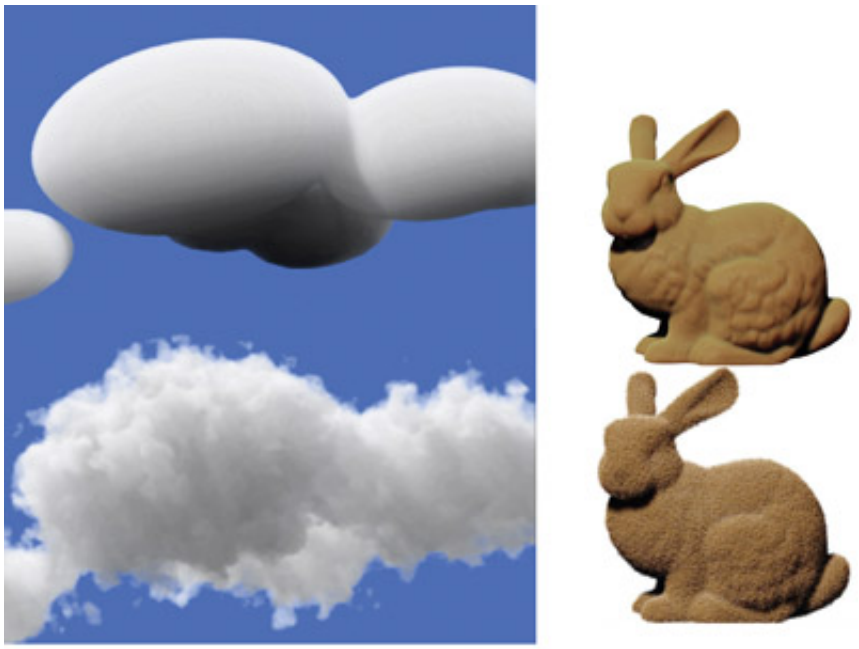

Figure 39-14 Examples of the Volume Perturbation Technique

Computing volumetric light transport in screen space, using a 2D buffer, is advantageous for a variety of reasons. Matching the resolutions of light propagation and the viewport produces crisp shadows with minimal aliasing artifacts. The method presented in this subsection decouples the resolution of the light transport from the 3D data grid, and it permits accurate lighting of procedural volumetric texturing effects, as described in the following subsection.

39.5.2 Procedural Rendering

One drawback of volume rendering is that small high-frequency details cannot be represented in low-resolution volumes. High-frequency details are essential for capturing the characteristics of many volumetric phenomena such as clouds, smoke, trees, hair, and fur. Procedural noise simulation is a powerful technique for adding detail to low-resolution volume data (Ebert et al. 2002). The general approach uses a coarse model for the macrostructure and procedural noise for the microstructure. Described next are two ways of adding procedural noise to texture-based volume rendering. The first approach perturbs optical properties in the shading stage; the second method perturbs the volume itself.

Both approaches use a small noise volume. In this volume, each voxel is initialized to four