

Area-minimizing integral currents and their regularity

Caccioppoli sets and integral currents (their generalization in higher codimension) were introduced in the late fifties and early sixties to give a general geometric approach to the existence of area-minimizing oriented surfaces spanning a given contour. These concepts started a whole new subject which has had tremendous impacts in several areas of mathematics: superficially through direct applications of the main theorems, but more deeply because of the techniques which have been invented to deal with related analytical and geometrical challenges. In this lecture I will review the basic concepts, the related existence theory of solutions of the Plateau problem, and what is known about their regularity. I will also touch upon several fundamental open problems which still defy our understanding.