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Some bio-inspired optimization problems

Evolution via natural selection in living systems has often led to "solutions" that approach local optima, sans design or designer. I will describe some optimal design, control and performance problems that arise naturally in the context of biological shape and motion. These include the optimal shape of a tree branch, the optimal control of gliding and bursting flight, optimization approaches to describe and predict tissue shape, optimal strategies for throwing a projectile accurately, and optimal strategies for balancing on a tightrope. In each case, the solution of the problem suggests engineering designs while sharpening the original biological question, and opening up new avenues for study.