Math 475
Geometry in Islamic art and architecture

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Background of history

- Islamic art focuses on geometry, patterns, symmetry, and calligraphy.
- Properties of Islamic Patterns
  - Transcribed with Arabic Calligraphy from the Quran.
  - Invented between 900 AD and 1500 AD.
  - Decorate architecture for Muslims in a place of mostly Islamic people.

From the 8th century and 13th century was the golden age of Islam world, the House of wisdom was built to attract famous scholars around the middle-east; each of them contributed. The book *The Elements* after 8th century was translated into Arabic in the house of Wisdom.
Islamic aniconism
Background of culture

Islam culture vehemently opposes Idol worships

This Leads to

- Avoiding figurative images and focus heavily on geometrical patterns
- No human statues
- Abstract thinking: algebra and algorithm
- No idol worship -> geometrical patterns -> circles and squares -> interlace and overlap
Arabic is the script of Quran, the Islam bible. But most of the arabic alphabets are not geometrically symmetric or reflexive, so even though calligraphers are highly respected, their zoomorphic art doesn’t contain too much geometrical patterns.
Geometry

Is one of the most important elements of Islamic art. From the simple polygons and rectangles used as framing devices to the highly complex interlaces of stars and irregular polygons.

The four basic shapes or repeated units from which the more complicated patterns are constructed are:

- circles and interlaced circles
- squares or four-sided polygons
- the star pattern (derived from squares and triangles inscribed in a circle)
- multisided polygons
In Islam,

- The circle emphasizes one God.
- The triangle symbolises human and the principles of harmony.
- The square is the symbol of physical experience and the physical world.
- The star symbolizes equal radiation in all directions from a central point. Also the spread of Islam.
- The hexagon represents Heaven.
Girih Tiles
Peter J. Lu

- was born in Cleveland, Ohio in 1978.

- is a post-doctoral research fellow in the Department of Physics and the School of Engineering and Applied Sciences at Harvard University in Cambridge, Massachusetts.

- He has been recognized for his discoveries of girih tiles, quasicrystal patterns in medieval Islamic architecture, early precision compound machines in ancient China, and man's first use of diamond in neolithic China.
Darb-i Imam Shrine, Isfahan, Iran (1453)

Abdullah Khan Madrasah, Bukhara, Uzbekistan (1590)

http://www.peterlu.org/content/decagonal-and-quasicrystalline-tilings-medieval-islamic-architecture
Abdullah Khan Madrasah, Bukhara, Uzbekistan (1567)

Mir Arab Madrasah, Bukhara, Uzbekistan (1536)

http://www.peterlu.org/content/decagonal-and-quasicrystalline-tilings-medieval-islamic-architecture
Topkapi Scroll, Istanbul, Turkey

http://islamic-arts.org/2012/tiles-of-infinity/
the Abbasid al-Mustansiriyya Madrasa in Baghdad, Iraq (1227)
Green Mosque in Bursa, Turkey. (1424)
Islamic Center of Washington (1954)
Jameh Mosque, Isfahan, Iran

Architecture
Mosques

Hypostyle

Great Mosque of Cordoba
(784 Spain)


(Ettinghausen and Grabar 258)
Great Mosque of Isfahan
(1000 - 1200 Iran)

(Ettinghausen and Grabar 258)

https://classconnection.s3.amazonaws.com/277/flashcards/2375277/jpeg/05d_isfahan_shah_aerial_ha_soemg573355070073619.jpeg
Central Plan

Selimiye Mosque (1569 - 1575 Turkey)
Mausoleums

Kharraqan mausoleum (1067 Iran)
https://upload.wikimedia.org/wikipedia/commons/b/bd/Kharaghan.jpg
Mausoleum of Sultan Sanjar (1157 Central Asia)
Dome of the Rock (691 Jerusalem)

Cupolas
Leonardo Da Vinci Cathedral Sketches

http://www.leonardodavinci.net/images/drawings/study-of-a-central-church.jpg

https://classconnection.s3.amazonaws.com/899/flashcards/1896899/jpg/da_vinci_project_for_a_church1348422995175.jpg
Muqarnas
**Bibliography**


