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From tilings to fibers: bio-mathematical aspects of fold plasticity

Protein oligomers are made by the association of protein chains via intermolecular amino acid interactions (interaction between subunits) forming so called protein interfaces. This talk proposes mathematical concepts to investigate the shape constraints on the protein interfaces in order to promote oligomerization. First, we focus on tiling the plane (2 dimensions) by translation with abstract shapes. Using the fundamental Theorem of Beauquier-Nivat, we show that the shapes of the tiles must be either like a square or like a hexagon to tile the whole plane. Second, we look in more details at the tiling of a cylinder and discuss its relevancy in constructing protein fibers. The universality of such "building" properties are investigated through biological examples.

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