# Volume Visualization: Technology to Tools

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Every new technology travels a path from excitement to application. At first we are excited and amazed by the technology. "How is this done?" we ask. We study it and experiment with it, and try to impress our friends by explaining to them how it works. Later, as the technology matures, we begin instead to ask "How is this useful?" It is no longer important how it works, but rather how it helps in real applications. The technology becomes a tool.

This path has been taken many times. Perhaps you recall when word processing first arrived? We all played with fonts and styles and used as many as we could in one document. Today, the technology is mature and even boring. It is now a tool. Or perhaps you recall the birth of spreadsheets, painting programs, or simple PC databases? Or, more recently, the arrival of interactive 3D on the PC, or the use of image based rendering tricks in the special effects for "The Matrix" movie. Each of these technologies splashed onto the scene, amazed us, and now are slowly maturing to tool status.

In this talk, I will speculate on where volume visualization is now on this path from technology to tool. I will discuss some of the advancements still needed, and give examples on current real uses for volume visualization. I will highlight recent work at the San Diego Supercomputer Center where we are using volume visualization to explore the enormous structure of the Orion Nebula, examine the microstructure of cancer cells, and study changes in temperature in the world's oceans.