Selected highlights of eastern Islamic ornamental art

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• The Seljuk ornamental art in Iran, Central Asia and Turkey

• Between 1037 and 1055 Turcoman Seljuks conquered Central Asia, Iran and occupied Bagdad, in 1051 they captured Esfahan and in 1071 they defeated Byzantines, founded the Sultanate of Rum (Konya).

• They were defeated by Mongols in 1243 (already 1219 in Iran) and Turkish sultans ruled as a Mongol protectorate: the artistic apogee in Turkey is later (1250-1300).

• Much of it is the art of a pre-glaze age (the pale to strong blue glaze appears from 1058 but more frequently only after 1113-1127).
The Kharrakan tomb towers: architect Muhammad ibn Makki-al-Zanjani, for unnamed Turkoman chieftains in 1067 and 1086. W Iran.
• We classify patterns using plane and layer groups of symmetry

• Eastern tower has 61 patterns
• Western tower has 36 patterns
Size, material and preservation of the $p4gm$ pattern
Plane group $p4gm$ – double $y$’s are on crystallographic positions $b$, dots on $c$ and squares on $a$ positions ↓

$p4$ panel: only 4-fold and 2-fold rotation axes are present
A rib edition of $p622$

(pattern simulates a two-sided layer group with interlacing)

Top frieze: $p6mm$ (or, in detail, a layer group $p622$)
Plane group statistics for the E Kharraqan tomb tower

Total number of classified patterns: 15
Caravanserai Rubat-i-Sharaf, 12th century (constructed about 1120, restored about 1154) on a Silk Road, E Iran: Interlacing worked out in plaster; Layer group $p422$
Entrance gate. A complex *p4mm* pattern. Interlace? No! – just a construction practicality
Inner gate: \textit{p4gm} and \textit{floral kufi} as brick ribs
Nameless tomb tower
Maragha, NW Iran

What is the plane group of symmetry?! p4
Rey, Iran, 11-12 cent.
Overall: *cm; local: p6mm, cmm, p6*….

**Typical early Islamic plaster (‘nanopatterns’)***

$p3m1$ and $p6mm$
A $p4$ pattern in glazed shaped bricks and tiles

Karatay Medrese
Konya
Quasicrystalline patterns:

The Blue Tomb

Gunbad-e-Qabud

Maragha, W Iran

Seljuk, 1196-97

(Makovicky 1992)
One face and buttresses

Fundamental and composite tiles: ↑ primary and derived composite tiles

¼ of the decagonal quasiperiodic cartwheel
Transcription into 'classical' Penrose tiling

Conway worms (ruled)

↑ (idealized)

← Transcription into 'classical' Penrose tiling
Ammann bars and phason flipping

Pattern inflation – deflation

Proofs of quasicrystallinity
The pattern family of Maragha:
Tympanum from Darb-e-Imam, Esfahan: \textit{cmm pattern}
with large quasiperiodic islands [e.g. at the bottom of the panel] (built: 1453)

A \textit{cmm} pattern very similar to Darb-e-Imam pattern; Friday Mosque, Esfahan
A jigsaw puzzle from the Masjid-e-Hakim, Esfahan (1656-1662)
Interpretation of the Masjid-e-Hakim jigsaw in terms of tiling

Jameh Mosque, Yazd. Original $cmm$ pattern reduced to $c112$. The same ‘Ali’ as in Masjid-e-Hakim
Iwan of the Karatay Medrese, Konya (1251-52), ceiling vault; layer group \textit{c222}
Maragha and its heirs:  
*Left:* Karatay Medrese  
*centre:* Maragha Blue Tomb Tower  
*right:* Darb-e-Imam tympanum

Varieties of composite 5- and 10-fold tiles are accentuated in blue and orange. Configurations surrounding the origin are indicated by shades of green.

**CONCLUSION:** consciously modified copies of the same pattern
A PLETHORA OF STYLES.....

Shah Abbas’s Iran means refined technology, colour palette and a very different style
Masjed-e-Emam Esfahan
1611-1629, $p4mm$

Kerman, Iran, $cmm$ + dichroic
Iznik tiles and tilings

Stoneware production at Iznik (W Turkey) between about 1500 and 1620

Tile decoration of the most prominent Ottoman mosques

Combination of floral, vegetal and geometric elements in several colours
Faults and strange combinations.... Using symmetry studies to gain insight into working practices

And 100 further patterns..... next time!
Both are in the plane group $p1$. What is wrong here?
The many faces of 3D art....

Qazvin, Iran

Esfahan

Friday Mosque Esfahan
Yazd
Jameh Mosque
14-15 cent.

THE END
Thank you