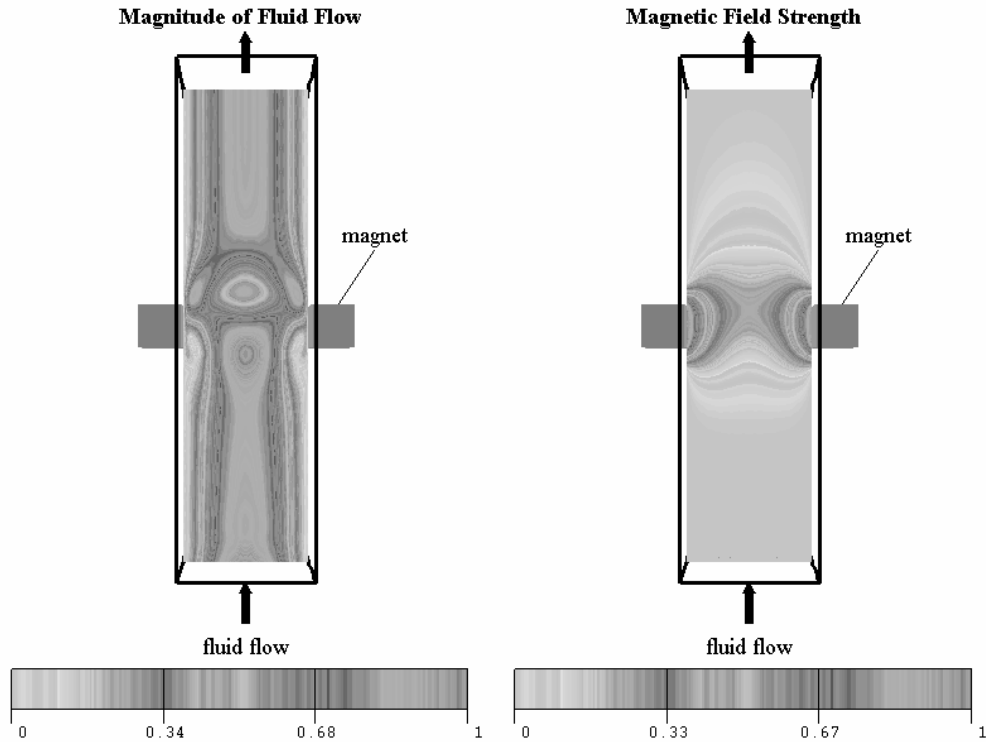# Visualizations of a Physically Coupled System
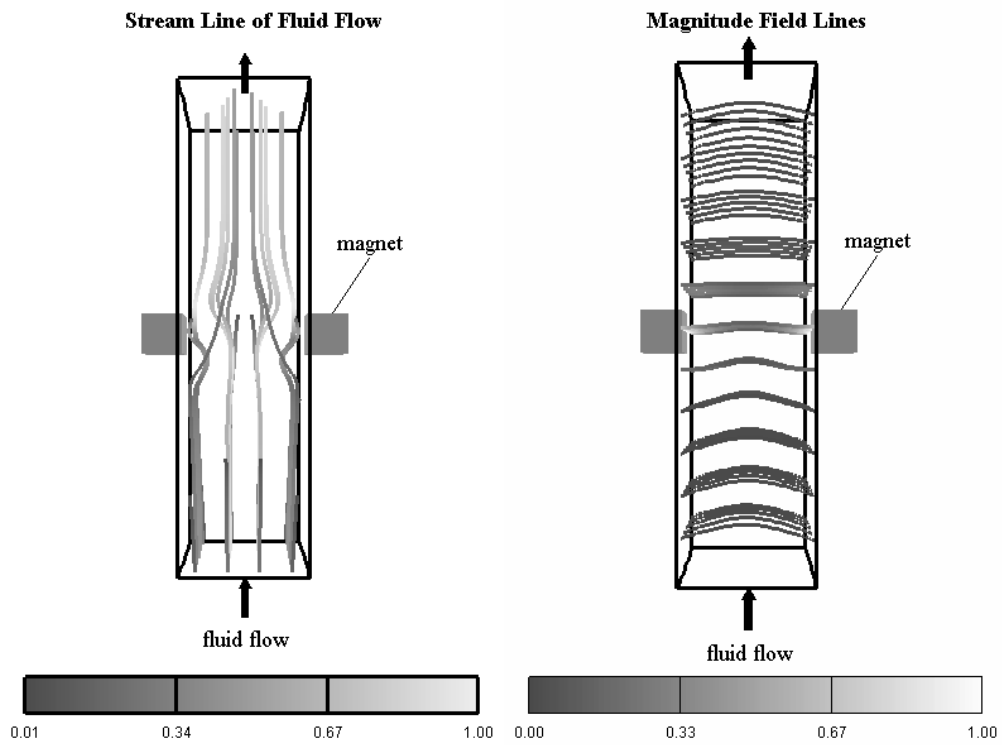
J. Leng, L. Margetts, I. M. Smith from the University of Manchester
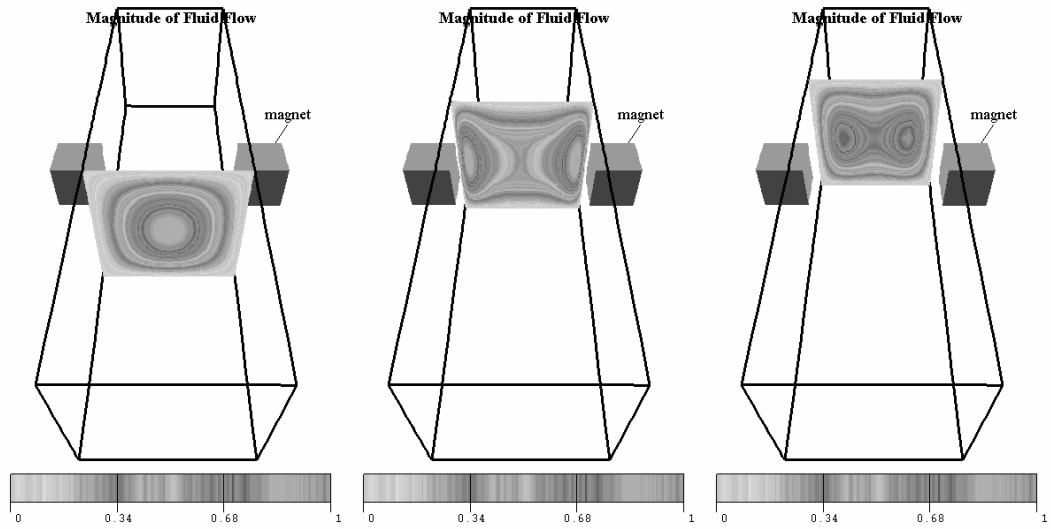
Grey Scale Images

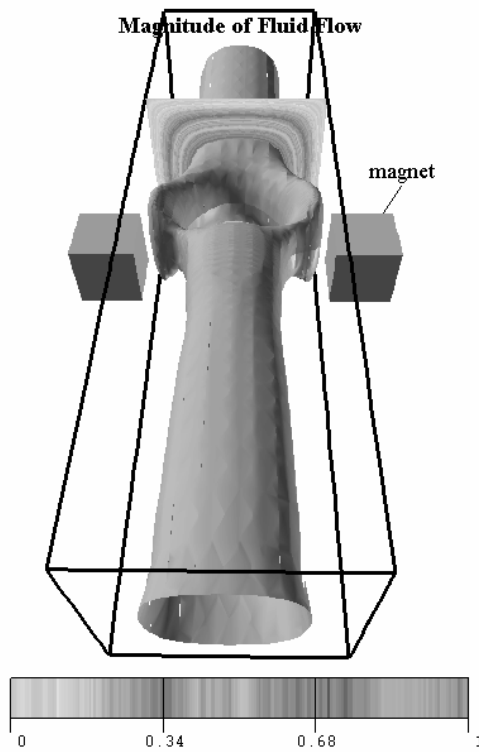**Magnitude of Fluid Flow**

Magnetic Field Strength

magnet

magnet

fluid flow

fluid flow

0   0.34   0.68   1

0   0.33   0.67   1

The left image shows the fluid flow while the right shows the magnetic field.

Stream Line of Fluid Flow

Magnitude Field Lines

magnet

magnet

fluid flow

fluid flow

0.01   0.34   0.67   1.00

0.00   0.33   0.67   1.00

Again the left image shows fluid flow while the right shows magnetic field
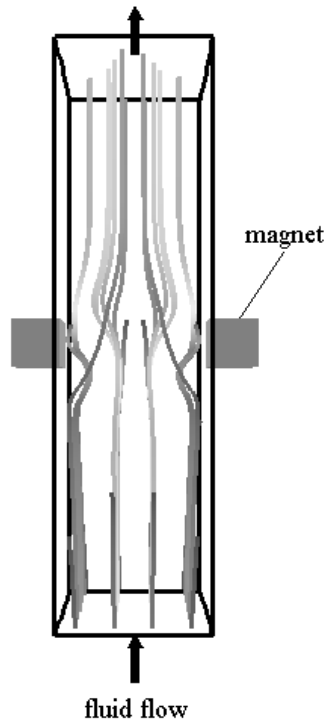
A sequence of images shows the formation of two jets in the flow after the magnet.
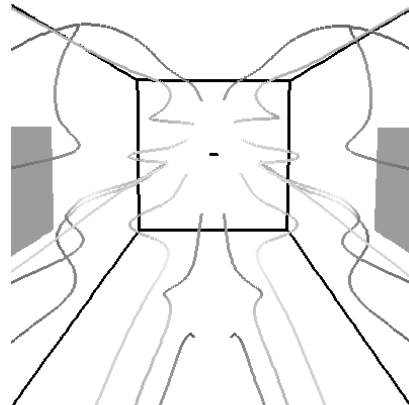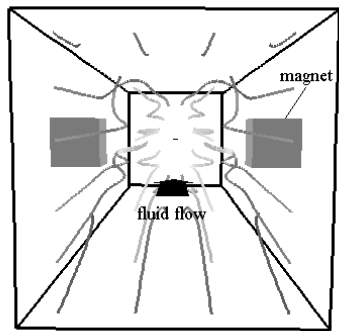

An isosurface of the magnitude of field flow shows the jets but there are holes in the surface. The underlying data is 20 node cubic cell data and the isosurfacer has not produced a continuous surface.
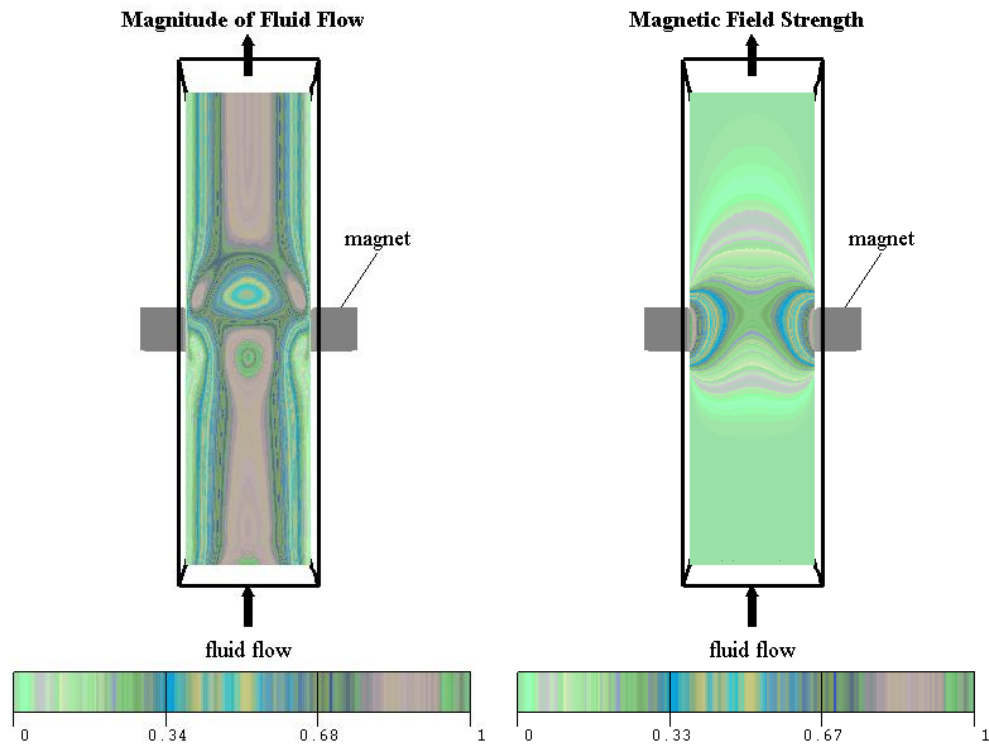
Stream Line of Fluid Flow

magnet

fluid flow

| 0.01 | 0.34 | 0.67 | 1.00 |

magnet

fluid flow
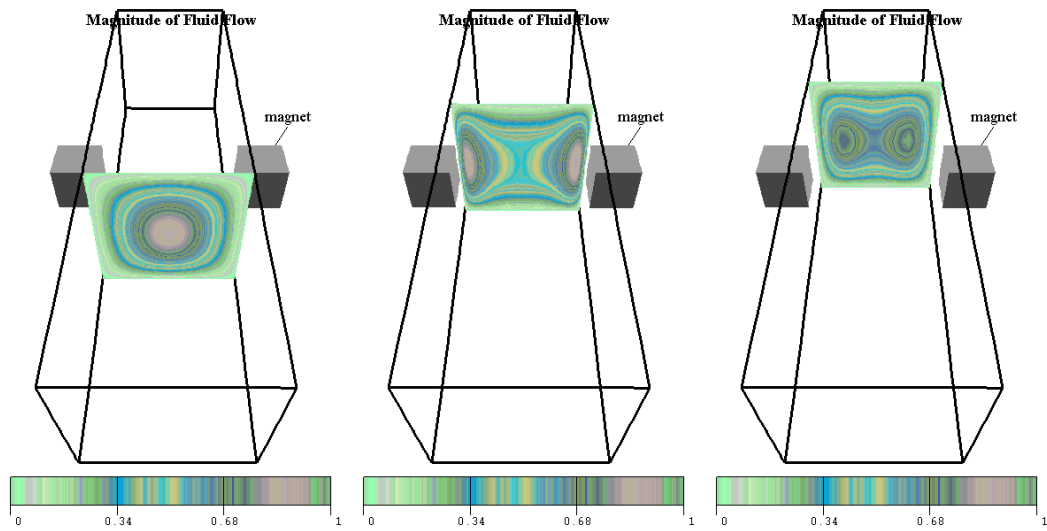
| 0.01 | 0.34 | 0.67 | 1.00 | | 0.01 | 0.34 | 0.67 | 1.00 |

Sequence of images shows the 3D nature of the fluid flow with stream lines.

Colour Images for Presentations

Magnitude of Fluid Flow

Magnetic Field Strength

magnet

magnet

fluid flow

fluid flow

| 0 | 0.34 | 0.68 | 1 |

| 0 | 0.33 | 0.67 | 1 |

The left image shows the fluid flow while the right shows the magnetic field.

Magnitude of Fluid Flow

Magnitude of Fluid Flow

Magnitude of Fluid Flow

magnet

magnet

magnet

| 0 | 0.34 | 0.68 | 1 |

| 0 | 0.34 | 0.68 | 1 |

| 0 | 0.34 | 0.68 | 1 |

A sequence of images shows the formation of two jets in the flow after the magnet.

Colour Images from a Virtual Reality Demo Application

Colour is used to encode meaning; blue for fluid flow and red for magnetic field. There are two mirror planes in the data. One was known before the simulation and has not been recreated for the demo while the other was only noticed by the scientists after some time using the virtual reality suite. This application is used in the virtual reality suite at the University of Manchester and it was also shown at a show case event for the international review of Physics organised by EPSRC in autumn 2004.
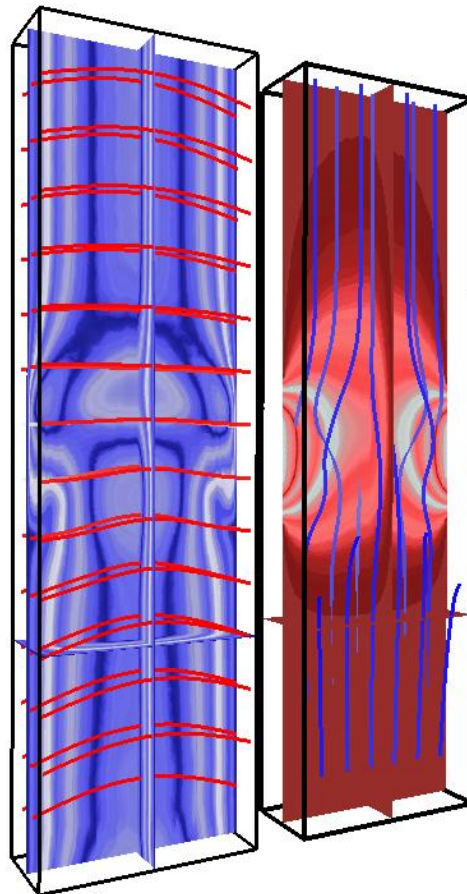
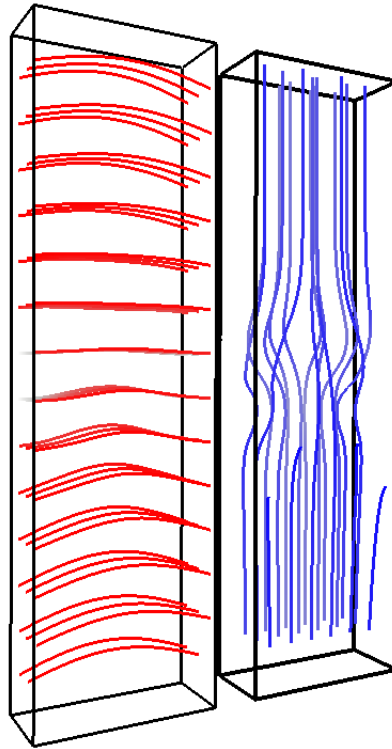*Two ducts are rendered side by side to show the coupled physics. A white background is used because the image is used for a presentation.*

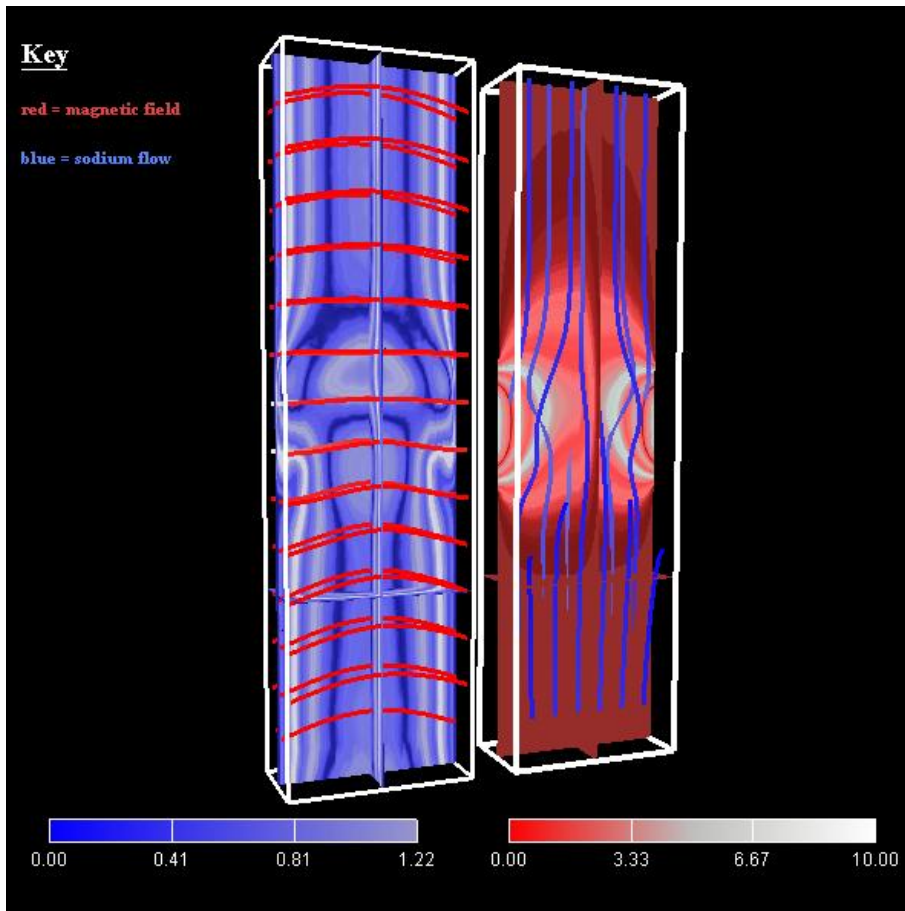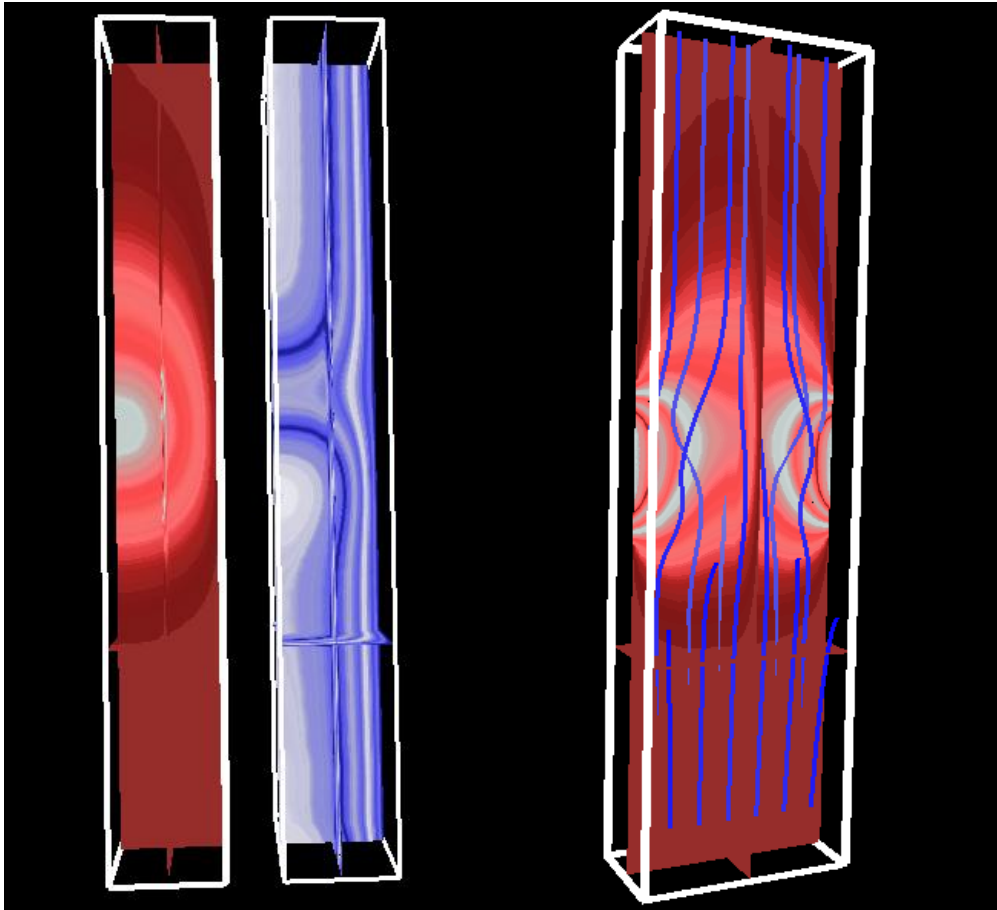*Again the ducts are rendered side by side but this time just with stream lines to show the flow.*

A screen shot of the start up view of the demo uses a black screen as the images look better when stereo-projected.

Objects can be removed from the scene so that clutter is reduced. The orientation of the ducts can be altered so they can be compared from different angles or they can be superimposed so all information can be viewed as one duct.