

# Fractal thinking

**Professor Christos Vassilicos (Aeronautics)** on how he is creating 'bespoke turbulence' to address a range of problems from ventilating buildings more efficiently to reducing the noise of aircraft.

## What's the basis of your research?

My team has developed a way to design turbulent flows by using fractal grids – structures made of repeating shapes that continually fit inside themselves.

## What applications could your research have in our homes?

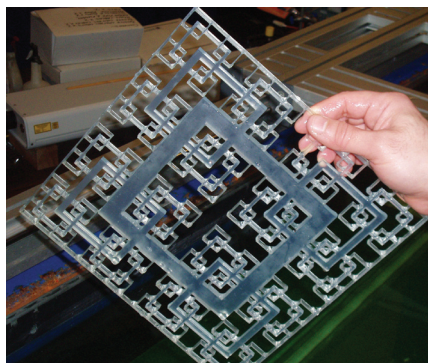
I'm working with Dr Gary Hunt (Civil and Environmental Engineering) to address the problem of ventilating buildings without wasting the energy created within them. We're looking at creating a new style of window or opening, using fractal grids to develop the shape as that has a major influence on how the air moves through the opening. This will help save energy.

## How might industry benefit from using fractal grids?

One example is in the way companies mix food or liquids, which can be a huge drain on a company's resources. Working with Dr Hunt I am looking at using fractal stirrers (pictured top right) to provide maximum mixing using minimal power.

## Are there applications for how energy is generated?

Today there is a move towards using lean mixtures for combustion. These mixtures



are more environmentally friendly but are typically harder to burn. I'm working alongside Dr Frank Beyrau, Professor Alex Taylor and Professor Yannis Hardalupas (Mechanical Engineering) on using fractal combustors to mix fuel more efficiently and aid combustion.

## Are there other projects benefiting from your fractals research?

Another related line of research is with Dr Bharathram Ganapathisubramani (Aeronautics) where we are focusing on the development of silent air brakes or spoilers using fractal grids. We're aiming to shift the aero-acoustic noise to higher, quieter frequencies, without damaging drag or lift properties.

## What lies ahead?

Imperial Innovations is helping to license the technology to designers of gas turbines and manufacturers of inline mixers (components which mix liquids or gases).

— ANOUSHKA WARDEN, IMPERIAL INNOVATIONS