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On the diminishing process of B. Tóth

B. Tóth suggested some 20 years ago the following random process to investigate: let $B = B_0$ be the unit circular disc in R^2 centered at the origin, and define B_n recursively as follows: we choose a random point p_n from B_{n-1} according to the uniform distribution and let $B_n = B_{n-1} \cap (p_n + B)$. B_n is a disc-polygon, the first interesting questions are: what can we say about the expectations of different geometric quantities of B_n (e.g. number of vertices, diameter). These problems turned out to be very tough, no relevant results are known about the process. In this talk we consider some closely related problems.

In the first part of the talk we replace the unit disc in the process by regular simplices (in any dimension) and by regular polygons (in the plane). Asymptotic results are given for the speed of the process, and we examine the limit distribution of the center in the case of simplices.

In the second part of the talk we consider another model to obtain random disc-polygons: we fix a spindle convex disc S in the plane, we choose n independent random point from S according to the uniform distribution, and we define S_n as the spindle convex hull of the chosen points. We show asymptotic results for the expectation of the number of the vertices of S_n , if S has smooth enough boundary, or if S is a disc-polygon.

The talk is based on joint work with G. Ambrus, F. Fodor and P. Kevei.