# Applications of Fractals

The behavior of fractals is not yet full understood. The more we study them, the more we understand the concept of chaos of which fractals are an excellent example.

Of all their uses today, perhaps the one with the most promise is Fractal Image
Compression. Basically, the theory behind it is the same as behind any other fractal- determine
a set of rules, that, when repeated, create a picture that looks like something.

To get a picture of anything recognizable, (say, a human face) you would obviously need hundreds or thousands of different transformation formulas. The good news is that you could store MILLIONS of rules with the space taken up by most images.

Modern Fractal Image Compression can achieve 50:1 to 300:1 compression on most images.

Images compressed with fractal compression have other advantages as well. They can be blown up with minimal loss of detail, in fact, they often appear much better than the **source** image when blown up!

## Check out the following demo of fractal image compression.

The source image was a 16.7 million color 320x200 graphic. It was 209,000 bytes in size.
The fractal output file was only 22,000 bytes, an 9:1 ratio with almost no change in quality (in fact, there was an improvement!)

Click on fraclogo.bmp on the left to see the original image.
Then click on fraccmp.bmp to see the fractal compressed one.
[1]
[2]
See any difference? Not much!

The biggest use of image compression today is in two areas: Multimedia programs, and the
INTERNET. The well known encyclopedia Microsoft Encarta uses image compression to squeeze what would be an multi-CD program onto 1 compact disc.

1. ~BMP: fraclogo.bmp
2. ~BMP: fraccmp.bmp

On the Internet, it takes *FOREVER* to download graphics at the speeds of most modems. Fractal
image compression promises to help eliminate this.

Both of these areas have the advantage that their graphics are relatively small compared to the size of the screen. This helps to wash out any loss of detail that would be obvious when viewed at full screen.
Fractal images also have the advantage of being highly scaleable which means you can blow them up without losing much detail. The fractal algorithms used to produce the original image are simply iterated more times.

Look at this example. The first picture (fraczm1.bmp) is the normal bitmap zoomed in on the letter 'E' in experience.
The second picture (fraczm2.bmp) is the fractal compressed version zoomed in on the same place.
[3]
[4]
Which one looked better? The second if you ask me!

And yet the file is 1/9 the size of the other!
How does it hold so much more DETAIL?
The secret lies in that wonderful little world of fractal geometry!

3 ~BMP: fraczm1.bmp
4 ~BMP: fraczm2.bmp