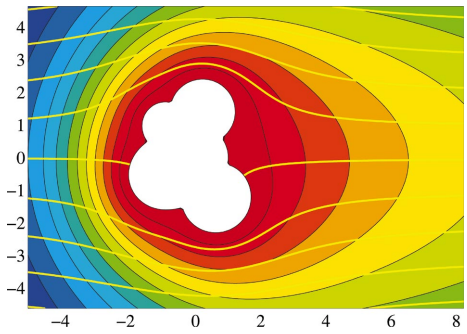

FIG. 1. (Enhanced online).

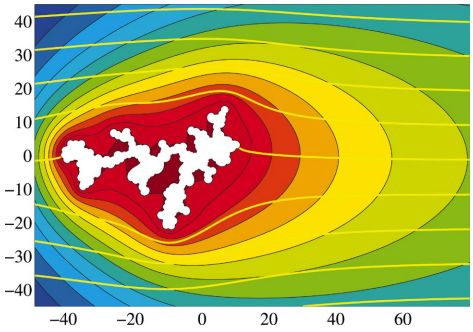

FIG. 2.

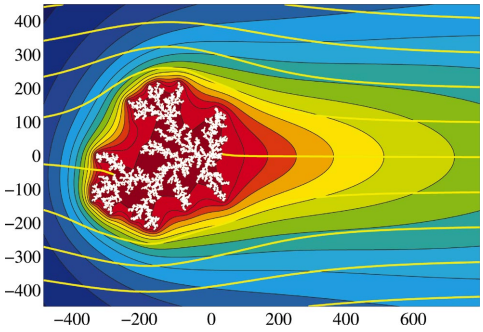

FIG. 3.

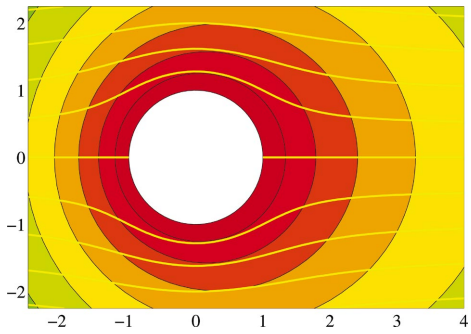

FIG. 4.

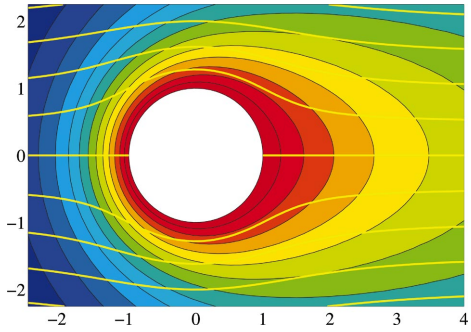

FIG. 5.

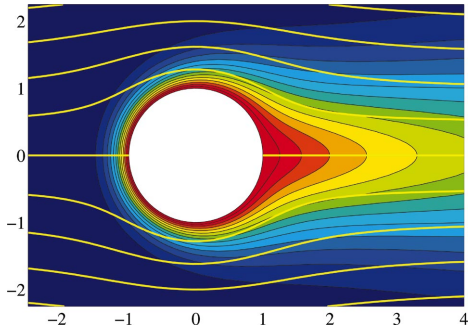

FIG. 6.

Advection-diffusion-limited aggregation

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Much is known about diffusion-limited growth from a dilute suspension. The simplest and most famous model is diffusion-limited aggregation[1] (DLA), in which random walkers are released one-by-one far away and become frozen where they first touch a growing fractal cluster. Real growth phenomena, such as mineral deposition in rocks, however, often involve multiple processes, such as advection-diffusion in a fluid flow, which would be difficult to simulate by random walkers.

This difficulty may be surmounted by adapting the conformal-mapping formulation of DLA[2] for more general transport processes.[3] The resulting growth models include advection-diffusion-limited aggregation (ADLA) in a fluid flow.[4] The video clip shows ADLA growth with 10 000 particles in a weak background flow (yellow streamlines) of uniform concentration (color contours). The cluster grows symmetrically at first, like DLA, but later extends toward the incoming particle-laden fluid (to the left). The cluster (Figs. 1–3) is obtained by iterated conformal maps from the exterior of the unit circle (Figs. 4–6), where the flow profile is static, with increasing dimensionless speed (Peclet number).

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