This talk will be on joint work with David Griffeath on diffusion-based models of snow crystal growth. To this day, the growth of snow crystals, often called snowflakes, with its tension between disorder and pattern formation, remains puzzling in many respects. With emphasis on computer-generated pictures and movies, the talk will review a few mathematical models of snow crystal dynamics, and discuss their contributions to mathematics and to understanding of real snowflakes. (Received September 20, 2010)