight times. He won an award for thirty-five of them [1]. This includes two Oscars in 2012 and 2017. He is one of a select list of directors who have won the Best Foreign Film Oscar more than once. The others are *Vittorio de Sica* and *Federico Fellini* (four times each), *Ingmar Bergman* (three times), and *Rene Clement and Akira Kurosawa* (twice each). *A Separation* won the Academy Award for Best Foreign Language Film in 2012, becoming the first Iranian film to win the award. The film was nominated for the Academy Award for Best Original Screenplay. *The Salesman* won the Academy Award for Best Foreign Language Film in 2017 [1].

The following is a selection of his two Oscar-winning film descriptions.

A Separation (2011)

In his film *A Separation* (see Figure 39.1) premiered on 9 February 2011 at the 29th Fajr International Film Festival in Tehran and received critical acclaim from the Iran Society of Film Critics. It earned Farhadi four awards including Best Director (for the third time after *Fireworks Wednesday* and *About Elly*). On 15 February 2011, it also played in competition at the 61st Berlin International Film Festival, which received a Golden Bear for best film, becoming the first Iranian film to win that award. In June 2011, *A Separation* won the Sydney Film Prize in competition with Cannes Festival's winner *The Tree of Life*, directed by Terrence Malick. It also won the Best Film award at the 2011 Asia Pacific Screen Awards. On 19 December 2011, Farhadi was a jury member for the 62nd Berlin International Film Festival, which was held in February 2012.

On 15 January 2012, *A Separation* won the Golden Globe for the Best Foreign Language Film. The film was also the official Iranian submission for the Best Foreign Language Film at the 2012 Academy Awards where, in addition to being nominated in this category, it was also nominated in the Best Original Screenplay category. On 26 February 2012, *A Separation* became the first Iranian movie to win the Academy Award for Best International Feature Film, at the 84th Academy Awards. This marked Farhadi as the first Iranian to have won an Academy Award in any of the competitive categories. He was invited to join the Academy of Motion Picture Arts and Sciences in June 2012, along with 175 other members. *A Separation* also won the César Award for Best Foreign Film and the Independent Spirit Award for Best International Film in 2012. Figure 39.1 shows Farhadi accepting his first Oscar [2, 3].

Figure 39.1 Farhadi's *A Separation* an Oscar Winning Film [2].

The Salesman (2016)

The Salesman released in France as *Le Client* is a 2016 drama film written and directed by Asghar Farhadi and starring Taraneh Alidoosti and Shahab Hosseini. It is about a married couple who perform Arthur Miller's 1949 play *Death of a Salesman* on stage. When the wife is assaulted, her husband attempts to determine the identity of the attacker, while she struggles to cope with post-trauma stress. Farhadi chose Miller's play as his story within a story based on shared themes. A co-production between Iran and France, the film was shot in Tehran, beginning in 2015.

The film premiered in competition in the 2016 Cannes Film Festival, where it won two awards—Best Screenplay for Farhadi and Best Actor for Hosseini. *The Salesman* went on to receive more positive reviews, and won the Academy Award for Best Foreign Language Film. However, Farhadi did not attend the 89th Academy Awards ceremony in protest of the U.S. [3].

Figure 39.2 Farhadi's *The Salesman* Second Oscar Winning Film [2].

Everybody knows (2018)

Everybody Knows (Spanish: *Todos lo saben*, lit. '*Everyone Knows It*') is a 2018 Spanish-language mystery/crime drama film written and directed by Iranian filmmaker Asghar Farhadi, and starring Javier Bardem and Penélope Cruz. The film was selected to open the 2018 Cannes Film Festival in competition and was released in Spain on 14 September 2018. It was released in the United States on 8 February 2019 [5].

Figure 39.3 Farhadi's Spanish Production Film *Everybody Knows* [5].

References

[1] https://en.wikipedia.org/wiki/Asghar_Farhadi

[2] https://en.wikipedia.org/wiki/A_Separation_(2011_film)

[3] https://www.scmp.com/lifestyle/entertainment/article/3004359/double-oscar-winner-asghar-farhadi-perils-academy-awards

[4] https://en.wikipedia.org/wiki/The_Salesman_(2016_film)

[5] https://en.wikipedia.org/wiki/Everybody_Knows_(2018_film)

CHAPTER 40 History of Medical Education in Modern Iran

40.1 Introduction

The history of medical education in modern Iran with emphasis on 19th to 21st centuries will be summarized in this chapter. The current map of Iran and the location of all 31 provinces is shown in Figure 40.1. Table 40.1 shows the Iranian Provinces with cities where at least one medical school exists with their website links.

Figure 40.1. The Provisional Map of Iran [1]

Table 40.1: A Summary of Universities of Medical Sciences of Iran

Province	Medical School	URL
Alborz	Alborz University of Medical Sciences	https://en.wikipedia.org/wiki/Alborz_University_of_Medical_Sciences
Ardabil	Ardabil University of Medical Sciences	https://en.wikipedia.org/wiki/Ardabil_University_of_Medical_Sciences
Bushehr	Bushehr University of Medical Sciences	https://en.wikipedia.org/wiki/Bushehr_Universitof_Medical_Sciences
Chaharmahal and Bakhtiari	Shahrekord University of Medical Sciences	https://en.wikipedia.org/wiki/Shahrekord_University_of_Medical_Sciences
East Azerbaijan	Tabriz University of Medical Sciences	https://en.wikipedia.org/wiki/Tabriz_University_of_Medical_Science
West Azerbaijan	Urumia University School of Medical Sciences	https://english.umsu.ac.ir/
Fars	Shiraz University of Medical Sciences	https://en.wikipedia.org/wiki/Shiraz_University_of_Medical_Sciences
Gilan	Gilan University of Medical Sciences	https://en.wikipedia.org/wiki/Gilan_University_of_Medical_Sciences
Golestan	Golestan University of Medical Sciences	http://goums.ac.ir/index.php?gsmp=100-en
Isfahan	Isfahan University of Medical Sciences	https://en.wikipedia.org/wiki/Isfahan_University_of_Medical_Sciences
Kerman	Kerman University of Medical Sciences	https://en.wikipedia.org/wiki/Kerman_University_of_Medical_Sciences
Khuzestan	Gondishapur University of Medical Sciences, Ahvaz	https://en.wikipedia.org/wiki/Ahvaz_Jundishapur_University_of_Medical_Sciences
Kohkooyeh and Boyer Ahamd	Yasuj University of Medical Sciences	https://en.wikipedia.org/wiki/Yasuj_University_of_Medical_Sciences
Lorestan	Lorestan University School of Medical Sciences	https://en.wikipedia.org/wiki/Lorestan_University_of_Medical_Sciences
Markazi	Arak Univ. Medical School	https://en.wikipedia.org/wiki/Arak_University_of_Medical_Sciences

Province	Medical School	URL
Mazandaran	Mazandaran University School of Medical Sciences (Sari)	https://en.wikipedia.org/wiki/Mazandaran_University_of_Medical_Sciences
Markazi	Arak University Medical School	https://en.wikipedia.org/wiki/Arak_University_of_Medical_Sciences
North Khorasan	Bojnourd University School of Medical Sciences	http://en.nkums.ac.ir/
Razavi Khorasan	Mashhad University of Medical Sciences	https://en.wikipedia.org/wiki/Mashhad_University_of_Medical_Sciences
Razavi Khorasan	Torbat Jam University of Medical Sciences	http://educationiran.com/en/torbate-jam/tmums
Qazvin	Qazvin University of Medical Sciences	https://en.wikipedia.org/wiki/Qazvin_University_of_Medical_Sciences
Semnan	Semnan University of Medical Sciences	http://educationiran.ir/en/semnan/semums
South Khorasan	Birjand University of Medical Sciences	https://en.wikipedia.org/wiki/Birjand_University_of_Medical_Sciences
Yazd	Sadoughi University of Medical Sciences	https://en.wikipedia.org/wiki/Shahid_Sadoughi_University_of_Medical_Sciences
Zahedan	Zahedan University of Medical Sciences	http://en.med.zaums.ac.ir/
Zanjan	Zanjan University of Medical Sciences	https://en.wikipedia.org/wiki/Zanjan_University_of_Medical_Sciences
Tehran	Shahid Beheshti University of Medical Sciences (formerly National University)	https://en.wikipedia.org/wiki/Shahid_Beheshti_University_of_Medical_Sciences
Tehran	Azad University Medical Sciences	https://en.wikipedia.org/wiki/Islamic_Azad_University,_Tehran_Medical_Branch
Tehran	Iran University of Medical Science	http://www.educationiran.com/en/iran
Tehran	Tehran University of Medical Sciences	https://en.wikipedia.org/wiki/Tehran_University_of_Medical_Sciences

Province	Medical School	URL
Mazandran	Babol University of Medical Sciences	https://en.wikipedia.org/wiki/Babol_University_of_Medical_Sciences
Golestan	Golestan University of Medical Sciences	https://en.wikipedia.org/wiki/Golestan_University_of_Medical_Sciences

40.2 Ancient History of Medicine in Persia

The practice and study of science, including medicine in Persia has a long and prolific history. The ancient Iranian medicine that was combined with different medical traditions from Mesopotamia, Egypt, India, China, and Greece for more than 4500 years emerged to form what became the nucleus and foundation of the medical practice in European countries during the 13th century. Most of the 420 tablets, survived from library of Asshurbanipal at Nineveh (668 BC) Assyria, do indicate the science of medicine. A major number of these tablets were prescriptions, but there were also many medical "treaties". [2].

Zoroastrian priesthood, called "Mobeds", performed rituals and acted as healers of the soul. Later on physicians and surgeons were formed 2700 years ago. The Avestan system of medical practice, extracted from the Zoroastrian texts, had existed throughout 1200 years from the start of the Achaemenid dynasty in 553 BC to the end of the Sassanid dynasty in 651 AD [3].

There was, however, major advances in Persian medicine during the Sassanian Era from 3rd to 7th Centuries AD. A very famous medical center named Jondishapur (See next section and Chapter 4) was created in southwest of today's Iran in the Khuzestan Province. [3] Details to follow in the next section.

During 7th Century AD, Arabs invaded Persia and during the Umayyad Caliphate (661-750 AD), many Persians fled the country and got settled in Transoxiana (parts of northern Grater Khorasan and today's Uzbekistan, Tajikistani, Kazakhstan, and Kyrgyzstan). They took the Parsi Dari language with them, which later became the language of the region. Within the eastern part of the pre-Islamic Sassanid dynasty, more than 250 years after the Arab invasion, a new Parsi-based empire was formed named Samanids (874-999 AD). Although Samanids converted to Islam, they maintained the Parsi language, culture, and science, including medical. [4]. Major cities of the Samanids were Samarkand and Bukhara (Uzbekistan), Balkh (Afghanistan), Neishapur (Iran), Merv (Turkmenistan), Ray and Isfahan (Iran). This renaissance of Parsi language, culture and science was called by Richard Fryer in his book "*Golden Age of Persia*". [3]. It was the Golden Age that Persia which gave the world geniuses such as Khaweazmi (Chapter 5, creator of Algebra, Algorithm, etc.), Razi (Chapter 6, Al Hawi book of medicine, first pediatrician in the world) , Biruni (Chapter 11, Astronomer), and Pour Sina (Chapter 12, Cannon of Medicine), among many others. While these books were all written in the language of the time – Arabic, a physician by the name of Akhawani Bukhari wrote the book "Hedayat Motaallemin fi Tebb" in old Parsi offering a significant book in medicine. [4]

40.3 Jondishapur Medical Complex

As noted above, the Iranian academic centers such as the Jondishapur University (3rd century AD) were a breeding ground for the union among great scientists from different civilizations. These centers successfully followed their predecessor's theories and greatly extended their scientific research through time. Persian physicians during the glorious Islamic civilization had a tremendous share in the progress of medical sciences [5].

The Academy of Jondishapur (Chapter 4), also known as the Jondishapur University, was one of the three Sasanian centers of education (Ctesiphon, Resaina, and Jundishapur) and was the academy of learning in

the city of Jondishapur, Iran during the late antiquity (the intellectual center of the Sasanian Empire) [1]. It offered education and training in medicine, philosophy, theology and sciences. The faculty were versed in Persian traditions. According to *The Cambridge History of Iran*, it was the most important medical center of the ancient world during the 6th and 7th centuries A.D. During the time the Arab Caliphate closed Jondishapur and brought all scientist and physicians to Baghdad, where they built a replica of Jondishapur called "House of Wisdom".

Under the Pahlavi dynasty, the heritage of Jondishapur was memorialized by the founding of the *Jondishapur University* and its twin institution *Jondishapur University of Medical Sciences* near the city of Ahvaz in 1955. It was renamed as Ahvaz Jundishapur University of Medical Sciences in recent years [5].

In 1952, the French philosopher A. M. Goichon wrote the following, which is quoted here; "When we speak of philosophy, people think of Greece and when they speak of medicine, they think of Pars (Iran)" [6,7].

Figure 40.2 shows the ancient and new Gondishapur Medical School.

(a) *(b)*

Figure 40.2. The Ancient and New Gondishapur Medical Schools. (a) Ruins of the medical School from the 3rd Century AD, and (b), The Current Jondishapur Medical School.

40.4 Modern History of Medicine and Schools of Medicine in Iran

40.4.1 Medical Education in Tehran

The Tehran University Medical School (TUMS) was part of the Tehran University, which is the oldest university in modern Iran. Tehran University was established as Dar-ol-Fonoon (see Perspective on Amir Kabir) in 1851. In 1934, the Medical School was added to the University of Tehran. The School of Medicine finally separated from the University of Tehran by parliamentary legislation in 1986, incorporated under the new Ministry of Health, Treatment, and Medical Education.

TUMS is ranked as one of Iran's top research medical universities. Over 13,000 students (40% of whom are women) in approximately 290 undergraduates, graduate, and non-degree (short course) programs are trained at TUMS. It is comprised of 11 schools, operates 16 teaching hospitals, is equipped with over 44 libraries, and publishes 58 journals, some of which are in collaboration with academic societies [8].

The location where the anatomy hall was built 80 years ago (as the first part of the School of Medicine) was located in the most northern point of Tehran. Over the years, the capital city grew rapidly, and the university campus came to be in the city center, thus becoming an active center for academic, cultural, political, and social activities of this large and crowded city.

The central campus of the Tehran University of Medical Sciences contains most of the university buildings including the School of Medicine, Pharmacy, Public Health, and associated disciplines. Today, what is located at the central campus is a complex of the oldest Schools of Medicine, Pharmacy, Dentistry, and Public Health. In addition to the central campus, the University Headquarters is also located nearby. Following the establishment of new schools and due to the limited physical area of the central campus, other schools were moved to different locations.

Figure 40.3 shows the old entrance of TUMS, School of Pharmacy and a scene from a student's residence complex called Amirabad.

Figure 40.3. The Entrance of 1934 TUMS Building, the Pharmacy Building, and the Amirabad Student's Residence Complex in Northern Tehran.

Today, TUMS has many modern buildings with several more schools, and continues to train and graduate the highest number of physicians in Iran.

In addition to Tehran University, there are three more Medical Sciences Universities: Shahid Beheshti University of Medical Sciences (formerly National University), Iran University of Medical Sciences, and Azad University Medical Sciences. Unfortunately, due to space limitations more details are not given here. The reader can refer to their websites in the above table.

40.4.2 Medical Education in Shiraz

Introduction. The Foundation of Shiraz University of Medical Sciences (SUMS) dates to about 70 years ago when the Shiraz Institute of Higher Health Education (founded by Zabiollah Ghorban, see perspective on Ghorban) admitted a few medical students in 1945. The High Institute of Health developed into a Medical Faculty in 1946. The medical school is located in central Shiraz and was founded in 1946 as a college within the Shiraz University. In 1953. A Faculty of Nursing was added, followed by a Faculty of Dentistry in 1969. After 1979, the name of Pahlavi University was changed to Shiraz University. In 1986, the Iranian Ministry of Health, Treatment and Medical Education took over the departments and faculties in the medical sciences and SUMS became an independent institution. This change took place in all medical schools in the country. Figure 40.4 shows one of the 1945 Institutes for Medical Care in Shiraz [9].

SUMS is ranked as one of Iran's top medical schools, with more than 9000 students studying in over 200 different disciplines, and a faculty staff of nearly 900 and 25,000 personnel; it is one of the best medical universities in Iran. Iranian students are recruited to SUMS through the National Entrance Exam (*Konkur*) and are registered to the main campus of the university. Shiraz University of Medical Sciences (SUMS), exhibiting nearly 70 years of Medical education experience, is the most popular University of Medical Sciences in southern Iran, and offers degree and non-degree programs to Iranian and international students at different levels and disciplines including Doctor of Medicine (M.D.), Doctor of Dental Medicine (D.M.D.), Doctor of Pharmacy (PharmD.), B.Sc., M.Sc., and Ph.D degrees. With 41 hospitals (including 14 teaching hospitals), SUMS is a regional health care provider and the main medical center in

Fars Province [6]. Figure 40.5 shows the oldest building and one of the newest buildings of SUMS, as well as Nemazee hospital, built in 1955.

Figure 40.4. A 1940's Medical Clinic in Shiraz, Iran.

Figure 40.5. The First Building built, the First Building built at Shiraz Nemazee hospital, and the Newest Building at the Shiraz University Medical School [9].

The Shiraz Model (1969-1979). Nasr [10], an accomplished visionary, published a historical account of the "Shiraz Model" of Medical Education in 2009. He gave six key reasons for the success of Shiraz University School of Medicine, which was ranked as one of the highest schools of medicine in all the Middle East during the decade from 1969-1979. The six-key attributes, which he called "pillars", were as follows:

1. *Pillar One* - English was the official instructional language of the School, as well as the other schools of the then Pahlavi University (now Shiraz University).
2. *Pillar Two* – Construction and creation of the Nemazee Hospital founded by Mohammad Nemazee in 1955 and further improvements of it (see Figure 40.5, and [11]). The hospital started with 25 beds first and in a few short years upgraded to 600 beds.
3. *Pillar Three* – Creation of a great regional university, called Pahlavi University, in Shiraz, Iran
4. *Pillar 4* – Faculty members recruited were attracted in the new School and University on a 100% full-time basis. The young faculty were enthusiastic and competent in all schools, including the School of Medicine.
5. *Pillar 5* – The City of Shiraz that is known for its hospitality, rose gardens, and welcoming and friendly residents. Shiraz welcomed all non-Shirazi's and non-Iranians and visiting scholars in all its schools. Visiting professors were from the USA, Europe, and Asia.

6. *Pillar Six* – Incoming students were smart, hardworking, and accepted the "Shiraz Model" of Medicine as well as in other disciplines across the three campuses of Pahlavi (now Shiraz) University.

More details are available in the Perspectives of Nasr, Ismail-Beigi, and Rastegar.

40.4.3 Medical Education in Isfahan

To the north of the Isfahan city center lies an area called Dardasht, formerly known as Bab-ol Dasht, through, which the Khiaban-e-Ibn Sina (Avicenna) avenue runs. This ancient 11th century dome traditionally marks the spot where the great Sheikh-al-Rais Ibn-e-Sina, or Avicenna (see Chapter 12), as he is known in the West, established his school of medicine under the patronage of the Kakouid ruler Alla-al-Dowleh Mohammad, who had conquered the town from the Deylamid rulers at the start of the 11th century AD.

Teaching at the school began as early as 1024 AD under the name of "Alaii School". Avicenna School makes Isfahan University of Medical Sciences one of the oldest medical university in the world and the world's second-oldest university in continuous operation.

Isfahan University of Medical Sciences or Medical University of Isfahan (IUMS) specializes in basic medical sciences, clinical science, and health services and is located in Isfahan, Iran. Isfahan University of Medical Sciences is one of the most prestigious Iranian medical schools. Admission to the university is limited to students with top scores on the national entrance examination, administered yearly by the Ministry of Science, Research and Technology (Iran). IUMS was established in 1946 as the Isfahan Higher School of Health Education. In 1950, Isfahan Faculty of Medicine was inaugurated, and students were admitted for M.D. degrees after a 6-year medical training course. Today, the university campus is located on Hezarjarib Street in southern Isfahan.

Isfahan University of Medical Sciences provides undergraduate, graduate, and postgraduate programs in 10 faculties and 75 main departments. The student body consists of about 10,000 students from all 31 provinces of Iran and some foreign countries. [12].

40.4.4 Medical Education in Mazandaran

The Mazandaran University of Medical Sciences (MazUMS) is a medical university located in Sari, Mazandaran province, Iran. This university is one of the top medical universities in Iran and is a Type I university of Medical Sciences with more than 10,000 students in different programs. This university includes 9 faculties and some research centers.

The Sari School of Medicine encompasses the Students Research Center, Sari Academic Hospital, Avicenna Hospital, Mazandaran Cardiovascular Diseases Center, and the Psychiatric Hospital of Sari [13]. Another major medical school is located in City of Amol [14].

40.4.5 Medical Education in Ahvaz

The Ahwaz Jondishapur University of Medical Sciences (AJUMS) is located in the Khuzestan Province of Iran. Located in southwestern Iran in the city of Ahwaz, the university was established as a *College of Medicine* administered by the Shahid Chamran University of Ahvaz in 1955, which itself was a revived reincarnation of the ancient Academy of Jondishapur that existed in the same area in antiquity. AJUMS separated and joined the Ministry of Health and Medical Education of Iran in 1986. The university has 3 campuses in Ahwaz, Behbahan, and Abadan, and is constituted of 9 Schools, offering doctorate degrees in science and medicine in 27 fields. The university administers 8 public hospitals in the city of Ahvaz, and 20 other hospitals in the surrounding areas, as well as dozens of clinics scattered across the province.

AJUMS had faculties of pharmacy, Paramedicine, Nursing with degrees of PhD and MS given in all faculties. University publishes 6 journals. [15].

40.4.6 Medical Education in Gilan

The Gilan University of Medical Sciences (GUMS) is located in the Gilan Province of northern Iran. Located in the city of Rasht, the university was incorporated in 1986. The university consists of four schools including Medicine, Dental, Nursing, and Allied Health Sciences; it administers seven hospitals and several research centers in the city of Rasht. Six hospitals are affiliated with GUMS. [16]

40.4.7 Medical Education in Tabriz

The Tabriz University of Medical Sciences (TUMS) is public medical sciences university located in Tabriz, the East Azerbaijan Province of Iran. It is ranked as one of Iran's top medical schools, with more than 5000 students. The University consists of seven faculties: Medicine, Pharmacy, Dentistry, *Paramedical* Sciences, Health & Nutrition, Rehabilitation, and Nursing & Midwifery. The school offers professional degrees in Medicine (M.D.), Dentistry (D.D.S.), Pharmacy (PharmD.); in addition, it offers Bachelor's, Master's, and Doctor of Philosophy (Ph.D.) in various other medically related subjects. The school also offers technical courses in pursuit of associate degrees and certification in medically related fields. TUMS operates over 10 teaching hospitals and is a major medical care provider in East Azerbaijan Province and the surrounding provinces [17].

Figure 40.6. The American Hospital of Tabriz.

40.4.8 Medical Education in Mashhad

The Mashhad University of Medical Sciences (MUMS) is located in the Razavi Khorasan Province in the city of Mashhad. It was established in 1949 with the Ferdowsi University of Mashhad and separated in 1986. The university is currently ranked as one of the best in the Middle East. In 2001, its department of Medicine was ranked first among the Iranian universities. The latest rankings placed Mashhad University 3rd nationally.

History: Mashhad Faculty of Medicine was officially opened on November 23. The school started out with 61 students, one associate professor and seven tutors. In 1956, when the School of Arts opened, the two schools merged to form the University of Mashhad. In 1965, Ms. Badri Teymourtash and Ismael Sondoozi founded the University's School of Dentistry.

In 1989, the faculties offering Medical Sciences' degrees across the country. Thus, the original University of Mashhad was divided into two independent universities: Ferdowsi University of Mashhad and the Mashhad University of Medical Sciences [18].

The Mashhad University of Medical Sciences (MUMS) now operates with 8 faculties, 32 hospitals, 179 rural and 147 urban health centers. Its faculty includes 600 teaching staff, 1700 physicians, 140 dentists, 130 pharmacists, and 25,402 staff employees. In 2001, 7,000 students were enrolled full-time [15]. MUMS covers an enormous area stretching from the northeast to the central parts of the country, which makes it the largest university of medical sciences providing health care and treatment services. With 597 teaching staff, 1645 MDs with different specialties, 138 dentists, 123 pharmacists and 25,402 employees, the university provides health care and medical services to the area's largest population, as well as to over 25 million tourists and religious worshipers a year. [18].

40.4.9 Medical Education in Kohgiluyeh and Boyer-Ahmad

The Yasuj University of Medical Sciences (YUMS) is one of the State's Universities of Iran under the supervision of the Ministry of Health and Medical Education in Kohgiluyeh and Boyer-Ahmad Province, Iran. The University has 177 faculty members and approximately 2,000 students. The university accepts students in Medicine, Dentistry, Paramedical, Nursing, Midwifery and Healthcare majors, at undergraduate and graduate levels. Admissions are decided by scores earned on an annual national examination.

History: The Yasuj University of Medical Sciences (YUMS) was established as a college in 1990 with the goal of becoming a regional organization for treatment in Kohgiluyeh and Boyer Ahmad. It first enrolled medical students in 1995 from the national entrance examination. In September 1995, after three years as an Institute, the organization was promoted to the Yasuj University of Medical Sciences. The university is comprised of School of Medicine, School of Dentistry, School of Nursing, Midwifery, School of Health, and School of Paramedicine, Medicinal Plant Research Center.

The Cellular-Molecular Research Center: The Cellular-Molecular Research Center is an academic research center. Established in 2010, the center serves as a framework for both professor and graduate student research projects in medicine and other fields. The center's laboratory facilities are specialized for the implementation and promotion of research projects in the fields of cellular and molecular biology [19].

40.4.10 Medical Education in Kerman

The Kerman University of Medical Sciences, also called the KMU (Kerman Medical University), is located in Kerman, Iran. KMU is the 8th largest medical university in Iran and the largest university of medical sciences in the southeast of the country with about 6000 students and 503 faculties. More than 125 undergraduate and postgraduate program degrees are taught in 10 schools including the school of Medicine, Dentistry, Pharmacy, Nursing and Midwifery, Public Health, Paramedics and Allied Medicine, Iranian Traditional Medicine and Health Care Management and Information. Kerman University of Medical Sciences has 6 campuses including two in Zarand and Sirjan counties [20].

40.4.11 Medical Education in Qazvin

The Qazvin University of Medical Sciences (QUMS) is a located in the Qazvin Province of Iran. Located in northwest of Tehran in the city of Qazvin, the university was established in 1984, and was officially approved in 1986. The university offers degrees in 4 schools including residencies and fellowships and administers all major hospitals and clinics throughout the city and Province of Qazvin [21].

40.4.12 Medical Education in Yazd

Shahid Sadoughi University (SSU) of Medical Sciences was the first Iranian medical university founded by 45 medical students. The department was then converted into a University of Medical Sciences in 1994. To date, over 20,000 health professionals have graduated from SSU in all branches of health care, including health, medicine, dentistry, pharmacy, nursing, midwifery, and paramedical sciences. [22].

40.4.13 Medical Education in Zanjan

The Zanjan University of Medical Sciences is a public medical sciences university located in Zanjan, Zanjan Province, Iran. The Zanjan University has many centers and institutes, such as the Institute for Advanced Studies in the Basic Sciences and Scientific information database. Also, there is a medical based journal: Journal of the Zanjan University of Medical Sciences and Health Services [23].

40.4.14 Medical Education in Zahedan

The Zahedan University School of Medical Sciences is a public university in Zahedan, Iran. The University has six faculties including medicine, dentistry, rehabilitation, health care, nursing, Paramedicine, and operates a satellite school in Khash. The university was founded in 1986 and it offers 64 fields in 6 faculties and its 378 academic members provide educational services to more than 4,400 students [24].

40.4.15 Medical Education in Bushehr

The Bushehr University of Medical Sciences (BPUMS) is a public medical school in Bushehr Province, Iran. BPUMS is one of the oldest and largest universities in Iran. Bushehr University of Medical Sciences administers all public hospitals in and around the city of Bushehr.

History: BPUMS was founded in 1983 under the name *Narjes* and started only with 25 students of midwifery. In 1995, after many developments the name was changed to the Bushehr University of Medical Sciences. Today BPUMS trains over 1500 students in 17 different fields of medical sciences. It not only offers education but also health service to people of its province. Medicine, Dentistry, Social Medicine, Microbiology, Nursing, Midwifery, Nutrition Science, Environmental Health, Public Health, Library science, operating room technology, Anesthesia and Emergency medical technology are the majors, that are offered by Bushehr University of Medical Sciences. The university has faculties of Dentistry, Allied Medical Sciences, Nursing & Midwifery, and Public Health Research centers: The Persian Gulf research center for Marine-Medicine Biotechnology, the Persian Gulf research center for Nuclear Medicine The Persian Gulf research center for Nuclear Medicine. In addition it has 8 hospitals throughout the Bushehr Province. It has at least one medical journal. [25].

(a)

School of Allied Medicine at a glance (FY 2015)

1	**Founded**	**1986**
2	**Departments**	5
3	**Faculty**	18
4	**Staff**	33
5	**Fields**	**Bachelor:** Health Information Technology, Laboratory Sciences, Library & Information Sciences, Radiology, Anaesthesiology Sciences
6	**Degree Programs**	Bachelor
7	**Total Students**	610

Departments	
Health Information Technology	**Library & Information Sciences**
Laboratory Sciences	**Anaesthesiology Sciences**
Radiology	

(b)

Figure 40.7. The Entrance of the Zahedan University of Medical Sciences, (a) and the Zahedan Medical School and its Relevant Data (b) [24].

References

[1] https://en.wikipedia.org/wiki/Provinces_of_Iran

[2] "History of ancient Medicine in Mesopotamia and Iran," see https://www.iranchamber.com/history/articles/ancient_medicine_mesopotamia_iran.php

[3] "A Brief History of Medicine in Iran," see, https://www.researchgate.net/publication/280966599_A_Brief_History_of_Ancient_Iranian_Medicine

[4] T. Nayernouri and M H Azizi, "History of Medicine in Iran The Known Medical Treaties in the Persian Language," See https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4154935/

[5] J. Pourahmad, "History of Medical Sciences in Iran," Iranian Journal of Pharmaceutical Research (2008), 7 (2): 93-99

[6] https://en.wikipedia.org/wiki/Academy_of_Gondishapur

[7] A. M. Goichon, *Archives Institute and Science*, 1952:31:308.

[8] https://en.wikipedia.org/wiki/Tehran_University_of_Medical_Sciences

[9] https://en.wikipedia.org/wiki/Shiraz_University_of_Medical_Sciences

[10] K. Nasr, "History of Contemporary Medicine: Shiraz University School of Medicine – Its Foundation and Development," *Archives of Iranian Medicine*, Vol 12, No. 1, pp. 87-92, 2009.

[11] M.H. Azizi, see www.aimjournal.ir

[12] https://en.wikipedia.org/wiki/Isfahan_University_of_Medical_Sciences

[13] https://en.wikipedia.org/wiki/Mazandaran_University_of_Medical_Sciences

[14] https://en.wikipedia.org/wiki/Babol_University_of_Medical_Sciences

[15] https://en.wikipedia.org/wiki/Ahvaz_Jundishapur_University_of_Medical_Sciences

[16] https://en.wikipedia.org/wiki/Gilan_University_of_Medical_Sciences

[17] https://en.wikipedia.org/wiki/Tabriz_University_of_Medical_Science

[18] https://en.wikipedia.org/wiki/Mashhad_University_of_Medical_Sciences

[19] https://en.wikipedia.org/wiki/Yasuj_University_of_Medical_Sciences

[20] https://en.wikipedia.org/wiki/Kerman_University_of_Medical_Sciences

[21] https://en.wikipedia.org/wiki/Qazvin_University_of_Medical_Sciences

[22] https://en.wikipedia.org/wiki/Shahid_Sadoughi_University_of_Medical_Sciences

[23] https://en.wikipedia.org/wiki/Zanjan_University_of_Medical_Sciences

[24] http://en.med.zaums.ac.ir/

[25] https://en.wikipedia.org/wiki/Bushehr_University_of_Medical_Sciences

CHAPTER 41 Engineering Education in Modern Iran

41.1 Introduction

In this chapter, the brief review of engineering education in modern Iran with a look into the past history will be given. Iran has 31 provinces (see Figure 41.1) [1] and there is now at least one engineering college in all of them, it will be lengthy to get into much details, but efforts will be done to give an adequate coverage of the topic. A summary of engineering education in the past 150 years is presented. Due to existence of tens of engineering schools, only four of them: Tehran, Sharif, Amir Kabir and Shiraz are given in detail. A table on US news and World Reports and the main web sites of 20 top engineering schools are given.

41.2 Some Engineering Advances of Ancient Persia

Persia and her new name Iran (since 1935) has had over 5000 years of civilization and as part of that in technical innovations. In Chapter 2 on Cyrus the Great, some of these innovations were presented, such as first formation of a battery, or introduction of Astrolabe by the genius of Khwarizmi in the 8th Century. Razi, in 9th and 10th Centuries, discovered several product who are now considered as chemical engineering (See Chapter 6).Or the genius of Biruni who used Astrolabe to estimate radius of Planet Earth in the 11th Century in his contributions in astronomy.

Archeological work on 5 centuries BC in Suess and Kashan in Iran have unearthed elements of science and technology in ancient Persia [2]. Further observations have shown that two centuries BC, Persians have been involved in metallurgical, glass-based materials, water purification, mining, civil engineering works such as dams, roads, fast postal service (see Chapter 2), etc. In post-Islamic era, the Persian architects have built some of the wonders of the world such as the Taj Mahal in Agra, India, and numerous mosques and castles all over Persia s well as in the Middle East. Among other construction marbles is the Ctesiphon City (See chapter 4) built by the Sassanid dynasty. In the 13th Century scientist and astronomer Tusi (See chapter 21) built the Marageh (In East Azerbaijan Province) Observatory, whose ruins is still present. Tusi also invented the so-called *Tusi-Couple* concept. The Tusi couple was a mathematical device in which a small circle rotates inside a larger circle twice the diameter of the smaller circle. Design and marvelous construction of Safavid Dynasty Architecture possibly Designed by Sheikh-Bahae (See chapter 28) in Isfahan, Iran are still a wonder of Islamic architecture.

Figure 41.1. Map of Iran showing all 31 Provinces [1]

41.3 Summary of Engineering Education in Modern Iran

In early 19th Century, Amir Kabir, the patriot Minister of Ghajar King Naser-edin Shah (see Perspective on Amir Kabir), created a set of national technology schools, called "*Dar-ol-Phonoon*," (Technology School) Dar-ol-Phonoon was the national "polytechnic" from 1851 for 80 years in Persia whose graduates established and manages factories like candles, press shops, glass, paper, fabrics, etc. [3]. This school became the foundation of the University of Tehran and a few others [4]. "Engineering education (based on construction engineering) at the Academy of Arts began during the reign of Nasser al-Din Shah (a Qajar king) and continues indefinitely until the establishment of the University of Tehran during the reign of Reza Shah. With the establishment of the University of Tehran, student admission to the Faculty of Engineering is formed. During the reign of Reza Shah (founder of Pahlavi dynasty) and until the end of 1941, it was the only higher engineering education center of the technical college that accepted students in the fields of road and construction, electromechanics, mining and industrial chemistry (chemical engineering). Initial disciplines at the University of Tehran School of Engineering ("Danesh-kadeh-e Fanni") were civil, mechanical, electrical and mining, which later added chemical, metallurgical, petroleum, electronic, computer, nuclear and general engineering [3]. Agricultural engineering was established in Karaj town, in the northern Tehran. In 1939, Abadan Oil Technical School was established by the Oil Company based on the 1933 Oil Contract to train Iranian specialists in oil-related fields and at the same time as sending Iranian youth to the United Kingdom for university training in oil-related fields [4].

In the late 1920s, two other higher education centers were established, namely the Telecommunication Training Center (affiliated to the Ministry of Posts and Telegraphs for its staff) and the Higher Art Gallery (only with a degree in electrical and machine-like electromechanics at the Technical College). In 1951, a field called Petroleum Engineering was added to the Higher Art Gallery. In the mid-1930s, with the help of UNESCO, the Polytechnic Higher Education Center was established, which after a short time became three centers, which are: 1- Polytechnic with electrical, mechanical, textile, road and building and chemical engineering, and 2- Higher School Business with the fields of business management, economic management and 3- Excellent Art Gallery with emphasis on training technical technicians in various fields such as electricity, mechanics, metalwork, carpentry, etc. [4]

With the transformation of Shiraz University into Pahlavi University in 1963, the Faculty of Engineering of this university with the help of the University of Pennsylvania accepted students in the fields of electrical and electronics, mechanics, chemical engineering and civil engineering.

In the mid-1960s, the Faculty of Engineering of the University of Tabriz and Aria Mehr University (Sharif University) were established.

In the early 50's, the private sector in Iran established a center for higher education in engineering: 1- Noshirvani Higher Education Center in Babol 2- Higher School of Construction.

From 1974 to 1976 in the universities of Isfahan, Jundishapur, Ahvaz and Mashhad, the Faculty of Engineering was established, and students were accepted.

Aria Mehr University of Technology of Isfahan and the Faculty of Engineering of Baluchistan University, Pour Ali Sina University of Hamadan and Razi University of Kermanshah were established in 1976.

After the 1979 Revolution, the Higher School of Construction, the Higher School of Telecommunications, the Higher School of Commerce and several other private schools were merged into Khajeh Nasir University. Also, Noshirvani High School of Babol became the Faculty of Engineering of Mazandaran University.

They established an engineering faculty in Kerman and Razi universities in Kermanshah and accepted students before the revolution.

In the years after the revolution, the state universities of the provinces have established their branches in the affiliated cities:

Other established institutions were Jundishapur University of Technology in Dezful, Khatam Al-Anbia University of Technology in Behbahan (Khuzestan) and Chabahar University of Marine Sciences (Baluchistan) [4]

41.4 University of Tehran School of Engineering

As mentioned earlier, during the mid-19th Century and Persia's minister Amir Kabir, a sequence of teaching schools called Dar-ol-Fanon (Technology Schools) were established in Persian of that time. It is noted that such schools in Japan and Turkey were established a decade or two later than in Persia [3]. By the year 1922, the Iranian Parliament approved the establishment of higher educational fellowships to promising students. This decision helped with the shortage of skilled faculty members. Also, a few professors were invited to come from Austria, but more importantly, during Reza Shah Pahlavi, hundreds of promising high school students were sent to Europe, many of them to France, to gain higher education in engineering, medicine, and other fields. These students became leaders of the nation in all fields, including some ended up in politics and diplomacy. In 1933 the Persian cabinet approved the creation of the University of Tehran. School of Engineering was established at the same time.

Establishment of Dar-ol-Fanon was a basis for creation of the University of Tehran. In fact the first few buildings of this new university were those of Dar-Ol-Fanon [3]. Figure 41.2 shows professors and graduates of University of Tehran School of Engineering (Daneshkadeh-e-Fanni) in 1938 on the grounds of old Dar-Ol-Fanon.

University of Tehran School of Engineering has numerous highly successful alumni. Among those mentioned in this book are late Lotfi Asghar Zadeh the creator of fuzzy logic (See chapter 33), late Fazlollah Reza, one of the first engineering graduate of the school (See chapter 32). Others here, among many, are late Caro Lucas, Parviz Jabbehdar, Saeed Sohrabpour, Galen Etemad, Kaveh Pahlavan, Hamid Jafarkhani and Nader Enghetah, (see their respective perspectives).

41.5 Shiraz University School of Engineering

Shiraz University School of Engineering (SUSE) was established in 1965. The pioneers who established SUSE were Manuchehr Vessal and Mohammad Sadegh Moayyeri. Dr. Vessal had a doctoral degree in mathematics from France. In fact, as a young student, he was one of over 100 brightest students to receive scholarship at the time of Reza Shah Pahlavi to receive a PhD in mathematics. He served as the founding Dean of Engineering at the School. Refer to Figure 41.3 for photos of Dr. Vessal and Dr. Moayyeri who played a key role in establishing the Mechanical Engineering Department as well as acting as the third Dean at SUSE. The second Dean was Dr. Ardeshir Aidun. [3,5-7]

Figure 41.2. A photo of 1938 UT School of Engineering professors and graduates on the grounds of Dar-Ol-Fanon [3].

Figure 41.3. Founding dean of SUSU (Dr. Vessal) and third dean (Dr. Moayyeri)

At the inception of the school in 1965, 4 departments were housed: Electrical and Electronic Engineering, Mechanical Engineering, Chemical Engineering, Civil and Environmental Engineering and Materials Science and Engineering.

Prior to the 1979 revolution, former Pahlavi University School of Engineering had joint collaborations with the University of Pennsylvania (UPenn) in Philadelphia for exchange of professors as well as master students were sent to UPenn for their doctoral degrees. Through numerous international conferences in Shiraz, where many scientists, professors and professional were attending these meeting from every corner of the world, a credible state was being earned by the School. Some of the graduates from the most prestigious universities in USA and UK were attracted to Shiraz, The regional Pahlavi University, top ranking faculty, instruction is English, and sharp incoming students were all very helpful in ranking the engineering school rather high.

After the 1979 revolution, the name of the university returned to its original name as Shiraz University. Since that time, many young faculty educated from overseas as well as Iran, have worked very hard to bring up the credibility and quality of education is Shiraz.

Currently, there are three schools as follows: School of Electrical and Computer Engineering, School of Chemical, Petroleum, and Ga Engineering, and School of Mechanical, Nuclear and Materials Engineering. Figures 4 to 7 show some of the old and new buildings of Shiraz University and SUSE.

Figure 41.4. Shiraz University new complex

A distinguished alumni of Shiraz University School of Engineering in this book is former Associate Administrator of NASA Ghassem Asrar (See his perspective).

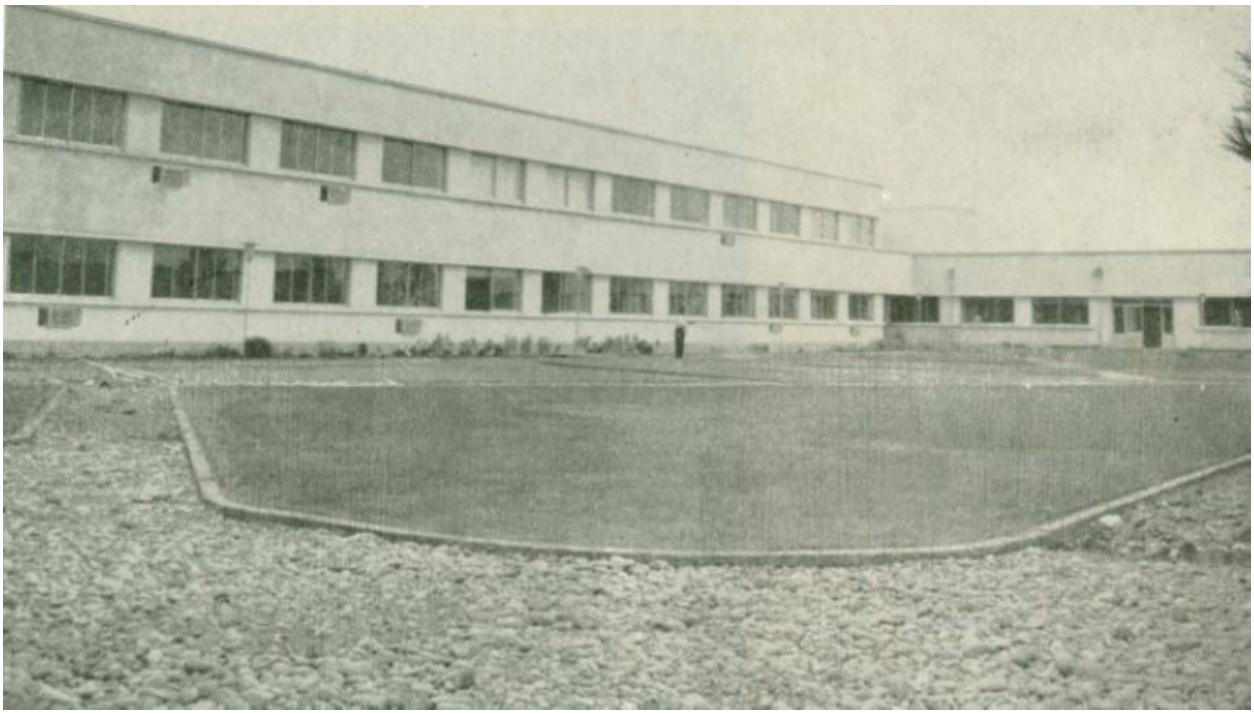


Figure 41.5. Section of the old building of Shiraz University School of Engineering

Figure 41.6, A scene from visit of a dignitary's visit at Shiraz University School of Engineering in 1970's (Author is in the center with a white suit) [4]

Figure 41.7. A few scenes of the School of Engineering buildings [5,6]

Below is the current students' population at Shiraz University School of Engineering.

School	BS Students	MS Students	PhD Students	Total
Material Science	345	276	122	743
Chemical, Petroleum and Gas	298	296	109	703
Electrical and Computer	644	457	212	1313
Mechanical	341	344	112	798
Grand Total	1628	1373	555	3556

41.6 Sharif University of Technology (Tehran)

> **"Sharif University of Technology** (SUT) is a public university in Tehran, Iran, and is widely considered the nation's leading institution for science, technology, engineering, and mathematics (STEM) fields. The international campus of the university is located in Kish Island, Persian Gulf.

Established in 1966 under the reign of Mohammad Reza Shah Pahlavi, it was formerly named the Aryamehr University of Technology and for a short period after the 1979 revolution, the university was called Tehran University of Technology. Following the revolution, the university was named Sharif University of Technology. The university provides both undergraduate and graduate programs in 15 main departments. The student body consists of about 6,000 undergraduate students and 4,700 graduate students from all the 31 provinces of Iran. Funding for Sharif University is provided by the government and through private sources. Undergraduate admission to Sharif is limited to the top 800 of the 500,000(Or 0.16 %) students who pass the national entrance examination administered annually by the Iranian Ministry of Science, Research and Technology.

In the 2013 Academic Ranking of World Universities Engineering/Technology and Computer Sciences rankings, SUT is ranked 5th in the Middle East. It is in the top 251–275 universities in the world and 37th in Asia in the 2014 Times Higher Education World University Rankings. In the 2014 Times Higher Education top 100 for newer universities (less than 50 years old), SUT ranked 1st in the Middle East, 6th in Asia, and 27th in the world.

Founded in 1966, SUT was established to train and supply part of the required expert human resources of the country on an equal level to credible universities of the world. Compared with other worldwide universities, it is a young and growing pioneer in both basic and applied sciences. The main aims of SUT are: (1) to create an organization where students can be instructed in both theoretical and applied sciences, with special emphasis on the particular needs of Islamic society; (2) to teach students the advanced knowledge and techniques required to participate in the fields of engineering and technology and to cultivate them into creative engineers, good scientists, and innovative technologists; and (3) to educate engineers who are ready to be employed, who contribute significantly to their jobs, and who have a strong sense of public responsibility and a desire to continue to learn. The emphasis is placed on the promotion of multidisciplinary research at the graduate and doctoral levels. Based on that, SUT provides a scientific and dynamic environment for those who are trying to gain knowledge. In other words, SUT is a place for those who are trying to understand and comprehend scientific realities and facts, and are trying to convey those to others. " [8]

History:

The university was founded in 1966 with the name *Aryamehr University of Industry* by Mohammad Ali Mojtahedi. Figure 41.8 shows two photos of Dr. Mojtahedi (See also his Perspective elsewhere in the book). At that time, there were 54 faculty members and a total of 412 students who were selected by national examination. Also, only four departments were established: Electrical, Metallurgical, Mechanical, and Chemical Engineering. In 1972, Mohammad Reza Pahlavi appointed Sayyed Hossein Nasr(See Chapter 37) as president of the university with the goal of modeling the school based on the Massachusetts Institute of Technology, but with roots in Iranian culture. In 1974 a new campus of the university was

established in Isfahan. But later that campus became an independent university, named Isfahan University of Technology (IUT). SUI has about 12,000 students and over 700 faculty members in 15 main departments. SUT has one of the highest faculty-to-student ratios in Iran. The second chancellor of SUT was late Fazlollah Reza (See chapter 32), while the 4th one was Dr. Hossein Nasr (See chapter 37). Perhaps the most famous alumni of SUT is late Dr. Maryam Mirzakhani – first woman in the world to win the Fields Medal also known as Mathematics Nobel Prize (See chapter 35).

Affiliated research centers

> "The university has supported the establishment of Research Centers. These are usually started with a spin-off funding provided by or through university but will start to accept research and development projects from industry in their first months of establishment. Most of the employees of these centers are Sharif University students, while in some cases recent alumni or students of other universities have been recruited as well. "[8]

Following is a list of research centers affiliated with Sharif University. [8]

- Advanced Communications Research Institute
- Advanced Information and Communication Technology Research Center (AICTC)
- Alborz Observatory for high energy cosmic and gamma rays
- Biochemical and Bio-environmental Research Center
- Condition Monitoring Center (CMC)
- Entrepreneurship Center
- Economical and Industrial Studies research Center
- Electronics Research Center
- Energy Technology Research Center
- Biochemical and Bioenvironmental Research Center(B.B.R.C)
- Green University: environmental research center
- Industrial Systems Research Center
- Institute for Nanoscience and Nanotechnology
- Institute for Transportation Studies and Research
- Sharif Applied Physics Research Center
- Water, Energy and Ocean Engineering Research Center
- Sharif Accelerator
- Sharif Incubator [8]

41.7 Amir Kabir University of Technology (Tehran)

Amirkabir University of Technology (AUT) also known as the Tehran Polytechnic, is a public research university located in Tehran, Iran.

"AUT is the second technical university established in Iran (Khajeh Nasir Toosi University of Technology is the oldest technical university in Iran, See Chapter 21on K N Toosi), and is referred to as the *"Mother of Engineering Universities"*. Acceptance to the university is competitive, and entrance to undergraduate and graduate programs requires scoring among the top 1% of students in the Nationwide University Entrance Exams, known as "Konkour". [9]

Figure 41.8. Two photos of founder of SUT Mojtahedi and a front entrance school's oldest building

The university was founded in 1928 as a technical academy, and was further developed into a full-fledged university by Habib Nafisi in 1956, after that it was extended and enlarged by Dr. Mohammad Ali Mojtahedi (see Figure 41.8 and his perspective elsewhere in the book), during the Pahlavi dynasty. Named the *Tehran Polytechnic,* it initially offered five engineering degrees, namely; Electrical and Electronics, Mechanical, Textile, Chemistry and Construction and Infrastructure. Six months before the victory of 1979 Iranian Revolution, Tehran Polytechnic was renamed after the Iranian prime minister Amir Kabir (1807–1852 see perspective n Amir Kabir elsewhere in the book).

The university now has 18 science and engineering departments, dozens of research groups and laboratories and three other affiliated centers, located in Garmsar, Bandar Abbas and Mahshahr. Around 13,400 students are enrolled in the undergraduate and graduate programs. AUT has more than 500 full-time academic faculty members and 550 administrative employees, giving it one of the highest faculty-to-student ratio among the country's universities. The executive branch consists of four departments which receive participation from councils in planning and administering affairs.

AUT has signed agreements with international universities for research and educational collaboration. There is a joint program between AUT and the University of Birmingham. AUT is one of the leading universities in E-Learning systems in Iran which began its activities in 2004.

AUT is the pioneer of sustainable development in Iran and established the Office of Sustainability in 2011. The activities of this office contribute to the AUT campus by reducing energy consumption, costs, and emissions, and also provide student coursework, volunteer opportunities for students, as well as research and education academic activities on sustainable development."[9]

History

"The establishment and formation of the Amirkabir University of Technology dates back to October 1956 by Habib Nafisi . The core of the university was formed at that time under the name Tehran Polytechnic in order to expand the activities of two technical institutes: the Civil Engineering Institute and the Higher Art Center. After Habib Nafisi, the founder of Tehran polytechnic, Dr. Abedi became the president of the university for a few months until Dr. Mohammad Ali Mojtahedi, the principal at the renowned Alborz High School, was appointed as president of the university early in 1963. Among the accomplishments of Dr. Mojtahedi is the construction of a central amphitheater, a dining area and a sports ground as well as various faculty buildings. "[9]

The university has grown into a national center of science and engineering and its undergraduates number more than 7,000, with a further 6,400 graduate students. The university boasts 35 undergraduate majors, around 90 M.Sc. majors and 36 Ph.D. and post-doctoral programs [8]

AUT has four satellite campuses in [9]:

- ***Mahshahr*:** The Mahshahr campus of AUT has been constructed in the province of Khuzestan in 2001 in order to establish close cooperation with the national company of petroleum industries.
- ***Bandar Abbas*:** The Bandar Abbas (a port city on the Persian Gulf) campus of AUT has been established in the province of Hormozgan, which is the center of marine industries in Iran (See Figure 41.1).
- ***Garmsar*:** The Garmsar campus of AUT has been constructed in the province of Semnan in order to establish close cooperation and distance with the main campus in Tehran.

Figure 41.9 shows the entrance of AUT's main campus in Tehran.

Figure 41.9. The entrance of AUT's main campus in Tehran.[8]

41.8 US News and World Report Ranking of Iranian Universities Engineering Schools [10]

University	Rank	URL	Enrollment
Tehran	1	https://www.usnews.com/education/best-global-universities/university-of-tehran-504903 https://enginter.ut.ac.ir/	44,960
Azad, Tehran Campus	2	https://www.usnews.com/education/best-global-universities/islamic-azad-university-528829 https://feazad.academia.edu/	NA
Amir Kabir University of Technology	3	https://www.usnews.com/education/best-global-universities/amirkabir-university-of-technology-aut-506266 https://aut.ac.ir/en	N/A
Sharif University of Technology	4	https://www.usnews.com/education/best-global-universities/sharif-university-of-technology-502898 http://www.sharif.ir/web/en/	NA
Babol Noshirvani University of Technology	5	https://www.usnews.com/education/best-global-universities/babol-noshirvani-university-of-technology-529310 https://en.nit.ac.ir/	5140
University of Tabriz	6	https://www.usnews.com/education/best-global-universities/university-of-tabriz-528957 https://tabrizu.ac.ir/en	12,444
Iran University Science & Technology	7	https://www.usnews.com/education/best-global-universities/iran-university-science-technology-505518 http://www.iust.ac.ir/en	14,067
Tarbiat Modares University	8	https://www.usnews.com/education/best-global-universities/tarbiat-modares-university-528825 https://www.modares.ac.ir/en-eng	N/A

University	Rank	URL	Enrollment
Ferdowsi University Mashhad	9	https://www.usnews.com/education/best-global-universities/ferdowsi-university-mashhad-502854 https://en.um.ac.ir/Faculty-schools-id-31.html	N/A
Isfahan University of Technology	10	https://www.usnews.com/education/best-global-universities/isfahan-university-of-technology-502590 http://english.iut.ac.ir/	9,373
K. N. Toosi University of Technology	11	https://www.usnews.com/education/best-global-universities/k-n-toosi-university-of-technology-529705 https://en.kntu.ac.ir/	N/A
Shiraz University	12	https://www.usnews.com/education/best-global-universities/shiraz-university-500400 https://ece.shirazu.ac.ir/, https://cpe.shirazu.ac.ir/, https.mee.shirazu.ac.ir, https://cme.shirazu.ac.ir/	N/A
University Kashan	13	https://www.usnews.com/education/best-global-universities/university-kashan-529415 https://kashanu.ac.ir/en	8,245
Semnan University	14	https://www.usnews.com/education/best-global-universities/semnan-university-529459 https://english.semnan.ac.ir/	N/A
Shahid Beheshti University Tehran (Formerly National University)	15	https://www.usnews.com/education/best-global-universities/shahid-beheshti-university-tehran-sbu-502879 http://en.sbu.ac.ir/SitePages/Home.aspx	18,438
Shiraz University of Technology	16	https://www.usnews.com/education/best-global-universities/shiraz-university-of-technology-529462 https://en.sutech.ac.ir/	N/A
University of Guilan	17	https://www.usnews.com/education/best-global-universities/university-of-guilan-529421 https://guilan.ac.ir/en/home	N/A

University	Rank	URL	Enrollment
Shahrood University of Technology	18	https://www.usnews.com/education/best-global-universities/shahrood-university-of-technology-529465 https://shahroodut.ac.ir/en/	N/A
University of Isfahan	19	https://www.usnews.com/education/best-global-universities/university-of-isfahan-529204 https://ui.ac.ir/en	N/A
Shahid Bahonar University of Kerman	20	https://www.usnews.com/education/best-global-universities/shahid-bahonar-university-of-kerman-sbuk-529425 https://uk.ac.ir/en/home	N/A`
Imam Khomeini International University	21	https://www.usnews.com/education/best-global-universities/imam-khomeini-international-university-529643 http://ikiu.ac.ir/en/	N/A
Urmia University	22	https://www.usnews.com/education/best-global-universities/urmia-university-529525 http://en.urmia.ac.ir/	N/A`
Razi University (Kermanshah)	23	https://www.usnews.com/education/best-global-universities/razi-university-529417 https://razi.ac.ir/	N/A
Sahand University of Technology	24	https://www.usnews.com/education/best-global-universities/sahand-university-of-technology-529513 http://www.sut.ac.ir/en/	N/A`
University of Yazd	25	https://www.usnews.com/education/best-global-universities/university-of-yazd-529540 https://yazd.ac.ir/en	N/A

References

[1] Map: https://www.google.com/search?q=iran+map+of+32+provinces&sxsrf=ALeKk03pLkaQJogQpFJgLmtJwzwPM3KulA:1622516079417&tbm=isch&source=iu&ictx=1&fir=a6Fm1bJiVIHqlM%252CFWofXRqik16CyM%252C_&vet=1&usg=AI4_-kSn2ij1t4JEU0C-vuHiCS4jF3fZ0w&sa=X&ved=2ahUKEwjr8Li0t_XwAhUVV80KHe6GDgsQ9QF6BAgJEAE#imgrc=a6Fm1bJiVIHqlM

[2] https://en.wikipedia.org/wiki/Science_and_technology_in_Iran

[3] M. Farasetkhah, *History of Eighty Years of University of Tehran School of Engineering,* Farsibookds, Ltd, London, 2013 (In Parsi)

[4] M. J. Jadbabaei, "A brief history of engineering education in Iran," Private communication, October, 2020.

[5] M. Namatollahi, "*History of Shiraz University School of Engineering from 1964 – 2014*," 2015, Shiraz, Iran (In Parsi).

[6] https://ece.shirazu.ac.ir/ , https://cpe.shirazu.ac.ir/,

[7] https.mee.shirazu.ac.ir , https://cme.shirazu.ac.ir/

[8] https://en.wikipedia.org/wiki/Sharif_University_of_Technology

[9] https://en.wikipedia.org/wiki/Amirkabir_University_of_Technology

[10] https://www.usnews.com/education/best-global-universities/iran

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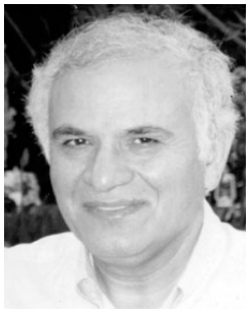	Abbas Firoozabadi	Director and Senior Scientist Distinguished Visiting Professor Reservoir Engineering Research Institute, Rice University Houston, TX, United States

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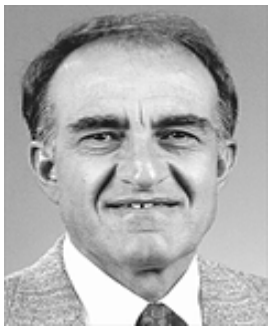	Hossein Kazemi	Chesebro' Distinguished Chair in Petroleum Engineering Colorado School of Mines Golden, CO, United States

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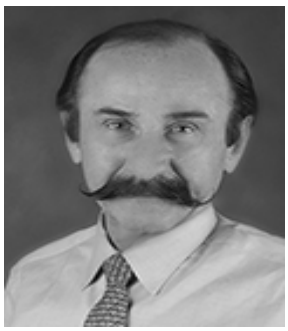	Robert Mehrabian	Executive Chairman Teledyne Technologies Incorporated Thousand Oaks, CA, United States
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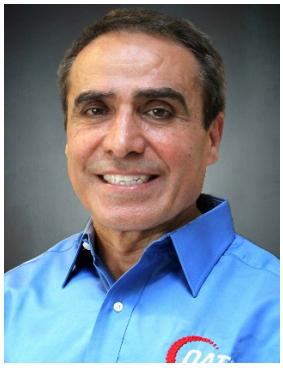	Sasan Mokhtari	President and CEO Open Access Technology International, Inc. Minneapolis, MN, United States
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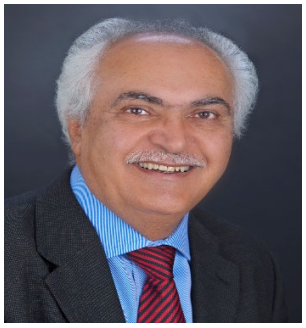	Soroosh Sorooshian	UCI Distinguished Professor and Director Center for Hydrometeorology and Remote Sensing University of California, Irvine Irvine, CA, United States

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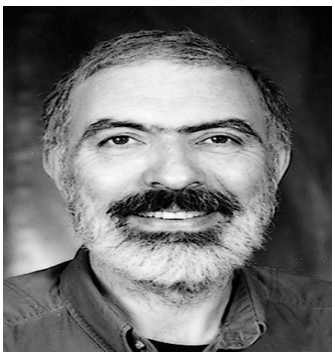	Farhad Ardalan, PhD.	Professor, Department of Physics Sharif University of Technology Tehran, Iran
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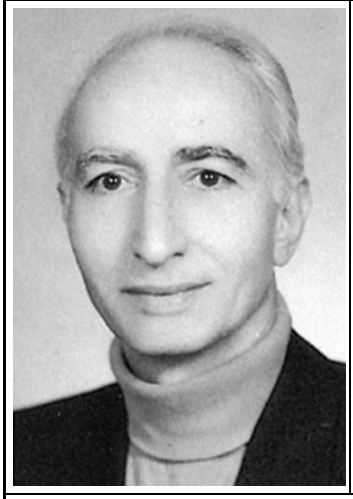
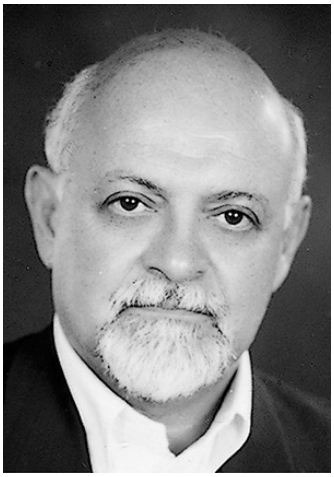
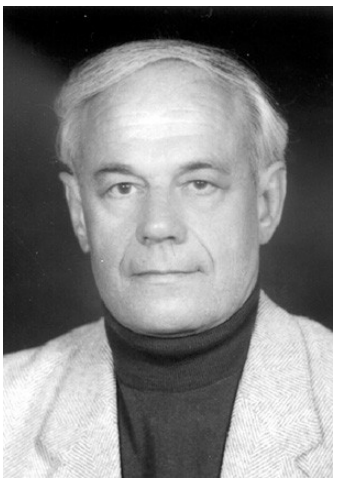
	Dariush Farhud, MD, PhD.	Professor, Department of Human Genetics and Anthropology Tehran University Tehran, Iran
	Habib Firouzabadi, PhD.	Professor, Department of Chemistry Shiraz University Shiraz, Iran
	Keramatollah Izadpanah-Jahromi, PhD.	Professor of Agricultural Science Shiraz University Shiraz, Iran

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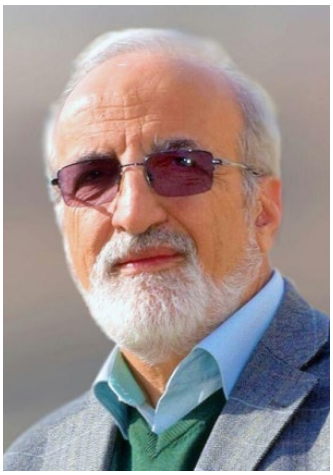	Reza Malekzadeh, MD	Professor, Digestive Disease Research Institute Tehran University of Medical Sciences Tehran, Iran

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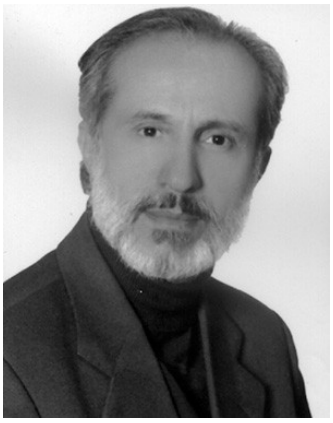	Reza Mansouri, PhD.	Professor, Department of Physics Sharif University of Technology Tehran, Iran
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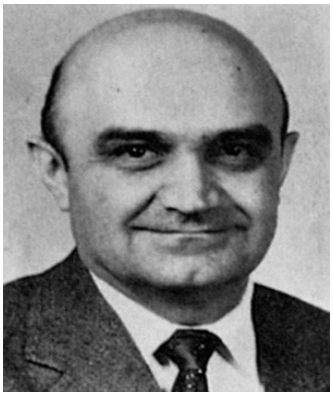
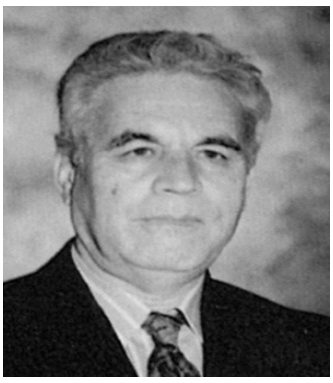
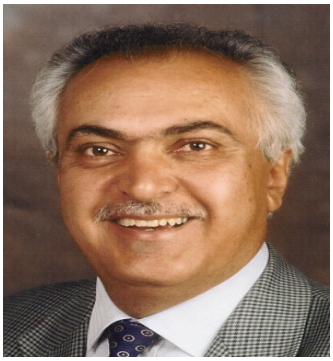
	Farrokh Saidi, MD	Iranian Academy of Medical Sciences Tehran, Iran
	Mojtaba Shamsipour, PhD.	Professor, Department of Chemistry Raazi University Kermanshah, Iran
	Yousef Sobouti, PhD.	Professor, Institute for Advanced Studies Zanjan, Iran

Iranian Photo	TWAS Name	Fellows Expertise and Affiliation
	Soroosh Sorooshian, PhD.	Distinguished Professor Department of Civil and Environmental and Earth System Science University of California, Irvine Irvine, CA, United States
	Siamak Yassemi, PhD.	Professor, Department of Mathematics University of Tehran Tehran, Iran

PERSPECTIVES

Patriot Ministers

Perspective on Bozorgmehr (Nobel Minister)

Introduction:

This perspective describes the life and contributions of Bozorgmehr a nobleman wazir during Sasanid Dynasty in Persia.

Facts on Bozorgmehr [1]

	AKA	Bozorgmehr-e Bokhtagan, Wuzurgmihr ī Bōkhtagān), Burzmihr, Dadmihr and Dadburzmihr
	Born	Unknown
	Place of Birth	Unknown
	Nationality	Persian, Iranian
	Death	580 AD
	Place of Death	Unknown

Biographical Sketch

"Bozorgmehr-e Bokhtagan (Middle Persian: Wuzurgmihr ī Bōkhtagān), also known as Burzmihr, Dadmihr and Dadburzmihr, was an Iranian nobleman from the Karen family, who served as minister (wuzurg framadār) of the Sasanian king (shah) Kavad I (498-531), and the latter son and successor Khosrow I (531–579). He also served as the military commander (spahbed) of Khwarasan under Khosrow I and his successor Hormizd IV (579–590). According to Persian and Arabic sources, Bozorgmehr was a man of "exceptional wisdom and sage counsels" and later became a characterisation of the expression. His name appears in several important works in Persian literature, most notably in the Shahnameh ("The Book of Kings", see Chapter 9). The historian Arthur Christensen has suggested that Bozorgmehr was the same person as Borzuya, but historigraphical studies of post-Sasanian Persian literature, as well as linguistic analysis show otherwise. However, the word "Borzuya" can sometimes be considered a shortened form of Bozorgmehr.[1]

The name of the Bozorgmehr is the New Persian variant of Middle Persian Wuzurgmihr ī Bōkhtagān, which was later transformed into Arabic as Abūzarjmehr, Bozorjmehr, or Būzorjmehr. The last variant was used by Ferdowsi in the Shahnameh ("The Book of Kings"). Etymologically the latter is a corruption of Burzmihr or Dād-Burzmihr, also reported as Zarmihr. Its proper version was Dādburzmihr, with Būrzūmihr being the original variant in ancient engravings. The name is attested as Dadburzmihr ("given by the high Mihr") in a seal, a theophoric name that emphasizes the Mihr worship of Bozorgmehrs clan, the Karenids. The -ī Bōkhtagān suffix is a patronymic name meaning "son of Bokhtagan", a title held by Bozorgmehrs father."[1]

"Bozorgmehr is first mentioned in 498, as one of the nine sons of the powerful nobleman Sukhra. He belonged to the House of Karen, one of the Seven Great Houses of Iran, which was descended from the Arsacid prince Karen. The Karen family claimed descent

from the legendary Pishdadian shah Manuchehr, and were based in Nihavand in Media. After the defeat and death of the Sasanian shah Peroz I (459–484) at the battle of Herat, Sukhra became the de facto ruler of Iran. He was eventually defeated and executed by Kavad I, which resulted in the Karen family being heavily weakened, with many of its members being exiled to the regions of Tabaristan and Zabulistan, which was away from the Sasanian court in Ctesiphon. In 496, Kavad I was deposed and imprisoned due to his support of the Mazdakite movement, and also for having Sukhra executed."[1]

Work

"Several Middle Persian treatises were written by Bozorgmehr. Most famous is the Wizārišn ī čatrang ("Treatise on Chess"), also known as the Chatrang Nama ("Book of Chess"). As well as; Ayādgār ī Wuzurgmihr ī Bōxtagān, Ketāb al-Zabarj (the original version a commentary on Vettius Valens's Astrologica), Ketāb Mehrāzād Jošnas ("Book of Mehrāḏar Jošnas") and the Ẓafar-nāma ("Book of Victory", a book written in Middle Persian, that was translated into New Persian by Avicenna."[1]

Figure 1 shows a game of chess that Bozorgmehr challenged an Indian envoy.

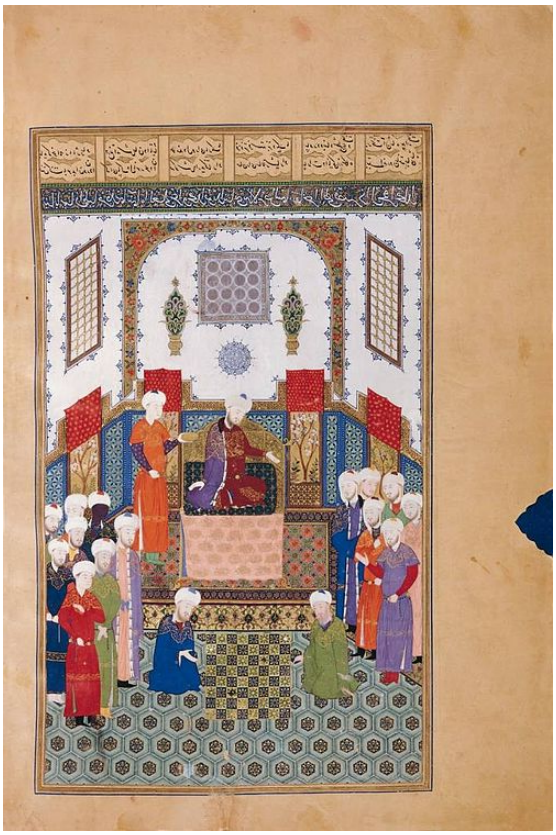


Figure.1. Chess game between Bozorgmehr and an Indian from Ferdowsi's Shahnameh[1]

References

[1] https://en.wikipedia.org/wiki/Bozorgmehr

Perspective on Nezam-Ol-Mulk (Educator, Vazir)

Introduction:

This perspective covers Abu Ali Hasan ibn Ali Tusi (Nezam-Ol-Mulk) who was a noted vazir and scholar during Srljuk's rein in Persia. "Nizam al-Mulk ('Order of the Realm') rose from a lowly position, he was the de facto ruler of the empire for 20 years after the assassination of Alp Arslan in 1072, serving as the archetypal "good vizier" of Islamic history. One of his most important legacies was founding madrasa (schools) in cities throughout the Seljuk Empire. These were called "nezamiyehs" after him. He wrote *Siyasatnama* (*Book of Government*), a political treatise that uses historical examples to discuss justice, effective rule, and the role of government in Islamic society "[1].

Facts on Nezam-Ol-Mulk [1]

AKA	Abu Ali Hasan
Born	April 10, 1018
Place of Birth	Tus, Iran
Nationality	Persian (Iranian)
Death	14 October 1092
Place of Death	Nahavand, Iran (Assassinated on his way from Isfahan to Baghdad)

Biographical Sketch

"Abu Ali Hasan was born on April 10, 1018 in a small village named Radkan, near Tus, in Iran, to a *dehqan* family. His father Ali ibn Ishak served as a financial officer to the Ghaznavids. However, when the Seljuk Turks defeated the Ghaznavids at the Battle of Dandanaqan in 1040, and conquered Khorasan, Abu Ali Hasan's father fled to Ghazni. Hasan followed his father to Ghazni, and it is there where he first assumed a government office. He remained in Ghazni for three or four years, he then left the Ghaznavid court and entered service with the Seljuks" [1].

"Around 1043, Abu Ali Hasan stopped serving the Ghaznavids and entered the service of the Seljuk Turks. He later became chief administrator of the entire Khorasan province " (Then from present Khorasan provinces of Iran all the way to land covering today's Afghanistan, parts of Pakistan, Tajikistan, and most of Uzbekistan) by 1059. "When Tughril died childless in the city of Ray, he was succeeded by his nephew Suleiman which was contested by Alp Arslan, both of them sons of his brother Chaghri. His cousin Kutalmish who had both been a vital part of his campaigns and later a supporter of Yinal's rebellion also put forth a claim. Alp Arslan, with the aid of Abu Ali Hasan, defeated Kutalmish and succeeded him on April 27, 1064."[1]

"After Alp Arslan had consolidated his power in the Sejluk realm, he appointed Abu Ali Hasan as his vizier who would remain in that position throughout the reigns of Alp Arslan (1063–1072) and Malik-Shah I (1072–1092). Abu Ali Hasan was also given the title of "Nizam al-Mulk" ("Order of the Realm").

"Alp Arslan's strength lays in the military realm. Domestic affairs were handled by Nizam al-Mulk, who also founded the administrative organization that characterized and strengthened the sultanate during the reigns of Alp Arslan and his son, Malik Shah I. Military *iqtā'* (fiefs), governed by Seljuk princes, were established to provide support for the soldiery and to accommodate the nomadic Turks to the established Anatolian agricultural scene. This type of military fiefdom enabled the nomadic Turks to draw on the resources of the sedentary Iranians, and other established cultures within the Seljuk realm, and allowed Alp Arslan to field a huge standing army without depending on tribute from conquest to pay his soldiers. He not only had enough food from his subjects to maintain his military, but the taxes collected from traders and merchants added to his coffers sufficiently to fund his continuous wars. "[1]

"Nizam accompanied Alp Arslan in all his campaigns and journeys, except a few. In February/March 1064 Alp Arslan, along with his son Malik-Shah I and Nizam al-Mulk, campaigned in Byzantine Armenia, where they managed to capture Ani Several minor rulers then acknowledged Seljuk authority, while Alp Arslan and Nizam continued to penetrate deeper into the Caucasus, reaching Georgia. The Georgian ruler Bagrat IV, managed to make peace with Alp Arslan by giving his niece to him in marriage. "[1]

Nizam also made some expeditions on his own and conquered the citadel of Estakhr from the Shabankara chieftain Fadluya in 1067, and made another expedition in Fars. These successful conquests are said to have greatly increased his reputation. On August 26 of 1071, the decisive battle of Manzikert was fought, which Nizam al-Mulk had missed because he had been sent to Persia with a convoy of materials." [1]

Other Contributions

"Aside from his extraordinary influence as vizier with full authority, he is also well known for systematically founding a number of schools of higher education in several cities like: Isfahan and Nishapur (Today's Iran), Baghdad, Mosul, Basra (today's Iraq), and Herat (Today's Afghanistan), the famous Nizamiyyah schools, which were named after him. In many aspects, these schools turned out to be the predecessors and models of universities that were established in Europe. Nizam al-Mulk is also widely known for his voluminous treatise on kingship titled *Siyasatnama* (*Book of Government*) which was written after Malik Shah had requested that his ministers produce books on government, administration and the troubles facing the nation. However, the treatise made by Nizam was the only one to receive approval and was consequently accepted as forming "*the law of the constitution of the nation*". The treatise uses historical examples to discuss justice, effective rule, and the role of government in Islamic society, and has been compared to Machiavelli's *The Prince*. The work also discusses various aspects of state surveillance and spying, advising rulers to establish an extensive espionage network. He also wrote a book titled *Dastur al-Wuzarā*, written for his son Abulfath Fakhr al-Malik, which is not dissimilar to the famous book of Qabus nama" [1].

Death

"Nizam al-Mulk was assassinated en route from Isfahan to Baghdad on 14 October 1092 The mainstream literature says he was stabbed by the dagger of a member of the Assassins, sent by

the notorious Hassan-i-Sabbah near Nahavand, as he was being carried on his litter. The killer approached him disguised as a dervish." [1]

References

[1] https://en.wikipedia.org/wiki/Nizam_al-Mulk

Perspective on Amir Kabir (Visionary Minister, Patriot)

Introduction:

This perspective describes the life and contribution of Amir Kabir who was prime minister during early 19th Century in Persia.

Facts on Amir Kabir [1]

	AKA	Mirza Taghi Khan Farahani
	Born	1807
	Place of Birth	Hazaveh Village, Arak, Persia
	Nationality	Persian, Iranian
	Death	10 January 1852, by Assassination
	Place of Death	Kashan, Iran, buried in Karbelah, Iraq

Biographical Sketch

"Mirza Taghi Khan Farahani, better known as Amir Kabir was born in 1807, also known by the titles of *Atabak* and *Amir-e Nezam* was chief minister to Naser al-Din Shah Qajar (Shah of Persia) for the first three years of his reign. He is widely considered to be "Iran's first reformer", a modernizer who was "unjustly struck down" as he attempted to bring "gradual reform" to Iran As the prime minister, he also ordered the killing of many Babis and the execution of the founder of the movement, the Báb. In the last years of his life he was exiled to Fin Garden in Kashan and was murdered by command of Naser al-Din Shah Qajar on January 10, 1852." [1]

"During his tenure, Amir Kabir participated in many missions abroad. He spent almost four years in Erzurum (in today's Turkey), part of a commission to delineate the Ottoman-Iranian. He resisted attempts to exclude Mohammareh (present-day Khorramshahr) from Iran sovereignty and to make Iran pay compensation for its military incursions into the area of Solaymaniyeh. In this, he acted independently of the central government in Tehran, which not only failed to formulate a consistent policy vis-à-vis the Ottomans but also opposed most of Amir Kabir's initiatives. Although a form of treaty was concluded between Iran and the Ottoman state, the borders had still not been delineated. When the Crimean War (The Crimean War was a military conflict fought from October 1853 to February 1856 in which Russia lost to an alliance made up of the Ottoman Empire, France, the United Kingdom and Sardinia) erupted and the British and Russian mediators, now at war with one another, withdrew. Amir Kabir nonetheless acquired first-hand knowledge of the procedures of international diplomacy and of the aims and policies of Britain and Russia with respect to Iran. This helped him in the elaboration of his own distinct policies toward the two powers when he became chief minister. [1]

When he returned to Tabriz, he was appointed as a chief tutor of the 15-year old crown prince Nasser. In 1854, when Mohammad Shah died in Tehran, Nasser and his tutor

moved to Tehran. When they arrived in Tehran,, he also appointed him chief minister shakhs-e avval-e Iran), with the supplementary titles of *amir-e kabir* and *atabak* (Ḏu'l-qaʿda in October, 1848. [1] His appointment as the chief minister aroused resentment, particularly the queen mother and other princes, who resented Amir Kabir's reduction of their spending and allowances, as well as diminishing the influence of the clergy in the State's affairs". [1]

Achievements

"Amir Kabir, in his short 3-year ministerial tenure, he reformed the Army by his assigning of patriotic and honest officers at all levels. He further worked a wide variety of administrative, cultural, and economic reforms that were the major achievement of his brief ministry. His immediate success was the vaccination of Iranians against smallpox, saving the lives of many thousands if not millions. Faced with an empty treasury on his arrival in Tehran, he first set about balancing the state budget by attempting to increase the sources of revenue and to decrease state expenditure. To aid him in the task, he set up a budgetary committee that estimated the deficiency in the budget of one million Iranian Toman. Amir Kabir thereupon decided to reduce drastically the salaries of the civil service, often by half, and to eliminate a large number of stipends paid to pensioners who did little or no governmental work. This measure increased his unpopularity with many influential figures and thus contributed to his ultimate disgrace and death."[1]

"His key accomplishment was to establish a series of schools called "Dar-al Fanun, initially intended to train soldiers. Among the various measures enacted by Amir Kabir, the foundation of the Darolfonun, in Tehran was possibly the most lasting in its effects. Decades later, many parts of this establishment were turned into the University of Tehran, with the remaining becoming Darolfonun Secondary School. The initial purpose of the institution was to train officers and civil servants to pursue the regeneration of the state that Amir Kabir had begun, but as the first educational institution giving instruction in modern learning, it had far wider impact. Among the subjects taught were medicine, surgery, pharmacology, natural history, mathematics, geology, and natural science "[1]

"Reagrding non-Moslem minorities, Amir Kabir took a largely benevolent interest in the non-Muslim minorities of Iran, though in order to further his desire of strengthening the state. In Erzurum he had observed how European powers intervened in Ottoman affairs on the pretext of "protecting" the Christian minorities, and there were indications that Britain, Russia, and France hoped for similar benefits from the Assyrians and Armenians of Iran. He moved therefore to remove any possible grievances and hence any need for a foreign "protector." He exempted the priests of all denominations from taxation, and gave material support to Christian schools in Azerbaijan and Isfahan. In addition, he established a close relationship with the Zoroastrians of Yazd, and gave strict orders to the governor of the city that they not be molested or subjected to arbitrary taxes. He also forbade attempts made in Shushtar to convert forcibly the Mandaean (is a monotheistic and gnostic religion in southwest of Iran) community to Islam." One exception to this was his harsh treatment of Bahai's including killing the founder of that religion." [1]

"Amir Kabir made a second indirect contribution to the elaboration of Persian as a modern medium with his foundation of the newspaper *Vaqayeʿ-ye Ettefaqiyeh*, which survived under different titles until several decades. Through this newspaper, he informed

his fellow citizens about events inside and outside of Persia. All of the measures enumerated had as their purpose the creation of a well-ordered and prosperous country, with undisputed authority exercised by the central government. This purpose was, in part, frustrated by the religious clergy, who throughout the Qajar period. His efforts eventually lead to hid demise in the Court of Nasser-Din Shah and cost him his life at a young 45 years old." [1]

"Among his Iranian contemporaries, Amir Kabir received praise from several poets of the age, but his services to Iran remained generally unappreciated in the Qajar period. Modern Iranian historiography has done him more justice, depicting him as one of the few capable and honest political leaders to emerge in the Qajar period and the progenitor of various political and social changes that came about half a century later" [1]. However, today his legacy among Persians is quite high after some 170 years after his death is alive and well. A major technical institution – Amir Kabir Technical University is named after him in Tehran (see Chapter 41).

References

[1] https://en.wikipedia.org/wiki/Amir_Kabir

Perspective on Mossaddegh (Lawyer, Prime Minister, Patriot)

Introduction:

This perspective describes the life and contribution of Mossaddegh who was Prime Minister and an Iranian Patriot during 19th and 20th Centuries in Iran.

Facts on Mossaddegh [1]

AKA	Mohammad Mossaddegh
Born	June 16, 1882
Place of Birth	Tehran, Iran
Nationality	Iranian
Death	March 5, 1967
Place of Death	Tehran, Iran
Special Creed	Iranian and Global Patriot

Biographical Sketch

"Mohammad Mosaddegh was born on June 16, 1882 in Tehran, Iran. He was the 35th prime minister of Iran who served from 1951 until 1953, when his government was overthrown in the 1953 Iranian coup d'état orchestrated by the United States' Central Intelligence Agency and the United Kingdom's MI6.

An author, administrator, lawyer and prominent parliamentarian, his administration introduced a range of social and political measures such as social security, land reforms and higher taxes including the introduction of taxation of the rent on land. His government's most significant policy, however, was the nationalization of the Iranian oil industry, which had been built by the British on Persian lands since 1913 through the Anglo-Persian Oil Company (APOC/AIOC), later known as British Petroleum (BP)

Many Iranians regard Mosaddegh as the leading champion of secular democracy and resistance to foreign domination in Iran's modern history. In Iran it is referred to as the 28 Mordad 1332 Coup d'état, after its date on the Iranian calendar. Mosaddegh was imprisoned for three years, then put under house arrest until his death, on March 5, 1967, and was buried in his own home so as to prevent a political furor. In 2013, the U.S.

government formally acknowledged the U.S. role in the coup, as a part of its foreign policy initiatives." [1]

Early Life

"Mosaddegh was born to a prominent Persian family of high officials in Tehran on 16 June 1882; his father, Mirza Hideyatu'llah Ashtiani, was the finance minister under the Qajar dynasty, and his mother, Princess Malek Taj Najm-es-Saltaneh, was the granddaughter of the reformist Qajar prince Abbas Mirza, and a great-granddaughter of Fath-Ali Shah Qajar. When Mosaddegh's father died in 1892, his uncle was appointed the tax collector of the Khorasan province and was bestowed with the title of Mosaddegh-os-Saltaneh by Nasser al-Din Shah. Mosaddegh himself later bore the same title, by which he was still known to some long after titles were abolished.

In 1901, Mosaddegh married Zahra Khanum (1879–1965), a granddaughter of Nasser al-Din Shah through her mother. The couple had five children, two sons (Ahmad and Ghulam Hussein) and three daughters (Mansura, Zia Ashraf, and Khadija)." [1]

Figure 1 shows a photo of his childhood.

Figure 1. A photo of Mosaddegh's childhood

"In 1909, Mosaddegh pursued education abroad in Paris, France where he studied law at the Institut d'études politiques de Paris (Sciences Po). He studied there for 2 years, returning to Iran because of illness in 1911. After 5 months, Mosaddegh returned to Europe to study a Doctorate of Laws (doctorate en Droit) at the University of Neuchâtel in Switzerland. In June 1913, Mosaddegh received his doctorate and in doing so became the first Iranian to receive a PhD in Law from a European university. He practiced law in Switzerland for a few years. Mosaddegh taught at the Tehran School of Political Science at the start of World War I before beginning his political career."[1]

Mossaddegh was a true defender and practitioner of democracy with conviction and trust in the rule of law. His nationalization of the Iranian oil, motivated other nations in Southwest Asia (Middle East included) to learn how to fight colonial powers, especially

United Kingdom. In 1951, he visited Cairo, Egypt and he was welcomed as a global hero [2]. He inspired the Egyptian government to nationalize the Suez Canal. During the nationalization of Iranian oil and his attendance at the United Nations in 1951 and visiting President Harry Truman, he paid respect to the Tomb of the Unknown in Arlington Cemetery (see Figure 2a). In 1982, Mosaddegh's hundredth birth year a stamp was issued in Iran (see Figure 2b).

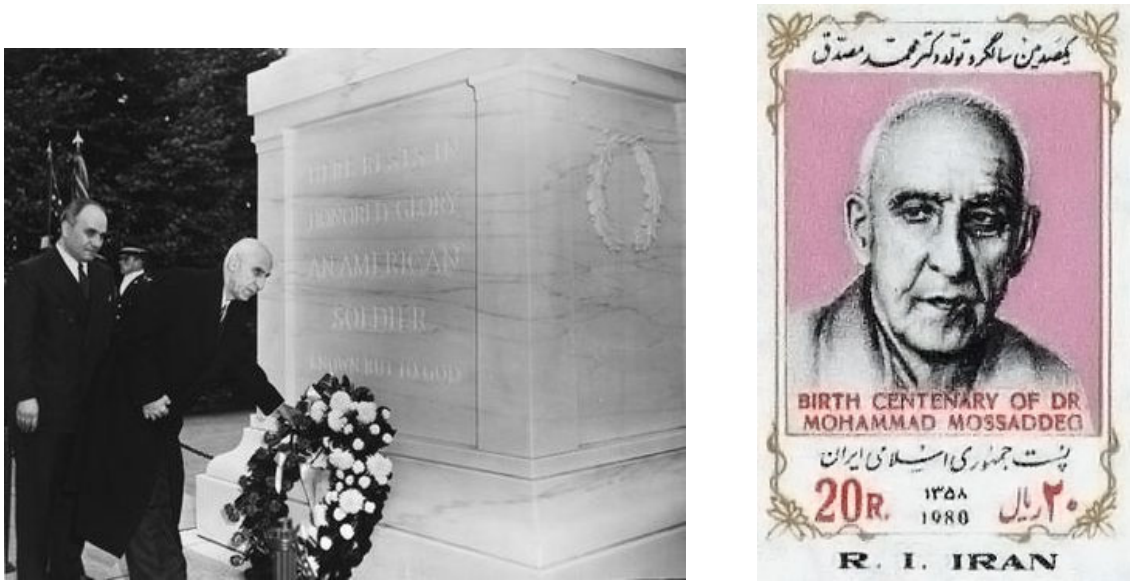


Figure 2. Mosaddegh during visit of Washington, DC in 1951 (a) and an Iranian stamp issue at his hundredth birthday (b)

Dr. Mosaddegh spent a lot of time at the United Nation and Washington, DC explaining that the nationalization of Iran's Oil industry was not a State issue for Britain and only between Iran and the British Petroleum – a Corporation. His global efforts earned him as Time Magazine's Man of the Year, as shown in Figure 3.

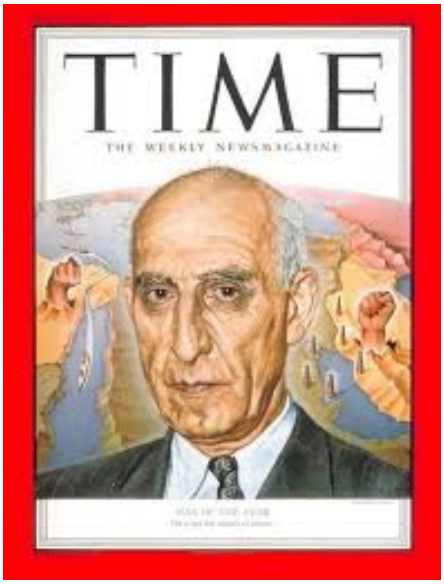


Figure 3. Mosaddegh was chosen as Man of the year, dated January 7, 1952.

References

[1] https://en.wikipedia.org/wiki/Mohammad_Mosaddegh

[2] http://www.mohammadmossadegh.com/biography/egypt/

Painters

Perspective on Kamal-udin Behzad (Painter)

Introduction:

This perspective describes the life and contribution of Kamal-udin Behzad who was a painter during the 15th and 16th centuries in Persia. He was head of the royal ateliers in Herat and Tabriz during the late Timurid and early Safavid Persian periods.

Facts on Kamal Behzad [1]

AKA	Kamal al-din Bihzad or Kamaleddin Behzad
Born	1450 AD
Place of Birth	Herat, Greater Khorasan, Persia, Timurid Empire now Afghanistan
Nationality	Persian
Death	1535 AD
Place of Death	Herat, Greater Khorasan, Persia, Safavid Empire, now Afghanistan

Biographical Sketch

Bezhad was born and lived most of his life in Herat, a city in western Afghanistan, which was an important center of trade and the cultural and economic capital of the Timurid Empire. As an orphan, he was raised by the prominent painter, Mirak Naqqash, and was a protégé of Mir Ali Shir Nava'i. His major patrons in Herat were the Timurid sultan, Husayn Bayqarah (ruled 1469–1506 AD) and other amirs in his circle. After the fall of the Hamad, he was employed by Shah Ismail I Safavi in Tabriz, where, as director of the royal atelier, he had a decisive impact on the development of the later Safavid painting. Behzad died in 1535 AD, and his tomb is in Herat, in Saeede Mukhtar, which is located north of the Herat city on the top of a hill. A statue of Behzad is placed in a 2-Kamal Tomb 1].

Work and Style

Behzad is the most famous of Persian miniature painters, though he is more accurately understood as the director of a workshop (or kitabkhāna) producing manuscript illuminations in a style he conceived. Persian paintings of the period frequently uses an arrangement of geometric architectural elements as the structural or compositional context in which the figures are arranged.

Behzad is equally skilled with the organic areas of landscape but where he uses the traditional geometric style, Behzad stretches that compositional device in a couple of ways. One is that he often uses open, unpatterned empty areas around, which action moves. In addition, he pins his compositions to mastery at moving the eye of the observer around the picture plane in a quirky organic flow. The gestures of figures and objects are not only uniquely natural, expressive, and active, they are arranged to keep moving the eye throughout the picture plane [1].

Figure 1 shows a few samples of Behzad's Miniature paintings of his time [1].

(a) (b) (c) (d)

(e) (f) (g) (h)

Figure 1 Sample Paintings of Kamal-udin Behzad.

(a) Battleground of Timur and the Mamluk Sultan of Egypt.

(b) The construction of castle Khavarnaq in al-Hirat, c. 1494-1495 C.E.

(c) Bihzad illustrating the funeral of the elderly Attar (Chapter 20) of Nishapur after he was held captive and killed by a Mongol invader.

(d) Yusef and Zuleykha (the story of Prophet Joseph).

(e) A miniature painting from the Iskandarnama (Alexander Letter).

(f) The hunting ground.

(h) Timur granting audience on his accession [1].

References

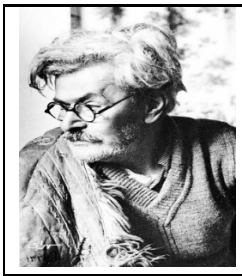
[1] https://en.wikipedia.org/wiki/Kam%C4%811_ud-D%C4%ABn_Behz%C4%81d

Perspective on Hossein Behzad (Prominent Painter)

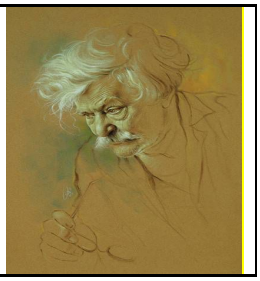
Introduction:

This perspective describes the life and contribution of Hossein Behzad who was a painter during 19th and 20th Centuries in Iran.

Facts on Hossein Behzad [1]



AKA	Hossein Behzad
Born	1894
Place of Birth	Iran
Nationality	Iranian
Religion	Islam
Death	October 13, 1968
Place of Death	Iran



Biographical Sketch

"Hossein Behzad was a prominent Iranian painter. His early work was in the styles of the old masters of Persian painting of the sixteenth and seventeenth centuries, hoping to save Persian miniature painting from oblivion.

In 1934 he left Tehran for Paris and stayed for thirteen months. During this time which time he studied various Eastern and Western painting styles at the Louvre, Guimet museum, and Palace of Versailles. It was during this trip that he developed a completely new style of miniature painting, combining aspects of traditional Persian painting with contemporary painting from the West.

He became internationally well-known and won many awards including the 'first class medal of the ministry of culture' from Iran in 1949 and the 'first class medal of international painting' from Minneapolis, USA in 1958. In 1968 Behzad was given an honorary professorship by the College of Ornamental Arts, Behzad's works have been displayed across the world. To celebrate the millennium of Avicenna, in 1953 he held an exhibition at the Iran Bastan (Historical) Museum. This caused a sensation and was seen by many international visitors. The paintings on show, which took ten years to complete, included the like of Ferdowsi and the Maedan Arch. The exhibition became particularly important to scholars of oriental studies. In an article for the Vatan newspaper of Istanbul, Professor Soheil Anwar wrote, "Behzad, this great artist does not belong only to Iran. He now belongs to the world."

Shortly after, and to much critical acclaim, Behzad held an exhibition, which was sponsored by the French government, at the Museum of Modern Art in Paris. The exhibition was opened by the French minister for culture on 18 May 1955.

He first practiced a conservative form of Neo-Safavidism, and later developed a new idiom that merged revivalism and modernism. In 1956, fifty Behzad miniatures were put on display in the Library of Congress, Washington DC. As Behzad became a living

master, he held exhibitions across the world including London, Prague, New York, Boston and Brussels, as well as in India and Japan.

Death

"By 1968 Behzad had become ill and was sent twice to Europe by the Ministry of Culture. Despite this, Behzad died on 13 October 1968 at the age of 74. He was buried at the cemetery near Imamzadeh Abdollah in Shahr-i Ray (A shrine south of Tehran). In honor of the artist, the *Behzad Museum* was founded in 1994, and is located in Tehran's Sa'dabad Complex and holds a large collection of his works." [1]

Figure 1 shows just a few samples of his paintings [1]

Figure 1. Three paintings of Behzad, from left to right are: Bahram-Gur (Sassanid King 420 to 438 AD), A famous love story of Persian literature called of Shirin and Farhad, and a portrait of Epic Poet Ferdowsi (Chapter 9) [1]

References

[1] https://en.wikipedia.org/wiki/Hossein_Behzad

Physicians

Perspective on Ahmad Jamshidi (Pioneering Cardiologist)

Introduction:

This perspective describes the life and contribution of Jamshidi who was a cardiologist during 20th and 21st Centuries in Iran and USA.

Facts on Ahmad Jamshidi [1]

AKA	Ahmed Jamshidi
Born	April 21, 1929
Place of Birth	Bushehr, Iran
Nationality	Iranian - American
Death	December 1, 2013
Place of Death	Middletown, CT, USA
Expertise	Cardiologists diagnose and treating heart disease, such as congenital heart defects, coronary artery disease, heart rhythm disorders and heart failure.

Biographical Sketch

Ahmad Jamshidi was born in Busheher, Iran on April 21, 1929. He finished his high school diploma as valedictorian from Alborz, High School in Tehran, Iran in 1948. He entered University of Tehran's Medical School in the same year entering as the 2nd ranked in the entrance exam. In 1952. He moved to New York and Columbia University Medical Hospital. He completed his cardiology specialty at Albert Einstein - Montefiore Medical Center Residency, Metropolitan Hospital Center Residency, and Coney Island Hospital Residency, and Coney Island Hospital Internship. Jamshidi was a cardiologist whose main passion in life was helping others, especially children. He was an associate clinical professor at Yale University School of Medicine, past president of the American Heart Association Connecticut Chapter and established the first practice of invasive Cardiology at Bridgeport Hospital. The cardiac catheterization Laboratory at Bridgeport Hospital bears his name today (See Figure 1). He was a Fellow (FACC) American College of Cardiology [2]

Figure 1. Ahmad Jamshidi Cardiac Cauterization Laboratory, Bridgeport Hospital, Bridgeport, CT, USA

References

[1] https://health.usnews.com/doctors/ahmed-jamshidi-496013

[2] https://www.doximity.com/pub/ahmed-jamshidi-md

Perspective on Ghassem Jamshidi (Orthopaedics Surgeon)

Introduction:

This perspective describes the life and contribution of Jamshidi who was an Orthopaedics surgeon during 20th and 21st Centuries in Iran and USA.

Facts on Abol Jamshidi [1]

AKA	Abolghasem Jamshidi, Manutchehr Jamshidi, Manu Jamshidi
Born	May 1, 1932
Place of Birth	Shiraz, Iran
Nationality	Iranian
Expertise	Orthopaedics –surgery: total hip, knee, and general surgery cases.
Alumni	Shiraz (Pahlavi) University Medical School, Shiraz, Iran

Biographical Sketch

Ghassem Jamshidi was born on May 1, 1932 in Shiraz, Iran. His pre-college years were spent in Soltani School in Shiraz, when he received his high school diplomas in 1952. He entered Shiraz (formerly Pahlavi) University medical school from 1954 to 1961. In 1962, after passing American medical ECFMG exam he joined Morisania City Hospital in New York City for internship in 1962. From 1962 to 1964, he spent his residency at the Massachusetts' Memorial Hospital in Boston, MA, USA. From 1965 to 1969 he was a resident of Orthopedic Surgery in Henry Ford Hospital in Detroit, Michigan. After a 2-year visit of Tehran, Iran, he returned to US and with a medical license in Pennsylvania, he practiced medicine in Port Jersey, NY until 1974. In 1977, he started private practice in Tehran and as an Associate Professor of Medicine at the University of Tehran Medical School. From 1978 to 2003, he was the Chief of Orthopedics Surgery at Sina Hospital of the University of Tehran. In 2012, he retired from the University of Tehran. He is, however, still active in private practice and some surgeries. His publications include translation of the *Adam's Outline of Orthopaedics,* from English to Parsi, "Total Orthopaedics of the Hip," 1982. He has also authored papers on knee surgery, 1983, leg lengthening of short limbs, 1982, percutaneous pinning in supracondylar fractures, 1985, fracture of patella, 1986, among others. Jamshidi was one of the founding physicians of Dey Hospital in Tehran, which is still among best hospitals in Iran. Figure 1 shows a view of Dey Hospital and cover of Adam's Outline of Orthopaedics [1]

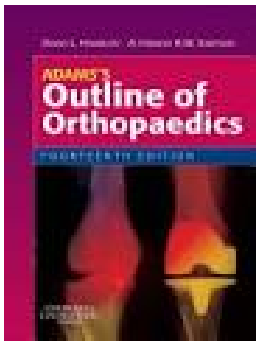


Figure 1. Left a photo of Dey Hospital in Tehran and right, Cover of Adam's *Outline of Orthopaedics*

References

[1] https://www.elsevier.com/books/adamss-outline-of-orthopaedics/unknown/978-0-7020-3061-1

Perspective on Khodadoost (Ophthalmologist and Surgeon)

Introduction:

In these pages the contributions of a legendry ophthalmologist and surgeon, Khodadoost is presented.

Facts on Khodadoost [1]

AKA	Ali Asghsar Khodadoost, Khodadoust
Born	October 27, 1935
Place of Birth	Shiraz, Iran
Nationality	Persian (Iranian)
Religion	Shite Islam
Death	March 8, 2018
Place of Death	New York City

Biographical Sketch:

Khodadoust was an Iranian eye surgeon specializing in corneal transplantation, in whose honor the Khodadoust rejection line is named.[2] He worked at different eye clinics in the U.S. like the Wilmer Eye Institute at the Johns Hopkins School of Medicine and at the Connecticut Ophthalmology Center in New Haven.[3] His medical reputation was the result of his extensive studies on corneal diseases and transplantation biology [1].

American Academy of Ophthalmology has made the following message upon the passing of Dr. Khodadoost [2]:

> "Born in Shiraz, Iran, Dr. Khodadoust was the founder of the Khodadoust Eye Hospital in Shiraz and a long-time faculty member at Yale University and Johns Hopkins University. Dr. Khodadoust was recognized as one of the world's leading corneal graft surgeons and the first to describe the endothelial rejection sign known as the Khodadoust line. He was honored by UNESCO in 2015.
>
> "Ali was a brilliant ophthalmologist, a superb clinician and one of the best ophthalmic surgeons I have known. His quiet, humble and essential efforts in Shiraz are a legacy for humanity," said his colleague Vincent DeLuise, MD. "Ali will be forever linked to the endothelial rejection line he observed, and for his pedagogy in the OR and lecture room to generations of Wilmer and Yale ophthalmologists. We are all the beneficiaries of his clinical acumen and wisdom."

Sajjadi, et al. [3] have also observed the legendary ophthalmologist Dr. Khodadoost as follows:

> "This is a brief celebratory overview of the fruitful life and scientific endeavors of Professor Ali Asghar Khodadoust (b.1935), a world renowned ophthalmologist, Persian icon of modern ophthalmology and an international pioneer of eye research. The global

reputation of Dr. Khodadoust is rooted in his extensive studies on corneal diseases and transplantation biology. As a result of his truly deserved world renown, several famous American ophthalmologists have recognized him as the world's best corneal graft surgeon. Due to his exceptionally impressive achievements in this field, a clinical finding has been named in his honor, the "Khodadoust rejection line", a sign indicative of a chronic focal transplant reaction." [3]

Dr. Khodadoust's pioneering practice of eye diseases has denoted the phenomenon called "Khodadoust rejection line" or "chronic focal transplant reaction is a medical sign that indicates a complication of corneal graft surgery on the eye. This method is called Khodadoust Line because of many years research about this by Professor Ali Asghar Khodadoust". [1]

Figure 1 shows two photos displaying Khodadoust rejection line [4]

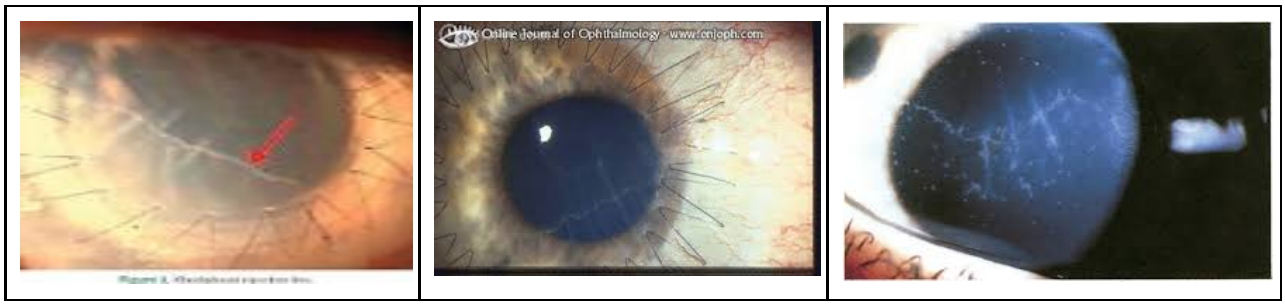


Figure 1. Khodadust's Rejection Line [4]

Final note: The author experience the pleasure of meeting Dr. Khodadoust at a reunion meeting of Shiraz University faculty and students in Los Angeles in early 2000's.

References:

[1] https://en.wikipedia.org/wiki/khodadoost

[2] https://www.aao.org/member-services/member-obituaries-detail/ali-asghar-khodadoust-md

[3] https://pubmed.ncbi.nlm.nih.gov/23725074/

[4] google.com/search?rlz=1C1JZAP_enUS797US797&sxsrf=ALeKk03_B4sp2Pj8MhoxBLd45SkMReClNA:1591133528629&source=univ&tbm=isch&q=photos+of+Khodadoust+rejection+line&sa=X&ved=2ahUKEwiell6miuTpAhUNRqwKHYMyCBAQ7Al6BAgJECk&biw=1166&bih=438

Perspective on Broumand (Nephrologist, Innovator, Patriot)

Introduction:

In these pages, the life story of a pioneering physician of current time. He is Behrooz Broumand, also known as "The father of Nephrology of Iran". He has dedicated his life to serving fellow citizens. [1.2]

Facts on Brumand [1]

AKA	Behrooz Broumand, "Iran's Father of Nephrology"
Born	April 5, 1940
Place of Birth	Shahi, Iran
Nationality	Persian (Iranian)
Special expertise	Nephrology, 1965 medical degree from the University of Tehran
Special creed	A patriot of Iran

Biographical Sketch

Broumand was born in Shahi (now renamed Ghaemshar) in northern Iran. In 1958 he passed the competition examination to enter Tehran Medical School and was awarded an M.D. degree in fall 1965. After graduation, he went to Neka a small town in north of Iran in Mazandaran and started practicing as a family physician. After two years practice in Neka he arrived in United States. In US, Broumand followed his medical education and training in Hackensack, NJ, Georgetown Medicine, Washington, DC a Nephrology Fellow at Veterans Administration Hospital, Georgetown and George Washington Universities, and a 6-month fellowship in Renal Pathology Armed Forces Institute of Pathology, Washington DC.

During 1972-1974, he continued his training through Nephrology Fellowship, Veterans Administration Hospital, Georgetown and George Washington Universities, Washington, D.C. Dr. Broumand during and after his training received certification and Licenses in Washington D.C. 1973 and Maryland 1974 -1994 and later in Pennsylvania 1980-1990, State of New York 1989-1991 and in West Virginia 1981-1991. He successfully passed and achieved three prestigious Specialty and subspecialty board: 1974 Diplomat American Board of Internal Medicine, 1974 Diplomat American Board of Nephrology and after 12 years returned to USA by passing the then non obligatory recertification recognized as Diplomat in Advanced Achievement in Internal Medicine.

In summer of 1975, he returned to Iran and due to his political background was not accepted in Tehran University then. He started working as Internist Nephrologist in the fee for service program at a hospital in 1975. Soon interns and residents from many university hospitals learned about the quality of his medical knowledge and American Board Certification in nephrology (Dr. Broumand was the first American Board Certified internist, Nephrologist in Iran) came to him for his mentorship. In 1975, Iran's *Dialysis and Transplant Center* of Ministry of Health (MOH)

appointed him as head of it, to provide budget and facilities to expand renal replacement therapy for first time in the country. He started teaching these 20 general practitioners and around 20 registered nurses from MOH in a mere six months teaching program in end stage renal diseases (ESRD) and Hemodialysis (HD) and after passing their examination, they established the first 12 dialysis units in different cities such as Mashhad, Tabriz, Isfahan, Kerman, Yazd and Shahi and accepted ESRD patients for maintenance HD.

From 1975 to 1978, more nephrologist arrived to Iran and some trained by Dr. Broumand himself so a society by 10 nephrologist established which later on turned to Iranian Society of Nephrology. In 1979, Dr. Broumand with some of his colleagues and ESRD patients founded related donors, the Dialysis and Transplant Patients Association (DATPA) that now is a great-expanded society helping ESRD patients training and providing them donors for kidney transplantation. Because of Dr. Broumand services to expansion of this society in 2010 DATPA declared that Dr. Broumand indeed is ***the father of management of kidney diseases*** in Iran. In 1977, Dr. Broumand organized a national conference with the help of 10 Nephrologist and Cardiologist and three American guest speaker for difference aspects of Hypertension and its significant adverse cardiovascular outcome, that around 520 physicians from all over Iran attended that conference. Gradually seven internists were employed by Ministry of Health for being trained at Beh Avar hospital by training program for management of kidney diseases that was initiated by Dr. Broumand with co-operation of two of trained nephrologist that joined the group by 1978. After several years this training and experiences was accepted by Ministry of Health and several of those Internist now are Nephrologist [1,2]. Dr. Broumand returned from the United States as the first American board certified Internist -nephrologist, and was elected as the president of the Scientific Iranian society of Nephrology in 1975 and remained as President of the Scientific society until 1980 when the 8 years Iran and Iraq war halted the activities of all scientific societies.. In 2000, Dr. Behrooz Broumand was re-elected as president of the Society and served for six years until 2006. Dr. Broumand hosted the 7th-10th International Congresses of Nephrology, Dialysis, and Transplantation in Iran. He has been active member of International Society of Nephrology (ISN) since 1974. Back in Iran, he tried very hard to expand the activities of ISN in Middle East and as a result was recognized as the Pioneer of Nephrology in Middle East and obtained the 2015 Pioneer Award Middle East region in Cape Town South African meeting of ISN.

Apart from the above scientific activities, Dr. Broumand had several official appointments such as President of University of Medical Sciences of Iran (UMSI) 1980-1981. Indeed UMSI was continuation of Imperial Medical Sciences University of Iran, which was, stablished on July 1973 and by August 1974, the University of Imperial medical sciences of Iran had established a close affiliation with Harvard and Columbia Universities with some cooperation with Cornell University and the University of Pittsburgh. The revolutionary environment and lack of any responsible efficient management encouraged the faculty and student revolutionary committee to search for a replacement. Indeed the goal was to find someone who believed on comprehensive medical education with acceptable training and experience. Dr. Broumand then was one of the few qualified American trained physicians with acceptable revolutionary background following approval of revolutionary committee and then minister of higher education Dr. Broumand was appointed as president of IMCI from June 21, 1980. After 18 months in office. The prestigious Iranian Medical Science as a permanent member has honored him.

Dr. Broumand is the author of more than 100 papers in Persian about kidney diseases and Renal Transplantation two books in Persian about kidney diseases and transplantation plus a chapter in the book entitled Nephrology worldwide by Springer in 2020.

Final Comment: One of Dr. Broumand's admirable efforts is his dedications and patriotic fever to his country Iran and especially helping the disadvantaged and deprived fellow Iranians. He has built hospitals, schools and much other effort to affect the lives of Iranians. Figure 1 shows a scene from one of the schools he built in Province of Sistan and Baluchistan during the opening ceremony of the school. Dr. Broumand has donated his family house that was born at and has been inherited to him to Mazandaran University of Medical Sciences to be used for a subspecialty clinic in Shahi.

Figure 1. Dr. Broumand among the young Baluchi and Sistani pupils in their new school

References:

[1] http://www.thepersianjournal.com/vol-2-no-1.html

[2] http://aia.de.com/index.php?option=com_content&view=article&id=139%3Adjawari&catid=918%3A2006&Itemid=121&lang=de

Perspective on Rahbar (Physician, Discoverer of HbA1C Blood Sugar Test)

Introduction:

This perspective describes the life and contribution of Rahbar who was a physician and innovator during the 20th and 21st centuries in Iran and the USA.

Facts on Rahbar [1]

AKA	Samuel Rahbar
Born	May 12, 1929
Place of Birth	Hamadan, Iran
Nationality	Iranian, American
Death	November 10, 2012
Place of Death	Los Angeles County, USA

Biographical Sketch

Samuel Rahbar was an Iranian scientist and physician who discovered the linkage between diabetes and HbA1C, (a form of hemoglobin used primarily to identify plasma glucose concentration over time). He was born in the Iranian city of Hamedan in 1929. He obtained his MD degree from the University of Tehran in 1953 and a Ph.D. degree in immunology in 1963.

From 1952 to 1960 he pursued mainly clinical activities in Abadan and Tehran, returning to an academic life as a postdoctoral fellow in 1959. After earning his Ph.D., he was promoted to assistant professor in 1963 and to associate professor in 1965 in the Department of Immunology. He spent 1968–1969 as a visiting scientist at the Department of Medicine of the Albert Einstein College of Medicine in New York, where he collaborated with Helen M. Ranney. After his return to Tehran, Rahbar was promoted to full professor in 1970 and to director of the Department of Applied Biology at the University of Tehran Medical School in Tehran. In 1979, he left Iran and moved to United States. Shortly after his arrival, he became a researcher and professor of diabetes in the Department of Diabetes, Endocrinology, and Metabolism at the City of Hope in Duarte, California (in Los Angeles County).

In 2012, the American Diabetes Association (ADA) bestowed a special, one-time National Scientific Achievement Award to Rahbar in recognition of his discovery of HbA1c as a marker of glycemic status in persons with diabetes. The award is named after the awardee and is called the Samuel Rahbar Outstanding Discovery Award [1].

Perspective on Ghorban (Physician, Leader, Pioneer)

Introduction:

This perspective describes the life and contribution of Ghorban who was the Dean at the Shiraz University Medical School during the 20th century in Iran.

Facts on Ghorban [1]

AKA	Zabih Ghorban
Born	1903
Place of Birth	Shiraz
Nationality	Iranian
Death	2006
Place of Death	Shiraz
Alumni	American University of Beirut
Known	Legendry Dean of the Medical College at Shiraz University, Iran

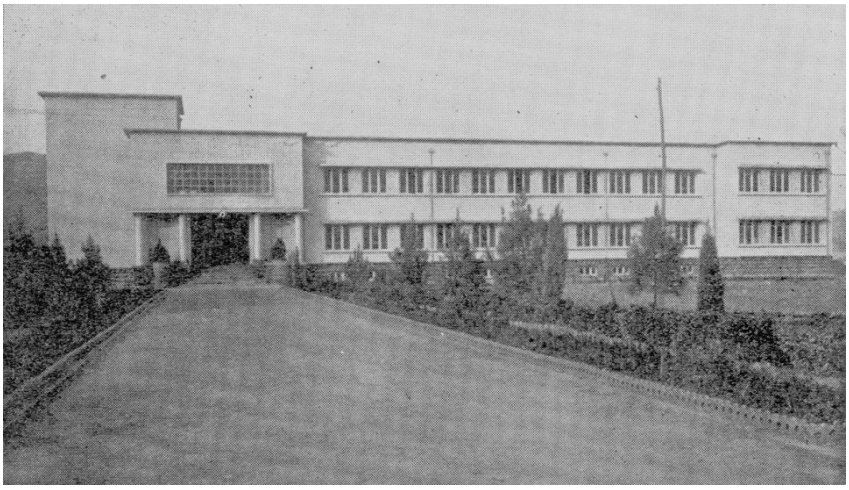
Biographical Sketch

Ghorban was born in 1903 in Shiraz, Iran. He was a physician who graduated from the American University of Beirut. He returned to Shiraz after receiving his medical degree and began establishing an Auxiliary Training School (see Figure 1) in 1945. Although a few students were being trained, there was no formal medical school in Shiraz until 1952. However, if one considers the Auxiliary Training School as the forerunner of the Shiraz University Medical School (SUMS), it goes back to 1946 (see Figure 1) [1].

Ghorban played a tremendous role in establishing SUMS. Year by year, new departments would be added to the school. One of the earliest departments was pathology, which was established with help and service of foreign physicians from Germany, and other nations [2].The medical school was located in central Shiraz, as a college within the Pahlavi University (now Shiraz University). In 1953, the Faculty of Nursing was added, followed by the Faculty of Dentistry in 1969. A key addition to medicine is Shiraz was the establishment of the Nemazee Hospital through a donation by Mohammad Nemazee. Figure 2 shows the initial building of this hospital. Soon thereafter, Nemazee Hospital became the Shiraz University Hospital, a major factor, at the time, to attract high quality physicians to Shiraz.

Ghorban can be designated as "*The Father of the Shiraz University Medical School",* who is a legend in the medical filed not only in Shiraz but also in Iran as a whole. He served tirelessly as Dean of the School for several years and passed away in 2006. Today, SUMS is still one of the best medical centers in Iran and in the Middle East, thanks to Ghorban and numerous other physicians who taught medicine in that school. More information can be found in the "History of Medicine in Modern Iran" book.

(a)



(b)

Figure 1. The Auxiliary Training School Established by Ghorban (a) and the First Building of the Shiraz University Medical School (b).

Figure 2. A scene from the Nemazee Hospital Established in 1955 in Shiraz [1].

References

[1] https://en.wikipedia.org/wiki/Shiraz_University_of_Medical_Sciences

[2] Azizi MH, Bahadori M, Dabiri S. "Professor Parviz Haghighi and His Role in Promotion of Academic Pathology at the Shiraz School of Medicine in Iran", (1969–1979). *Archives of Iran Medicine,* 2015; 18(8): 552 – 555.

Perspective on Nasr (Gastroenterologist, Dedicated Leader, Pioneer)

Introduction:

This perspective describes the life and contribution of Nasr who was a physician during the 20th and 21st centuries in Iran and the USA.

Facts on Nasr [1]

AKA	Khosrow Nasr, Dean Emeritus of Shiraz University School of Medicine, Director Emeritus of Nemazee Hospital, Shiraz, Iran.
Born	1937
Place of Birth	Tehran
Nationality	Iranian, American
Death	January 21, 2020
Place of Death	Roseville, CA, USA
Alumni	Yale University, Columbia University, University of Chicago

Biographical Sketch

After completing his education through high school, young **Nasr** entered Yale University and received a B.S degree in 1958. Afterwards, he enrolled in the College of Physicians and Surgeons, at Columbia University and obtained his MD in 1962. He completed his internship and first year of residency training from 1962 to 1964. After that, he continued the residency in internal medicine at the University of Chicago from 1964 to 1966. In subsequent years, during 1966 and 1968, Nasr completed his postgraduate studies in gastroenterology. Upon his return to Iran in 1968, he joined the faculty of Shiraz University Medical School. Because of his outstanding competence, Nasr was initially elected by his colleagues as the chair of department of internal medicine from 1968 to 1972. Next, he served as Director of the Nemazee University Hospital in Shiraz in 1972, and in due course, as Dean of Shiraz University Medical School. Later, he and his colleagues founded medical schools in two cities in the Fars Province; Fasa and Jahrom in 1977, both of which were initially supervised by Shiraz School of Medicine. He was the first dean of the Fasa School of Medicine from 1981 to 1987 [1].

Dr. Asghar Rastegar (see elsewhere Rastegar) who served as Professor of Internal Medicine at Shiraz Medical School during the same period wrote, "During the past forty years, I have had the privilege of working with many outstanding leaders in academic medicine in Iran and the United States. I still consider Khosrow Nasr and Faramarz Ismail-Beigi as among the top individuals I have had the privilege of working with in my professional life".

As a tribute to several former distinguished mentors of the Shiraz School of Medicine, between 2012 and 2019, ceremonies were held for six pioneering professors in Tehran and Shiraz and a five-volume set of ceremony books were published. On Thursday April 26, 2012, when the first

ceremony was held in Shariati Hospital, Tehran, in honor of Dr. Faramarz Ismail-Beigi (see elsewhere for Ismail-Beigi), Nasr sent a message and it read as: "I am unfortunately unable to participate in this wonderful celebration, recognizing the contributions made by my close colleague and friend, Dr. Faramarz Ismail-Beigi to the Shiraz University Medical School. There is no question that the success of the "Shiraz Model" of medical education is due to the work of many individuals. However, the leadership provided by Dr. Ismail-Beigi was critical to this success. Dr. Ismail-Beigi set the standard for the department and became a living model of an academic physician for the younger faculty, residents, and students" [1].

Figure 1 shows a poster for an event in Shiraz, Iran in honor of Dr.'s Nasr and Rastegar [1].

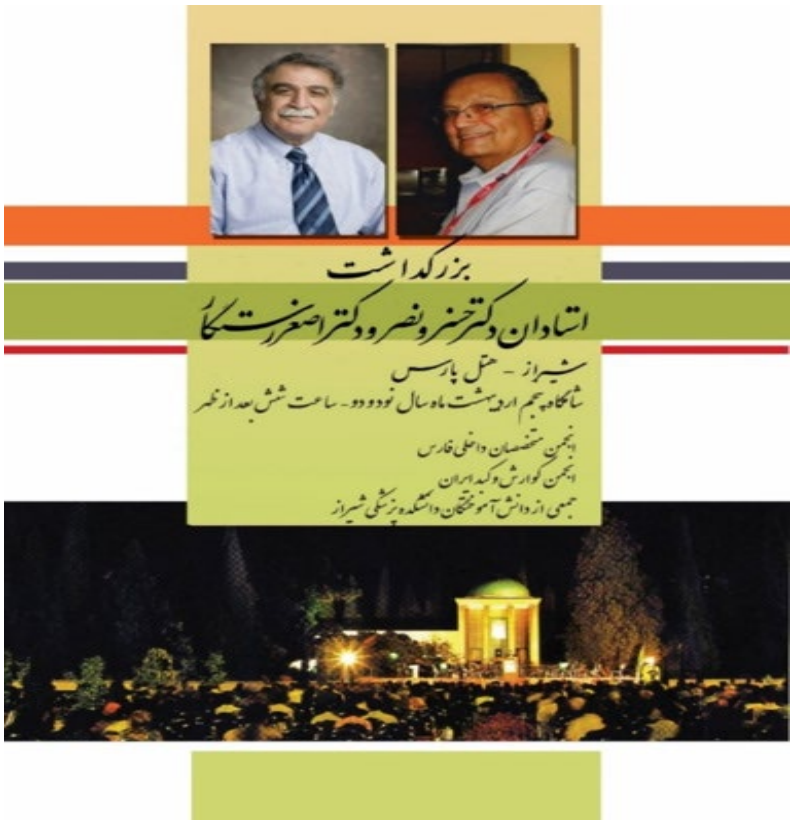


Figure 1. Pictures from an honor event of Nasr and Rategar

During the above ceremony, Dr. Ismail-Beigi said this about Nasr: "He is a great communicator who thinks positively and always considers what can be done instead of why things cannot be done. As the chair of the Department of Medicine, he welcomed me to Shiraz and the School and made every effort to make sure that my family and I were comfortable and well settled. Mostly due to his demeanor and attitude, there was great warmth and friendship in the Department. I could feel the happiness of the Departmental faculty the School become internationally respected a strong (if not the strongest) School and Department of Medicine in the entire Middle East region" [1].

Contemporary Medicine: Shiraz Medical School [2]

Nasr, an accomplished visionary that he was, published a historical account of the "Shiraz Model" of Medicine in 2009. He gave six key reasons for the success of the Shiraz University

School of Medicine, which ranked as one of the highest schools of medicine in all of the Middle East. The six key attributes, which he called them "pillars", are as follows:

1. Pillar One - English was the official instructional language of the School as well as other schools of then Pahlavi University (Now Shiraz University).
2. Pillar Two – Construction and creation of the Nemazee Hospital founded by Mohammad Nemazee. Reader can see the Perspective on the History of Medicine in Modern Iran in this volume. This hospital (see Figure 2) started with 25 beds first and in a few short years upgraded to 600 beds.
3. Pillar Three – Creation of a great regional university, called the Pahlavi University in Shiraz, Iran
4. Pillar 4 – Faculty members recruited were attracted in the new School and University on full-time basis. The young faculty were enthusiastic and competent in all schools, including the School of Medicine.
5. Pillar 5 – The city of Shiraz, which is known for its hospitality, rose gardens and very welcoming and friendly residents. Shiraz welcomed all non-Shirazi's and non-Iranians visiting scholars in all of the schools. Visiting professors were from the USA, Europe, and Asia.
6. Pillar Six – Incoming students were smart, hardworking, and accepted the "Shiraz Model" of Medicine as well as in other disciplines across the three campuses of the Pahlavi University.

Dean Nasr passed away on January 21, 2020 in Roseville, CA, USA and left a legacy of care and competent leadership enshrined into the History of Shiraz University School of Medicine.

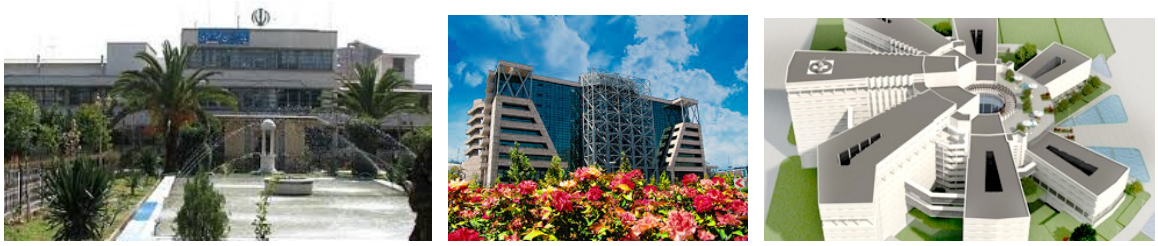


Figure 2 Nemazee Hospital in Shiraz, Iran: Past, Present and Future.

References

[1] M.H. Azizi, see www.aimjournal.ir

[2] K. Nasr, "History of Contemporary Medicine: Shiraz University School of Medicine – Its Foundation and Development," *Archives of Iranian Medicine*, Vol 12, No. 1, pp. 87-92, 2009

Perspective on Ismail-Beigi (Scientist, Physician, Endocrinologist, Innovator)

Introduction:

This perspective describes the life and contribution of F. Ismail-Beigi who is a physician during the 20th and 21st centuries in Iran and the USA.

Facts on Ismail-Beigi [1]

AKA	Faramarz Ismail-Beigi
Born	December 28, 1941
Place of Birth	Tehran, Iran
Nationality	Iranian, American
Expertise	Internal Medicine, Diabetes, Endocrinology
Alumni	Hadaf High School, Tehran, Iran, Berea College, Berea, KY, John Hopkins University (MD), Baltimore, MD, and UC Berkeley (PhD – Biophysics), Berkeley, CA, USA

Biographical Sketch

Ismail-Beigi was born on December 28, 1941 in Tehran, Iran. Both parents were educators: His father was a professor of Physics at Tehran University and subsequently served as the Chancellor of Mashhad University, and his mother was a high school teacher and served as the principal of one of first high schools in Iran for women. He attended the Hadaf High School until 1957. He then moved to United States and graduated from Berea College, Berea, Kentucky in1962 with a BA degree. He attended the Johns Hopkins School of Medicine, Baltimore, MD and received his MD degree in1966. Following the internship and residency at Johns Hopkins, he moved to California as a post-doctoral research fellow and received a Ph.D. in Biophysics at the University of California, Berkeley, San Francisco in 1972. He joined the faculty of Pahlavi (current Shiraz) University in 1972 as an Associate Professor and then as Professor of Medicine and Physiology until 1982. He moved to Tehran where he served as Professor of Medicine at the Firoozgar Hospital (under the Ministry of Health) and was also in private practice. He left Iran in 1983 and was a visiting research scientist at the Ciba-Geigy Pharmaceutical Company in Basel, Switzerland. He served as the Professor of Medicine and Biochemistry at the Columbia University in New York (1983-1993) before joining Case Western Reserve University in Cleveland Ohio as Professor and Chief of Clinical and Molecular Endocrinology in 1993-2012. He is currently a Professor of Medicine, Physiology and Biophysics, and Biochemistry at the University, 1993-present.

He has a celebrated a professional career in Asia, Europe, and North America. Here is a summary of his many positions: Associate Professor of Medicine and Physiology, Pahlavi University, Shiraz, Iran, 1972-78. Chairman, Department of Medicine, Pahlavi University, Shiraz, Iran, 1972-79. Visiting Professor, Dept. of Medicine, University of California, San

Francisco, CA, 1976-77. Professor of Medicine, Pahlavi University, Shiraz, Iran, 1978-82. Associate Professor of Medicine, Columbia University, New York, NY, 1984-1991. Professor of Clinical Medicine, Columbia University, 1991-93. Professor of Medicine, and Chief of the Division of Clinical and Molecular Endocrinology, Case Western Reserve University, 1993-2012. Professor of Physiology and Biophysics, Case Western Reserve University, 1993-present, and Professor of Biochemistry, 2010-present.

He has served as a member of American Heart Association Research Committee (New York Affiliate), 1987-91. Ad hoc member of various Study Sections at National Institutes of Health (NIH), 1987-2011. Physiology Study Section, NIH, 1989-1992. Executive Committee, Council on Basic Sciences of American Heart Association, 1990-92. Editorial Board, *American Journal of Physiology: Cell Physiology*, 1992-2008. Editorial Board, *Journal of Biological Chemistry*, 2012-2016, and reviewer for multiple basic and clinical science journals.

Boards, Honors and Awards

- Beaumont Tuition Scholarship (full tuition), Johns Hopkins School of Medicine 1962-1966
- Bay Area Heart Association Fellowships, 1968-71
- American Board of Internal Medicine, 1972

Major Achievements

Research Contributions:

- Discovery of the major action of thyroid hormone in control of bioenergetics. 1971.
- Major role in the conduct of the NIH-funded multicenter randomized clinical trials ACCORD, BARI 2D, and GRADE that delineated the most effective and safest approaches to treatment of patients with type 2 diabetes.
- Reviewer for multiple grant agencies (including the NIH, American Heart Association, and American Diabetes Association, and others including several European grant agencies).
- Service on multiple guideline committees for the management of diabetes.
- Continuous research grant funding from the NIH from 1995-present.
- Multiple collaborative research projects with faculty of different universities in Iran.
- Development and testing of novel insulins that are highly stable at high temperatures (hence requiring no refrigeration) with prolonged shelf-life, as well as being less mutagenic compared to available insulins.
- On-going research focused on the development of "smart" insulins that become activated and inactivated depending on the blood glucose.
- Published 125 basic science research papers largely focused on thyroid hormone action, glucose transport biology, glucose transporters, and insulin action, and published 120 research papers in clinical science largely focused on type 2 diabetes and prevention of complications associated with the disease.

Contributions to Administration:

- Pahlavi/Shiraz University. A few months after joining Pahlavi University, he was selected (voted by the members) to serve as the Chairman of the Department of Internal

Medicine. His major focus became the development an outstanding Department of Medicine. The Department already had a small (10) but strong faculty, a highly intelligent and hard-working student body, well-functioning hospitals and outpatient departments, a completely full-time faculty, a first-rate medical library, and a curriculum that was in English language. What needed to be enlarged and strengthened was a group of outstanding medical residents (post-doctoral trainees), as well and recruitment of additional outstanding faculty.

- High caliber medical residents are the key to the development of an outstanding educational program. They spend large amounts of time with students, and they demand superb knowledge from the faculty. A major problem for development of a strong residency program was the continuous "brain-drain" (largely to the United States) that was occurring from all medical schools. Graduating students were willing to go to any second- or third-class medical institution in the USA rather than staying in Iran.
- With the recruitment of Dr. Asghar Rastegar in 1973 who became in charge of the residency program, together they proposed a competitive program (with much support from Dr. Khosrow Nasr) that encouraged the best graduates from the University as well as other schools of Medicine in Iran to join the residency program in Shiraz with the promise that the Department would send them to first-rate institutions for post-residency sub-specialty training with the aim that they would return and serve in Iran. The incentive for joining by residents was that the obligatory 2-year military service that would start immediately after graduation with an MD degree be delayed to the end of their post-doctoral education. Dr. Ismail-Beigi, joined with the Dean (Dr. Ali Farpoor), and the Chancellor (Dr. Farhang Mehr) presented this plan to high authorities of the Iranian government and won their approval. Over the subsequent 7 years (till 1980) the residency program in Medicine increased from 8 to 40 trainees, most of whom were top graduates of their schools. At one time there were three #1 and four #2 and #3 graduates from different universities of Iran enrolled in the Department of Medicine in Shiraz. The same program was emulated by other departments of the School resulting in higher overall excellence of the school.
- Alongside with the residency program additional highly trained superb faculty were recruited in different disciplines (the medicine faculty number rose to 24 by 1980). The educational program was also strengthened by establishing a robust visiting professorship program from USA and England where prominent faculty at various renowned universities would spend 1-2 and up to 12 months as visiting faculty.
- After returning to the United States in 1993 and serving as Clinical Professor at Columbia University in New York, he was recruited as Chief of the Division of Clinical and Molecular Endocrinology at Case Western Reserve University in Cleveland, Ohio in 1993, a position he held till 2012. Currently, he is Professor of Medicine, Biochemistry, and Physiology and Biophysics at Case Western Reserve University.

<u>Contributions in Education and Clinical Practice</u>:

- The central driving point in education for him has been the impetus towards excellence. Trainees have been prompted to achieve excellence in their work, and the same demand has been placed on trainers (including himself). The endeavor to achieve this goal was one of the reasons that the model for training of residents was so successful (see above).

- During the more than 52 years of work in academic medicine, he has trained countless number of medical students, residents, and postdoctoral fellows. He has been a mentor to over 50 doctoral and 100 postdoctoral fellows in basic science and clinical research. Many of his former trainees are faculty members at major universities in Iran and US.
- As a physician, treating patients both in the hospital and in the outpatient clinics has been his continuous activity during the years. This activity has most frequently been in conjunction with one or more students, residents, or postdoctoral fellows in Endocrinology.
- Invited speaker at scientific conferences in many countries, including Iran.

References

[1] Ismail-Beigi, F., and Edelman, I. S. Mechanism of thyroid calorigenesis: Role of active sodium transport. *Proc. Nat. Acad. Sci. USA* 67: 1071-1078 (1970). **This paper describes the discovery of the mechanism of thermogenic action of thyroid hormone.**

[2] Reinhold, J. G., Faraji, B., and Ismail-Beigi, F. Fiber *vs.* phytate as determinant of the availability of calcium, zinc, and iron in breadstuffs. *Nutrition Reports International* 12: 75-85 (1975). **This research was performed in Shiraz. It describes the pathogenesis of the common Ca, Zn, and iron deficiency due to consumption of unleavened tanok bread in Fars province. The article was chosen by *Current Contents* as a citation classic in 1988.**

[3] Gick, G. G., Ismail-Beigi, F., and Edelman, I. S. Thyroid hormone regulation of Na,K-ATPase alpha, and beta subunit gene expression. *J. Biol. Chem*. 263: 16610-16618 (1988). **This article describes for the first time the genetic regulation of the sodium pump expression by thyroid hormone.**

[4] The ACCORD Study Group. Effects of Intensive Glucose Lowering in Type 2 Diabetes. *N. Engl. J. Med.* 358: 2545-2559 (2008). **This article summarizes the results of a large multicenter trial focused on setting blood glucose goals for patients with type 2 diabetes to prevent cardiovascular disease.**

[5] The BARI 2D Study Group. A randomized trial of therapies for type 2 diabetes and coronary artery disease. *N. Engl. J. Med.* 360: 2503-2515 (2009). **Summarizes results of a large multicenter trial on best treatments for patients with type 2 diabetes and atherosclerotic cardiovascular disease.**

[6] Ismail-Beigi, F., *et al.* Effect of intensive treatment of hyperglycemia on microvascular complications of type 2 diabetes: an analysis of the ACCORD randomized trial. *Lancet.* 376: 419-430 (2010). **Describes the role of glycemic control on prevention of microvascular complications (such eye and kidney disease) in patients with type 2 diabetes**.

[7] Ismail-Beigi, F., *et al.* Individualizing Glycemic Targets in Type 2 Diabetes: Implications of Recent Clinical Trials. *Ann. Intern. Med.* 154: 554-559 (2011). **In this Opinion paper, how to set glucose targets in patients with type 2 diabetes is described. The paper was widely discussed and a version of a diagram in this publication is shown in all subsequent guidelines on type 2 diabetes issued yearly by the American Diabetes Association.**

[8] Ismail-Beigi, F. Glycemic Management of Type 2 Diabetes. *N. Engl. J. Med.* 366: 1319-1327 (2012). **This is an invited paper by a highly prestigious journal describing best practices.**

[9] Glidden MD, *et al.* An ultra-stable single-chain insulin analog resists thermal inactivation and exhibits biological signaling duration equivalent to the native protein. *J Biol Chem*. 293:47-68 (2018). **This article describes the production and activity of a thermally stable insulin.**

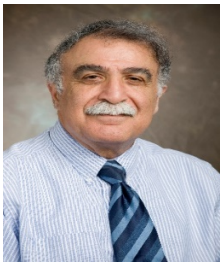
[10] Rege NK, *et al.* "Register-shift" insulin analogs uncover constraints of proteotoxicity in protein evolution. *J Biol Chem*. 295:3080-3098 (2020). **This paper describes the constraints in the evolution of insulin.**

Perspective on Rastegar (Nephrologist, Global Contributor, Compassionate)

Introduction:

Rastegar is an Iranian American physician, internist and nephrologist, Professor at the Yale School of Medicine, has dedicated his life in developing programs to train physicians for Iran as well as other resource-limited regions of the world. This perspective describes his life and contribution during 20th and 21st Centuries in Iran, USA and around the Globe.

Facts on Rastegar [1]

	AKA	Asghar Rastegar
	Born	1942
	Place of Birth	Shiraz, Iran
	Nationality	Iranian, American
	Known for	A quintessential physician and human being
	Alumni	University of Wisconsin at Madison

Biographical Sketch

Early Life and Education:

Dr. Rastegar was born in Shiraz, Iran in 1942. He graduated from Alborz High School, a college preparatory school, in Tehran. He then received his BA and MD from the University of Wisconsin in Madison and did postgraduate training in internal Medicine and nephrology at the Hospital of the University of Pennsylvania in Philadelphia where he spent an additional year as instructor and chief resident.

Career:

Dr. Rastegar returned to Shiraz in 1973 and joined the faculty of the Pahlavi (Shiraz) University Medical School as Associate Professor. During the next 9 years in Shiraz he held many leadership posts. Before the revolution he served as the Director of the Residency Training Program and Vice-Dean for Academic Affairs. Immediately after the revolution he was elected as the Chair of the Executive Committee of the Medical School, and later the Chair of the Executive Committee of the Department of Medicine. He was dismissed from the medical school in 1981 and spent the next 11/2 in private practice as consultant nephrologist in Tehran while serving as voluntary faculty at the Firouzgar Hospital of Tehran U Medical School.

He returned to the United States in 1983 as was appointed as the Director of Residency Training and Chief of Clinical Services at the University Of Colorado School Of Medicine (1984-1985) before moving to Yale University School of Medicine. At Yale, he has held many leadership positions including Chief of Medical Services at the Veterans Affairs Medical Center, Vice Chair for Education and Academic Affairs, Co-Chief of the Nephrology Section, Director of Graduate Medical Education at the Yale New Haven Medical Center. In 1988 he was promoted to the rank

of Professor of Internal Medicine. In 2010 he became founding Director of the Office of Global Health overseeing collaboration between Yale and 6 international sites in Sub-Saharan Africa, Indonesia and Colombia focusing on building human capacity to improve health in limited resource regions. He retired from full time faculty in 2020 and is presently Emeritus Professor of Medicine and Senior Research Scientist at the Yale School of Medicine.

Major achievements:

Iran 1973-1983: Major challenge Iranian medical schools were facing when Dr. Rastegar joined the faculty in Shiraz was the loss of the best graduates to the hospitals in the US. To combat this loss, a unique model of collaboration with some of the best institutions in the US and UK was developed, whereby training in Shiraz was complemented by further training in these institutions. The goal was to recruit the best graduates of the Iranian medical schools with focus on training the future faculty for Iran. Dr. Rastegar, as Director of Residency Training Program, working with colleagues played a key role in designing and implementing this model. Although this model was interrupted by the Iranian revolution, it was successful in recruiting some of the best graduates of Iranian medical school, many who went on to become leaders in Iranian health care system or in academic centers in the US. In addition, as Vice Dean for Education, he played a key role in redesigning the undergraduate training at the Pahlavi medical school. As a nephrologist he developed the first fellowship program in Iran training the first 2 Iranian nephrologist before the revolution.

US (1985-2020): Dr. Rastegar's many leadership positions at Yale ~~has~~ allowed him to focus on enhancing the quality of the training of medical students and physicians-in-training at this institution. He was recognized for his work by multiple teaching and mentoring awards. However, given his experience in Shiraz, he also used his position at Yale to develop projects to enhance quality of training in resource-limited regions of the world. In 1992 he first travelled to the Ural regions of Russia to study medical education in 3 medical universities. In 1996 working with Dr. Majid Sadigh, and Iranian American physician at Yale, he developed collaboration with the Kazan State Medical University in Russia focusing on training faculty for this institution. The 20th year anniversary of this collaboration, celebrated in 2016, highlighted the critical impact of this project in modernizing medical education at the KSMU, now ranked as one of the top 3 institutions in Russia. In 2006, this model was expanded to several institutions in sub-Saharan Africa specifically in Uganda, Rwanda and Liberia. These projects have been funded by the World Bank, USAID, PEPFAR as well as several private foundations. Most recently these projects have become a foundation for the development of applied research to improve health of the community as well as individuals at these sites.

He has also served as the Co-Director of Yale-Stanford Johnson & Johnson Global Health Scholar program which has sponsored over 1000 US scholars for a 6-week clinical rotations at one of these collaborative sites. The goal of this program has been to familiarize US students, physicians-in-training and faculty to become familiar with challenges faced by the health care system in providing care in resource-limited regions. A number of these scholars are now in leadership positions in institutions in the US and abroad.

As nephrologists, Dr. Rastegar, working with the International Society of Nephrology, where he served as the Co-Chair of its Education Committee, has focused on improving care of patients with kidney disease. This has included training nephrologists from these regions at Yale as well as developing educational curriculum relevant to their need. He is a well-known authority in

acid-base and fluid homeostasis and has served as one of the editors of American Society of Nephrolgy NephSap publication as well as feature editor of the American Journal of Kidney disease.

Dr. Rastegar has continued to collaborate with ~~colleagues~~ institutions in Iran specially with the Iranian Society of Nephrology. He has served as visiting professor in many medical schools in Iran and has participated in many national and international conferences held in Iran. In 2003 he travelled to BAM with Americares to deliver medical equipment and drugs for the care of patients injured in the 2003 earthquake.

Honors:

1993 Named teaching award given annually to a faculty in Yale the Department of Medicine

2002 Honorary Distinguished Professor, Kazan State Medical University, Kazan, Russia

2006 Elected as Honorary Member, Iranian Academy of Medical Sciences

2013 Honorary Distinguished Professor, Shiraz University Medical sciences

Selected awards (all at the Yale Medical School)

1987, 2009, 2010 Teacher of the year, selected by medical house staff

1988 Francis Gilman Blake Award, as the most outstanding teacher of Medical Sciences, selected by the graduating class

1989 First winner of the Charles W. Bohmfalk Prize for Excellence in Clinical Sciences

1993 Governor's Award, American College of Physician's (Connecticut Chapter)

Selected References:

1. Ismail-Beigi, N. Ghahramani. Impact of Quality Mentorship on Achievements of Shiraz Medical School in the 1970s and the Role of Professors Khosrow Nasr and Asghar Rastegar. Arch Iran Med. 2013; 16(4): 251 – 253
2. Bodnar BE, Claassen CW, Solomon J, Mayanja-Kizza H, **Rastegar A**. Effect of bidirectional exchange on faculty and institutional development in a global health collaboration. PLoS One. 2015 Mar 23;10(3):e0119798
3. Rabin TL, Mayanja-Kizza H, **Rastegar A.** Medical Education Capacity Building Partnerships for Health Care Systems Development. AMA Journal Ethics (2016)
4. **Rastegar A.** The Threat to the Universality of Science in the Post-9/11 World. Nat Clin Pract Nephrol. 2006 Sept;2(9):465
5. Ziganshin BA, Sadigh M, Yausheva LM, Ziganshina AP, Pichugin AA, Sozinov AS, Amirov NK, **Rastegar A**, Ziganshin AU, Sadigh M. Developing medical education capacity in Russia: twenty years of experience. BMC Med Educ. 2017 Jan 25;17(1):24.
6. Cancedda, C., **Rastegar A.** Health Professional Training and Capacity Strengthening Through International Academic Partnerships: The First Five Years of the Human Resources for Health Program in Rwanda. Int J Health Policy Manag. 2018 Nov 1;7(11):1024-1039
7. https://medicine.yale.edu/news-article/25571/ Nephrologist / Global Health Trailblazer Dr. Asghar Rastegar Retiring July 1

(a)

(b)

(c)

Figure 1. Historical Bam, Kerman Iran Arg (a), before (b) and after (c) devastating earthquake

References

[1] https://medicine.yale.edu/profile/asghar_rastegar/

]2] Ismail-Beigi, N. Ghahramani. Impact of Quality Mentorship on Achievements of Shiraz Medical School in the 1970s and the Role of Professors Khosrow Nasr and Asghar Rastegar. *Arch Iran Med*. 2013; 16(4): 251 – 253.

Perspective on Massoumi (Cardiologist Pioneer)

Introduction:

This perspective describes the life and contribution of Massoumi who was a cardiologist during the 20th and 21st centuries in Iran and the USA.

Facts on Massoumi [1]

AKA	Ali Massoumi
Born	January 15, 1945
Place of Birth	Naein, Iran
Nationality	Iranian, American
Death	March 2015
Place of Death	Houston, TX, USA
Alumni	University of Tehran
Expertise	A pioneer in electrophysiology

Biographical Sketch

Massoumi was born on January 15, 1945 in the city of Naein, Iran. He graduated from School of Medicine, University of Tehran in 1969. In 1973, he came to Buffalo, New York to spend his residency in Cardiology at the Milard Filmore Hospital there and later he moved to Houston in 1977, working at St. Luke's Hospital (Texas Heart Institute) until 2015.

Massoumi joined Hall-Garcia Cardiology Associates in 1979 as a partner and remained there throughout his professional career. Massoumi was a pioneer in electrophysiology at the Texas Heart Institute and the youngest physician to become a full Professor of Medicine at the Baylor College of Medicine. Massoumi was recognized as a ground-breaking electrophysiologist, always at the forefront of his field, and was consistently named one of the best electrophysiologists in the United States, most recently in 2014 by *USA Today*. Massoumi was the personal physician of celebrities, prominent physicians, kings, and royal families. The Sultanate of Oman endowed the Massumi Chair in Cardiology and Cardiac Electrophysiology at St. Luke's Hospital in his honor. Massumi left an indelible legacy as a mentor. He trained more than 30 electrophysiologists and over 180 cardiologists and interventional cardiologists. Massoumi was a pillar in the Iranian American community and helped countless people.

References

[1] https://www.dignitymemorial.com/obituaries/houston-tx/dr-Massoumi-massumi-6362315

Perspective on Malek Hosseini (Physician, Pioneer, Liver and Kidney Transplant Surgeon)

Introduction:

This perspective describes the life and contribution of Malek Hosseini who was a liver transplant surgeon during20th and 21st Centuries in Iran. He is the first person conducting a liver transplant surgery from a living donor during March 1993-March 1994.

Facts on Malek Hosseini [1]

AKA	Ali Malek Hosseini, "Iran Father of Kidney and Liver Transplant Surgery"
Born	1949
Place of Birth	Boyer-Ahmad, Iran
Nationality	Iranian
Known for	Pioneer in transplantation of kidney and liver

Biographical Sketch

Malek Hosseini was born into a religious family in southwest Province of Kohkuheyeh Boyer-Ahmad, Iran (see Figure 1) in 1949, he completed his elementary education in his rural village before going to Shiraz (capital of Fars Province) to attend a high school. After receiving his diploma in Shiraz, he returned to his hometown and served as a teacher in a nearby village for two years.

Figure 1. Map of Iran, showing Province of Kohkuheyeh Boyer-Ahmad, Iran [3]

In 1973, he passed the national entrance exam to enter the Faculty of Veterinary Medicine of the University of Tehran. During the same year, his mother died of a liver disease, a tragedy that

soon changed his course of life and led him to take part again in the entrance exam to study medicine. At his second time on national entrance exam, he entered Tehran University of Medical Sciences in 1974.

After span of 7 years, General Medicine education and internship summa cum laude (top grade) in 1981. He then entered general surgery residency at Shiraz School of Medicine (see Figure 2). After that, he went back to Tehran to fulfill his fellowship program in kidney transplantation at Shahid Beheshti (formerly National University Medical Faculty) School of Medicine, and during the same period, he became an assistant professor of general surgery at Shiraz Medical School. He accepted a medical fellowship at Pittsburgh University (PA, USA) in 1990 to perform research on liver transplantation. Upon his return to Iran in 1992, he formed a liver transplantation team at Nemazi Hospital (see Figure 3) in Shiraz and performed the first liver transplant in Iran and the Middle East to earn the title 'Father of Iran's liver transplantation'.

Figure 2. A scene from Shiraz Medical Science University [4]

Figure 3. Nemazi Hospital, Shiraz, Iran in 1950's [5]

Dr. Malek Hosseini has since been highly active in organ transplantation surgeries especially liver transplantation and has advanced his theoretical and practical knowledge by attending various international courses and conducting research, including a research fellowship at King's College London in 2001.

He has also been active in benevolent organizations and made charitable contributions to poor people in need of medical attention.

Achievements

Dr. Malek Hosseini has had many leadership positions, including Founder of Kidney Transplantation Department of Shiraz Medicine School, 1987 (expanded to Organ Transplantation Department in 1992), performed the first liver transplant in Iran in 1992, performed the first partial liver transplant in Iran in 1998, performing the first liver transplant from adult to adult in Iran in 2002. He has been President of Faghihi Hospital, Shiraz, Iran, 1987-89, Examiner at Iranian Board of General Surgery, 1991- Present, Vice President of Shiraz University of Medical Sciences, 1992-1994, President of Shiraz University of Medical Sciences, 1994. He has been invited at many medical meetings in over 10 countries in Asia and Europe.

References

[1] https://ariamedtour.com/info/doctors/dr-ali-malek-hosseini/

[2] https://www.tehrantimes.com/news/433246/Iran-s-father-of-liver-transplant-honored

[3] https://www.google.com/search?q=Iran+map+and+Boyer+ahmad&sxsrf=ALeKk00l3FWOJXe1ZplPdgaNvttmZiP1bw:1594951452504&tbm=isch&source=iu&ictx=1&fir=1nu3GTAXAQpRfM%252Ca7042xDvpfzndM%252C_&vet=1&usg=AI4_-kRo9sq7zDnNk2Klz0aFve0Bn02SPw&sa=X&ved=2ahUKEwiZmYqWmdPqAhUR7awKHYefD5cQ9QEwAnoECAoQHA&biw=1229&bih=530#imgrc=nNmRagHL1JnZ4M&imgdii=JbkQeXupYV0uNM

[4] SUMS https://www.google.com/search?q=photo+of+Shiraz+Medical+University+Iran&rlz=1C1JZAP_enUS797US797&sxsrf=ALeKk00c7n2UUYq7D0XjsEWJgX19gvZ9Tw:1594951147541&tbm=isch&source=iu&ictx=1&fir=K4_latfQaTFxBM%252Cx_96wmsvxQESEM%252C_&vet=1&usg=AI4_-kS9roegA3z0DdNUYdG7uYsVWgq-ww&sa=X&ved=2ahUKEwjw3dSEmNPqAhVQI6wKHXRkDC0Q9QEwAXoECAoQEQ&biw=1229&bih=530#imgrc=32rln0A92I6jRM

[5] Nemazi hospital https://www.google.com/search?q=photo+of+Shiraz+Nemazi+hospital+Iran&tbm=isch&ved=2ahUKEwiToMqImNPqAhVQ0KwKHcXhBkEQ2-cCegQIABAA&oq=photo+of+Shiraz+Nemazi+hospital+Iran&gs_lcp=CgNpbWcQDFC4yANYgfMDYOGTBGgAcAB4AIABmQGIAZwKkgEEMTUuMZgBAKABAaoBC2d3cy13aXotaW1nwAEB&sclient=img&ei=8wURX9PaLdCgswXFw5uIBA&bih=530&biw=1229&rlz=1C1JZAP_enUS797US797#imgrc=PC3HpLFgMLR7XM

Perspective on Ghahramani (Nephrologist, Patriot)

Introduction:

This perspective describes the life and contribution of Ghahramani who currently is a nephrologist during the 20th and 21st centuries in Iran and the USA.

Facts on Ghahramani [1]

AKA	Nasrollah (Nasr) Ghahramani
Born	March 21, 1956
Place of Birth	Shiraz, Iran
Nationality	Iranian, American
Expertise	Chronic kidney disease, Acute kidney injury, Kidney transplantation
Alumni	University of Pennsylvania, Iran University of Medical Sciences, Pennsylvania State University

Biographical Sketch

Ghahramani was born on March 21, 1956 in Shiraz, Iran. After high school, he attended the University of Pennsylvania in Philadelphia and obtained his medical degree (MD) from the Iran University of Medical Sciences. While growing up, he accompanied his father to the most deprived regions of Iran, including remote coastal areas of the Persian Gulf in the south. After finishing the primary school in Shiraz, he moved to Tehran, when his father was training as a neurology resident. In 1968, his entire family moved to Philadelphia, where he finished high school and college, receiving his BA in pre-medicine. To the surprise of his whole family, he decided to go back to Iran and briefly attended the then Iran National University (INU) Medical School. When the Imperial Medical Center of Iran (IMCI), an English-language medical school modeled after the American medical school and was established by a consortium of 3 Ivy-league schools: Harvard, Columbia, and Cornel, which announced they were accepting applicants through MCAT and included an interview process. Ghahramani applied and was one of 32 accepted students out of 500 applicants. The proposed IMCI curriculum consisted of two basic science years, each consisting of 4 terms of 10 weeks each, to be followed by the NBME Part I. Based on the NBME exam, the plan was for the students to be divided into 3 groups and to go to one of the members of the consortium for their clinical rotations: Harvard, Columbia, and Cornel [1].

However, following the Islamic Revolution and the Iran-Iraq war, all of his plans changed. During the war, as a medical student, and a medical resident, he served on eight medical missions to the war from where he made the most of the situation by learning, gaining clinical skills, while serving the injured. He pursued the residency and was a chief resident at Shiraz Medical School and completed the nephrology fellowship in Tehran. Following completion of training, he served as the first Chair of Medicine for the newly established Kermanshah Medical School for two years, where he was also a member of the first kidney transplant team. In 1993-1994, he was awarded the International Medical Scholarship to pursue a research fellowship at

Yale University. On his return to Iran, he was exiled for one year to serve in Larestan, (a remote part of Fars Province). He subsequently served as a faculty member in Shiraz University Medical School, where he received tenure and was promoted to the rank of Associate Professor in the year 2000. The same year, he decided to re-immigrate to the United States to pursue his academic goals. He initially started training at Vanderbilt but moved to Pennsylvania State University in 2001 to pursue the combined Medicine/Nephrology Physician Scientist and a Masters in Clinical Research program through the NIH-K30 project. In 2006, the Pennsylvania State University College of Medicine offered him a faculty position as Assistant Professor of Medicine with a joint appointment in the Department of Public Health Sciences. He rapidly rose through the ranks to obtain tenure and he has been Professor of Medicine and Chief of the Division of Nephrology since 2016. He currently also serves as the Vice Chair for Educational Affairs for the Department of Medicine at Penn State.

Expertise

Ghahramani's primary areas of research interest have included patient-centered studies regarding peer mentoring among patients with chronic kidney disease, perceptions of patients and physicians about transplant, and geographic disparities in transplant. Other areas of interest are acute kidney injury, kidney transplantation, use of methods to monitor graft survival and comparison of forms of induction immunosuppression.

His clinical activities are focused on the care of patients with kidney disease. His specific area of interest is kidney and pancreas transplants. He evaluates patients with chronic kidney disease for their transplant candidacy and manages their post-transplant care, including immunosuppression management. He also evaluates potential kidney donor candidates. He is the medical director of the kidney transplant program at Penn State. In addition to kidney transplantation, his other major area of clinical interest is acute kidney injury.

As an educator, he has trained several generations of medial students, residents, and fellows in Iran and in the United States. He has received numerous teaching awards and is a member of the Penn State College of Medicine Society of Distinguished Educators.

Boards and Awards

- Fellow, American Society of Nephrology, 2012,
- Fellow, American College of Physicians, 2011,
- Board-certified in Nephrology, American Board of Internal Medicine, 2006 (certified through 2027),
- Board-certified in Internal Medicine, American Board of Internal Medicine, 2004 (recertified through 2024).

References

[1] http://shafaonline.ir/ (Parsi web site)

Perspective on Ghajar (Neurosurgeon, Innovator)

Introduction:

This perspective describes the life and contribution of Ghajar who is a neurosurgeon and inventor during the 20th and 21st centuries in the USA.

Facts on Ghajar [1]

AKA	Jamshid Ghajar
Born	Unknown
Place of Birth	Berkeley, CA, USA
Nationality	Iranian, American
Expertise	Brain surgery, neurochemistry and metabolism during coma, and eye tracking cognitive performance monitoring

Biographical Sketch

Jamshid Ghajar was born in Berkeley, California and grew up in California, Iran, and England. As a freshman at UCLA, he started his investigations in brain sciences at the Brain Research Institute, which continued into graduate work in developmental neurobiology. At Cornell University Medical College, he completed the MD/Ph.D. program in neuroscience specializing in brain metabolism and blood flow during a coma. While he was a resident in the neurosurgery program at the New York Hospital, he invented several neurosurgical devices, which are now used worldwide. After residency, he joined the faculty and staff at the New York Hospital-Cornell Medical Center and founded the Brain Trauma Research Laboratory and the Brain Trauma Foundation, (formerly the 'Aitken Neuroscience Center'). He currently spends his time as President of the nonprofit foundation, developing and implementing scientific guidelines for treating head injuries. He is also the Chief of Neurosurgery at the New York Jamaica Hospital – Cornell Trauma Center and was a practicing neurosurgeon at the New York Hospital. Currently, he is a board-certified neurosurgeon, Clinical Professor of Neurosurgery, Moghaddam Family Director of the Stanford Brain Performance Center and President of the Brain Trauma Foundation [2].

He is a Clinical Professor of neurosurgery at Stanford and he has numerous publications and 4 patents thus far.

Honors and Awards

- Honorary Police Surgeon, New York Police Department (2007-2014)
- Ellis Island Award, Ellis Island Award Committee (2013)
- American Iranian Council Award, American Iranian Council (2001)
- Boards, Advisory Committees, Professional Organizations

- Committee on Trauma, American College of Surgeons (2012 to Present)

Patents

Jamshid Ghajar. "United States Patent 7,849,525 Apparatus for Reducing Brain and Cervical Spine Injury due to Rotational Movement", G-Brace, Dec 14, 2010

Jamshid Ghajar. "United States Patent 7,819,818 Cognition and Motor Timing Diagnosis Using Smooth Eye Pursuit Analysis", SyncThink, Oct 26, 2010

Jamshid Ghajar. "United States Patent 7,708,700 Method for Improving Cognition and Motor Timing", SyncThink, May 4, 2010

Jamshid Ghajar. "United States Patent 7,384,399 Cognition and Motor Timing Diagnosis and Training System and Method", SyncThink, Jun 8, 2008 [3]

References

[1] https://web.stanford.edu/group/psa/events/1999-00/ghajar/bio.utf8.html

[2] https://profiles.stanford.edu/jamshid-ghajar

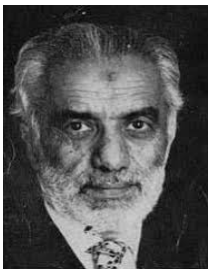
[3] https://www.brainline.org/author/jamshid-ghajar-md-phd

Perspective on Gharib (Physician, Pioneer, "Father of Pediatrics in Iran")

Introduction:

This perspective describes the life and contribution of Gharib who was a pediatrician during the 20th century in Iran.

Facts on Gharib [1]

	AKA	Mohammad Gharib, Father of Iran's Pediatrics'
	Born	1910
	Place of Birth	Tehran, Iran
	Nationality	Iranian
	Death	1975
	Place of Death	Tehran
	Alumni	Paris Medical School

Biographical Sketch

Gharib was born in Tehran in 1910, he went to France in 1932, and received his MD degree from Paris Medical School, after which he continued his training in pediatrics. He returned to Iran in 1939 and was initially employed at the Department of Pediatrics of Raazi Hospital. Later, Gharib became Chair of the Departments of Pediatrics at Raazi and Hezar Takhte-Khabi Hospitals. Gharib and Ahari were among the pioneers who established the Children's Medical Center [1].

Children Medical Center

Tehran's Children's Medical Center was founded in 1968 thanks to Ahari, and Gharib's efforts, previously called the Dr. Ahari Hospital as a general pediatric center. Now the hospital consists of 20 specialties and sub-specialty wards, including: Emergency, EICU, infectious diseases, hematology, nephrology, hemodialysis, endocrinology, gastrointestinal disease, endoscopy, neonatology, NICU, PICU, immunology, rheumatology, neurology, psychiatry, cardiology, open heart ICU, CICU, respiratory disease, bone marrow transplant, surgery 1 & 2 and general, orthopedic, cardiac, ENT, neurosurgery & urology operation theaters. There are 117 faculty members (63 of them are specialist and subspecialist in pediatrics). There are 56 fellows, 65 pediatric residents, about 150 interns of pediatrics (3 of them are international students) and 200 medical students each year. Sixty percent of the staff can speak English fluently. Seven research centers are in the hospital including Growth & Development, Pediatric Urology & Regenerative, Asthma & Allergy, Immune Deficiency, Pediatric Digestive & Liver, Pediatric Chronic Kidney Disease, and Infectious Disease and the research centers have several MOUs with other academic centers. The center manages the *Iranian Journal of Pediatrics (IJP)* and the IJP is published bi-monthly. The IJP is indexed in ISI, Pub Med, and Scopus.

Provided are sub-specialty care in out-patient clinics for more than 10,000 patients also more than one thousand elective and emergent surgeries are performed in the center including bone marrow transplantation monthly. Also, there are fully equipped Para clinic departments like, radiology, CT scan & MRI, laboratory, physiotherapy, dentistry, around the clock pharmacy and many others. The hospital offers 420 registered bed capacities, which 80 percent of them are well equipped. The Children's Medical Center is one of the most experienced sub-specialized hospitals in the country that offers high quality and specialized therapeutic services to neonates, infants and children throughout the country and region. This center was selected as the hub of excellence in pediatrics in 2008 by the ministry of health and medical education. Our hospital services and facilities are open to all nationalities, irrespective of race, color and creed. It is our ability to deliver the best health care is made possible through our team of highly trained, dedicated and committed professionals within our medical, nursing, and clinical services [2].

Figure 1a, shows a picture of the Children's Medical Center in Tehran, while Figure 1b shows an Iranian stamp issued in honor of Gharib.

(a) (b)

Figure 1a and b. A scene from the Children's Medcial Center in Tehran and a Tribute Stamp of Gharib.

Death

Gharib passed away at a young age of 65 in 1975 in Tehran. Figure 2 shows his tomb.

Figure 2 Tomb of Gharib.

References

[1] http://www.ams.ac.ir/AIM/NEWPUB/13/16/8/AIM/NEWPUB/12/15/3/0015.pdf

[2] http://medicine.tums.ac.ir/college/en/page/children%E2%80%99s-medical-center

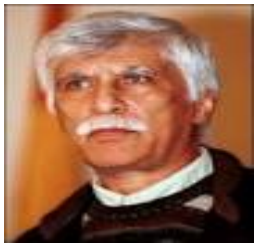
Scientists/Engineers/ Educators

Perspective on Beyzai (Playwright, Film Editor)

Introduction:

This perspective describes the life and contribution of Bahram Beyzai who was a Playwright, Film director, Theatre director, Screenwriter, Film editor during 20th Century in Iran.

Facts on Beyzaei [1]

	**AKA**	Bahram Beyzaei
	Born	December 26, 1938
	Place of Birth	Tehran, Iran
	Nationality	Persian
	Religion	Unknown
	Known for	Playwright, Film director, Theatre director, Screenwriter, Film editor

Biographical Sketch

> **"Bahrām Beyzāie** (also spelled **Beizai**, **Beyza'i**, Persian: بهرام بیضائی, born 26 December 1938) is a critically and popularly acclaimed filmmaker, playwright, theatre director, screenwriter, film editor, and *ostād* ("master") of Persian letters, arts and Iranian studies.
>
> Bahram Beyzaie is the son of the poet Ne'matallah Beyzai (best known by his literary pseudonym "Zokā'i").[1] The celebrated poet Adib Beyzai, known as one of the most profound poets of 20th-century Iran, is Bahram's paternal uncle. Bahram Beyzaie's paternal grandfather, Mirzā Mohammad-Rezā Ārāni ("Ebn Ruh"), and paternal great-grandfather, the mulla Mohammad-Faqih Ārāni ("Ruh'ol-Amin"), were also notable poets.[3]
>
> In spite of his somewhat belated start in cinema, Beyzai is often considered a pioneer of a generation of filmmakers whose works are sometimes described as the Iranian New Wave. His *Bashu, the Little Stranger* (1986) was voted "Best Iranian Film of all time" in November 1999 by a Persian movie magazine *Picture World* poll of 150 Iranian critics and professionals. Still, even before the outset of his cinematic career in 1970, he was a leading playwright (as well as theater historian), so much so that he is often considered the greatest playwright of the Persian language, and holds a reputation as "the Shakespeare of Persia."[1]

Since 2010, Beyzai has lived and taught at Stanford University, United States.

References

[1] https://en.wikipedia.org/wiki/Bahram_Beyzai

Perspective of Kermani (Mathematician, Physician, Poet)

Introduction:

This perspective describes the life and contribution of Khajoo Kermani, who was a mathematician, physician and poet during the 13th and 14th centuries in Iran.

Facts on Khajoo Kermani [1]

AKA	Khwaju Kermani
Born	December 24, 1280 AD
Place of Birth	Kerman, Iran
Nationality	Iranian
Death	1349 AD
Place of Death	Shiraz, Iran

Biographical Sketch

Kermani was born in Kerman, Iran on 24 December 1290 AD. His nickname Khwaju is a diminutive of the Persian word *Khwaja,* which he uses as his poetic penname. This title points to the descent from a family of high social status. The nisba (name title) Morshedi, displayed his association with the Persian Sufi master Shaykh Abu Eshaq Kazeruni, the founder of the Morshediyya order. Kermani died around 1349 AD in Shiraz, Iran, and his tomb in Shiraz is a popular tourist attraction today. When he was young, he visited Egypt, Syria, Jerusalem and Iraq. He also performed the Hajj in Mecca. One purpose of his travel is said to have been education and meeting with scholars of other lands. He composed one of his best-known works, *Homāy o Homāyun* in Baghdad. Returning to Iranian lands in 1335 AD, he strove to find a position as a court poet by dedicating poems to the rulers of his time, such as the Il-Khanid rulers, Abu Sa'id Bahadur Khan and Arpa Ke'un, the Mozaffarid Mubariz al-Din Muhammad, and Abu Ishaq Inju of the Inju dynasty [1].

List of Poems

- *Divan* - a collection of his poems in the form of Ghazals, qasidas, strophic poems, qeṭʿas (occasional verse), and quatrains.
- *Homāy o Homāyun* - The poem relates to the adventures of the Persian prince, Homāy, who falls in love with the Chinese princess, Homāyun.
- *Gol o Nowruz* - The poem tells another love story, this time vaguely situated in the time shortly before the advent of Islam.
- *Rowżat-al-anwār* - In twenty poetic discourses, the poet deals with requirements for the mystical path and the ethics of kingship.
- *Kamāl-nāmeh*
- *Gowhar-nāma*
- *Sām-nāma* - A heroic epic about the grandfather of Rustam [1].

Figure 1 shows the Khajou-Kermani tomb in Shiraz. Figure 2 shows the Quran Gate (the old entrance to the city of Shiraz, Iran) where the Khajoo-Kermani tomb is located on top of a hill next to the gate.

Figure 1. Khahoo-Kermani's Tomb in Shiraz, Iran [1].

(a)

(b)

Figure 2. Khajou-Kermani's tomb is located next to the Quran Gate of Shiraz (a) old scene and (b) new scene [1].

References

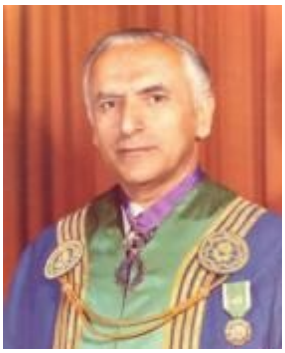
[1] https://en.wikipedia.org/wiki/Khwaju Kermani

Perspective on Mojtahedi (Engineer, Pioneer in Education)

Introduction:

This perspective describes the life and contribution of Mojtahedi who was a pioneering educator and leader during the 20th century in Iran.

Facts on Mojtahedi [1]



AKA	Mohammad Ali Mojtahedi Gilani
Born	September 23, 1908
Place of Birth	Lahijan, Gilan, Iran
Nationality	Iranian
Death	July 1, 1997
Place of Death	Nice, France
Known for	Founding Sharif University of Technology and 8th Principal of Alborz High School for 35 years, mathematician, mechanical engineer

Biographical Sketch

Mohammad Ali Modjtahedi Gilani was an Iranian University professor and lifetime principal of the highly prestigious Alborz High School in Tehran, Iran. Founder of Sharif University of Technology (originally Aryamehr Technical University) and dean of Tehran Polytechnic University (currently renamed to Amirkabir University of Technology). Memoirs of Mohammad Ali Modjtahedi (Persian) 2000 were published as part of Harvard University's Iranian Oral History Project, editor Habib Ladjevardi. ISBN 964-7359-10-1 [1].

Life

He was born in Lahijan, Gilan in the northern part of Iran. He started his elementary school at the age of seven at Haghighat School after, which he came to Tehran to continue his education at the Daar-Ol-Moallemin-E-Markazi in 1925. He finished high school at Madrese-Motevasete in the eastern part of Tehran and received his high school diploma in 1931. In 1932, among 100 other prominent students, he received a fellowship to go to France for higher education. He completed his undergraduate studies at the Université Lille Nord de France in 1935 and his doctorate at the Paris-Sorbonne University in 1938. He received his Ph.D. in mechanical engineering in 1938 [1].

Alborz High School

Alborz High School is a college-preparatory high school located in the heart of Tehran, Iran. It is one of the first modern high schools in Asia and the Middle East, named after the Alborz mountain range, north of Tehran. Its place in the shaping of Iran's intellectual elite compares with that of Eton College in England and institutions such as Phillips Academy, Phillips Exeter

Academy, and Milton Academy in the United States.-Mojtahedi is known as the able leader and pioneer in higher education in Iran during the 20th century. In 1944, he took over as the 8th Principal of Alborz High School until 1979 [2].

History of Alborz High School

The school was founded as an elementary school in 1873 by a group of American missionaries led by James Bassett. This was in the 26th year of the reign of Nasereddin Shah Qajar, 22 years after Amir Kabir founded the Dar ul-Funun school in Tehran, and 33 years before the Constitutional Revolution in Persia (as it was known back then; later it became "Iran" during the Reza Shah Era). When Dr. Samuel Jordan arrived in Persia in 1898, he instituted change; subsequently, Alborz became a 12-year elementary and secondary school, with its share of college courses. Thereafter, the institution came to be known as the American College of Tehran [2].

Dr. Jordan remained president of Alborz for 42 years (1899–1940). During his tenure, Alborz grew from an elementary school to a high school and college. In 1932, the school received a permanent charter from the Board of Regents of the State University of New York.

In 1940 and during World War II, by the order of Shah Reza Pahlavi, Alborz was removed from the American management and placed under the auspices of the Iranian Ministry of Education as part of Reza Shah's modernization reforms. The school's name was changed from "*College*" back to "*Alborz*", and it was reinstated as a high school. In 1944, Professor Mohammad Ali Mojtahedi, member of University of Tehran's faculty, was appointed as the president of Alborz. From then until 1979, and continuing after the Iranian Revolution, Alborz had the most successful period of its history. Figures 1 and 2 shows photos of this historical school [2].

During his 35-year tenure, Mojtahedi supervised education of more than ten thousand boys, many of whom went on to some of the world's best colleges and universities. His graduates made up the core of Iran's post-war young elite, filling almost every position of power and influence in corporations, universities, and the government [3]. While he was maintaining his Alborz High School Principal, he served one year, as was president of Shiraz University (formerly Pahlavi University) for one year as well as a 3-year chancellor of Tehran Polytechnic (now Amirkabir University of Technology).

In 1965, he was asked to establish a higher education technical university, then called Aryamehr University of Technology (now called Sharif University of Technology) and held the chancellorship position until 1967. Professor Fazlollah Reza (Chapter 32) succeeded him. Sharif University of Technology is among the highly ranked institutions in the world. Figure 3 shows an aerial view of the University and the entrance of the main building. In addition to Alborz High School and Sharif University of Technology, he also served as president of two other major universities: Phalavi (Now Ahiraz) University and Amir Kabir Technical University.

References

[1] https://en.wikipedia.org/wiki/Mohammad_Ali_Mojtahedi

[2] https://en.wikipedia.org/wiki/Alborz_High_School

[3] http://www.parstimes.com/history/dr_mojtahedi.html

Figure 1 A View of *McCormick Hall, American College of Tehran*, Circa 1930. The School received a Permanent Charter from the Board of Regents of the University of New York in 1932 [2].

Figure 2 A View of Alborz High School in 1930 Tehran [2].

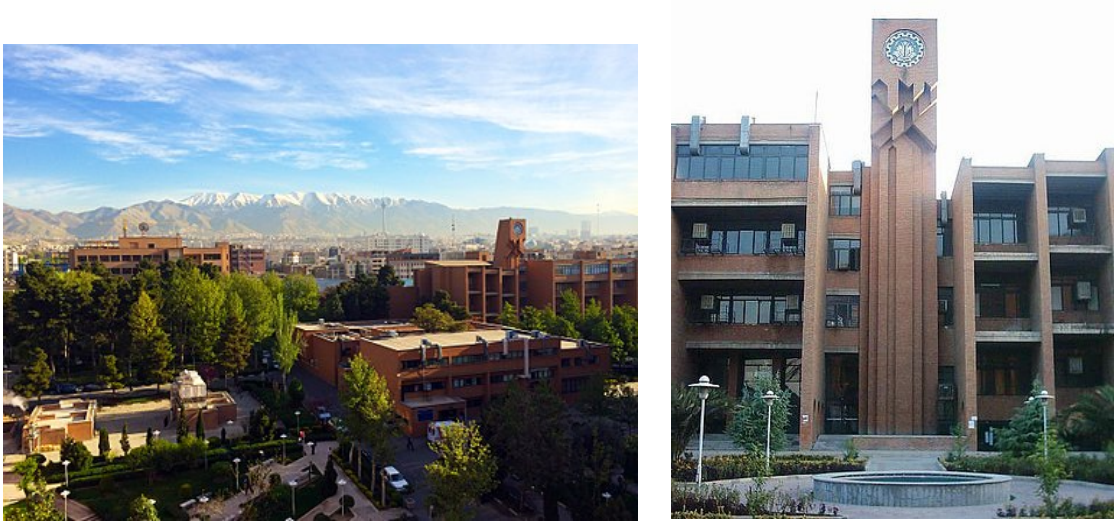


Figure 3 Two Views of the Sharif University of Technology Founded by Mojtahedi in 1965 [2].

Perspective on Mosaheb (Mathematician)

Introduction:

This perspective describes the life and contribution of Mosaheb who was a mathematician and a logician in 20th century Iran.

Facts on Mosaheb [1]

AKA	AKA Gholamhossein Mosaheb
Born	October 13, 1910
Place of Birth	Tehran
Nationality	Persian
Place of Death	Tehran

Biographical Sketch:

Gholamhossein Mosaheb was an Iranian mathematician and logician whose works have been praised by other scholars such as; Iraj Afshar and Najaf Daryabandari. Being fluent in Persian, Arabic, French and English, he studied in Iran, France and England, and received his Ph.D. from Cambridge University. He was the founder of the Mosaheb Institute of Mathematics, the Teacher Training University and was the Director of the Institute of Mathematics of Kharazmi University in Iran from 1972-1974.

During the 1950s, when Persian scientific typography was flourishing, Mosaheb invented a left slanted right-to-left font style that he named the *Iranic font*. This term is still commonly used by typographers in Iran, often as a general term for any left slanted font.

In 1955, Mosaheb's *Madkhale Manteghe Soorat* (introduction to Formal Logic) was the first scholarly writing in mathematical logic to be published in Iran. This work was given a positive review in 1957 by L. A. Zadeh in the *Journal of Symbolic Logic*. Mosaheb's most famous work in non-mathematical society is as the author of 'The Persian Encyclopedia', written in the Persian language and consisting of 3 volumes. His methods of organizing and categorizing are still in use. The 1996 publication of *The Persian Encyclopedia* gave credited authorship to himself, Ahmad Aram and Mahmoud Mosaheb.

On June 28, 2009, it was announced that the 100th book released from the Society for the Appreciation of Cultural works and Dignitaries had been allocated to the life, scientific and cultural works of the late Gholamhossien Mosaheb. This tribute is written by Pegah Hajjan. In it are many of Mosaheb's published works including an article entitled *The First Trigonometry Book*, as well as appraisals from other scholars.

He is the founder of the Institute of Mathematical Research (IMR), which is still known as one of the most important Iranian mathematical centers. The Institute of Mathematical Research started

its work in October 1965 under the direction of Mosaheb, as a semi-independent institute affiliated with the *Tarbiat Moaalem University.*

References:

[1] https://en.wikipedia.org/wiki/Gholamhossein_Mosaheb

[2] https://financialtribune.com/articles/economy-sci-tech/37447/father-of-irans-modern-math-commemorated

Perspective on Jadbabaei (Engineer, Educator, Pioneer)

Introduction:

This perspective describes the life and contribution of Jadbabaei who is a chemical engineer, an educator, a leader of higher education and an innovator.

Facts on Jadbabaei

AKA	Mohammad Jadbabaei
Born	1935
Place of Birth	Behbehan, Province of Khuzestan, Iran
Nationality	Iranian
Expertise	Chemical Engineering
Known for	Higher education leader and pioneer

Biographical Sketch

Professor Dr. Mohammad Jadbabaei was born in Behbehan, Khuzestan, Iran in 1935. He finished his high school in 1954. He was accepted into prestigious Abadan Institute of Technology, and received his BS in Refining Engineering in 1958. Moving on to United States, attended Case Western Reserve University in Cleveland, Ohio from 1959 to 1964, and received a Masters and doctoral (PhD) degrees in Chemical Engineering.

Figure 1. Two scenes from Shiraz University, Shiraz, Iran

Professional Career

Jadbabaei begun his illustrious career by working for Abadan (Khuzestan) Refinery in 1964. In 1965 to 1970, he joined the School of Engineering of Pahlavi (now Shiraz) University (see Figure 1). He was in fact one of the founders of Chemical Engineering Department at Shiraz University School of Engineering. He sought more work that is challenging and in 1970, he accepted to serve as Chancellor of Tehran Polytechnic (now Amir Kabir Technical University) until 1973 (see Figure 2). From 1973-74 he served as Deputy Minister of Ministry of Higher

Education promoting research in science and engineering at the national level. At the ministry of Higher Education, he realized the need for post-high school education at deprived areas of Iran like Sistan and Baluchistan (see Figure 3). Hence, he, once again, took the challenge and became the founding Chancellor of the University of Sistan and Baluchistan from 1974-1978. At that young institution, he helped build the entire university and hired many faculty members at all levels. Having established this new institution, he moved on to yet another challenge. From 1978-1980, he acted as founding managing director of Iran Engineering and Construction: A joint venture company of Iranian government and Bechtel power Company, USA. He was the force and computerization of Iran's National Entrance Examination in 1970. He established CHBAHAR School of Navigation (second campus of the University of Baluchistan) in collaboration with Southampton school of Navigation 1976. In 2015 he received the Lifetime Achievement Award of the World Automation Congress in San Antonio, TX, USA.

Amirkabir University of Technology
(Tehran Polytechnic)

Figure 2. Emblem and a scene from Amir Kabir University (AKA Tehran Polytechnique) in Tehran, Iran

دانشگاه سیستان و بلوچستان

University of Sistan
and Baluchestan

Figure 3. Emblem of Sistan-Baluchistan University and location of Sistan and Baluchistan Province of Iran.

References

[1] https://www.google.com/search?rlz=1C1JZAP_enUS797US797&sxsrf=ALeKk00zfBvErmVBGhhRvfGqDrz_qncG-g:1593534950093&source=univ&tbm=isch&q=shiraz+university+photos+shiraz+Iran&sa=X&ved=2ahUKEwjQh4yl_KnqAhUC7qwKHfIIBT4Q420oCnoECAkQKQ&biw=1218&bih=555

[2]
https://www.google.com/search?rlz=1C1JZAP_enUS797US797&sxsrf=ALeKk00zfBvErmVBGhhRvfGqDrz_qncG-g%3A1593534950093&ei=5mn7XtD8BILcswXykZTwAw&q=Amirkabir+university+university+photos+Iran&oq=Amirkabir+university+university+photos+Iran&gs_lcp=CgZwc3ktYWIQDDoECCEQCjoFCCEQqwJQli9YpZsBYJ2oAWgAcAB4AIABpAKIAdMbkgEGNy4xOC4zmAEAoAEBqgEHZ3dzLXdpeg&sclient=psy-ab&ved=0ahUKEwjQh4yl_KnqAhUC7qwKHflIBT4Q4dUDCAw

[3]
https://www.google.com/search?rlz=1C1JZAP_enUS797US797&sxsrf=ALeKk01Sw_4iA59OqNAqmQs93FkA1Jjydg:1593535153770&source=univ&tbm=isch&q=Photos+of+Sistan+and+Baluchestan+University+Iran&sa=X&ved=2ahUKEwjr1puG_anqAhVOVK0KHQdeAOcQ420oCnoECAkQJg&biw=1218&bih=555

Perspective on Amouzegar (Iranian Linguistic)

Introduction:

This perspective describes the life and contribution of Amouzegar who is an Iranian linguistic during 20th and 21st Centuries in Iran.

Facts on Amouzegar [1]

AKA	Jaleh Amouzgar
Born	December 2, 1939
Place of Birth	Khoy, West Azerbaijan Province, Iran
Nationality	Iranian
Alumni	Sorbonne University (PhD), Paris, France
Expertise	Iranian linguistics

Biographical Sketch

Amouzegar was born on December 2, 1939 in Khoy, West Azerbaijan, Iran. She received her PhD in Iranian Studies from Sorbonne University in Paris, France in 1967. She is currently chairperson of the department of *Ancient Iranian Culture and Languages* at Tehran University. Prof. Amouzgar, in collaboration with Prof. Ahmad Tafazzoli, has contributed significantly to *Ancient Iranian studies* and the history of literature in ancient Iran. She is also associated with the *Encyclopædia Iranica* project at Columbia University. She has won numerous awards including Chevalier of the Legion of Honor and Persian Cypress Award (an Iranian Cultural Heritage Prize) in 2016. In 2010, she received the Lifetime Achievement Award of is a distinguished scholar of Ancient Iranian Languages and Culture who has trained many leading students in her field. She completed her Ph.D. thesis on "Studies of Mazdean Language and Literature in Persian" at the Paris-Sorbonne University in 1967. Beginning her career as a researcher at the Iran Cultural Foundation (Bunyad-i Farhang-i Iran) in 1968, Amouzegar became a faculty member of the Department of Literature at the University of Tehran in 1970. She has since been teaching ancient languages, mythology, and ancient Iranian culture and religions at the same institution. She has nearly a hundred articles in the languages of Persian, English and French. Her recent major work is the translation of the fifth book of the 9th-10th century Dēnkard Encyclopedia into French, Le cinquième livre du Dēnkard: Transcription, traduction et commentaire, Studia Iranica 23, Paris, 2000.

References

[1] https://en.wikipedia.org/wiki/Jaleh_Amouzgar

Perspective on Jabehdar (Engineer, Educator)

Introduction:

This perspective describes the life and contribution of Jabehdar who was an educator and mentor during 20th and 21st Centuries in Iran.

Facts on Jabehdar [1]

AKA	Parviz Jabehdar Maralani
Born	1941
Place of Birth	Tabriz, Iran
Nationality	Iranian
Key Contribution	Publication of 18 textbooks in Parsi language and dissemination of those books at the national level in Iran.

Biographical Sketch

Jabehdar was born in Tabriz in 1941. He received his B.S. and M.S. degrees in Electrical Engineering from Tehran University (1959-1963), his M.S. degree in Electrical and Computer Engineering from University of California, Berkeley – UCB (1965-1966), and his Ph.D. degree in Electrical and Computer Engineering, from UCB (1966-1969). He joined the Faculty of Engineering of the University of Tehran in 1970 where he became distinguished professor later and emeritus professor. Besides his research work, he has contributed significantly to the engineering education of electrical engineering in Iran. Many of prominent Iranian electrical engineers and professors have been his students or students of his students, including the late Caro Lucas, Babak Araabi. He is the author of 18 Books, 54 Journal articles, and 94 Conference papers.

Major Administrative Positions: Major Memberships: Member of Technical Staff (1969-1970) Bell labs, Holmdel NJ, USA. Member of the Founding Team of Iranian Universities Scientific Olympiad and responsible for Developing the Electrical Engineering Olympiad (1994). Member of Editorial Board of 6 Scientific and Research Journals. Dean of School of Electrical and Computer Engineering University of Tehran (2000-2009), Fellow of Iranian Academy of Science. Awards: Award of the outstanding alumni of the university of Tehran in its 70th anniversary (Dec 2004). Distinguished Achievement Award of the 6th Biannual World Automation Congress in recognition of outstanding contributions to control systems, motivational mentorship of young engineers and scientists and publication of important textbook, Seville Spain (Jun 28, 2004). Winner of the golden certificate and the award of the Iranian Association of Electrical and Electronic Engineers (IAEEE) for a distinct and continued work of excellent teaching and research (May 2003). Distinguished professor of the faculty of Engineering 1994 for the excellence of teaching and Research. Distinguished Professor of the University of Tehran for the excellence of Teaching, Research and Administration (1992).

Three time winner of the award of the best published textbook in the country.

First Rank Graduate of the University of Tehran in 1963 and winner of the award of PhD Scholarship in US. He was selected as an Eternal Figures (Chehreh ye Mandegar) in Electrical Engineering in 2002.

References

[1] https://en.wikipedia.org/wiki/Parviz_Jabehdar_Maralani

Perspective on Naderi (Engineer, Leader)

Introduction:

This perspective describes the life and contribution of Naderi, who was a leader in space exploration at NASA during the 20th and 21st centuries in the USA.

Facts on Naderi [1]

AKA	Firouz Michael Naderi
Born	March 25, 1946
Place of Birth	Shiraz, Iran
Nationality	Iranian - American
Alumni	Iowa State University University of Southern California – USC

Biographical Sketch

Naderi was born in Shiraz, Iran on March 25, 1946. He moved to the USA after he received his high school diploma. He received his BS in electrical engineering from the Iowa State University. He then attended the University of Southern California, where he received a Ph.D. in electrical engineering. He joined the Jet Propulsion Laboratory (JPL) at the California Institute of Technology in 1979. He was the Director for the Solar System Exploration Program (SSEP) Directorate at JPL. Dr. Naderi joined the JPL in September 1979. His career at JPL spanned to system engineering, technology development, and program and project management for satellite communications systems, Earth remote sensing observatories, astrophysical observatories, and planetary systems. His early work at JPL was on system design of large satellite-based systems for nationwide cellular phone coverage. He went to NASA Headquarters in Washington, D.C., for two years in the mid-80s to serve as the program manager for the Advanced Communications Technology Satellite (ACTS), the front-runner of today's multi-beam, space-switching commercial satellites. Gradually, he grew interested in Earth observing missions and became project manager for the NASA Scatterometer (NSCAT), a global weather-forecasting satellite aimed at making measurements of winds over global oceans. Later, he became manager of NASA's Origins program, designed to search for life in the universe. His oversight of these programs earned him a NASA Outstanding Leadership Medal. He was named head of the Mars Exploration Program at JPL in 2000 after the Program had suffered two consecutive failures. He helped replan the program as a chain of scientifically, technologically and operationally interrelated missions with a spacecraft launch to Mars every two years. Naderi led the program for the next five years, a span of time that included the successful launch of the Mars Odyssey, landing of the Mars Exploration Rovers, Spirit and Opportunity, and the development of the Mars Reconnaissance Orbiter. Before Mars, he managed the Origins Program, NASA's ambitious, technology-rich plan to search for Earth-like planets in other planetary systems. In addition to his current responsibilities on the Mars program, Naderi, as Director of SSEP, was

focused on planetary exploration and astrobiology — the search for life outside of the solar system.

Awards and honors: Fellow of the American Institute of Aeronautics and Astronautics (AIAA) / 2010 recipient of the William Randolph Lovelace II Award from the American Astronautical Society (AAS) / 2005 recipient of Ellis Island Medal of Honor / 2004 winner of the Liberal Prize / NASA Outstanding Leadership Medal / Space Technology Hall of Fame Medal and / NASA's highest award – The Distinguished Service Medal. NASA has named an Asteroid to his name called Naderi 5515 (see Figure 1) [2].

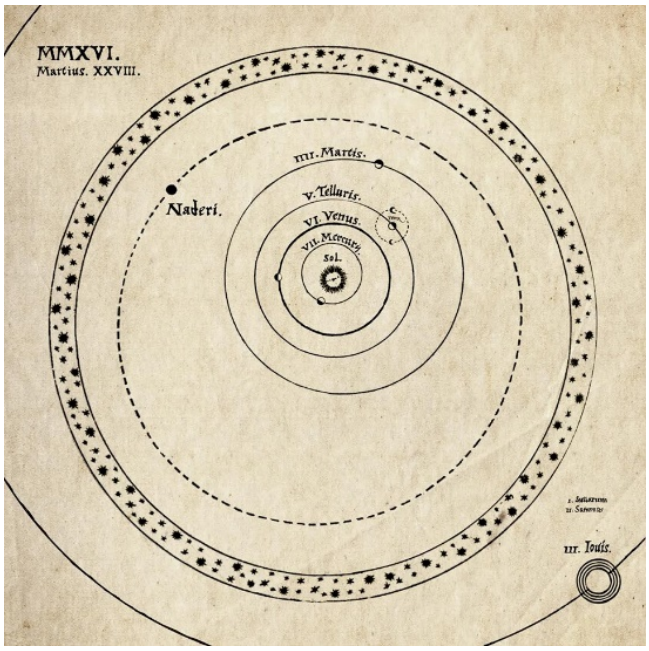


Figure 1 Naderi 5515 Asteroid Designated by NASA [1].

References

[1] https://en.wikipedia.org/wiki/Firouz_Naderi

[2] https://iranians.kodoom.com/en/firouz-naderi/

Perspective on Asrar (Engineer, Scientist, Leader)

Introduction:

This perspective describes the life and contribution of Asrar who is a scientist and a leader in earth studies during 20th and 21st Centuries in Iran in US.

Facts on Asrar [1]

AKA	Ghassem Asrar
Born	October 1951
Place of Birth	Shiraz, Iran
Nationality	Iranian American
Work	Earth sciences, environmental measurements, World climate, Science of Earth, Oceans and other natural resources.

Biographical Sketch

Asrar was born in Shiraz, Iran in October 1951. He received his elementary, high school and undergraduate education all in Shiraz before moving to USA to obtain his graduate degrees in environmental physics and civil engineering from Michigan State University. The first decades of his career was in academia focused on research and mentoring of students, prior to joining NASA as a distinguished visiting scientist in 1987. In 1992, He was appointed as chief scientist for the NASA Earth Observing System (EOS), a major component of NASA Mission to Planet Earth program. In 1988, he was appointed as the Associate Administrator for the newly established Office of NASA Earth Science and guided the development of EOS and other Earth observing satellites, including the U.S. weather monitoring ones. In 2004. He was promoted to deputy Associate Administrator for the newly established Science Mission Directorate (SMD) that encompassed the entire NASA Earth and space science programs, and the Chief Scientists for Space Exploration. His academic background and interest in education were the main motivation for leading the development and establishing the NASA Earth System Science Fellowship and New Investigators programs to support training and development of next generation of Earth system scientists, engineers and technology experts. Throughout his professional career, He strived to maintain his connection with academia through adjunct professor appointments with universities in US, Europe and Asia, and continued to advise and mentor students and early career scientists. His tenure with the United Nations, serving as the executive director of World Climate Research Program, offered an opportunity to become more familiar with research and education programs of many countries around the world, and to identify challenges and opportunities that required nations working together to address them, such as global climate change and sustainable socioeconomic development. Throughout his professional career, He has found investing time and energy in mentoring, supporting and developing the next generation of science, technical and societal leaders to be the most rewarding and legacy contribution one can make. This is a way to leave behind better for next generations what we inherit from previous ones, as global citizens. Science and technology

research and education, and the innovations they offer, can serve current and future generations and the best gift we can offer to the global society. These are the fundamental principles that major religions, starting with Zoroastrian, have promoted through the course of history.

Currently, he serves as Universities Space Research Association (USRA's) Senior Vice President, Science, providing leadership and direction for the programs in the science portfolio at USRA. At NASA he his efforts at paved the way for over 20 earth science missions, which led to new measurements from Earth Science satellites and insights into the connections between Earth's land, oceans, atmosphere, ice, and life. He has decades of experience spanning service in the U.S. government, international organizations, and academe. Prior to joining USRA, he was the Director of the Joint Global Change Research Institute of the Pacific Northwest National Laboratory located at the University of Maryland, College Park, Maryland. Before that, he served as the Director of World Climate Research Program (WCRP) in Geneva, Switzerland from 2008-2013, the Deputy Administrator for Natural Resources and Agricultural Systems with Agricultural Research Service (ARS), of the U.S. Department of Agriculture from 2006-2008.

Dr. Asrar is a Fellow of the American Geophysical Union; the American Meteorological Society; and the Institute of Electrical and Electronics Engineers. Among his many awards and honors are the U.S. Presidential Distinguished Senior Executive Service Award; the American Institute of Aeronautics and Astronautics Space Systems Award; the American Geophysical Union Ambassador Award; and the American Meteorological Society Cleveland Abbey Award. In 2019, he was conferred an honorary doctoral degree by the University of Zurich. [1]

References

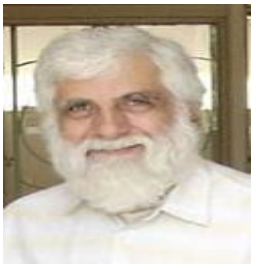
[1] https://www.usra.edu/people/dr-ghassem-asrar

Perspective on Lucas (Engineer, Educator, Patriot)

Introduction:

This perspective describes the life and contribution of Caro Lucas who was an engineering professor during 20th and 21st centuries. Caro Lucas Ghukasian (Armenian, Persian) was an Iranian Armenian scientist. His many areas of contribution to Iranian scientific society include biological computing, computational intelligence, uncertain systems, intelligent control, fuzzy systems, neural networks, multiagent systems, swarm intelligence, data mining, business intelligence, financial modeling, knowledge management, systems science, and general design theory. He was honored as an Eternal Figure (Persian: chehreye mandegar) by the Iranian Science and Culture Hall of Fame, which is a distinguishing honor offered to prominent Iranian chancellor scholars [1].

Facts on Lucas [1]



AKA	Caro Lucas, Caro Lucas Ghukasian
Born	September 4, 1949
Place of Birth	Isfahan, Iran
Nationality	Iranian, Armenian
Death	July 8, 2010
Place of Death	Tehran, Iran

Biographical Sketch

Early life and Education

Caro Lucas was born on September 4, 1949, in the historical city of Isfahan, in an Armenian family. Although he was born in Isfahan, he grew up in Tehran as he explained in an interview: "As my family used to go to their hometown, Isfahan in summers, and as I was born in one of these summers, I was born in Isfahan. Most of my summers have been spent in Isfahan, and I have been grown in Tehran so I am from both Isfahan and Tehran."

He graduated from Kooshesh High School (the school of Armenian Minority) in Tehran, received his M.Sc. degree in Electrical and Control Engineering from University of Tehran, in 1973, and the PhD. degree from University of California, Berkeley, in 1976.

Final Years and Death

Professor Lucas was diagnosed with cancer in 2009. After a year he had overcome his cancer, but he died on July 8, 2010 from intestinal infection resulting from a medical mistreatment which happened during a colonoscopy [1]

Academic career

> "He was a Professor, and founding director of the Center of Excellence for Control and Intelligent Processing (CIPCE), School of Electrical and Computer Engineering,

University of Tehran, as well as a researcher at the School of Cognitive Sciences (SCS), Institute for Studies in Theoretical Physics and Mathematics (IPM), Tehran, Iran. He served as the Director of School of Intelligent Systems, IPM (1993–1997) and Chairman of the ECE Department at the University of Tehran (1986–1988). Professor Lucas was also a Visiting Associate Professor at the University of Toronto, Toronto, Canada (summer, 1989–1990), University of California, Berkeley (1988–1989), an Assistant Professor at Garyounis University (1984–1985), University of California, Los Angeles (1975–1976), a Senior Researcher at the International Center for Theoretical Physics, and the International Centre for Genetic Engineering and Biotechnology, both in Trieste, Italy, the Institute of Applied Mathematics, Chinese Academy of Sciences, Harbin Institute of Electrical Technology, a research associate at the Manufacturing Research Corporation of Ontario, and a research assistant at the Electronic Research Laboratory, University of California, Berkeley. In 2004 he received the "Lifetime Achievement Award" of World Automation Congress (wacong.org). Professor Lucas authored/co-authored about 826 conference papers, 332 journal papers and 39 chapters in books, edited 8 book volumes, served as program committee (PC) member for 96 conferences, and presented invited talks (or keynote speeches) in 190 national and international events. He had been a pioneer in presenting new multi-disciplinary graduate courses like biologic computing, general systems design, and advanced topics in socio-cognitive systems, where, he has presented courses (and supervised theses) in different disciplines and departments like Electrical and Computer Engineering, Management, Psychology, Fine Arts and Architecture, and Finance and Economics. He was also the founder of the ISRF, Institute for Studies in Theoretical Physics and Mathematics and has assisted in founding several new research organizations and engineering disciplines in Iran. He is the holder of the patent for Speaker Independent Persian Isolated Word Neurorecognizer." [1]

Industry career

Professor Lucas served as Senior Advisor in many organizations including: Bank Mellat, Iran Railway Development Consultants, Manufacturing Research Corporation of Ontario- MRCO, Ministry of Energy, Iranian Bankers' Investment Company-IBICO and Megerdumian, and Associates Consulting Engineers.

References

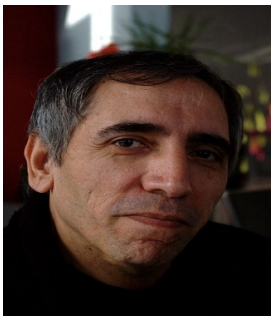
]1] https://en.wikipedia.org/wiki/Caro_Lucas

Perspective on Makhmalbaf (Film Director, 1st Nominated for Oscar)

Introduction:

This perspective describes the life and contribution of Makhmalbaf who was film director during the 20th and 21st centuries in Iran and France.

Facts on Makhmalbaf [1]



AKA	Mohsen Makhmalbaf
Born	May 29, 1957
Place of Birth	Tehran, Iran
Nationality	Iranian
Known for	film director, film editor, writer, and producer
Notable work	Films: *Kandahar, The Gardener*, *The President*, *Gabbeh, among many others*

Biographical Sketch

Makhmalbaf was born on May 29, 1957 in Tehran, Iran. He is an Iranian film director, writer, film editor, and producer. He has made more than 20 feature films, won some 50 awards and has been a juror in more than 15 major film festivals. His award-winning film includes *Kandahar*; and his latest documentary is *The Gardener* and latest feature, *The President*.

Makhmalbaf's films have been widely presented at international film festivals in the past ten years. The director belongs to the new wave movement of the Iranian cinema. *TIME* selected Makhmalbaf's 2001 film *Kandahar* as one of the top 100 films of all time. In 2006, he was a member of the Jury at the Venice Film Festival. Makhmalbaf left Iran in 2005 and has lived in Paris since then [1].

Best Films

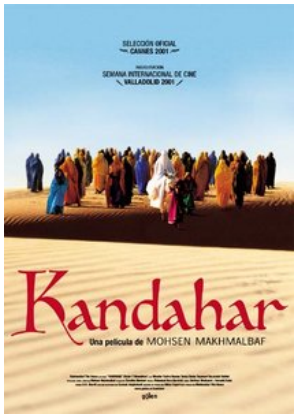


Figure 1. Kandahar is the 2001 Film of Makhmalbaf, Filmed in Iran and Afghanistan.

Kandahar 2001

Kandahar is a 2001 Iranian film directed by Mohsen Makhmalbaf, set in Afghanistan during the rule of the Taliban. Its original Afghan title is *Safar-e Ghandehar,* which means "Journey to Kandahar", and it is alternatively known as *The Sun Behind the Moon*. The film is based on a partly true, partly fictionalized story of a successful Afghan-Canadian, played by Nelofer Pazira, who returns to Afghanistan after receiving a letter from Dyana, (her lifelong girlfriend who was left behind when the family escaped. She plans on committing suicide on the last solar eclipse of the millennium).

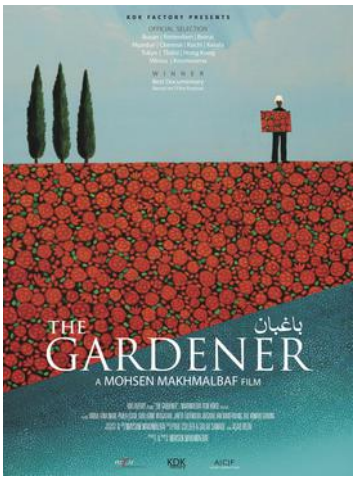


Figure 2. The Gardner is the 2012 film of Makhmalbaf, filmed in Iran.

The Gardner 2012

The Gardener is a documentary film by Mohsen Makhmalbaf. The Asian premiere was shown at the Busan International Film Festival, the European premiere shown at Rotterdam International Film Festival, and North American premiere shown at the Vancouver International Film Festival. It is the first film in decades to be made by an Iranian filmmaker in Israel. The film has been shown at more than 20 film festivals and won the Best Documentary award from the Beirut International Film Festival and the special Maverick Award at the Motovun Film Festival in Croatia. The film was selected as "Critic's Pick of the Week" by the New York Film Critics Circle, "Best of the Fest" at the Busan Film Festival by *The Hollywood Reporter*, and "Top Ten Films" at Mumbai Film Festival by *Times of India*, and its script was added to the Library of Academy of Motion Picture Arts and Sciences.

Figure 3. Gabbeh is the 1996 Film of Makhmalbaf, Filmed in the Rural Part of Iran.

Gabbeh 1996

Perhaps Makhmalbaf's most internationally acclaimed film, "Gabbeh" shows a drastic change in direction for Makhmalbaf's filmmaking. Minimalist, meditative, and pastoral, "Gabbeh" is the first time Makhmalbaf practices silence, and in doing so reaches a poetic new ideal for his filmmaking. The protagonist of the film is a girl called Gabbeh, who is the personification of a Gabbeh rug, (a type of Persian rug woven by nomadic Qashqai tribes). A Gabbeh is woven throughout the seasons, narrating a story with minimalist depictions along its long weaving process.

References

[1] https://en.wikipedia.org/wiki/Mohsen_Makhmalbaf

[2] https://www.tasteofcinema.com/2020/the-10-best-mohsen-makhmalbaf-movies/2/

Perspective on Nafisi (Fiction writer, Scholar, Poet)

Introduction:

This perspective describes the life and contribution of Nafisi who was a scholar, fiction writer and poet during the 19th and 20th centuries in Iran.

Facts on Nafisi [1]

AKA	Saeed Nafisi, Said Naficy
Born	June 8, 1885
Place of Birth	Tehran Iran
Nationality	Iranian
Death	November 13, 1966
Place of Death	Tehran, Iran

Biographical Sketch

Saeed Nafisi was born on June 8, 1885 in Tehran, Iran. He was an Iranian scholar, fiction writer and poet. He was a prolific writer in Persian. In Tehran, he conducted numerous research projects on Iranian culture, literature and poetry. He first emerged as a serious thinker when he joined Mohammad-Taqi Bahar, Abbas Eqbal Ashtiani, Gholamreza Rashid-Yasemi and Abdolhossein Teymourtash to found one of the first literary magazines to be published in Iran, called the Daneshkade, in 1918. He subsequently published many articles on Iran, Persian literary texts and Sufism and his works have been translated into more than 20 languages worldwide. He died in a Russian hospital in Tehran.

Saeed Nafisi's relatives were Moadeb Naficy, the guardian and doctor of the Shah of Iran (Reza Pahlavi); and Moadeb's son, Habib Nafisi (Naficy). He was a senior statesman, founder of Iran's labor laws, U.S.-Iran Attaché, and founder of multiple technical universities in Tehran, Hamid Naficy, a noted scholar of Media and Cultural Studies, Siamak Naficy, an anthropologist, as well as acclaimed author, and Azar Nafisi, a niece of his. Nafisi taught at the Tehran University, Kabul University, Cairo University and San José State University.

Personality

> "He was greatly fond of books, and he spent almost all his money on books, even depriving himself of some of his other needs. He thought that books should be published and be available to people, so that people can read and learn. He used to collect everything that had a connection to books and literature. In his last years, he collected Russian books about Iran. It is said he had a hard temper but that he had a kind heart, and he would calm down quickly. He would write honestly, which would sometimes disturb others" [1].

References

[1] https://en.wikipedia.org/wiki/Hakim-e-Gilani

Perspective on Eghbal-Ashtiani (Writer, Literary Scholar, Historian, Translator, Man of letters)

Introduction:

This perspective describes the life and contribution of Eghbal-Ashtiani who was a Writer, Literary Scholar, Historian, Translator, and a Man of letters during the 19th and 20th centuries in Iran.

Facts on Eghbal-Ashtiani [1]

AKA	Abbas Eghbal-Ashtiani
Born	1896
Place of Birth	Ashtian, Iran
Nationality	Iranian
Religion	Islam
Death	February 10, 1956
Place of Death	Rome, Italy

Biographical Sketch

Abbas Eghbal-Ashtiani (Persian: 1896-97 – February 10, 1956) was an Iranian literary scholar, historian, translator, and a man of letters. Eghbal-Ashtiani was born in Ashtian. He was educated at Dar ul-Funun (House of Sciences) in Tehran and the University of Paris. In 1944 Eghbal founded the monthly periodical *Yādgār*. Eghbal-Ashtiani died in Rome, Italy and was buried at the Shah-Abdol-Azim shrine in Rey, Iran [1].

During his years, he wrote several high-school textbooks that remained standard for many years to come. The scholarship he demonstrated in these books were all well regarded. In the articles he published in the leading literary periodicals of the time led to his appointment as an instructor in the Teachers College (Dār al-moʿallemīn), where some future outstanding scholars were among his students. At the same time, he taught history, geography, and Persian literature at the military lycée (high school in France). In 1924 he was sent to Paris by the Military Council as the secretary to the Persian military delegation in France, which supervised the progress of Persian students at the military academy there. Eghbal-Ashtiani used this opportunity to pursue his education at the Sorbonne, where he received a bachelor's degree in literature. In Paris, he met the distinguished scholar, Moḥammad Qazvīnī, who had a profound influence on him and whose meticulous methodology in research Eghbal-Ashtiani adopted like a disciple [2].

Eghbal-Ashtiani returned to Persia in 1929**.** The next five years were very productive for him. He published a number of books and articles, including the books he had worked on during his residence in Paris. He was a member of the delegation representing Persia in the millennium of Ferdowsī in 1934. In 1314, he received a government scholarship for a year of study in Europe. He returned to Persia the next year and became a professor of history in the newly founded University of Tehran and a permanent member of the Persian Academy (Farhangestān-e Īrān). Figure 1 shows some of his books, even on sale now.

Figure 1.Two of the Books Written by Eghbal-Ashtiani [2].

References

[1] https://en.wikipedia.org/wiki/Hakim-e-Gilani

[2] https://www.iranicaonline.org/articles/eqbal-astiani

Perspective on Etemad (Engineer, Innovator)

Introduction:

This perspective describes the life and contribution of Etemad who was an engineer and innovator during the 20th century in USA and Iran.

Facts on Etemad [1]

AKA	Galen A Etemad, Ali Etemad, "Mr. Apollo"
Born	November 1, 1922
Place of Birth	Mashhad, Iran
Nationality	Iranian, American, Azari
Alumni	University of Tehran, University of California at Berkeley
Key contributions	Help on the solution of Apollo's Earth Atmosphere heat transfer

Biographical Sketch

Etemad was born on November 1, 1922, in Mashhad, Iran. He entered the School of Engineering of the University of Tehran and graduated with a BS degree in mechanical engineering in 1945. Year 2021marks the 52nd anniversary of the historic moon landing of Apollo 11 on July 20, 1969. Etemad was one of the first Iranians to work in the American space program, becoming a prominent figure in Iran, earning the nickname of "Mr. Apollo". In the fall of 1969, he was invited to tour Iran. Etemad was a national celebrity and hero, making the papers almost daily, hosted and entertained by scholars, officials and the elite of Iran, an example and role model for both his family and his compatriots [1].

Etemad's early childhood and teenage years were somewhat challenging. He lost his mother at age 6 and his father at age eighteen. Facing the loss of both his parents, he ended up putting all his attention on his education. From an early age, those who knew him saw that he was destined for a successful future. After the passing of his mother, the family moved to Tehran [1].

Etemad graduated from the University of Tehran, School of Engineering in June 1945 with a Bachelor of Science degree. During World War II, the U.S. Army had a military base just outside of Tehran called Amirabad. When the war in Europe ended in May of 1945, the U.S. Army donated its base to the Iranian government, who in turn gave it to the University of Tehran. The school asked Etemad to investigate to see what they could do with the base. Etemad observed that it was like a modern city and saw its potential and submitted a proposal to the dean of engineering to turn the base into a University Village for student life, and use the abandoned army trucks, and buses for transportation between the university village and university. The dean marveled at his plan but informed him that no fund existed, so Etemad proposed that they create their own income through dividing the cold storage to customers among them purveyors of penicillin and caviar that were in high demand at that time. The resulting income funded the labor and conversions of the base to create the University Village, which from planning to completion took 17 months. It was there that Etemad became fascinated with subjects such as

refrigeration, electrical power, and water purification. He taught himself to drive the American army jeeps left behind. Little did he know that this first hands-on exposure to American mechanics would later lead to first instrumental role in the first-ever space landing by American astronauts [1].

In December 1946, at the age of twenty-four, Etemad had saved enough money to set out for America to further his education in mechanical engineering and find a new life in pursuit of his own *American Dream*. With no less than five hundred dollars in his pocket, he put himself through graduate school at Harvard with half his courses at Massachusetts Institute of Technology (M.I.T.) through their cooperation with the engineering department. On June 10, 1948, Etemad earned his Master of Science degree in Mechanical Engineering from Harvard University. It was time to pursue a Ph.D. in mechanical engineering. He chose to go to UC Berkeley and received his Ph.D. in technical engineering with specialization in heat transfer and fluid mechanics in 1954 [1].

Contributions in the Aerospace Industry

Upon completion of his Ph.D., he received an offer as an assistant and soon thereafter an associate professorship at the State University of New York at Buffalo. His tenure at SUNYB was short and by 1956 he left Buffalo and started his venture in aerospace with a job at North American Aviation in Los Angeles until 1958, working on their X- l5 program to determine re-entry heating of orbital spacecraft. From 1958 to 1963, Etemad worked at Lockheed Missiles & Space Company in Palo Alto where he was active in various technical and managerial positions, serving as Thermo-dynamics Department Manager, then promoted to Assistant Flight Sciences Manager of the Polaris Missile and Agena Spacecraft program, where they worked to solve base heating of Polaris.

He moved to Orlando, Florida from 1963-65 to work for The Martin Company (Martin Marietta, later merged into Lockheed Martin) as Division Manager of aerodynamics, thermodynamics, propulsion, and ordinance for the Sprint Anti- Ballistic Missile program, where they solved its complex silo propulsion system requirements. From 1965 through 1978, Etemad returned to North American Aviation (later renamed Rockwell International in 1973) in Downey, California, which had been selected by NASA in November 1961, as the prime contractor for the Apollo command service modules. An expert in thermodynamics, Etemad soon became head of his department in the Space Division, which designed and perfected the heat shields that would be outfitted on every command module in the Apollo series to provide the American spacecraft safe re-entry in the earth's atmosphere. Etemad's legacy work on the Apollo heat shields contributed to one of the most important events in the 20th century. The lunar spacewalk was an event that would see the United States leapfrog over the Soviet Union in the Space Race and position the United States as a global leader in technology and science. Two of the three astronauts of Apollo 11, Neil Armstrong and Buzz Aldrin spent two-and-a-half hours walking on the lunar surface. Who knew that the young, curious boy of unique intellect from Mashhad, Iran would contribute to propelling humanity in its quest for discovery and exploration of the final frontier? [1]

That autumn in 1969, he was invited by Aryamehr (now Sheriff University) to visit Iran for 3 months. During this visit, he gave many lectures and live TV presentations. He was treated as a genuine National Hero in Iran. It was during this trip that he met his lovely wife Ms. Jaleh Azarbeygui. The couple was married on December 29, 1969 and their extended family (from previous marriages) moved to the USA. Etemad left the space program in 178 and began a successful career in commercial real estate investment. In 1985, he moved the family to San Francisco to live near his late brother and his family. Now at 99 years young, he enjoys spending time listening to Ted Talks, reading historical biographies, and listening to classical music.

References

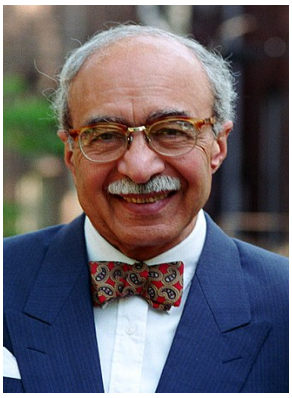
[1] N. Etemad," Dr. Galen A. Etemad: Iran's Mr Apollo," *Persian Heritage*, Vol. 24, No. 96, 2019, pp. 29-32.

Perspective on Mehr (Educator, Leader, Patriot)

Introduction:

This perspective describes the life and contribution of Mehr who was an Educator, Leader and Patriot during the 20th and 21st centuries in Iran and the USA.

Facts on Mehr[1]



AKA	Farhang Mehr
Born	December 11, 1923
Place of Birth	Tehran, Iran
Nationality	Iranian, American
Death	March 3, 2018
Place of Death	California, USA
Alumni	Amir Kabir University of Technology (Formerly Tehran Polytechnic), Tehran University, Iran, University of London, University of Southampton, UK, Boston University, USA

Biographical Sketch

Mehr was born to a Zoroastrian family in Tehran, Iran on December 11, 1923. His father, Mehraban Mehr was from the province of Kerman, and at the age of 14 migrated to Tehran for greater economic and social opportunities. He went on to become Chief Accountant in the National Parliament, the predecessor of the Islamic Consultative Assembly (Iran). His mother, Paridokht (née Barkhordar), was a granddaughter of Khajeh Barkhordar, a Zoroastrian Yazdi immigrant to Tehran, who served as one of the farm-managers of Naser al-Din Shah Qajar. Farhang was raised as a devout Zoroastrian and a patriotic Iranian.

Upon graduating from the Polytechnic University with a degree in mechanical engineering, he joined the Tehran University and obtained a bachelor's degree from the School of Law, Economics and Political Science. He then went to England, where he received an L.L.M. from the London School of Economics, University of London, and a Doctor of Philosophy from the University of Southampton. In 1957, he was awarded a LL.D. (honoris causa) by the University of Pennsylvania, Philadelphia, Pennsylvania, USA. Returning to Tehran in 1957, Mehr joined the National Iranian Oil Company as head of the Department of International Contracts and Industrial Relations. During this period, he also served as an advisor to the Minister of Commerce. Subsequently, at the invitation of the Minister of Finance, Mehr moved to that ministry where he consecutively held the following positions: Director General of Oil and International Relations, Governor for Iran in OPEC, Director General of Economic Affairs and Monopolies, Deputy Minister in charge of finance (revenue and treasury) and economic affairs.

He took on several other public and private positions until 1971. In 1971, he became President of Pahlavi University (now Shiraz University) as a premier institution in the Middle East. During

his presidency, the university became internationally known for its academic excellence and for instituting innovative policies that were later adopted by other developing countries. In 1973, the International Health Organization (WHO) chose the Pahlavi University as the center for giving on the job training courses to the faculties of the medical schools for the South Mediterranean countries. In recognition of his valuable services Mehr was the first and only non-Muslim Iranian decorated with First rank Homayoun Medallion and Second rank Taj Medallion [1].

In 1981, he immigrated to US by accepting a professorship at Boston University. There he joined Boston University as Professor of International Relations, known now as the Pardee School of Global Studies. In 1982, Mehr served as the recipient of a certificate in appreciation for the contribution of Iranians to life in the Commonwealth of Massachusetts from Governor Michael Dukakis. He retired in 1997 as Professor Emeritus.

References

[1] https://en.wikipedia.org/wiki/Farhang_Mehr

Perspective on Badie (American Film and Television Director)

Introduction:

This perspective describes the life and contribution of Badie who was a film and television director during 20th and 21st centuries in in Persia.

Facts on Badie [1]

AKA	Reza Badiyi,
Born	April 17, 1930
Place of Birth	Arak, Iran
Nationality	Iranian American
Death	August 20, 2011
Place of Death	Los Angeles, CA, USA
Work	Director of several popular TV shows in Hollywood, USA.

Biographical Sketch

Badie was born on April 17, 1930 in Arak, Iran. He was an Iranian-American film director. He directed many popular television series. His credits also include developing the opening montages for *Hawaii Five-O*, *Get Smart*, and *The Mary Tyler Moore Show*. His parents were from Isfahan, Iran. He graduated from the Academy of Drama in Iran. He worked with the Audio Visual Department in Tehran, and completed 24 documentary films, prior to leaving the country. He moved to the United States in 1955, in order to continue his film studies at Syracuse University. He was invited by the United States Department of State to continue his studies in America after winning an international film award for the *Flood in Khuzestan*. He graduated from Syracuse University with a degree in filmmaking [1].

Career

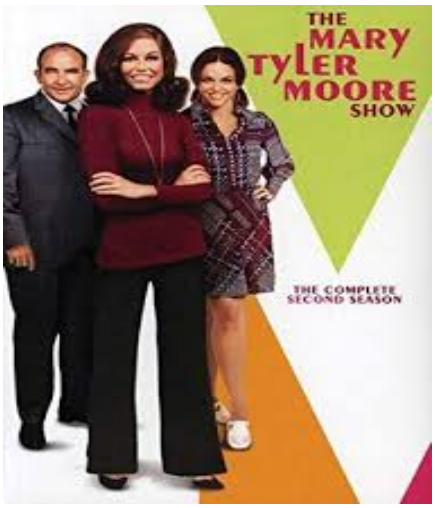
Badie often worked with Robert Altman (who was known for directing M*A*S*H (1970), McCabe & Mrs. Miller (1971), The Long Goodbye (1973), Nashville (1975), 3 Women (1977), Secret Honor (1984), The Player (1992), Short Cuts (1993), and Gosford Park (2001)). Badie was the assistant director on the low-budget 1957 film, *The Delinquents*, which marked Altman's feature film debut as a director and the cult classic horror film, *Carnival of Souls*, made in 1962. Early in his career, he directed episodes of *Get Smart*, *Mission: Impossible*, *Hawaii Five-O*, *The Incredible Hulk*, *Mannix*, *The Six Million Dollar Man*, *Starsky and Hutch*, *The Rockford Files* and *Police Squad*. He also directed the definitive "*fashion show*" sequence of the third season of the popular *Doris Day Show*. There were lowlights, as well, including directing the unsold pilot for *Inside O.U.T.*, starring up-and-coming actress Farrah Fawcett and a chimp for Screen Gems in 1971. In the 1980s and 1990s, he directed episodes of *Falcon Crest*, *Cagney and Lacey*, *Dr.*

Quinn, Medicine Woman, *Star Trek: Deep Space Nine*, *Buffy the Vampire Slayer*, *Le Femme Nikita*, *Sliders* and *Baywatch* [1].

Below are some of the popular weekly TV shows Badie directed in the latter part of 20th Century.

Mission Impossible

Six Million Dollar Man



Mary Tyler Show

References

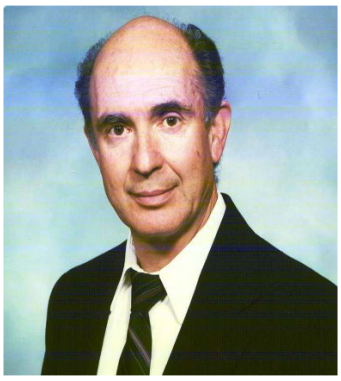
[1] https://en.wikipedia.org/wiki/Reza_Badiyi

Perspective on Arman (Physicist, Innovator)

Introduction:

This perspective describes the life and contribution of Arman who was a Particle Physics and Experimental Nuclear Physicist during 20th and 21st Centuries in Iran and USA.

Facts on Nahavandi [1]



AKA	Moosa Arman, Moe Arman, Joseph Arman
Born	1942
Place of Birth	Yazd, Iran
Nationality	Iranian, American
Death	2012
Place of Death	LOS Angeles, CA
Key accomplishments	Particle Physics and Experimental Nuclear Physics, High Power Microwave Directed Energy
Alumni	Shiraz University, UCLA

Biographical Sketch

Moossa Joseph Arman, PhD was an Iranian-American physicist, researcher, and inventor who is known for advancing the frontiers of Elementary Particle Physics and Experimental Nuclear Physics. He was born in Yazd and was the eighth of nine children. His childhood home has since been converted into the Silk Road Hotel.

After receiving his undergraduate degree in Physics from Shiraz University in 1967, Arman joined the UCLA Particle Physics Group in Los Angeles as a University of California Regents Fellow. The young scientist was awarded his doctorate in Physics in 1972 under the guidance of Professor Emeritus Bernard F. Nefkens of UCLA.

Arman's thesis, "A Measurement of Pion-Proton Bremsstrahlung and a Search for Magnetic Dipole Moment Radiation from the Δ++ (1236)" gained immediate recognition for significantly contributing to the understanding of subatomic forces. He was part of a group that conducted a sequence of subsequent experiments at Lawrence Berkeley National Laboratory conducted under the auspices of Nobel Prize Winners Owen Chamberlain, Emilio Segrè, Luis Alvarez, and Donald G. Glaser.

In 1974 Arman returned to the University of Shiraz in Iran as a Professor and Chairman of Physics Department. While in Shiraz, he founded the University's PhD program in Physics, built a state-of-the-art observatory, and institutionalized research on the physics of Elementary Particles and applications of High Energy Radiation.

In 1978 Arman took sabbatical leave from Shiraz University and re-joined UCLA as Adjunct Professor of Physics. In 1979 he received UCLA's Distinguished Lectureship Award. Concurrently, he worked on a Pion Scattering Project with Emeritus Professor

Bernard F. Nefkens sponsored by the Department of Energy, and was involved in Elementary Particle Physics research at Los Alamos National Laboratory.

By 1980, Arman's unclassified research was being published and discussed worldwide. Over the next decade, he developed the concept of high-current transit-time oscillators as a powerful mechanism for generation of coherent high power RF radiation from Intense Relativistic Electron Beams (IREBs). During this same period, he developed a comprehensive dispersion relation for Plasma/RF/slow-wave structures.

In 1991, Arman joined the Air Force Research Laboratory (AFRL) to lead the High Power Microwave Directed Energy Directorate in Albuquerque, New Mexico. In collaboration with Los Alamos National Laboratory, his leadership laid the foundation for Computation-Based Plasma Studies. He discovered methods of High Power Microwave sourcing that remain unparalleled in power, efficiency, repetition rate, and portability. Before leaving AFRL, Arman led the division that developed non-lethal Active Denial Technology (ADT), currently used extensively by all three U.S. defense services.

In the latter part of his career, Arman shifted to commercial applications of microwave physics in aerospace, medical, and renewable technology industries. His commercial collaborations include Fusion UV Systems Inc. in Maryland, Booz Allen Hamilton in Washington DC, and Lockheed Martin Corporation in California.

After retiring in 2011, Arman carried out a number of patented technologies in wireless power transfer using applied quantum mechanics, electromagnetism, and charged particle physics. He continued to serve rolls as Advisor to National Research Council (NRC); Advisor to National Academy of Sciences (NAS); Board Member of the American Physical Society (APS) for the Plasma Division, Scientific Consultant to DARPA, and a Senior Member of IEEE.

References

[1] A. Cyrus Arman and Diana R. Matheson, https://www.pa.ucla.edu/moossa-j-arman-colloquium.html, April 24, 2013

Perspective on Sohrabpour (Engineer, Educator, Leader)

Introduction:

This perspective describes the life and contribution of Sohrabpour who is an educational leader during the 20th and 21st centuries in Iran.

Facts on Sohrabpour [1]

AKA	Saeed Sohrabpour
Born	1943
Place of Birth	Tehran
Nationality	Iranian
Alumni	Tehran University, University of California at Berkeley
Known for	President of Sharif University of Technology, Tehran, Iran

Biographical Sketch

Sohrabpour was born in 1943 in Tehran, Iran, and is a full professor of the Faculty of Mechanical Engineering at the Sharif University of Technology. He has been elected to the Iranian Science and Culture Hall of Fame and was the chancellor of the Sharif University of Technology from 1997 to 2010. Furthermore, during his professional life, Sohrabpour has published a prolific number of scientific papers to a variety of high ranked journals. He was the president of the Research Institute for Science, Technology and Industry making Policy decisions until his retirement from Sharif University. He was the chair of the board for Iran Most Admired Knowledge Enterprise Award (MAKE), Center for Knowledge-based Management, and the chairman of the board for Iran EFQM Representative as well. Besides a variety of honors and awards, he has been the fellow of the Academy of Sciences of Iran [1].

In 1965, having completed his bachelors in mechanical engineering with a top-grade in Tehran University, College of Engineering, he was awarded a scholarship by Iran's government at that time, and continued his education in M.S. and a Ph.D. in mechanical engineering at the University of California Berkeley. After returning to Iran in 1971, he started teaching at the Pahlavi University, (now Shiraz University department of mechanical engineering as an assistant professor). He was the vice chancellor for student affairs and later took over the position of vice chancellor for development at Shiraz University in 1978-1981 and as the vice chancellor of the Shiraz University from 1979 until 1989 [1].

In 1998, the minister of Culture and Higher Education, appointed Sohrabpour as the president of Sharif University of Technology, recommended by the faculty members of the university and stayed in the position from 1997 to 2010 until his resignation. Sohrabpour was the head of mechanical engineering group in the Academy of Sciences in 1998. In February 2019, Sohrabpour was elected as a foreign associate of the US National Academy of Engineering "for

establishing the Sharif University as an academic Center of Excellence and advancing engineering and science education in Iran" [1].

References

[1] https://en.wikipedia.org/wiki/Saeed_Sohrabpour

Perspective on Seraji (Engineer, Roboticist)

Introduction:

This perspective describes the life and contribution of Seraji who was a control engineer during 20th and 21st Centuries in Iran.

Facts on Seraji [1]

AKA	Homayoun Seraji
Born	1947
Place of Birth	Tehran, Iran
Nationality	Iranian, American
Death	April 16, 2007
Place of Death	Los Angeles, CA, USA
Alumni	Hadaf High School No. 4, Tehran, Iran (with highest rank in the nation) University of Sussex, University of Cambridge, UK

Biographical Sketch

Serâji1 was born in 1947 in Tehran, Iran. He was an Iranian scientist, engineer, a JPL senior researcher and former professor of Sharif University of Technology who published extensively in the field of multivariable control systems, focusing on optimal control, pole placement, multivariable PID controllers, and output regulation. In addition, he has significant publications in the field of Robotics, and space exploration. [1]

In 1974, he joined Aryamehr University of Technology (now Sharif University of Technology), as a Professor of Electrical Engineering and was involved in teaching and research in control systems for ten years. He was also selected as a United Nations Distinguished Scientist in 1984 and spent one year as a visiting professor at the University of New Mexico, Albuquerque, NM, USA. [1]

In 1985, Seraji joined NASA's Jet Propulsion Laboratory (JPL) and Caltech. During his tenure at JPL, he conducted extensive research that has led to major contributions in the field of robot control systems, particularly in adaptive robot control, control of dexterous robots, contact control, real-time collision avoidance, rule-based robot navigation, and safe spacecraft landing. [1]

Awards

JPL Edward Stone Award for Outstanding Research Publication in 2003, NASA Group Achievement Award in 1991 and 2002, Fellow of IEEE in 1997, NASA Exceptional Engineering Achievement Award in 1992, NASA Major Space Act Award, and World Automation Congress Lifetime Achievement Award, Budapest, 2006

Death

Dr. Seraji passed away on April 16, 2007 in Los Angeles, CA, USA.

References

[1] https://en.wikipedia.org/wiki/Homayoun_Seraji

Perspective on Sorooshian (Engineer, Earth System Scientist)

Introduction:

This perspective describes the life and contribution of Sorooshian who is a distinguished hydrologist during the 20th and 21st centuries in USA and Iran.

Facts on Sorooshian [1]

AKA	Soroosh Sorooshian
Born	1948
Place of Birth	Kerman, Iran
Nationality	Iranian, American
Alumni	Cal Poly San Luis Obispo , UCLA
Expertise	Hydrometeorology and Remote Sensing

Biographical Sketch

Sorooshian was born in a Zoroastrian family in Kerman, Iran. He received his primary education in Kerman before moving to the United States in 1966. He earned his Bachelor of Science in mechanical engineering from Cal Poly San Luis Obispo and his MSc, operations research, Engineer Degree, systems engineering, and Ph.D., engineering from UCLA. Sorooshian is a member of such prestigious organizations such as the National Academy of Engineering (NAE), the World Academy of Sciences (TWAS); and the International Academy of Astronautics (IAA) [1]. He is also a fellow of the American Association for the Advancement of Science (AAAS), American Geophysical Union (AGU), American Meteorological Society (AMS), International Union of Geodesy and Geophysics (IUGG), International Water Resources Association (IWRA) among others and is a life member of the American Society of Civil Engineers (ASCE). Besides being a member and fellow of academies and professional societies, Sorooshian has served as Chair of the Scientific Steering Committee (SSG) for the Global Energy and Water Cycle Experiment (GEWEX) of the World Climate Research Programme (WCRP). This assignment was also under the joint sponsorship of the World Meteorological Organization (WMO), the International Council for Science (ICSU), and the Intergovernmental Oceanographic Commission (IOC) of UNESCO. Chair of the Rosenberg International Forum on Water Policy, University of California, Division of Agriculture and Natural Resources and Past President, Hydrology section of AGU. He has also served as a present and past Member and Chair of over 30 other advisory and review committees and boards for NASA, NOAA, DOE, EPA, NSF, National Labs, UNESCO, WMO, and professional societies. He has served the National Research Council (NRC) over the past 15 years, which includes being a member of 7 NRC committees. He has served as Editor of *Water Resources Research*, Associate Editor of the *Journal of Hydrology*, and member of numerous editorial boards.

Awards

Among other honors: In 2005 Sorooshian was awarded the *NASA Distinguished Public Service Medal* and in 2006 was awarded the *Robert E. Horton Memorial Lectureship award* by the American Meteorological Society. Sorooshian was the founding director of two centers, the Center for Hydrometeorology and Remote Sensing (CHRS) at the University of California Irvine and the NSF STC SAHRA, (sustainability of semi-Arid Hydrologic and Riparian Areas) at the University of Arizona, that were co-recipients of the 2007 UNESCO *Great Man-made River Water Prize*. In 2009 AMS awarded him *the Walter Orr Roberts Lecturer in Interdisciplinary Sciences* "for bridging the interdisciplinary gap between hydrology, meteorology, and remote sensing" and the same year received the *Distinguished Engineering Educator Award* from the Orange County Engineering Council. In 2010 he became the *4th Prince Sultan Bin Abdulaziz International Prize for Water, Resources Management & Protection* recipient and was named an *Honorary Professor* by the Beijing Normal University. In 2013 he received the *Robert E. Horton Medal* from the American Geophysical Union (AGU) for his "outstanding contributions to hydrology". He received the Chinese Academy of Sciences (CAS) *Einstein Professor award* in 2014. He was also the recipient of the 2017 *Ven Te Chow award* from the American Society of Civil Engineers' Environmental and Water Resources Institute in recognition of his lifetime achievements in the field of hydrology and hydrometeorology. In 2018 he was recipient of the *Lifetime Achievement Award*, World Automation Congress, Stevenson, WA, 2018, the 2021 *Hydrological Sciences Medalist*, American Meteorological Society (AMS) [2].

References

[1] https://en.wikipedia.org/wiki/Soroosh_Sorooshian

[2] https://www.faculty.uci.edu/profile.cfm?faculty_id=5082

Perspective on Pahlavan (Engineer, Mentor, Innovator)

Introduction:

In this perspective contributions of Pahlavan will be given. He is an outstanding expert in wireless communications during 20th and 21st Centuries.

Facts about Pahlavan [1]

AKA	Kaveh Pahlavan
Birth	March 6, 1951
Place of Birth	Tehran
Nationality	Iranian, American
Alumni	University of Tehran, Worcester Polytechnic, USA,
Expertise area	Wi-Fi network, Body-Area, wireless networks

Biographical Sketch

Pahlavan was born on March 16, 1951in Tehran, Iran. He received his BS/MS degree in Electrical Engineering in 1975, from the University of Tehran, and his PhD degree in 1979 from the Worcester Polytechnic Institute, Worcester, MA, USA. He began his academic career as an assistant Professor at the Northeastern University, Boston, MA, and then he joined the faculty at the Worcester Polytechnic Institute. At WPI, he founded an academic research program in wireless local area networks (WLAN) and indoor geolocation. He received an "overseas famous scholar award" from China, inviting him to serve as a visiting professor at University of Science and Technology Beijing. His research interest is Wi-Fi technology, wireless indoor geolocation, and Body Area Networks. He has contributed to technical publications and holds patents in these areas, and has authored several textbooks. [1,2]

Contributions

He is also the chief technical advisor of Skyhook Wireless, Boston, MA, since its inception in 2005. During the period of 1995–2007 he had a long and productive cooperation with the University of Oulu and Nokia in Finland. He is renowned for his pioneering research inzWi-Fi and Wi-Fi localization. Based on my 1983 research as a consultant to the GTE Laboratories, Waltham, MA, in June of 1985, He published a seminal paper entitled “Wireless Communications for Office Information Networks”, which was featured on the cover of the *IEEE Communication Magazine*. In that paper, he explored the possibility of using Infrared and Spread Spectrum Technology for wireless indoor communications. He was involved with industry as the chief technical advisor of a two of companies (WINDATA and Roam About group at DEC), which played leading roles in early days of WLAN. [2]

In 1994 he founded the *International Journal of Wireless Information Networks (*IJWIN), the first journal in wireless networks, and in 1995, he was the lead author to publish the first academic textbook in the field: *Wireless Information Networks*.

Awards and Honors

Fellow of Institute of Electrical and Electronic Engineering (IEEE, 1996). He is the first non-Finn fellow of the Nokia Medal (1999), First Fulbright-Nokia fellowship (2000) and WPI board of trustee's award for Outstanding Research and Creative Scholarship (2011).

References

[1] https://en.wikipedia.org/wiki/Kaveh_Pahlavan

[2] https://medium.com/@jahandad.memarian/kaveh-pahlavan-helping-skyhook-database-receive-over-a-billion-hits-per-day-79001b5bc479

Perspective on Shahidehpour (Engineer, Global Innovator)

Introduction:

This perspective describes the life and contribution of Shahidehpour who is a distinguished electrical power engineer during the 20th and 21st Centuries in USA and Iran.

Facts on Shahidehpour [1]

AKA	Mohammad Shahidehpour
Born	July 27, 1955
Place of Birth	Tehran, Iran
Nationality	Iranian, American
Alumni	Sharif University, Tehran, Iran, University of Missouri, Columbia, MO, USA
Expertise	Smart Grid, Power, and energy systems.

Biographical Sketch

Shahidehpour is a University Distinguished Professor, Bodine Chair Professor, and Director of the Robert W. Galvin Center for Electricity Innovation at the Illinois at Institute of Technology (IIT). He is a Fellow of IEEE, Fellow of the American Association for the Advancement of Science (AAAS), Fellow of the National Academy of Inventors (NAI), Laureate of KIA (Khwarizmi International Award), and an elected member of the US National Academy of Engineering. Shahidehpour served in 1999-2000 as the National President of HKN (Electrical Engineering Honor Society) and was a member of the HKN Board of Directors for 8 years.

Career

Shahidehpour is an IEEE Distinguished Lecturer who has delivered over 500 presentations at technical forums and conferences. He served as the VP of Publications for the IEEE Power and Energy Society, Editor of IEEE Transactions on Power Systems, and the founding Editor-in-Chief of the IEEE Transactions on Smart Grid. Dr. Shahidehpour was the 2009 recipient of the honorary doctorate from the Polytechnic University of Bucharest. He is the holder of the Nourbakhshian Endowed Chair Professorship at the University of Kashan, Iran, and the Otto Monsted Professorship at the Technical University of Denmark. He is a Research Professor at 17 universities worldwide. He has co-authored 6 books and over 700 technical papers on electric power system operation and planning and was the recipient of 6 best paper awards for his IEEE publications. He is listed as a highly cited researcher on the Web Science (ranked in the top 1% by citations demonstrating significant influence among his peers).

Awards

Shahidehpour is the recipient of:

- Member, US National Academy of Engineering (2016)
- IEEE PES Ramakumar Family Renewable Energy Excellence Award (2019)
- IEEE PES Douglas M. Staszesky Distribution Automation Award (2016)
- IEEE PES Outstanding Power Engineering Educator Award (2012)
- IEEE PES T. Burke Hayes Faculty Recognition Award in Electric Power Engineering (2007)
- Outstanding Alumnus Award (50th Anniversary of the Sharif University, Iran, 2016)
- Romanian Association of Engineers (Outstanding Author Award, 2013, jointly with Prof. Eremia)
- Sigma Xi Society (Outstanding Senior Faculty Research Award, (2003)
- Edison Electric Institute's Power Engineering Educator Award (1993)
- C. Holmes MacDonald Outstanding Young Electrical Engineering Professor Award (1990)

References

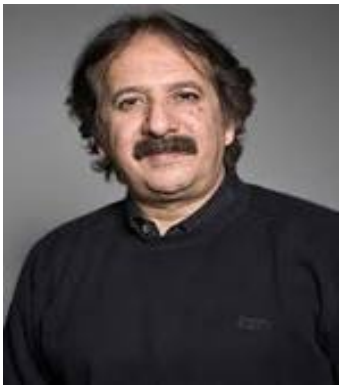
[1] https://en.wikipedia.org/wiki/Mohammad_Shahidehpour

Perspective on Majidi (Film Director, Screenwriter, Producer)

Introduction:

This perspective describes the life and contribution of Majidi who is a film director during the 20th and 21st centuries in Iran and the USA.

Facts on Majidi [1]



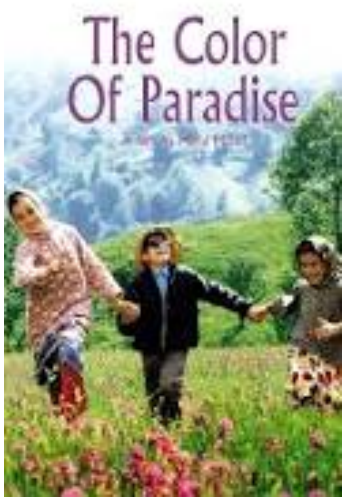
AKA	Majid Majidi
Born	April 17, 1959
Place of Birth	Talesh, Iran
Nationality	Iranian
Known for	Film *Children of Heaven*, First Iranian film nominated for an Academy Award in 1998
Films	Children of Heaven: The Color of Paradise in 2000 Baran in 2001 The Willow Tree in 2005

Biographical Sketch

Majidi was born on April 17, 1959 in Talesh, Iran. He is an Iranian film director, producer, and screenwriter, who started his film career as an actor. In his films, Majidi has touched on many themes and genres and has won numerous international awards. Born in an Iranian middle-class family, he grew up in Tehran and at the age of 14 he started acting in amateur theater groups. He then studied at the Institute of Dramatic Arts in Tehran. In 1979, his interest in cinema brought him to act in various films, most notably Mohsen Makhmalbaf's *Boycott* in 1985. In 1998, Majidi directed the *Children of Heaven*, which was nominated to receive the Academy Award for Best Foreign Language Film. Though it lost to the Italian film *Life Is Beautiful* by Roberto Benigni, *Children of Heaven* is the first Iranian film to have been nominated by the Academy.

Majidi has directed several other feature films since the *Children of Heaven*: *The Color of Paradise* in 2000, *Baran* in 2001, and *The Willow Tree* in 2005 (alternate English title *One Life More*). He also recently directed a feature-length documentary entitled *Barefoot to Herat,* which chronicles life in refugee camps and the city of Herat during and after the anti-Taliban offensive of 2001. In 2008, Majidi's acclaimed film *The Song of Sparrows* was the opening film of the Visakhapatnam International Film Festival in India. Majidi was one of five international film directors invited by the Beijing government to create a documentary short film to introduce the city of Beijing, in preparation for the 2008 Summer Olympics, which was held in the Chinese capital; the project was entitled "Vision Beijing".

Highly Acclaimed Films

. 

Children of Heaven is a 1997 Iranian family drama film written and directed by Majid Majidi. It deals with a brother and sister and their adventures over a lost pair of shoes. It was nominated for the Academy Award for Best Foreign Language Film in 1998. The film starts with Ali fetching his little sister Zahra's pink shoes after a cobbler has repaired them. He leaves them unattended to buy some potatoes. While he is pre-occupied, a homeless man picks up the shoes, hidden in a bag, thinking it was garbage and takes them away. Frantic to find them, the young boy, thinking the shoes fell behind the crates, knocks over plates of vegetables and is chased away by the grocer.

Ali's family lives in a poor South Tehran neighborhood and are having financial trouble, so he fears to tell his parents about the mishap. The landlord argues with Ali's mother, because she is five months behind on the rent, and the grocer has not been paid in a while either. Ali tells Zahra about the shoes and begs her not to tell their mother; she agrees. That night, Ali's father scolds him for not helping his ill mother when she asked. While the siblings were doing their homework, they passed notes to each other discussing what to do. They devise a scheme to share Ali's Converse sneakers: Zahra will wear them to school in the morning and return them to Ali at midday so he can attend afternoon classes [2].

The Color of Paradise 1999 is a story that revolves around a blind boy named Mohammad who is released from his special school in Tehran for summer vacation. His father, Hashem, shamed and burdened by Mohammad's blindness, arrives late to pick him up and then tries to convince the headmaster to keep Mohammad over the summer. The headmaster refuses, so Hashem eventually takes him home. Hashem, who is a widower, now wants to marry a local woman and prepares for the wedding. He approaches the woman's parents with gifts, and they give him their blessing. He attempts to hide the fact that his son is blind, because he fears that the woman's family will see it as a bad omen [3].

Baran 2001 is an original script by Majidi. The movie is set during recent times in which there are many Afghan refugees living on the outskirts of Tehran. *Baran* won several awards both nationally and internationally for the director and writer Majid Majidi [4].

Honors and Awards

Majid Majidi has received numerous awards up to now. Here are a few:

- Grand Prix Des Ameriques, 21st Montreal Film Festival, 1997.
- Ecumenical Jury award, 21st Montreal Film Festival, 1997.
- Nominated for Academy Awards for Best Foreign Film, 1998.
- Grand Prix Des Ameriques, 23rd Montreal Film Festival, 1999.
- Grand Prix Des Ameriques, 25th Montreal Film Festival, 2001.

References

[1] https://en.wikipedia.org/wiki/Majid_Majidi

[2] https://journeysinfilm.org/product/children-of-heaven/

[3] https://en.wikipedia.org/wiki/The_Color_of_Paradise

[4] https://en.wikipedia.org/wiki/Baran_(film)

Perspective on Nahavandi (Engineer, Educator, Innovator)

Introduction:

This perspective describes the life and contribution of Nahavandi who is an engineer and innovator during 20th and 21st Centuries in Australia.

Facts about Nahavandi

AKA	Saeid Nahavandi
Born	1962
Place of Birth	Rasht, Iran
Expertise	Robotics
Known for	Education, Innovation, Entrepreneurship

Biographical Sketch

Nahavandi received a Ph.D. from Durham University, U.K. in 1991. He is an Alfred Deakin Professor, Pro Vice-Chancellor, Chair of Engineering, and the Founding Director of the Institute for Intelligent Systems Research and Innovation at Deakin University in Australia. His research interests include modeling of complex systems, robotics and haptics. He has published over 1000 scientific papers in various international journals and conferences.

Achievements in Research and Innovation: from Conceptualization to Commercialization

Professor Saeid Nahavandi's pioneering research in intelligent systems has established platform technologies for robotic and haptic (tactile feedback) innovations. In a career spanning over 33 years, Saeid is internationally recognized for his outstanding contributions in innovative haptic technology that increase the fidelity of robotic and augmented/virtual reality (AR/VR) systems. His inventions in novel haptic devices enable users to "touch-and-feel" real or virtual objects remotely through tactile sensors, allowing perception of attributes like texture, hardness and force. The high-sensitivity feedback systems enhance sensory engagement in immersive environments. Saeid has applied this technology to a wide range of applications, from high-fidelity vehicle/aircraft simulators to low-cost and safe AR/VR firefighting training systems.

Honours and Awards

Professor Nahavandi is a Fellow of IEEE (FIEEE), Engineers Australia (FIEAust), the Institution of Engineering and Technology (FIET). Saeid is a Fellow of the Australian Academy of Technology and Engineering (ATSE).

Perspective on Jafarkhani (Engineer, Educator, Innovator)

Introduction:

In this Perspective, contributions of Jafarkhani during 2oth and 21st Centuries are given in US.

Facts about Jafarkhani [1]

AKA	Hamid Jafarkhani
Born	1966
Place of Birth	Tehran, Iran
Nationality	Iranian
Alumni	University of Tehran, University of Maryland
Known for	Communication theory, space–time block coding, quasi-orthogonal space–time block codes

Biographical Sketch

Jafarkhani was born in 1966 in Tehran and is a Chancellor's Professor in electrical engineering and computer science at the University of California, Irvine's Henry Samueli School of Engineering. His research focusses on communication theory, particularly coding and wireless communications, and networks.

Prior to studying at the University of Tehran, he was ranked first in the nationwide entrance examination of Iranian universities in 1984. After receiving his B.S. degree in 1989, he studied at the University of Maryland College Park and obtained his M.S. degree in 1994 followed by his Ph.D. in 1997. After graduating, Jafarkhani joined AT&T Laboratories-Research in August 1997 before moving to Broadcom in July 2000 and to the University of California, Irvine in September 2001.

Within the wireless communications field, Jafarkhani is best known for his contributions to two seminal papers, which established the field of space–time block coding, published while working for AT&T. The first of these, "Space–time block codes from orthogonal designs", established the theoretical basis for space–time block codes, and the second, "Space–time block coding for wireless communications: performance results", provided numerical analysis of the performance of the first such codes. Space–time codes rely on the use of multiple antennas at the transmit side of a wireless link. Multiple copies of the same data are transmitted from these multiple antennas in such a way that the receiver has a much better chance of correctly detecting the signal in the presence of corruption and noise than if just one copy is sent. The performance of space–time coded systems, in terms of the reliability of the transmission is significantly better than non-coded systems. Space–time block codes are known to be simple to implement and effective, and Jafarkhani's two papers triggered the massive international research effort into them that continues today.

Later, in 2001, Jafarkhani introduced the quasi-orthogonal space–time block codes, which overcome some of the difficulties inherent in earlier codes, at a cost of transmitting less data. These too are now widely studied. Then, in 2003 he introduced a more powerful version of his original codes, the super-orthogonal space–time trellis codes which combine the effects of both block codes and space–time trellis codes. Again, this work has led to significant research efforts around the world.

Jafarkhani received a National Science Foundation CAREER award in January 2003, which "recognizes outstanding scientists and engineers who, early in their careers, show exceptional potential for leadership at the frontiers of knowledge". He is also a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), an editor of IEEE Transactions on Wireless Communications and an associate editor of IEEE Communications Letters. Jafarkhani is the author of the *Space-Time Coding: Theory and Practice*, published in September 2005.

Jafarkhani is a co-recipient of the 2013 IEEE Eric E. Sumner Award for outstanding contributions to communications technology. He is a recipient of the IEEE Communications Society Award for Advances in Communication. He is one of the Top 10 Most Cited Researchers in Computer Science according to the ISI web of science [1].

References

[1] https://en.wikipedia.org/wiki/Hamid_Jafarkhani

Perspective on Birkar (Mathematician, Field Medal Winner)

Introduction:

A brief life story and scientific contributions of another distinguished Persian - Kurdish mathematician of 20^{th} and 21^{st} Centuries who is a mathematician who several contributions to the theory of Algebraic and Birational geometry [1].

Facts on Birkar [1]

	AKA	Caucher Birkar
	Name at Birth	Fereydoun Derakhshani
	Born	1978 in Kurdistan Province of Iran
	Place of Birth	Ney, Marivan County, Iran
	Nationality	Kurdish, Persian (Iran), British
	Fields of Expertise	Algebraic geometry, Birational geometry

Biographical Sketch [1]

Caucher Birkar FRS – Fellow of Royal Society of UK. He was born in July 1978 in Marivan County, Kurdistan Province, Iran. He received his BS degree in mathematics from the University of Tehran, and PhD also in mathematics from University of Nothing ham, UK. Currently, he is a professor at the University of Cambridge [1].

Birkar is an important contributor to modern birational geometry. In 2010 he received the Leverhulme Prize in mathematics and statistics for his contributions to algebraic geometry, and in 2016, the American Mathematical Society's Moore Prize for the article "Existence of minimal models for varieties of log general type", *Journal of the AMS* (2010) (joint with P. Cascini, C. Hacon and J. McKernan). He was awarded the Fields Medal in 2018, "for his proof of boundedness of Fano varieties and contributions to the minimal model program"[1].

Birational Geometry

In mathematics, birational geometry is a field of algebraic geometry in which the goal is to determine when two algebraic varieties are isomorphic outside lower-dimensional subsets. This amounts to studying mappings that are given by rational fun In algebraic geometry, a Fano variety, introduced by Gino Fano in (Fano 1934, 1942), is a complete variety X whose anticanonical bundle K_X^* is ample. In this definition, one could assume that X is smooth over a field, but the minimal model program has also led to the study of Fano varieties with various types of singularities, such as terminal or klt singularities actions rather than polynomials; the map may fail to be defined where the rational functions have poles. [2]

Fano Variety

In algebraic geometry, a Fano variety, introduced by Gino Fano in (Fano 1934, 1942), is a complete variety X whose anticanonical bundle K_X^* is ample. In this definition, one could assume that X is smooth over a field, but the minimal model program has also led to the study of Fano varieties with various types of singularities, such as terminal or klt singularities. [3]

Contributions

Caucher Birkar has made fundamental contributions to birational geometry in two particular areas: the minimal model program (MMP) and the boundedness of Fano varieties. The original MMP involves two kinds of projective varieties Y with so-called terminal singularities whose canonical divisors K have opposite properties: for a minimal model K is non-negative on curves on Y; while for a Fano fibering Y has a surjective morphism onto a lower dimensional projective variety with -K relatively ample. The MMP attempts to construct for each smooth projective variety a birational map to either a minimal model or a Fano fibering. Although the MMP is not always known to work, Birkar jointly with Cascini, Hacon, and McKernan made a stunning contribution; a special version of the MMP works for complex varieties of arbitrary dimension whose canonical divisor is either big or not pseudo effective, a situation which covers many important cases. They actually established the MMP for a wider class of singularities, which was essential for the induction on dimension in the proof, and it implies many important consequences such as the finite generation of canonical rings of arbitrary smooth projective varieties. The MMP is now a fundamental tool which is used extensively. It was Birkar who further proved that complex Fano varieties (i.e., Fano fiberings over a point) of arbitrary fixed dimension with terminal singularities are parametrized by a (possibly reducible) algebraic variety. Since these Fano varieties constitute one of the main outputs of MMP as applied to smooth projective varieties, their boundedness, previously considered unreachable, is fundamentally important. Birkar has settled the more general BorisovAlexeev-Borisov conjecture building upon results by Hacon, McKernan, Xu, and others. Birkar's boundedness will be crucial as a paradigm for the full MMP [4].

References

[1] https://en.wikipedia.org/wiki/Caucher_Birkar

[2] https://en.wikipedia.org/wiki/Birational_geometry

[3] https://en.wikipedia.org/wiki/Fano_variety

[4] https://www.mathunion.org/fileadmin/IMU/Prizes/Fields/2018/Birkar-Citation.pdf

Perspective on Sabeti (Computational Biologists, Medical Geneticist)

Introduction:

This perspective describes the life and contribution of Pardis Sabeti who is a biologist, during the 20th and 21st centuries in Iran.

Facts on Sabeti [1]

AKA	Pardis Sabeti
Born	December 25, 1975
Place of Birth	Tehran, Iran
Nationality	Iranian, American
Education	Trinity Preparatory School
Alma Matters	Massachusetts Institute of Technology (SB), University of Oxford (MSc, Ph.D.), Harvard University (MD)

Biographical Sketch

Pardis Christine Sabeti was born on December 25, 1975 in Tehran, Iran. She is an Iranian American computational biologist, medical geneticist, and evolutionary geneticist. She developed a bioinformatic statistical method, which identifies sections of the genome that have been subject to natural selection and an algorithm, which explains the effects of genetics on the evolution of disease.

In 2014, Sabeti was part of a team led by Christian Happi, (a Cameroonian geneticist), which used advanced genomic sequencing technology to identify a single point of infection from an animal reservoir to a human during the Ebola outbreak in West Africa. RNA changes suggest that the first human infection was followed by exclusive human-to-human transmissions. The work led her to be named one of the *TIME Magazine's* Persons of the Year in 2014, (Ebola Fighters), and one of *TIME's* 100 most influential people in 2015.

Sabeti is a full professor at the Center for Systems Biology and Department of Organismic and Evolutionary Biology at Harvard University and on the faculty at the Center for Communicable Disease Dynamics at the Harvard T.H. Chan School of Public Health and is an institute member at the Broad Institute and an investigator at the Howard Hughes Medical Institute. She is also the head of the Sabeti Laboratory [1, 2].

Research Work

Sabeti is an annual participant in the Distinguished Lecture Series at the acclaimed Research Science Institute at MIT for high school students. In May 2015, she delivered a TED talk called "How we'll fight the next deadly virus". Her team was recently awarded funding from the TED Audacious Project to build Sentinel, (a pandemic pre-emption and response system).

As a graduate student at Oxford and a postdoctoral fellow with Eric Lander at the Broad Institute, Sabeti developed a family of statistical tests for positive selection that looks for common genetic variants found on unusually long haplotypes. Her tests, (extended haplotype homozygosity (EHH), the long-range haplotype (LRH) test, and cross population extended haplotype homozygosity (XP-EHH), are designed to detect advantageous mutations whose frequency in human populations has risen rapidly over the last 10,000 years. As a faculty member at Harvard, Sabeti and her team have developed a statistical test to pinpoint signals of selection, (the Composite of Multiple Signals (CMS) and a family of statistical tests to detect and characterize correlations in datasets of any kind, maximal information non-parametric exploration (MINE)) [1].

Awards and honors

Additional awards and honors are the 2012 recipient of the *Smithsonian* magazine's American Ingenuity Award in the Natural Sciences category [3]. In 2014, she received the Vilcek Prize for Creative Promise in Biomedical Science. She is a World Economic Forum Young Global Leader and a National Geographic Emerging Explorer.

In 2015, Sabeti was selected for the prestigious Howard Hughes Medical Institute Investigator award. She has also received a Burroughs Welcome Fund Career Award in the Biomedical Sciences, a Packard Foundation award in Science and Engineering, and an NIH Director's New Innovator Award, and a L'Oréal for Women in Science Fellowship. [1].

Personal Life

Sabeti is the lead singer and a writer for the rock band, 'Thousand Days' and is also the current host of the educations series *Against all Odds: Inside Statistics* sponsored by Annenberg Learner. Her show is included in many high school statistics curriculums, including the Research Statistics 1 course at Thomas Jefferson High School for Science and Technology [1].

References

[1] https://en.wikipedia.org/wiki/Pardis_Sabeti

[2] https://www.sabetilab.org/pardissabeti/

[3] https://www.smithsonianmag.com/science-nature/pardis-sabeti-the-rollerblading-rock-star-scientist-of-harvard-135532753/

Perspective on Moghbeli (Aerospace Engineer, Pilot, Astronaut)

Introduction:

This perspective describes the life and contribution of Moghbeli who is an Aerospace engineer during the 20th and 21st centuries in the USA.

Facts on Moghbeli [1]

AKA	Jasmin Moghbeli, Astronaut, Pilot
Born	June 24, 1983
Place of Birth	Bad Nauheim, West Germany
Nationality	Iranian, American
Alumni	MIT, Naval Postgraduate School
Rank	Major US Marine Corp
Occupation	Astronaut, Test Pilot

Biographical Sketch

Jasmin Moghbeli is an Iranian-American US Marine Corps test pilot and NASA astronaut. She is a graduate of the Massachusetts Institute of Technology, Naval Postgraduate School, and the US Naval Test Pilot School, and as of 2019, has over 2,000 hours of flight time. In her early life, she moved with her family to Baldwin, New York. Moghbeli graduated from Baldwin Senior High School, and attended the Advanced Space Academy at Space Camp while as a high school student. Moghbeli earned a bachelor's degree in aerospace engineering with information technology at the Massachusetts Institute of Technology, and played basketball for the MIT Engineers [1].

Moghbeli was commissioned as a US Marine Corps officer in 2005, and trained to become an AH-1 Super Cobra pilot. She deployed three times, and completed 150 combat missions. She received a master's degree in Aerospace Engineering from the Naval Postgraduate School. She attended the US Navy Test Pilot School at Patuxent River Naval Air Station in Maryland, and became a helicopter test pilot at VMX-1 at the Marine Corps Air Station Yuma in Arizona [1].

In June 2017, Moghbeli was selected as a member of NASA's Astronaut Group 22. She began her two-year training then. In January 2020, Moghbeli graduated as one of the 13 graduates of the NASA Astronaut Candidate Training Program, making her "now eligible for spaceflight, including assignments to the International Space Station, Artemis missions to the Moon, and ultimately, missions to Mars" [1].

Moghbeli has received four Air Medals, the Navy and Marine Corps Commendation Medal, and three Navy and Marine Corps Achievement Medals. She received the US Navy Test Pilot School Class 144 Outstanding Developmental Phase II Award and the Commander Willie McCool Outstanding Student Award as the Class 144 Honor Graduate.

References

[1] https://en.wikipedia.org/wiki/Jasmin_Moghbeli

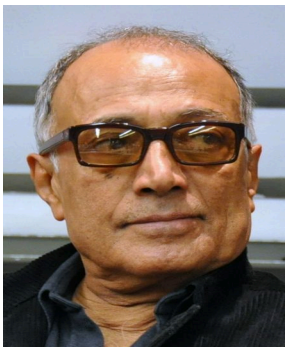
Perspective on Kia Rostami (Film Director, Photographer, Producer, Painter, Poet, Screenwriter, Producer)

عباس کیارستمی

Introduction:

This perspective describes the life and contribution of Kia Rostami who was a pioneering film director during 20th and 21st Centuries in Iran.

Facts on Kia Rostami [1]



AKA	Abbas Kia Rostami
Born	June 22, 1940
Place of Birth	Tehran, Iran
Death	July 4, 2016
Place of Death	Paris, France
Nationality	Iranian
Known for	Filmmaker, photographer, producer, painter, poet

Biographical Sketch [1]

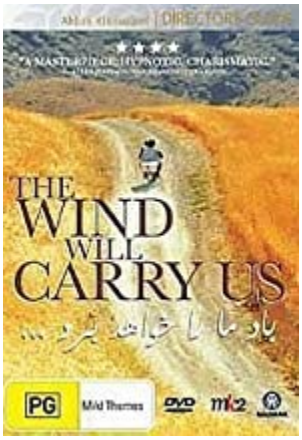
Abbas Kia Rostami "was an Iranian film director, screenwriter, poet, photographer, and film producer. An active film-maker from 1970, Kia Rostami had been involved in the production of over forty films, including shorts and documentaries. Kia Rostami attained critical acclaim for directing the *Koker* trilogy (1987–1994), *Close-Up* (1990), *The Wind Will Carry Us* (1999), and *Taste of Cherry* (1997), which was awarded the Palme d'Or at the Cannes Film Festival that year. In later works, *Certified Copy* (2010) and *Like Someone in Love* (2012), he filmed for the first time outside Iran: in Italy and Japan, respectively. His films *Where Is the Friend's Home?*, *Close-Up*, and *The Wind Will Carry Us* were ranked among the 100 best foreign films in a 2018 critics' poll by BBC Culture.[4] *Close-Up* was also ranked one of the 50 greatest movies of all time in the famous decennial *Sight & Sound* poll conducted in 2012.

Kia Rostami had worked extensively as a screenwriter, film editor, art director and producer and had designed credit titles and publicity material. He was also a poet, photographer, painter, illustrator, and graphic designer. He was part of a generation of filmmakers in the Iranian New Wave, a Persian cinema movement that started in the late 1960s and includes pioneering directors such as Bahram Beyzai, Nasser Taghvai, Ali Hatami, Masoud Kimiai, Dariush Mehrjui, Sohrab Shahid-Saless and Parviz Kimiavi. These filmmakers share many common techniques

including the use of poetic dialogue and allegorical storytelling dealing with political and philosophical issues.

Kia Rostami had a reputation for using child protagonists, for documentary-style narrative films,[1] for stories that take place in rural villages, and for conversations that unfold inside cars, using stationary mounted cameras. He is also known for his use of Persian poetry in the dialogue, titles, and themes of his films. Kia Rostami's films contain a notable degree of ambiguity, an unusual mixture of simplicity and complexity, and often a mix of fictional and documentary elements. The concepts of change and continuity, in addition to the themes of life and death, play a major role in Kia Rostami's works." [1]

Below are three of his best films, including a choice at the New York Film Festival.



References

[1] https://en.wikipedia.org/wiki/Abbas_Kiarostami

Perspective on Seyhoun (Architect, Sculptor, Painter, Scholar, Poet)

Introduction:

This perspective describes the life and contribution of Seyhoun who was a superb architect, sculptor, scholar and poet film director during 20th and 21st Centuries in Iran.

Facts on Seyhoun [1]

AKA	Hooshang Seyhoun
Born	August 22, 1920
Place of Birth	Tehran, Iran
Death	May 26, 2014
Place of Death	Vancouver, BC, Canada
Nationality	Iranian
Known for	Architect, Sculptor, Painter, Scholar and Poet

Biographical Sketch [1]

Seyhoun was an Iranian architect, sculptor, painter, scholar and professor. He studied fine arts at the École nationale supérieure des Beaux-Arts in Paris, and earned a degree in architecture from University of Tehran.[1] Seyhun is noted specially for his innovative and creative architectural design. His architectural legacy includes countless monuments and over one thousand private villas. After the Iranian Revolution he moved to Vancouver and lived in exile until his death. Seyhoon became famous for his design work in the 1950s in Iran, including: *Tehran's Central Railway Station* and tombs of scientific/literary figures (such as the Avicenna Mausoleum in Hamadan). He has been a faculty member of Tehran University's College of Architecture, where he also served as Dean of the College of Fine Arts (Beaux arts) of Tehran University for six years. [1]

Seyhoun's work includes several monuments such as the Avicenna Mausoleum in Hamadan, Tomb of Nader Shah in Mashhad and Omar Khayyam Mausoleum in Nishapur. Below are two of lasting mausoleum of famous poets and physician and scientist Avicina and Khayyam.

References

[1] https://en.wikipedia.org/wiki/Hooshang_Seyhoun

Perspective on Panahi (Film Director, Screenwriter, Producer)

Introduction:

This perspective describes the life and contribution of Panahi who is a notable film director during 20th and 21st Centuries in Iran.

Facts on Panahi [1]

AKA	Jafar Panahi
Born	11 July 1960
Place of Birth	Mianeh, Iran
Nationality	Iranian
Known for	Films, Production, Screenwriter

Biographical Sketch

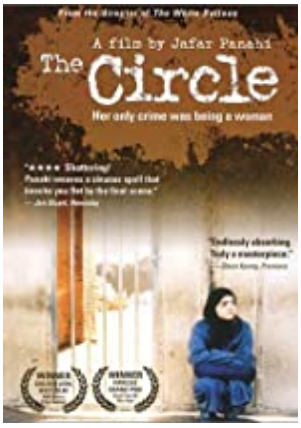
Jafar Panahi, is "an Iranian film director, screenwriter, and film editor, commonly associated with the Iranian New Wave film movement. After several years of making short films and working as an assistant director for fellow Iranian filmmaker Abbas Kiarostami, Panahi achieved international recognition with his feature film debut, The White Balloon (1995). The film won the Caméra d'Or at the 1995 Cannes Film Festival, the first major award an Iranian film won at Cannes.

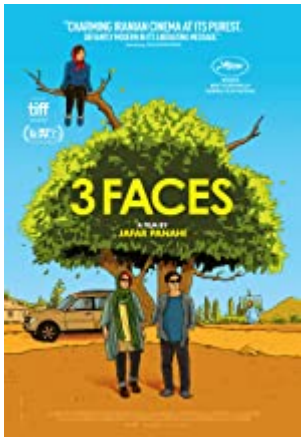
Panahi was quickly recognized as one of Iran's most influential filmmakers. His films were often banned in Iran, but he continued to receive international acclaim from film theorists and critics and won numerous awards, including the Golden Leopard at the Locarno International Film Festival for The Mirror (1997), the Golden Lion at the Venice Film Festival for The Circle (2000), and the Silver Bear at the Berlin Film Festival for Offside (2006). His films are known for their humanistic perspective on life in Iran, often focusing on the hardships of children, the impoverished, and women. Hamid Dabashi has written, "Panahi does not do as he is told—in fact he has made a successful career in not doing as he is told."

After several years of conflict with the Iranian government over the content of his films (including several short-term arrests), Panahi was arrested in March 2010 along with his wife, daughter, and 15 friends, and later charged with propaganda against the Iranian government. Despite support from filmmakers, film organizations, and human rights organizations around the world, in December 2010 Panahi was sentenced to six years in prison and a 20-year ban on directing any movies, writing screenplays, giving interviews with Iranian or foreign media, or leaving the country except for medical treatment or making the Hajj pilgrimage. While awaiting the result of an appeal he made This Is Not a Film (2011), a documentary feature in the form of a video diary. It was smuggled out of Iran on a flash drive hidden inside a cake and shown at the 2011 Cannes Film Festival. In February 2013 the 63rd Berlin International Film Festival showed

Closed Curtain (Pardé) by Panahi and Kambuzia Partovi in competition; Panahi won the Silver Bear for Best Script. Panahi's subsequent film Taxi also premiered in competition at the 65th Berlin International Film Festival in February 2015 and won the Golden Bear, the prize awarded for the best film in the festival. In 2018 he won the Cannes Film Festival Award for Best Screenplay (tied) for *3 Faces*; he was unable to leave Iran to attend the festival, so his daughter, Solmaz Panahi, read his statement and received the award on his behalf." [1]

Below are some of his award-winning films, such as in Cannes and Berlin:





References

[1] https://en.wikipedia.org/wiki/Jafar_Panahi

Perspective on Alamouti (Technologist, Inventor of Alamouti Code)

Introduction:

This perspective describes the life and contribution of Alamouti who is a technologist and inventor of Mobile WiMAX mobile and Alamouti Code device during 20th and 21st Centuries in Iran.

Facts on Alamouti [1]

AKA	Siavash Alamouti
Born	1962
Place of Birth	Tehran, Iran
Nationality	Canadian, American
Known for	Invention of WiMAX mobile device, and Alamouti Code.

Biographical Sketch [1]

Alamouti "was born in 1962 in Tehran, Iran, and attended Sharif University in 1980 for one year and was expelled after the cultural revolution. Today, he holds dual citizenship of Canada and USA. Prior to Mimik, Siavash Alamouti was the Group R&D Director at Vodafone Group.

Prior to Vodafone, he was an Intel Fellow and the CTO of Mobile Wireless Group at Intel. Alamouti its technology champion for Mobile WiMAX

Prior to Intel, he was the Director of R&D and before his departure, the CTO of the smart antenna WiFi startup called Vivato[2]. While at Vivato, he championed fundamental changes to regulations in the unlicensed band to enable the use of smart antennas for WiFi.

He started his professional career at MPR Teltech in Vancouver where he worked on early mobile data protocols including CDPD. In 1995, he joined McCaw Cellular, now AT&T Wireless as a Senior Scientist where he worked on the physical and MAC layer design of United States' first [2] commercial OFDM/MIMO system known as Project Angel.

During that project, he invented a 2xN MIMO scheme which today is referred to by some as the "Alamouti Code" and has been adopted in various wireless standards including WiFi and LTE and is included in billions of wireless devices. Alamouti's 1998 paper in IEEE Journal on Selected Areas of Communications was by IEEE Communication Society for publication in, "The Best of the Best: Fifty Years of Communications and Networking Research." In 2001, AT&T Wireless Services Inc. was assigned a patent citing Alamouti and Tarokh as co-inventors of Transmitter diversity technique for wireless communications. In 1999, Tarokh, Jafarkhani, and Calderbank, published a paper, categorized the Alamouti Code as a Space-Time Block code, and generalized the code to more transmit antennas. In 2013, Alamouti, Tarokh and Jafarkhani, received an award for the invention of Space-time-Block codes. Alamouti, received B.A.Sc. and

M.A.Sc. degrees in Electrical Engineering from the University of British Columbia in 1989 and 1992, respectively.

References

[1] https://en.wikipedia.org/wiki/Siavash_Alamouti

[2] https://www.crunchbase.com/organization/vivato

Perspective on Shahbazi (Achaemenid archeologist, Iranologist)

Introduction:

This perspective describes the life and contribution of Shahbazi who was a Persian archeologist, Iranologist and a world expert on Achaemenid archeology during 20th and 21st Centuries in Iran.

Facts on Shahbazi [1]

AKA	Alireza Shapour Shahbazi
Born	1962
Place of Birth	Shiraz, Iran
Nationality	Iranian
Death	July 15, 2006
Place of Death	Washington, DC., USA
Known for	Achaemenid archeology

Biographical Sketch [1]

Shahbazi "was a prominent Persian archeologist, Iranologist and a world expert on Achaemenid archeology. Shahbazi got a BA degree in and an MA degree in East Asian archeology from SOAS. Shahbazi had a doctorate degree in Achaemenid archeology from University of London. Alireza Shapour Shahbazi was a lecturer in Achaemenid archeology and Iranology at Harvard University.[2] He was also a full professor of Archeology at Shiraz University and founded at Persepolis the Institute of Achaemenid Research in 1974. After the Islamic revolution, he moved to the USA, firstly teaching at Columbia University and then later becoming a full professor of history in Eastern Oregon University.

While employed at Columbia, Shahbazi became involved with the formation of the Encyclopedia Iranica. Shahbazi, who also served as visiting associate editor until 2003, would also author 76 articles of varying topics covering the Achaemenid, Arsacids, and Sasanian periods of Iran.

Shahbazi wrote numerous classic books and articles on archeology (Achaemenid, Sassanid and Islamic) in English, German, French, and the Persian language He died on 15 July 2006 after a long battle with cancer. He was transferred to Shiraz and buried in the memorials surrounding the Tomb of Hafez (see Chapter 25)" [1]

References

[1] https://en.wikipedia.org/wiki/Alireza_Shapour_Shahbazi

Perspective on Vafa (Theoretical Physicist)

Introduction:

This perspective describes the life and contribution of Vafa who is a theoretical physicist who has created F-theory, Vafa–Witten theorem, Gopakumar–Vafa invariant Mirror symmetry, Swampland (physics), and Weak gravity conjecture during 20th and 21st Centuries in Iran.

Facts on Vafa [1]

	AKA	Cumrun Vafa
	Born	August 1, 1960
	Place of Birth	Tehran, Iran
	Nationality	Iranian, American
	Alumni	MIT, Princeton University
	Honors	Member National Academy of Science, USA
	Known for	Theoretical Physicist

Biographical Sketch [1]

Vafa "is an Iranian-American theoretical physicist and the Hollis Professor of Mathematics and Natural Philosophy at Harvard University. He became interested in physics as a young child, specifically how the moon was not falling from the sky, and he later grew his interests in math by high school and was fascinated by how mathematics could predict the movement of objects.

He graduated from Alborz High School in Tehran and moved to the United States in 1977 for study at university.[1] He received a B.S. in mathematics and physics from the Massachusetts Institute of Technology (MIT) in 1981. He received his Ph.D. in physics from Princeton University in 1985 after completing a doctoral dissertation, titled "Symmetries, inequalities and index theorems", under the supervision of Edward Witten. After his PhD degree, Vafa became a junior fellow via the Harvard Society of Fellows at Harvard University, where he later got a junior faculty position. In 1989 he was offered a senior faculty position, and he has been there ever since. Vafa worked at Princeton University within the Institute for Advanced Study, within the School of Natural Sciences and the School of Mathematics in 1994

Vafa's research in string theory is focused on the nature of quantum gravity and the relation between geometry and quantum field theories. He is known in the string theory community for his co-discovery with Strominger that the Bekenstein-Hawking entropy of a black hole can be accounted for by solitonic states of superstring theory, and for expounding the relation between geometry and field theories that arise through string dualities (culminating in the Gopakumar–Vafa conjecture). This topic has been known as "geometric engineering of quantum field theories". In 1997, he developed F-theory, a 12-dimensional theory that compactifies to 10-D Type IIB superstring theory.

He is also interested in understanding the underlying meaning of string dualities, as well as trying to apply superstring theory to some unsolved questions of elementary particle physics such as the hierarchy problem and the cosmological constant problem. He has made contributions to topological string theories and to the understanding of mirror symmetry.

In 2017, Vafa, alongside Andrew Strominger and Joseph Polchinski, jointly won the Breakthrough Prize in Fundamental Physics for their advancement of string theory and jointly won the 2014 Breakthrough Prize in Physics Frontiers Prize.

He is the recipient of the Abdus Salam International Centre for Theoretical Physics (ICTP)'s, 2008 Dirac Medal, which was won alongside Juan Maldacena, and Joseph Polchinski for their advancement of string theory.

In 1998 he was a Plenary Speaker at the International Congress of Mathematicians.

In 2016, Vafa was awarded the Dannie Heineman Prize for Mathematical Physics.

Vafa was elected as a member of the American Academy of Arts and Sciences in 2005 and as a member of the National Academy of Sciences in 2009." [1]

References

[1] https://en.wikipedia.org/wiki/Cumrun_Vafa

Perspective on Moghaddam (Engineer, Trailblazer)

Introduction:

This perspective describes the life and contribution of Moghaddam who is an engineer and innovator during 20th and 21st Centuries in Iran and USA.

Facts on Moghaddam [1]

	AKA	Mahta Moghaddam
	Born	Unknown
	Place of Birth	Unknown
	Nationality	Iranian, American
	Known for	Microwave Systems, Sensors, and Imaging

Biographical Sketch

Mahta Moghaddam, the William M. Hogue Professor of Electrical and Computer Engineering at University of Southern California, received her B.S. degree (with highest distinction) from the University of Kansas, Lawrence, in 1986 and the M.S. and Ph.D. degrees from the University of Illinois, Urbana-Champaign, in 1989 and 1991, respectively, all in electrical and computer engineering. From 1991 to 2003, she was with the Radar Science and Engineering Section, Jet Propulsion Laboratory (JPL), California Institute of Technology, Pasadena, before joining the Radiation Laboratory in the EECS department at Michigan. Moghaddam joined the USC Ming Hsieh Department of Electrical Engineering in January 2012. She is a Fellow of IEEE and a member of the National Academy of Engineering.

As director of the Microwave Systems, Sensors, and Imaging Lab (MiXIL) at USC, Moghaddam's research touches on a wide range of problems. Her lab has designed and used microwave systems to, among other things, target and treat breast cancer, retrieve information about the earth's surface and subsurface, and conduct large-scale environmental mapping. Dr. Moghaddam is also director of the Viterbi Innovation Fund Arid Climates and Water Research Center (AWARE), which brings researchers from across USC together to better understand and address issues related to water scarcity in arid climates. Moghaddam's center seeks to contribute technological solutions to water extremes, such as droughts, in pursuit of a sustainable future. She is also the co-Director of the USC Center for Sustainability Solutions.

References

[1] https://en.wikipedia.org/wiki/Mahta_Moghaddam

Perspective on Yarshatar (Iranologist, Historian)

Introduction:

This perspective describes the life and contribution of Yarshatar who was an Iranologist, Historian during 20th and 21st Centuries in Persia.

Facts on Yarshatar [1]

	AKA	Ehsan Yarshatar, Ehsanollah Yarshatar
	Born	April 3, 1920
	Place of Birth	Hamadan, Iran
	Nationality	Iranian
	Death	September 2, 2018
	Place of Death	Fresno, CA, USA

Biographical Sketch

Ehsan Yarshatar was an Iranian historian and linguist who specialized in Iranology. He was the founder and director of The Center for Iranian Studies, and Hagop Kevorkian Professor Emeritus of Iranian Studies at Columbia University. He was the first Persian full-time professor at a U.S. university since World War II.. He was one of leading of the 40 editors of the Encyclopædia Iranica, with articles by 300 authors from various academic institutions. He also edited the third volume of the Cambridge History of Iran, comprising the history of the Seleucid, the Parthians, and the Sassanians, and a volume entitled Persian Literature. He was also an editor of a sixteen-volume series named History of Persian Literature. He had won several International awards for scholarship, including a UNESCO award in 1959, and the Giorgio Levi Della Vida Medal for Achievement in Islamic Studies from UCLA in 1991. Lecture series in his name have been instituted at the University of London, and the University of California, Los Angeles, and at the Centre National de Recherche Scientifique in Paris.

Life and Career

Ehsan Yarshater studied Persian language and literature at the University of Tehran and Iranian philology (Old and Middle Iranian) at the School of Oriental and African Studies (SOAS), University of London with Walter Bruno Henning. His Tehran University dissertation dealt with Persian poetry under the Timurid Shahrukh (15th century king). His University of London dissertation, elaborated and published later as *A Grammar of Southern Tati Dialects* (Mouton, 1969), describes a series of Tati dialects spoken in the southwest of Qazvin. He had published a number of articles on modern western Iranian dialects, notably Tati and Taleshi, and the Jewish dialects of Persian (including Lotara'i), and on Persian mythology.

> "Yarshatar founded the Encyclopedia Iranica in 1973 and remained its Editor-in-Chief until his retirement. Encyclopedia Iranica is arguably the most significant, extensive and comprehensive scholarly work dedicated to the study of Iranian civilization in the Middle East, the Caucasus, Central Asia and the Indian Subcontinent. The academic reference

work will eventually cover all aspects of Iranian history and culture as well as all Iranian languages and literatures, encompassing the whole range of Iranian studies research from archeology to political sciences. In 1990, Professor Yarshatar established the Encyclopedia Iranica Foundation to ensure the continuation of this comprehensive scholarly work. He was the Foundation's President until his death in 2018."[2]

"Yarshater authored and served as the editor of numerous scholarly works. Among many notable works, he has authored Persian Poetry in the Second Half of the 15th Century (1953), Southern Tati Dialects (1970), and has edited the third volume of Cambridge History of Iran, in two parts, covering the Seleucid, Parthian and Sasanian periods (1983, 1986), and Persian Literature (1988). He was the General Editor of the 40-volume Tabari Translation Project, and the Founding Editor of the Persian Text Series, the Persian Heritage Series and the Persian Studies Series. Lecture series in his name have been instituted at Harvard, the University of London, and the University of California at Los Angeles."[2]

Figure 1 shows a snapshot of Encyclopedia Iranica, which was the brainchild of Yarshatar.

Author	1300 named contributors
Country	United States
Language	English
Subject	Iranistics and Greater Iran studies
Genre	Reference encyclopedia
Publisher	Encyclopedia Iranica Foundation
Publication date	1985–present
Media type	45 hardback volumes 15 volumes and 2 fascicles have been published by 2016.[1]
ISBN	1-56859-050-4
OCLC	59605200
Website	http://www.iranicaonline.org

Figure 1. A snapshot of Encyclopedia Iranica, spearheaded by Yarshatar

References

[1] https://en.wikipedia.org/wiki/Ehsan_Yarshater

[2] https://iranicaonline.org/pages/ehsan-yarshater

Perspective on Enghetah (Physicist, Electrical Engineering)

Introduction:

This perspective describes the life and contribution of Enghetah who is a physicist and electrical engineer during 20th and 21st Centuries in Iran and USA.

Facts on Enghetah [1]

AKA	Nader Enghetah
Born	September 8, 1955
Place of Birth	Tehran, Iran
Nationality	Iranian, American
Alumni	University of Tehran, California Institute of Technology
Known for	Contributions in metamaterials, transformation, optics, plasmonic optics

Biographical Sketch

Enghetah has made pioneering contributions to the fields of physics and electrical engineering, including metamaterials, transformation, optics, plasmonic optics, nanophotonics, graphene photonics, nano-materials, nanoscale optics, nano-antennas and miniaturized antennas, physics and reverse-engineering of polarization vision in nature, bio-inspired optical imaging, fractional paradigm in electrodynamics, and electromagnetics and microwaves.

After earning a B.S. degree from the school of engineering (Daneshkadeh-e-Fanni) of the University of Tehran, he left for the United States in the summer of 1978 and earned his Masters and PhD degrees from the Caltech.

He is one of the original pioneers of the field of modern metamaterials, and is the originator of the fields of near-zero-index metamaterials, plasmonic cloaking and optical nano circuitry (optical metatronics.).

His metamaterial-based optical nano circuitry, in which properly designed nano structures function as 'lumped' optical circuit elements such as optical capacitors, optical inductors and optical resistors. These are the building blocks for the metatronic circuits operating with light. This concept has been recently verified and realized experimentally by him and his research group at the University of Pennsylvania. This provides a new circuit paradigm for information processing at the nanoscale.

His near-zero-index structures exhibit unique properties in light-matter interaction that have provided exciting possibilities in nanophotonics. His plasmonic cloaking ideas have led to new methods in stealth physics. He and his group have developed several areas and concepts in the fields of metamaterials and plasmonic optics, including, (1) 'extreme-parameter metamaterials'

and 'epsilon-near-zero (ENZ) metamaterials'; (2) the concept of Omega structures, as one of the building blocks of structured materials; (3) ultrathin cavities and waveguides, with sizes beyond diffraction limits, providing possibilities for unprecedented miniaturization of devices; (4) supercoupling phenomena between waveguides using low-permittivity ENZ metamaterials; (5) extended Purcell effects in nano-optics using the ENZ phenomena, in which enhanced photon density of states occurs in a relatively large area with essentially uniform phase; (6) far-field subwavelength imaging lens based on ENZ hyperbolic metamaterials; (7) scattering-cancellation-based plasmonic cloaking and transparency; (8) merging the field of graphene with the field of metamaterials and plasmonic optics in infrared regime, providing the roadmaps for one-atom-thick optical devices and one-atom-thick information processing; (9) microwave artificial chirality; (10) "signal-processing" metamaterials and "meta-machine"; and (11) "digital" metamaterials.

He is currently the H. Nedwill Ramsey Professor at the University of Pennsylvania, Philadelphia, Pennsylvania, USA, affiliated with the departments of Electrical and Systems Engineering, Bioengineering, materials science and engineering, and Physics and Astronomy.

Awards

- Isaac Newton Medal (2020)[1]
- Max Born Award (2020)[1]
- Pioneer Award in Nanotechnology from IEEE Nanotechnology Council (2018)
- Highly Cited Researcher (Clarivate Analytics, Top 1% Researcher most cited) (2017 and 2018)
- William Streifer Scientific Achievement Award from IEEE Photonics Society (2017)
- Beacon of Photonics Industry Award from Photonics Media (2017)
- Honorary Doctorate from National Technical University Kharkov Polytechnic Institute (2017)
- Honorary Doctorate from University of Stuttgart, Germany (2016)

References

[1] https://en.wikipedia.org/wiki/Nader_Engheta

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