Diffusion-limited aggregation (DLA). Many objects in nature grow by the random addition of subunits. Examples include snowflakes, lightning, crack formation along a geological fault, and the growth of bacterial colonies. Although it might seem unlikely that such phenomena have much in common, the behavior observed in many models that have been developed in recent years gives us clues that these and many other natural phenomena can be understood in terms of a few unifying principles. One model that has provided much insight is known as diffusion limited DLA. The model provides an example of how random motion can self-similar clusters.

The first step is to occupy a site with a seed particle. Next, a particle is released from the perimeter of a large circle whose center coincides with it undergoes a random walk, i.e., diffuses, until it reaches a perimeter point. Then another random walker is released and allowed to a perimeter site of one of the two particles in the cluster and is released many times (typically on the order of several thousand to a large cluster is formed. A typical DLA cluster is shown in Fig. properties of DLA clusters are explored in Problem 14.9.

Problem 14.9 Diffusion limited aggregation

a. Write a program to generate diffusion limited aggregation (DLA). Let each walker begin at a random site on a circle of radius \( R_{\text{max}} \) is the maximum distance of any cluster particle to the center. To save computer time, assume that a walker that reaches the seed site is removed and a new walker is placed at a distance of 1 from the seed site.