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The longest shortest fence and sharp Poincar-Sobolev inequalities

The following long standing conjecture concerning the fencing problem in the plane will be addressed: among planar convex sets of given area the disc, and only the disc maximizes the length of the shortest area-bisecting curve. The proof of the above conjecture and some consequences will be presented. Also the fact that among planar convex sets of given area the set which maximizes the length of the shortest bisecting chords is the so-called Auerbach triangle will be discussed.