Fractal states on quasicrystals

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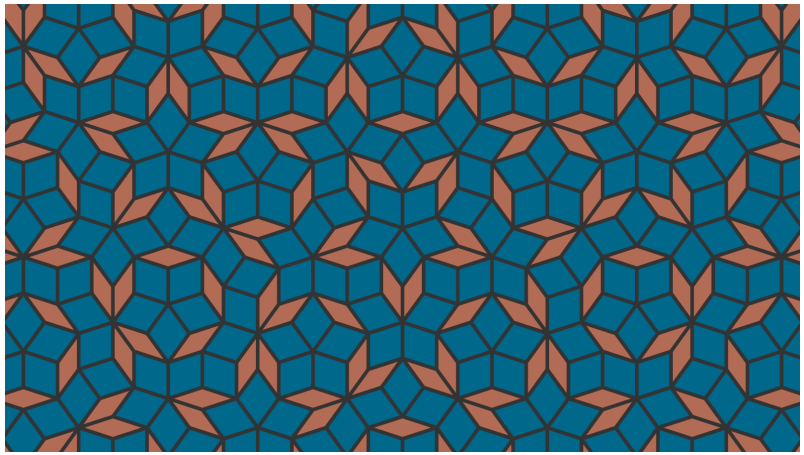
February 21, 2017



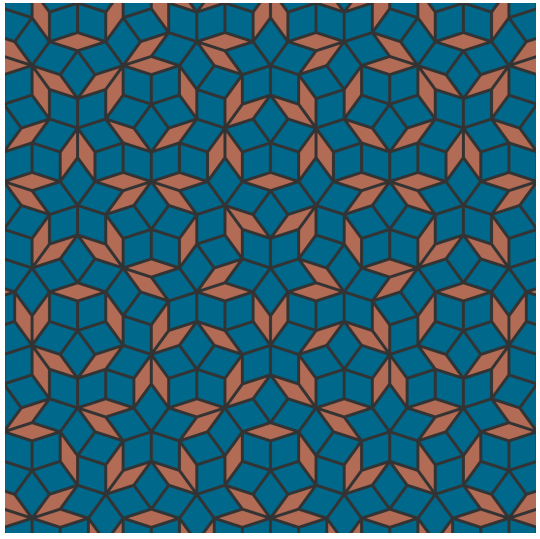
Outline

Quasicrystal?

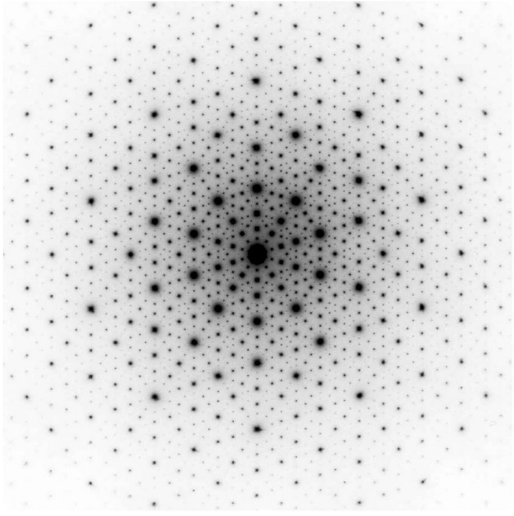
Aperiodic yet "ordered" arrangement of atoms/molecules/colloids
More specifically, a quasicrystal is required to:

- be **aperiodic**
- have **some kind of long range order** (diffraction reveals sharp peaks)

Quasiperiodic tilings are used to model quasicrystals.

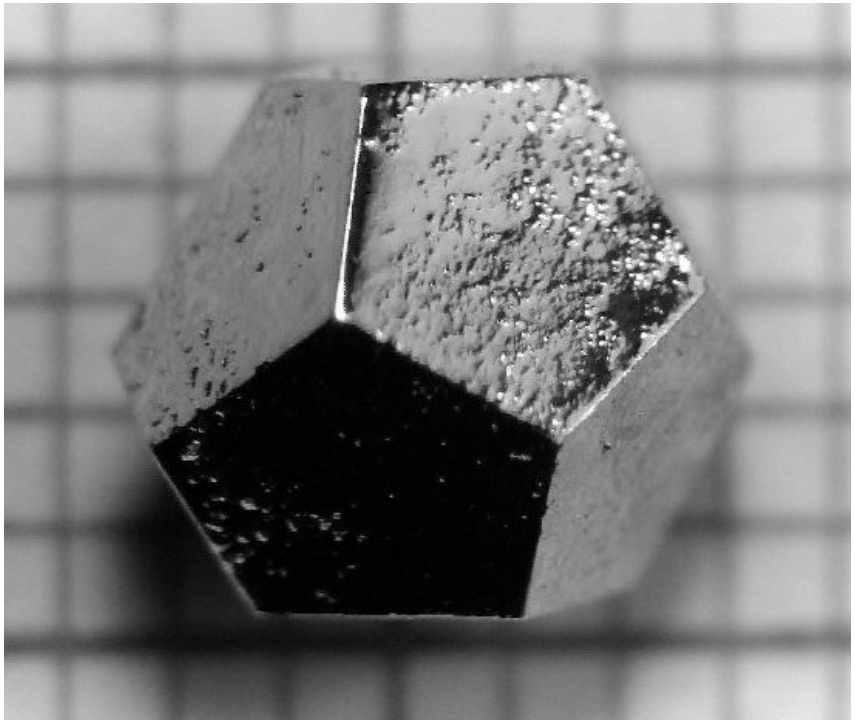


A patch of the Penrose tiling,
which has an order 5 rotational symmetry

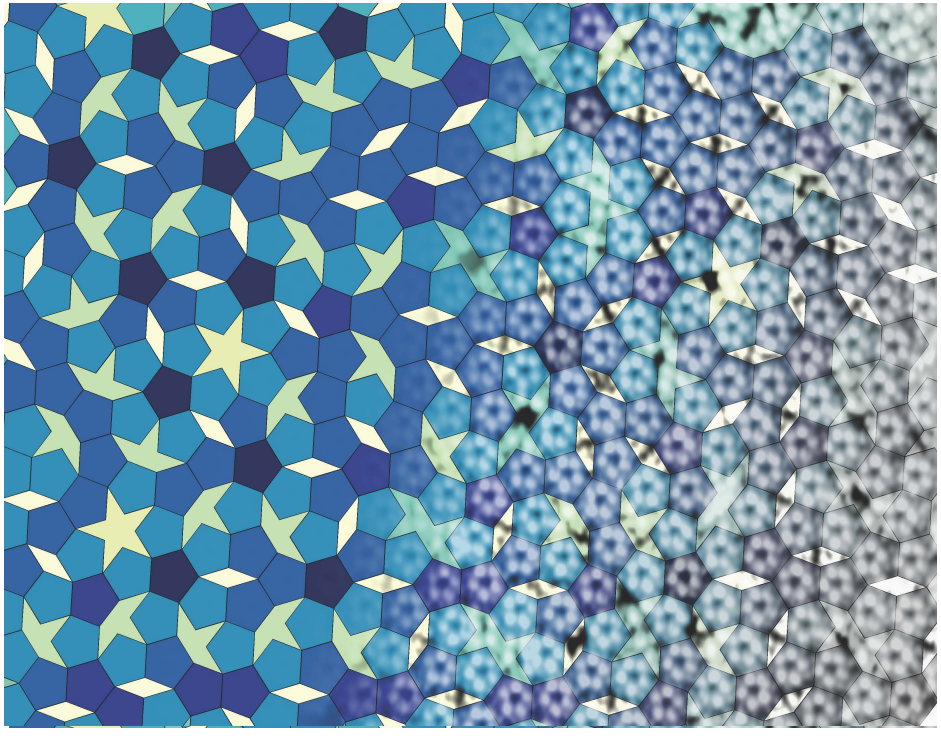


Experimental diffraction pattern of AlPdMn
(Conradin Beeli group)

Exemples de quasicristaux



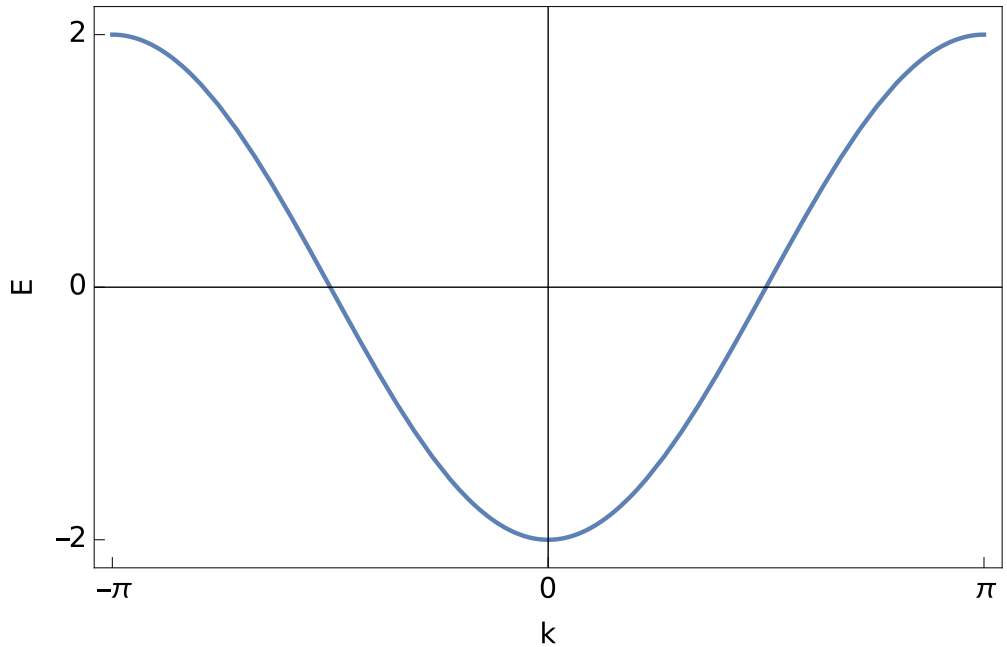
HoMgZn alloy in its icosahedral phase
(see doi:10.1038/nmat1244)



A 2D hydrogen-bonded quasicrystal
(see doi:10.1038/nature12993)

- De nombreux alliages métalliques sont quasipériodiques sous de bonnes conditions
- Seul un exemple connu dans la nature: la météorite de Khatyrka (voir doi:10.1126/science.1170827).

Chaîne d'atomes dans l'approximation des liaisons fortes



[spectre de la chaîne périodique]
Physiquement, un (grand) morceau de chaîne conduit le courant si $E_{\text{incident}} \in [-2t, 2t]$.