As the biological sciences are becoming more and more quantitative, physics, mechanics and applied mathematics are playing an increasingly central role in the understanding of life. For instance, morphogenesis is a process of shape formation and organization during which physical forces are used to carry out a genetic programme. Many of the mechanisms used during morphogenesis also occur in non-animate systems, e.g. in swelling or shrinking gels. Therefore the analysis of key problems in physical biology is a truly multi-disciplinary endeavour relying on advanced methods from continuum mechanics, soft matter physics, polymer physics, nonlinear physics, dynamical systems and scientific computing. Accordingly, this interdisciplinary mini-colloquium will gather experts from different fields to identify current scientific challenges in the fields of morphogenesis, cell mechanics, biological growth and tissue organisation and in different biological systems (plants and algae, sea-shells, biofilms, epithelial monolayers, solid tumours and organs).

Figure 1: From left to right: Zigzag patterning by the previllus ridges in a turkey embryo, curvature analysis in brain tissue and a single tissue cell in a three-dimensional scaffold.

Acknowledgements We acknowledge support of IUC (UPMC) and GDR: MEPHY (CNRS)