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Hyphal tip morphogenesis

Tip growth is a mechanism by which cells can expand in a preferred direction. It is the defining feature of filamentous organisms such vegetative fungi and actinomycete bacteria. The ability to extend by apical growth allows these organisms to optimally explore and exploit the complex environments that they normally inhabit. Mathematical modelling of tip growth is a mature subject. However, recent advances in imaging and genetic manipulation has brought new impetuous to this area, as the mechanisms by which cell wall building material is brought to the tip and subsequently used to extend the hypha, are now beginning to be revealed. However, there are still many open questions regarding the organisation of these complex processes. In particular, how the biomechanics of the cell wall-plasma membrane complex and vesicle supply centre (Spitzenkorper) interact is still largely unknown. We discuss models that treat the cell-wall development as a consequence of either geometry or elasticity and detail what progress can be made regarding tip morphologies from these basic assumptions.