The concept of an open set came later than those of limit point and closed set, after what the author calls "an abortive approach to open sets" by Cantor, Peano, Jordan, Dedekind, and others. The concept was first published by René Baire in 1899. The name open ("ouvert") set originated with Lebesgue in 1902 in his doctoral dissertation, where he introduced what we now call Lebesgue measure and Lebesgue integration. Lebesgue and Baire used open sets in $\mathbf{R}^n$. In 1914, Felix Hausdorff first used the idea of an open set in an abstract space when he axiomatized topological spaces by using the neighborhood of a point as the primitive term. Other axiomatizations soon followed, with mathematicians like Kuratowski and Sierpiński using different primitive concepts, such as closure of a set, the derived set, and closed set. Sierpiński (1928 in Polish, translated into English in 1934) gave axioms based on open set as the primitive concept "that eventually became the standard definition for a topological space." After another decade, with influential books by Lefschetz, Seifert and Threlfall, Aleksandrov and Hopf, M. H. A. Newman, and especially Bourbaki's *Structures topologiques* in 1940, basing general topology on open sets became firmly established. The first draft of the Bourbaki book, which took four years to develop, was by André Weil. It began with metric spaces and then based more general spaces on Kuratowski's closure operator. But Claude Chevalley insisted on the need "to put general topological spaces before metric spaces, since the notion of a metric appears more and more ridiculous to me." His insistence on starting firmly with the axioms for open sets generally won over the Bourbaki. **PR**

The Method of Sweeping Tangents, Tom M. Apostol and Mamikon A. Mnatsakanian. *The Mathematical Gazette* 92:525 (November 2008) 396–417.

When you ride a bicycle, the tracks of the two tires cross from time to time, creating regions bounded by the tracks. How can we calculate the area of such a region? In a pair of articles published in the *American Mathematical Monthly* 10 (2002) 880–908, the authors demonstrated an elegant method for solving such problems, which they labeled the method of sweeping tangents. In the method, rays of finite length tangent to a smooth curve sweep out an area called the tangent sweep. When the rays are brought together so the points of tangency are condensed to a single tangent point, the resulting figure is called a tangent cluster. Mamikon's sweeping-tangent theorem states that "The area of a tangent sweep is equal to the area of its tangent cluster, regardless of the tangency curve." When the tangent rays all have the same length, as in the case of the bicycle tires, the tangent cluster is a circular sector. In this paper, the authors extend the method to find arclength. They apply the extended method to find the arclengths of many classical curves described by geometric properties, such as the tractrix, the exponential curve, the parabola, the cycloid, the epicycloid, the hypocycloid, the catenary, and the general pursuit curve. **RNG**

Matchmaking for Kidneys, Dana Mackenzie. *SIAM News* 40:10 (December 2008) 1–3.

This article describes a novel application of mathematics: creating chains of kidney donors. A Maryland woman needed a kidney, and her husband was willing to donate one of his, but could not because he had a different blood type. Meanwhile, two other couples in other parts of the country faced the same predicament. Through a game of "musical kidneys," each donor gave a kidney to a patient in one of the other couples. The idea of such kidney exchanges was first conceived by Harvard economist Alvin Roth, whose method was based on an idea by mathematician David Gale to facilitate exchanges in a housing market. Unfortunately, Roth's method produced large multi-patient exchanges that are impractical for numerous reasons. Mathematician Sommer