Poster Presentation

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Construction of quasiperiodic patterns in the Moroccan ornamental art

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The similarity between the structure of Islamic decorative patterns and quasicrystal, aroused the interest of several crystallographers. They analyzed these patterns, by different approaches, various kinds of ornamental quasiperiodic patterns encountered in the Morocco and Alhambra (Andalusia) as well as in the eastern of Islamic world. In this work, we are interesting in the quasiperiodic patterns found in several Moroccan historical buildings constructed in the 14th century. We first describe the Zellige panels (fine mosaics) decorating the Madrasas (schools) Attarine and Bou Inania in Fez in term of Penrose tiling, to confirm that both panels have quasiperiodic structure (Makovicky et al, 1998). The panel Madrasas Attarine appears as a finite part of this quasiperiodic pattern (Figure 1-c). As already mentioned by several authors, we can notice the similarity of the decagonal pattern with the diffraction pattern of the quasicrystal Al Mn (Schechtman et al, 1984) (Figure 1-a and c). The multigrid method developed by De Bruijn (1981) and reformulated by Gratias (2002) to obtain a quasiperiodic paving, is used to construct known quasiperiodic patterns from periodic patterns extracted from the Madrasas Bou Inania and Ben Youssef (Marrakech). At last, we propose a method of construction of heptagonal, enneagonal, tetradecagonal and octadecagonal quasiperiodic patterns, not encountered in the Moroccan ornamental art. They are built from tiling (skeleton) generated by the multigrid method and decorated by motifs obtained by the craftsmen method.

[1] *Aboufadil, Y. & al. (2013), Quasiperiodic tiling in Moroccan ornamental art. Symmetry: Culture and Science Vol. 24, Nos. 1-4, 191-204,* ***[2]*** *Makovicky, E., Rull P.rez, F. & Fenoll Hach Al., P. (1998), Decagonal patterns in the Islamic art of Spain and Morocco. Bolet.n de la Sociedad espa.ola de Mineralog.a, 21, 107-127,* ***[3]*** *Shechtman, D., Blech, I., Gratias, D. & Cahn, J. W. (1984), Phys. Rev. Lett. 53, 1951–1953*

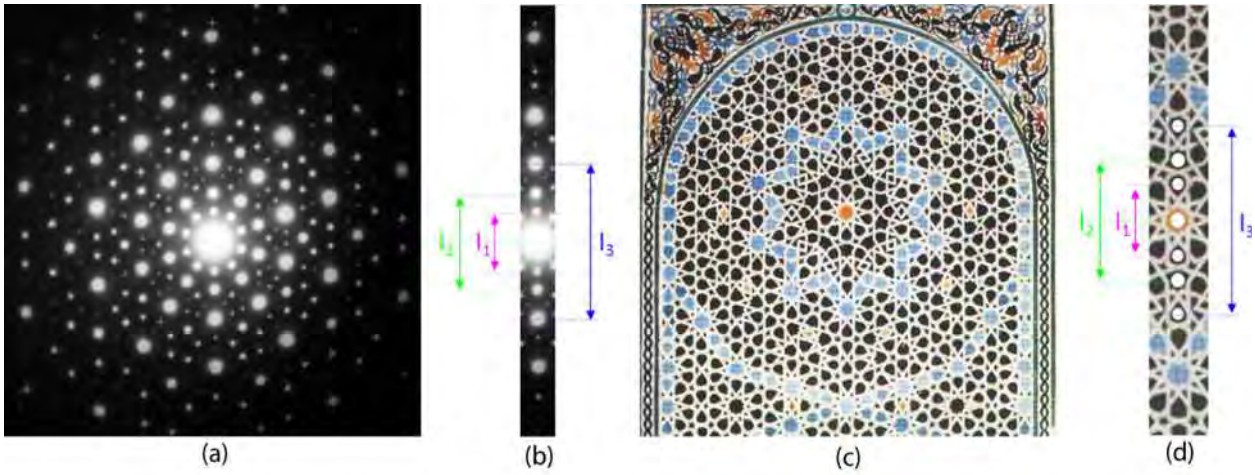

Figure 1: (a) Electron diffraction pattern of the quasicrystal Al-Mn along a 5-fold direction (Shechtman & al, 1984) and (b) distances between two symmetrical spots relative to the centre of the diffraction pattern are in the ration of the golden mean. (c) Zellige panel of the Madrasa Attarine (Fez) and (d) Distances between two symmetrical elements relative to the pattern with the same ratio as those shown an (b).

Keywords: quasiperiodic patterns, multigrid method, craftsmen method