

Proof Positive:
Women in Science and Technology

Poster Exhibition

Residence of the German Consul General
Jeddah, Saudi Arabia
November 2015

This project was a collaboration between:



Robert Bosch **Stiftung**

Welcome Notes

Dear Gentlemen, dear ladies, dear visitors of the exposition, dear readers of this brochure,

In Germany, and not only in Germany, many supporters of gender equality and the empowerment of women favor an enforced quota for certain bodies in the political and economic spheres, encouraging the participation of women in all areas and strata of society on an equal footing with men. It is, of course, even more impressive when women establish themselves in their fields of expertise through their own efforts and the recognition of their peers, at times under truly adverse conditions - well before any discussions about enforced gender quotas or inhibitive "glass ceilings".



The posters which are on display today are only a small selection of all the examples through the ages and among very different cultures, which prove that competent women can find their way in any society, regardless of their area of interest. It may not be easy, it may require several attempts, detours, compromises and it certainly needs conviction and many times – a conscious decision for or against one of many meritorious alternatives.

I would like to encourage all young women (and all young men!) to make a conscious decision about their objectives in life and to review them every once in a while. It is a good thing to have encouraging examples from whom to draw inspiration when the going gets tough. It is even more important to know what you want. Then – go for it and fulfill your dreams!

H.E. Mrs. Annette Klein

German Consul General

I welcome this collection of Arab and Muslim women in science and technology as their contribution significantly added to the development of the world as we know it today.



The collaboration of Dar Al-Hekma University with the Robert Bosch Foundation back in April 2015 is a testament to the Graphic Design students' skills and talents to pull off such an exhibition which serves as a great reminder of women's achievements in the past. We are all pleased with the outcome and very proud of our students for choosing some great personalities.

I would also like to thank the Visual Communication Department for their constant efforts to instill excellence and enthusiasm in our students and encouraging them to always think outside the box in order to become creative and innovative designers.

I hope this catalog will serve as an inspiration to every woman as well as man as it demonstrates historical female role models who ventured into science and technology which are, until this day perceived as male territories.

When reading through this I want our female readers to believe that they too can achieve greatness and make history!

Enjoy the fascinating work of our wonderful students.

Suhair H. Al Qurashi, Ph.D.

President, Dar Al-Hekma University

For more than 30 years there have been various projects and initiatives in Germany to increase the number of women in natural sciences and technology – and until today this is necessary, we still have only ca. 30 % female students in these fields.

Traditionally and historically, these fields are predominantly developed, formed and occupied by men, they are lucky to have a lot of male role models.



We know from the past, however, that role models have a great effect. This is why I created a poster exhibition for the University of Applied Sciences Lübeck which presents the paths and biographies of 23 women who excelled with their research in the scientific and technological sectors, although the access to higher education was often difficult or even officially refused to them at the time.

My primary objective was to present female role models in order to draw more young girls and women to the areas of mathematics, computer sciences, natural sciences and technology (in German we use the acronym MINT for these fields of study).

Compared to Germany, there are a lot more young women in Saudi Arabia choosing to study sciences and technology – choosing these fields of study is no big deal for them as science and technology are not specifically labelled as “male subjects” and they study with a lot of fervor and enthusiasm. This is why they can be seen as role models for young German female students!

The current poster exhibition from Lübeck does not at all see itself as final or complete. Up to now, women from other cultures have been missing. It is an

important goal for us to extend the list of famous and well-known women in science and technology by expanding the poster exhibition.

In this regard the poster exhibition from Dar Al-Hekma University presents an impressive number of Arab and Muslim women who were and are active in the field of science and technology and I am immensely proud and glad to be a part of the common project presenting some of these women in this brochure!

I am also very much looking forward to showing the joint exhibition with the posters of famous European, Arab and Muslim women in science and technology at the University of Applied Sciences in Lübeck.

I hope you enjoy reading this brochure.

Katrin Molge

Member of the Executive Committee
Equal Opportunity Officer
University of Applied Sciences in Lübeck

Dar Al-Hekma students in “Art of the Poster” and “Introduction to Illustration” classes were given the opportunity to create posters and magazine covers featuring Muslim women in science and technology. They researched and chose women whose contributions have had a significant impact on society. As their professor, I enjoyed seeing the creative approaches and techniques they used to illustrate their concepts. We are pleased to be part of this exhibition.



Ms. Sylvia Shapiro, Assistant Professor
Visual Communication, Dar Al-Hekma University

Working on this project was a rich educational experience for both my students and me, this project was a great opportunity to gain more knowledge about female Muslim achievers.



Ms. Ola Nassief, Lecturer
Visual Communication, Dar Al-Hekma University

Proof Positive:

Women in Science and Technology

Poster Exhibition

GERMAN WOMEN

Emmy Noether

Developer of Modern Algebra

Some terms and vocabulary of physical and mathematical technical literature are named after her work (Noether modules, Noether rings). Emmy Noether primarily dedicated herself to the development of modern algebra.

It is thanks to her ground work that algebra became a prominent world-wide research topic in mathematics.

Emmy Noether

[23 March 1882 - 14 April 1935]



Special Scientific Achievements

Some terms and vocabulary of physical and mathematical technical literature are named after her work (*Noether modules*, *Noether rings*). Emmy Noether primarily dedicated herself to the development of modern algebra.

It is thanks to her ground work that algebra became a prominent world-wide research topic in mathematics.

1882 Amalie Emmy Noether is born in the city of Erlangen, to Jewish parents, on March 23. Her father is a professor of mathematics.

1900 As there is no high school for women, she goes to the Higher Women's School, and takes the state examination to become a teacher of French and English.

1900 - 1903 Without a high-school graduation, Emmy Noether attends the University of Erlangen as a guest. This is the only status allowed for women.

1903 She acquires her high-school graduation as a private student, and with it, the right to matriculation.

1903 - 1907 Emmy Noether studies mathematics in Erlangen and quickly finishes her studies *summa cum laude*.

1907 - 1915 She works privately as a scientist, providing research assistance for faculty and graduate students – all without a working contract or payment. Nevertheless, her scientific expertise soon grows. As the first female faculty member, she lectures in a variety of mathematical subjects.

1909 Likewise, Emmy Noether becomes the first female member of the German Mathematic Society. Her lectures increasingly attract attention in the professional scientific community.

1915 Emmy Noether goes to the Institute of Mathematics in Göttingen. Felix Klein and David Hilbert, famous luminaries, support her in her research work. Nevertheless, she is refused the possibility of making scientific career in research on her own; Prussian law does not permit women to habilitate. She continues to work, without a contract and free of charge. Highly impressed with her work, Albert Einstein tries to use his influence to her benefit – in vain.

1919 After women are given the right to vote in the Weimar Republic, Emmy Noether finally receives permission to teach at German universities.

1920 - 1923 She continues to work, unpaid, as a private lecturer in Göttingen, and publishes her work, establishing her recognition in the elite mathematic community.

1922 Emmy Noether receives the title of Adjunct Professor of Algebra, which is still unaccompanied by income.

1923 At 41, for the first time, she receives a contract with a modest remuneration.

1923 - 1933 Emmy Noether strengthens her position in the world of professional academics. She becomes a guest professor in Moscow (1928 - 1929), receives the renowned *Ackermann-Teubner-Preis* (1932), and publishes numerous works.

1933 - 1935 After the National Socialists seize power in Germany, Emmy Noether is forced out of her position on anti-Semitic grounds, and her teaching permission is rescinded. She emigrates to the USA, where she teaches at an American Women's College, and holds lectures at the Institute for Advanced Physics.

1935 Emmy Noether dies on April 14 as a result of complications following surgery.

GERMAN WOMEN

Karoline Herschel

Astronomer and Discoverer of 8 Comets

Karoline Herschel was the first woman to discover a comet and has received many honors for her scientific achievements as an astronomer.

She received a gold medal from the Astronomical Society of London and was an honorary member. She has the distinction to have written a supplementary catalogue to Flamsteed's Atlas of stars.

Karoline Herschel

[16 March 1750 - 9 January 1848]



Special Scientific Achievements

Karoline Herschel was the first woman to discover a comet.

Karoline Herschel received many honors for her scientific achievements as astronomer.

Writing of a supplementary catalogue to Flamsteed's Atlas of stars.

She received a gold medal from the Astronomical Society of London and was an honorary member.

1750 Karoline Herschel is born in Hanover.

1750 - 1767 In addition to playing the violin, Karoline learns to read and write.

1772 - 1780 Karoline Herschel moves to England, to live with her brother, the astronomer Wilhelm Herschel. There she learns English, occupies herself with book-keeping and cultivates her musical qualification. She discusses astronomical problems with her brother, addresses herself to the theoretical basics of astronomy and assists her brother with building telescopes and other astronomical tasks: Copying of catalogues, as well as grinding and polishing mirrors.

1781 Wilhelm discovers the planet Uranus, becomes known in scientific circles and is elected Fellow of the Royal Society. King George III offers him the position of court astronomer.

1783 Karoline Herschel observes the night skies systematically and finds 14 new nebulae.

1785 She receives her own little observatory, where she works independently in Wilhelm's absence.

1786 On August 1, Karoline Herschel is the first woman to discover a comet. For this discovery she receives honours from the Royal Society. As Wilhelm's assistant she receives a small annual salary of 50 pounds (her brother receives 200 pounds).

1789 - 1797 Karoline Herschel discovers 7 other comets and a multitude of double stars. She is well known in Europe as an outstanding astronomer. Furthermore she works on her catalogue of nebulae based on earlier observations.

1822 After Wilhelm's death Karoline returns to Hanover. She is financially independent as she receives a small pension and an inheritance from her brother.

1825 Karoline presents the Flamsteed's Atlas with the supplementary catalogue that she has compiled to the Royal Academy of Göttingen. In addition she publishes books written by her brother.

1828 She completes a catalogue of the nebulae and stars observed by her brother and herself, for which she receives a gold medal from the Astronomical Society of London, of which she is elected an honorary member.

1835 At the age of 85, Karoline Herschel is nominated Fellow of the Royal Astronomical Society as a leading scientist of the 19th century.

1840 On her 90th birthday, the King of Prussia sends her the gold medal awarded for the "furtherance of science".

1848 Karoline Herschel dies at the age of 98.

Note:

In her honour a crater of the moon bears the name of Karoline Herschel.

GERMAN WOMEN

Lise Meitner

The German Marie Curie

Lise Meitner contributed significantly to the discovery of nuclear fission. She is internationally recognized for her investigation of alpha-, beta- and gamma-radiation and their core processes.

In addition, she is the discoverer of element 91 (protactinium) on the periodic table of elements.

Lise Meitner

[7 November 1878 - 27 October 1968]



Special Scientific Achievements

Discovery of element 91 (protactinium).
International recognition for her investigation of alpha-, beta- and gamma-radiation and their core processes.

Lise Meitner contributed significantly to the discovery of nuclear fission.

1878 Lise Meitner is born in Vienna on November 7.

1892/1901 At 14, she is forced to end her schooling, as girls in Vienna are not permitted to attend high school. Nine years later, in 1901, she finally obtains her high-school degree as external pupil from a high school for boys.

1901 - 1906 She studies mathematics, physics and philosophy at the University of Vienna, where in 1906 she obtains her doctorate in physics, on the thermal conduction of inhomogenous bodies.

1907 Lise Meitner goes to Berlin, where she attends lectures by Max Planck – secretly, as women are not yet permitted to register for lectures in Prussia. Her work quickly leads her to Otto Hahn and the chemistry institute at which he works. As a woman, her access to the fundamental workspaces there is restricted.

1909 - 1912 She collaborates with Otto Hahn on the elements and radioactivity at the *Kaiser-Wilhelm-Society* Institute of Chemistry. Lise Meitner must perform her activities as an unpaid “visitor”.

1912 She becomes the first woman to receive a position at the University of Berlin, as assistant to Max Planck.

1913 Appointed as a scientific member of the *Kaiser-Wilhelm-Institut*.

1918 Lise Meitner and Otto Hahn discover the element 91 and call it protactinium. Through this achievement, she earns the long-deserved appointment as Head of an own Physics Department at the *Kaiser-Wilhelm-Institut*.

1922 Lise Meitner establishes herself as the first woman of physics. In the following four years she becomes a distinguished professor.



1933 As a result of her Jewish ancestry, her permission to teach is revoked. She continues work with powerful determination.

1938 She escapes to Sweden. Otto Hahn and Fritz Straßmann discover the nuclear fission of uranium and thorium the same year, to which Meitner had made a considerable contribution. One year later, she and her nephew Otto Robert Frisch deliver the first theoretical interpretation of nuclear fission.

1944 Only Otto Hahn was awarded the Nobel Prize for the discovery of nuclear fission despite the fact that both Lise Meitner and Otto Robert Frisch made a decisive contribution to the discovery. Otto Hahn was able to receive the prize not until the end of the war in 1945. Small comfort for the disappointed Meitner: she is selected by the American press as “Woman of the Year”.

1947 Research professor at the Technical University of Stockholm.

1955 - 1966 Lise Meitner receives numerous honors: in 1959, an Order of Merit and in 1966, together with Hahn and Straßmann, the *Enrico-Fermi Prize* of the US Atomic Energy Commission.

1968 Lise Meitner dies in Cambridge, where she has lived since 1964, on Oktober 27.

GERMAN WOMEN

Margarete Schütte-Lihotzky

Pioneer in Social Housing and
Resistance Fighter

She is the developer of the Frankfurt Kitchen, the core house idea, and central laundries. She was instrumental in the creation of housing estates for disabled ex-servicemen and gave consideration to the housing needs of children.

She gained multiple awards and recognition for her work, including The Lobmeyer Prize, Joliot-Curie Medal, Architecture Prize (Vienna), Prechtl Medal, Medal of Honour (Vienna) and honorary doctorates from different universities.

Margarete Schütte-Lihotzky

[23 January 1897 - 18 January 2000]



Special Scientific Achievements

Development of the *Frankfurt Kitchen*, the *core house* idea, central laundries, and housing estates for disabled ex-servicemen.

She cared for the housing needs of children.

Awards: Lobbmeyer Prize, Joliot-Curie Medal, Architecture Prize (Vienna), Prechtl Medal, honorary doctor of different universities, Medal of Honour (Vienna).

1897 Margarete Lihotzky is born in Vienna as the daughter of an Austrian state official.

1915 - 1919 She acts against her father's wishes and is the first woman to study architecture at Vienna's *Kunstgewerbeschule*. In 1919, she becomes the first graduated female architect.

1922 - 1925 She wins housing development competitions and organises an information centre for furnishing. Margarete and her parents come down with tuberculosis, Margarete is the only one to survive.

1926 For the Municipal Building Department in Frankfurt, Margarete develops the *Frankfurt Kitchen* which today is regarded as the prototype of modern fitted kitchens.

1927 Margarete marries Wilhelm Schütte, an architect and a colleague of hers.

1930 - 1933 She is the only woman among 32 architects to design two terraced houses for the Vienna *Werkbundsiedlung*. In 1933, her work is shown at the World's Fair in Chicago.

1930 - 1937 Due to the political situation in the Weimar Republic, Margarete, her husband, and a group of architects flee to the Soviet Union (1930). The group is supposed to implement the first of Stalin's five-year plans and to turn a town of mud huts and barracks into an industrial town with 200,000 inhabitants. Margarete functions as an expert for children's housing.

1934 Together with her husband, she travels from the Soviet Union to China in order to create building regulations for kindergartens for the Chinese ministry.

1937 Because of Stalin's cleansing campaigns, the couple leaves the Soviet Union and travels to London, Paris, and Istanbul.

1938 - 1940 Margarete Schütte-Lihotzky joins the communist resistance against the Nazi regime. In 1939, she becomes a member of the Austrian Communist Party (KPÖ). She and her husband travel back to Vienna.

1941 - 1945 Margarete Schütte-Lihotzky is arrested by the Gestapo and sentenced to death. By falsifying public documents, her husband obtains a conversion of the death sentence into a 15-year jail sentence. A few days before the end of the war, Margarete is released by American troops.

1946 She heads the Department of Children's Facilities of the Building Regulations Authorities in Bulgaria.

1947 Together with her husband, Margarete returns to Vienna and gets involved with equality and peace movements. Being a communist, she is not awarded public contracts. Therefore, she works as a consultant for the People's Republic of China, Cuba, and the German Democratic Republic.

1951 She breaks up with her husband.

1962 Margarete becomes urban development expert of the UN.

1980 She is awarded the City of Vienna's Architecture Prize.

1988 She does not accept a tribute by the Austrian Federal President, Kurt Waldheim, because of his dubious Nazi background.

1996 She supports a women's referendum in order to make the equality of treatment of women and men part of the Federal Constitutional Law.

2000 Margarete Schütte-Lihotzky dies in Vienna on January 18. She is interred in an honorary grave in Vienna's central cemetery.

GERMAN WOMEN

Melli Beese

First Licensed Women Pilot in Germany

First licensed German aviatress and aircraft constructor, Melli Beese has applied for several patents for various airplane types, e.g. a demountable airplane, a water plane, and a lightweight plane.

She also began her own flying school to teach future pilots.

Melli Beese

[13 September 1886 - 22 December 1925]



Special Scientific Achievements

First licensed German aviatrix,
aircraft constructor.

Constitutor of an own flying school.

Melli Beese applies for several patents of various airplane types, e.g. a demountable airplane, a waterplane, and a light plane.

1886 Hedwig Amelie Beese is born in Dresden, Germany, on September 13. "Melli" is her nickname.

1906 - 1909 Melli Beese studies at the Royal Academy of Fine Arts in Stockholm. Her father supports her financially. She hears of the first trial flights in Germany. She starts yearning for flying.

1909/1910 She returns to Dresden and hears guest lectures in mathematics, ship building, aircraft engineering and mechanics at the *Politechnikum*.

1910 Her father supports the plans of his daughter to become a pilot. But many flying schools refuse to take Melli Beese as a student; her being a woman, they doubt her capabilities. In November though, her first training flight takes place.

1911 On September 8, Melli graduates as first German woman pilot at the airport Berlin-Johannisthal and receives at her 25th birthday the license no. 115. Shortly after that, Melli reaches a height of 825 meters - a French woman just reached 450 meters before.

1912 Melli Beese establishes her own flying school *Melli Beese* in Berlin-Johannisthal and works additionally as aircraft constructor.

1912 - 1914 She applies for several patents, e.g. a demountable plane, a waterplane, and light plane. Melli crashes several times and is severely injured; nevertheless, it does not keep her from flying.

1913 Melli Beese marries Charles Boutard, a French pilot.

1914 By her married status she is regarded as French citizen during World War I. Therefore her license for teaching and business is withdrawn from her.

Melli's husband, being French, is arrested. Her flying school is confiscated; her planes are used for military purposes. This is her financial ruin.

1917 Release of Charles Boutard and their forced relocation.



1925 When Melli Beese tries to renew her pilot license, she crashes the plane. The dream of flying is over. She does not receive any reimbursement for her planes damaged during war.

As a consequence of severe setbacks and depression, Melli Beese commits suicide on December 22.

MUSLIM WOMEN

Arfa Abdul Karim Randhawa

Pakistan

Computer prodigy

21st century

At age 9, Arfa Randhawa was the youngest Microsoft Certified Professional (MCP) and the recipient of the President's "Pride of Performance" award, the highest honor the Pakistani government bestows upon distinguished professionals.

*Artwork designed and illustrated by
Qurra-UI-Ain Akhter*



Arfa Karim Randhawa

Youngest Microsoft Professional at the age of 9

2 February 1995 - 14 January 2012

Pakistani

MUSLIM WOMEN

Dr. Sameera Moussa

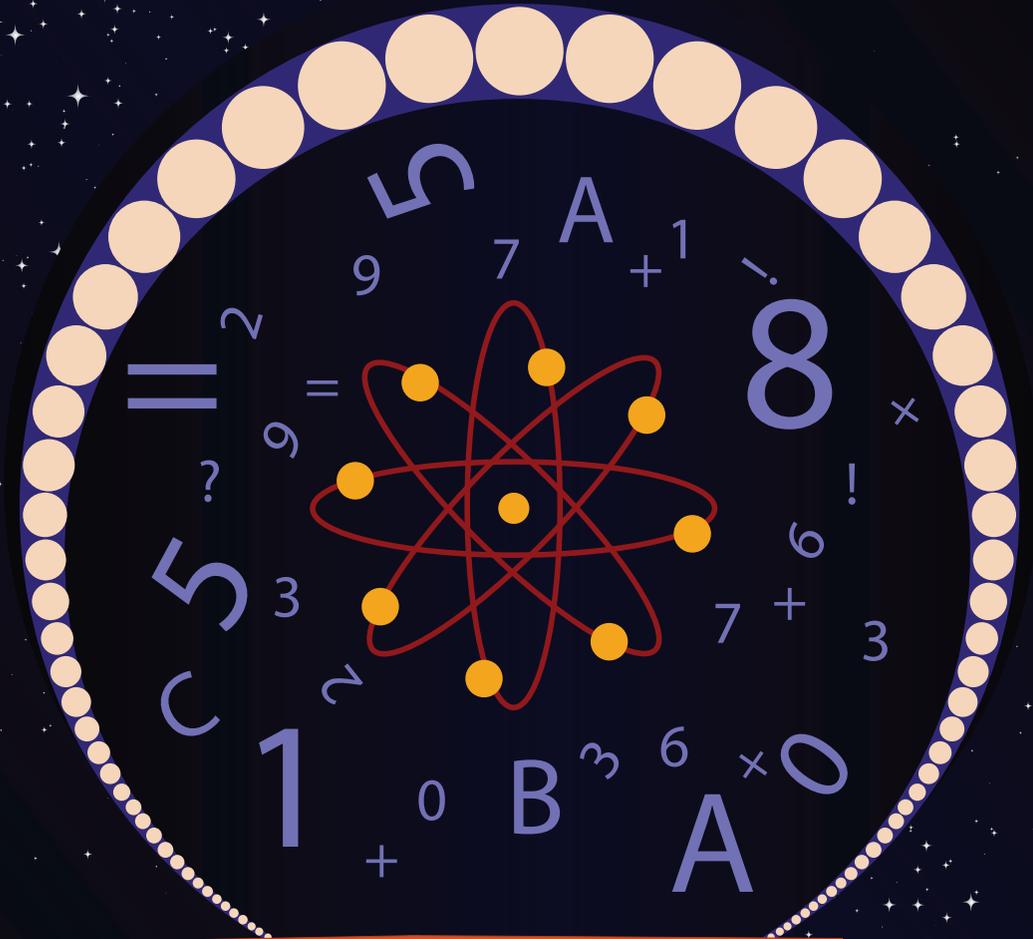
Egypt

“Mother of Atomic Energy”

20th century

With a PhD in atomic radiation, Dr. Moussa’s goal was to make nuclear technology safe and affordable to all.

Artwork designed and illustrated by
Lama Kattan



Dr. Sameera Moussa

Egyptian Nuclear Scientist

1917 - 1952

MUSLIM WOMEN

Dr. Ibtesam Saeed Badhrees

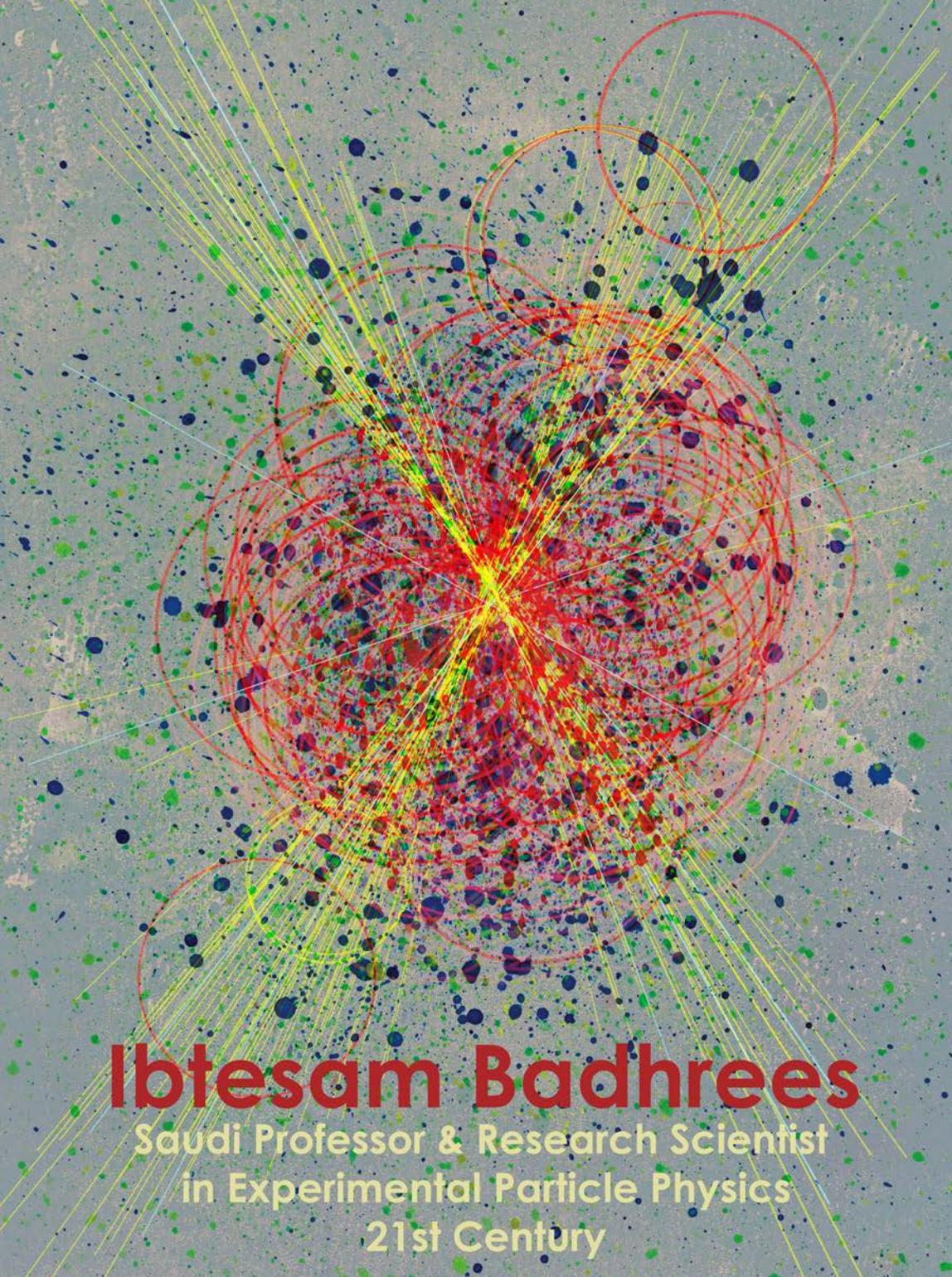
Saudi Arabia

World renowned research scientist in
experimental particle physics

21st century

Dr. Ibtesam Saeed Badhrees was the first Saudi female PhD holder to work in the National Center for Mathematics and Physics in King Abdulaziz City for Science and Technology.

Artwork designed and illustrated by
Manar Dahlawi

An abstract visualization of particle physics, featuring a central cluster of red and yellow lines radiating outwards, surrounded by numerous small blue and green dots. The background is a light gray with scattered green and blue speckles. The overall effect is that of a complex, multi-colored particle collision or decay event.

Ibtesam Badhrees

Saudi Professor & Research Scientist
in Experimental Particle Physics
21st Century

MUSLIM WOMEN

Lubna of Cordoba

Andalusia

Mathematician

10th century

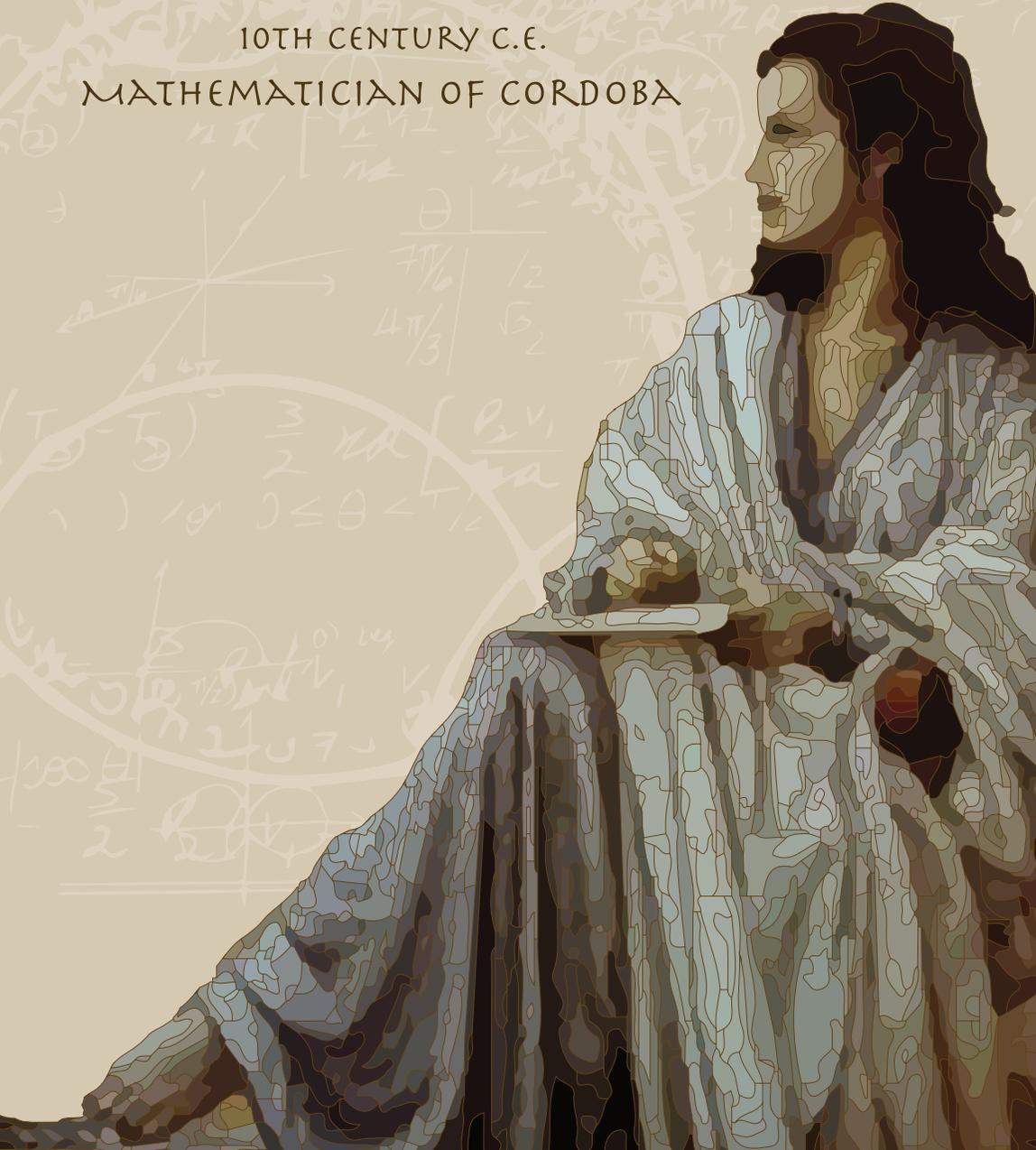
Lubna of Cordoba was a mastermind of mathematics, a talented writer and a poet.

Artwork designed and illustrated by
Yasmine El Sawy

Lubna of Cordoba

10TH CENTURY C.E.

MATHEMATICIAN OF CORDOBA



MUSLIM WOMEN

Rufaida Al-Aslamia

Saudi Arabia

Nurse

7th century

Healer Rufaida Al-Aslamia practiced medicine from inside a tent located near the Prophet's Mosque in Madinah.

Artwork designed and illustrated by
Reem Bakker

الأمة
الأسلمية

The First Muslim Nurse
Rufaida Al Aslamia
[unknown]

دا
ق
ي
ف



MUSLIM WOMEN

Dhayfa Khatun

Syria

Queen of Aleppo

12th century

Founder of schools and charities, this ruler fostered her love of architecture by funding many projects across Syria.

Artwork designed and illustrated by
Miriam Basowad

Muslim Women in Science and Technology

TIME

100

Dhayfa Khatun

1186 CE- 1242

Sponsored learning in Aleppo and established two schools “ Al- Firdaous School and the Khankah School” that specialized in Islamic studies.



MUSLIM WOMEN

Mariam Al Ijliya

Syria

Designer

10th century

The daughter of an apprentice to an astrolabe workshop, Mariam Al Ijliya designed these devices, which are used to find the Qibla and establish prayer times.

Artwork designed and illustrated by
Lina Jamjoom

Muslim Women in Science and Technology

TIME

100



Mariam Al-Astrolabiya

MUSLIM WOMEN

Sabiha Gökçen

Turkey

Pilot

20th century

Military bomber pilot, Ms. Gokcen was appointed Senior Instructor at the THK Turk Kusu School of Aviation. Sabiha Goken International Airport in Istanbul is named after her.

Artwork designed and illustrated by
Dalia Khojah

Muslim Women in Science and Technology

TIME

100

SABIHA GÖKÇEN

The first Turkish
female combat pilot

22 March 2001



MUSLIM WOMEN

Dr. Samia Maimani

Saudi Arabia

Doctor

20th century

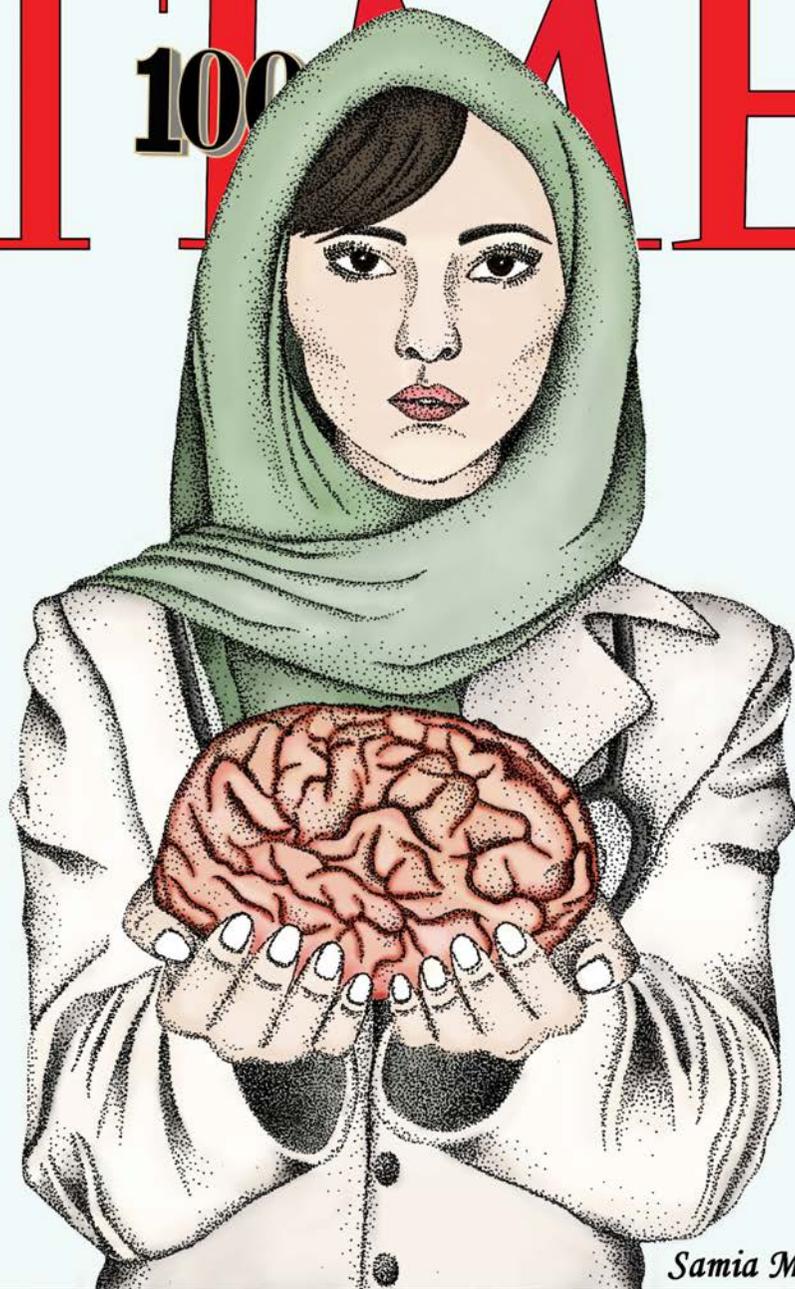
Dr. Maimani conducted vital research on the nervous system and was renowned for her contribution to the medical field.

Artwork designed and illustrated by
Sudayr Algamdi

Muslim Women in Science and Technology

TIME

100



Samia Maimani

MUSLIM WOMEN

Anousheh Ansari

Iran

Engineer

21st century

Anousheh Ansari was the first Muslim woman in space.

Artwork designed and illustrated by
Banan BinMahfouz

Muslim Women in Science and Technology

100

TIME



Anousheh Ansari
18-9-2006

1st Muslim woman in space

