

# Shape formation in chiral protein fibrils

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## Abstract

We discuss the shape change from flat ribbon to cylindrical tubules observed in long protein fibrils. Our hypothesis is that macroscopic morphing is the outcome of the time evolution of a chiral microstructure. In particular, chirality induces a target metric that can control both the curvature radius and the pitch of a helical ribbon: a fine tuning of these two parameters can deform a flat ribbon to a perfectly sealed cylinder.

Deformations due to a target metric, in contrast to those generated by forces, can have a peculiar feature: they can produce stress-free configurations. This strategy could be one of the key strategies exploited by many soft biological materials, which can exhibit very large shape-change in response to a target metric controlled by chemicals or by temperature changes, while keeping their stress state almost null.