

*Singularities in PDE and the calculus of variations*

Singularités en EDP et dans le calcul des variations

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## On the motion of an elastic closed curve with constant enclosed area

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### **Abstract**

Let us consider a simple closed curve made of springy wire in the plane. The inner domain enclosed by the wire and its exterior are filled with two kinds of incompressible viscous fluids  $F_i$  and  $F_o$ , respectively. The wire is expected to change its shape so as to decrease its bending energy as efficiently as possible. On the other hand, by the assumption of incompressibility, the area of the inner domain is preserved. Can the wire change its shape so as to decrease its bending energy and preserve its enclosed area? The motion of the closed curve is governed by a system involving fourth order parabolic equations. We shall prove that this system has a unique classical solution for all time and the solution converges uniformly to a stationary solution together with its derivatives of any order.