



An Exploration in Ethnomathematics through Criticisms of the Discussion of Penrose Tiling in Islamic Art.

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Penrose Tiling in the Darb-i Imam?

In 2007, Peter J. Lu and Paul J. Steinhardt published an article presenting a new idea for how Medieval Islamic tilings were constructed. This construction lends itself to the creation of aperiodic tilings, one of the most famous of which is Penrose tiling. They present an imperfect mapping for the tiling in the left portal of the Darb-i Imam to Penrose Tilings. Lu and Steinhardt argue that Penrose tiling must have been the original goal. While some people support Lu and Steinhardt, and others disagree, across the board mathematicians fail to see the tiling through anything other than our system and force it into our mathematical ideas.

The Darb-i Imam

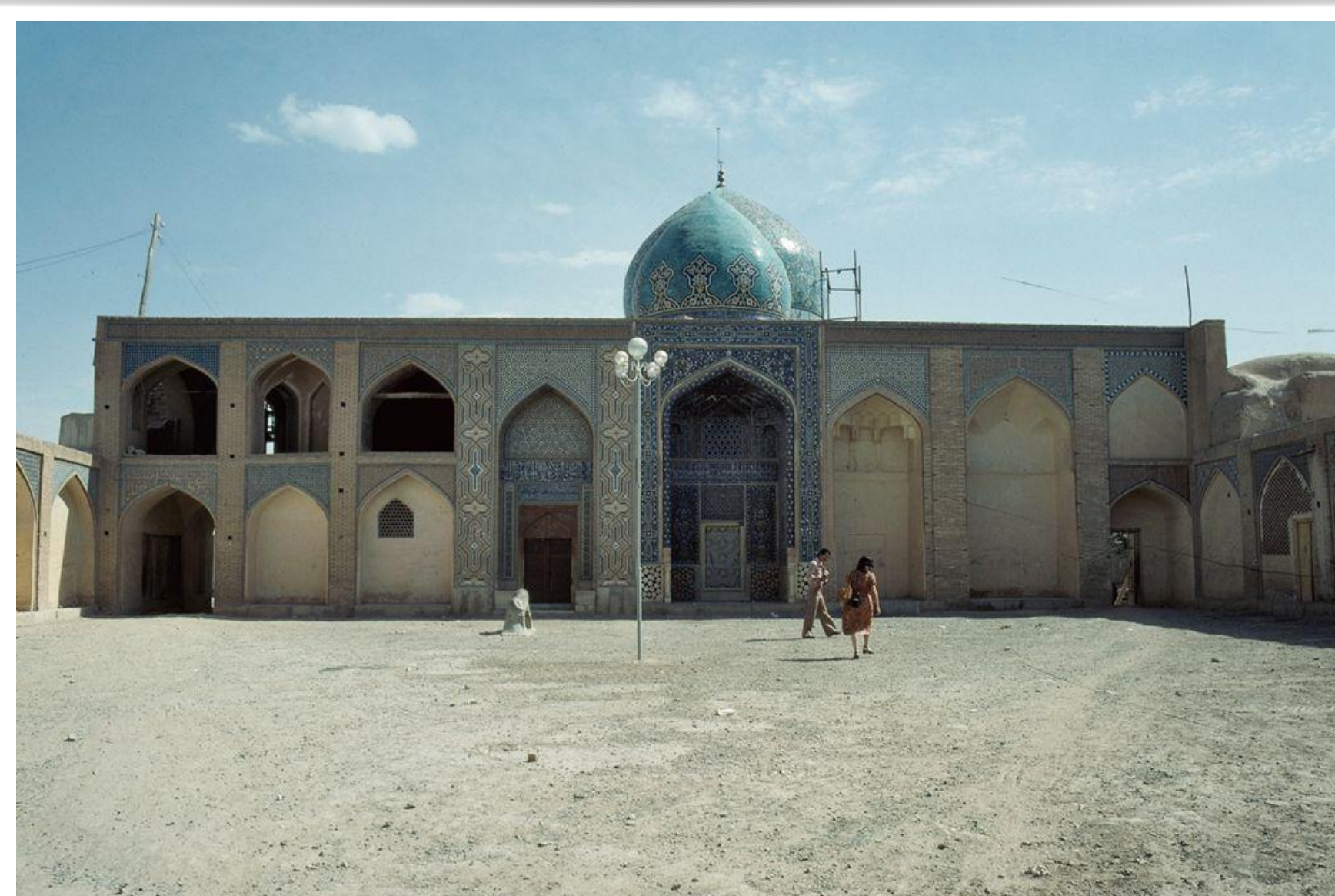


Figure: The exterior of the Darb-i Imam. Photo by [1]

The Darb-i Imam is an **imamzadeh** in Isfahan, Iran. The original sections of the Darb-i Imam were built in the mid 15th century. The rest of the Darb-i Imam was constructed from 1502 - 1722. [2]

An **imam** is a leader or a head of a community. Specifically for Shi'ites an imam is a descendant of the prophet Muhammad. [3]

Imamzadeh translates literally to "one born of an imam". The word is used to refer to both to a descendant of Shi'ite imam and to a "shrine where such a descendant is buried". [3].

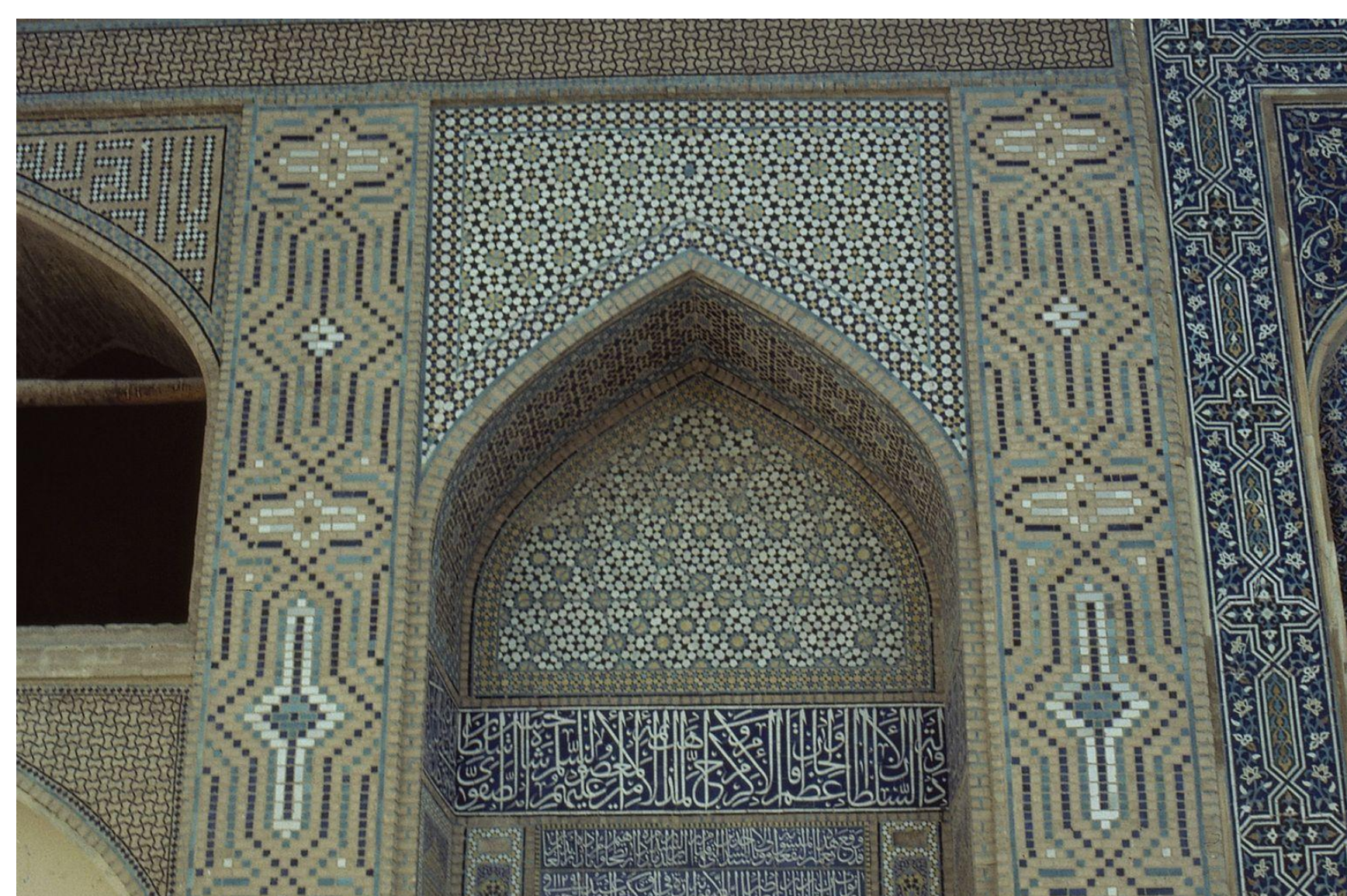


Figure: The Left Portal of the Darb-i Imam. Photo by [4]

Penrose Tiling

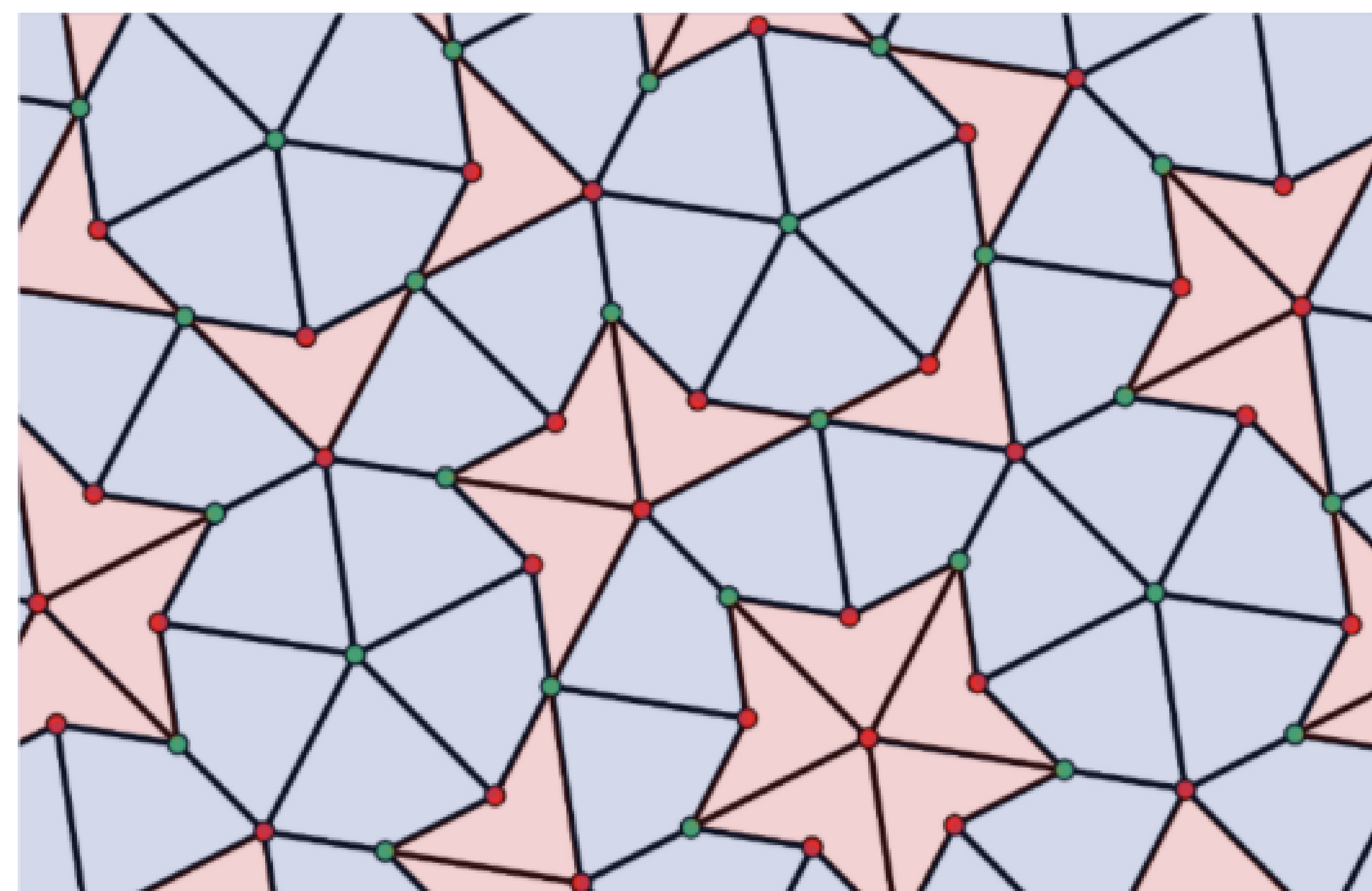


Figure: Penrose tiling. Photo from [5]

The Concerns of Alexandre Pais

- In trying to study cultural practices in relation to mathematics, we often assume that every culture has our mathematics [6]

This idea of mathematics that we can find in every culture must then resemble our own understanding of mathematics

- By bringing cultural practices into our system of mathematics, we strip them of everything that makes them unique [7]

Upholding Universality

- "This arbitrary and unnecessary choice means that, strictly speaking, the tiling is not self-similar" in referring to the aspects of the tiling which make the mapping to Penrose tiling imperfect. [8]
- "They probably had an intuitive understanding of the crystallographic restriction" they argue that the Darb-i Imam does not contain Penrose tiling, but that medieval artisans must have an intuitive understanding of important features of Penrose tilings. [9]
- "The quasicrystal patterns have defects" in discussing how the tiling in the Darb-i Imam is not quite Penrose tiling (a quasicrystal pattern). [10]
- "Although the Darb-i Imam pattern illustrates that Islamic designers had all the elements needed to construct perfect quasi-crystalline patterns, we nonetheless find indications that the designers had an incomplete understanding of these elements." [8]

Conclusion

What we see across these different papers is a continual assumption that there is no other option than our idea of mathematics. These studies of the Darb-i Imam strip it from almost all cultural context but its possible connection to Penrose tilings. While it is possible that the Darb-i Imam is meant to be Penrose tiling, by assuming Penrose tiling is the only option, we lose any other way of studying it. We lose any cultural context. We must be more careful about when we assume our mathematics and when we do not.

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