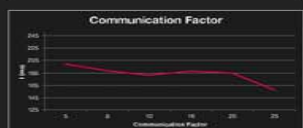
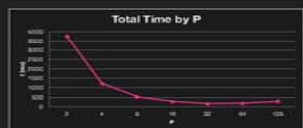
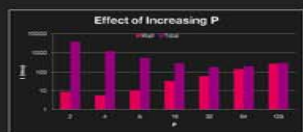


# MPI programming for Julia Sets

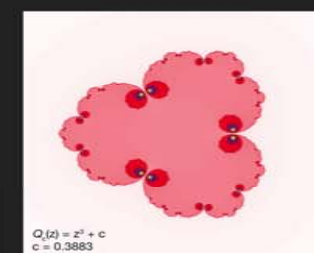
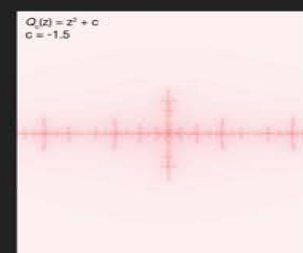
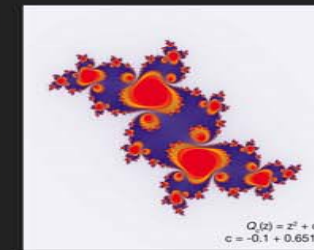
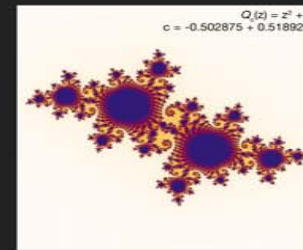
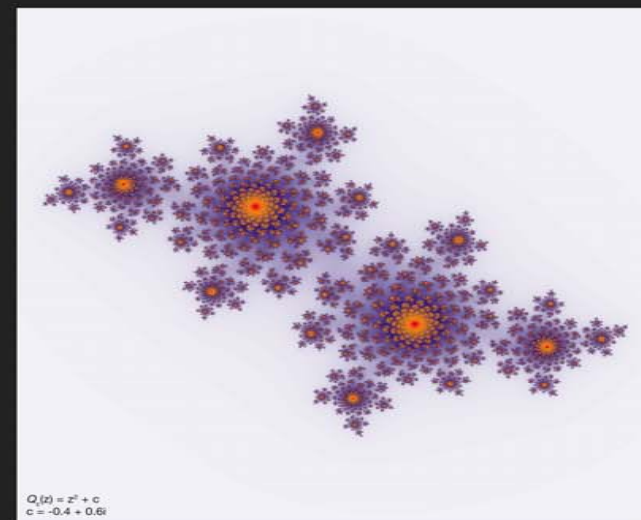
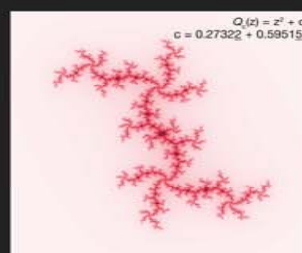
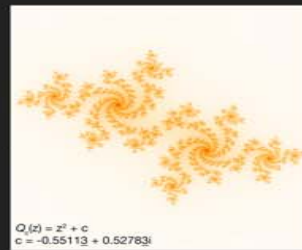
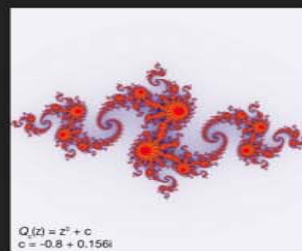
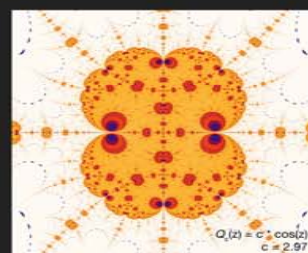
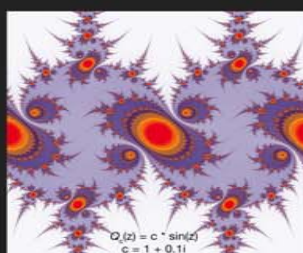
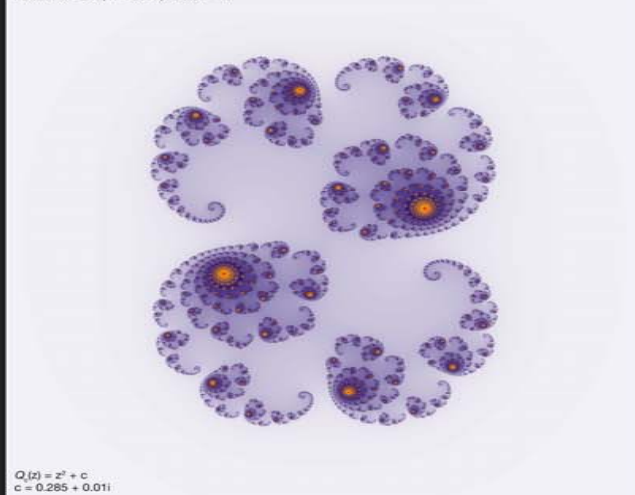


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CP400N (Introduction to Parallel Programming) Term Project  
Winter 2012  
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Wilfrid Laurier University  
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Iterations = 255, n = 2000, Factor = 10



## MPI programming for Julia Sets

Gaston Julia (1893-1978) was a French mathematician, who achieved international fame after his death, when Benoit B. Mandelbrot uncovered his beautiful 200-page 1918 paper (Memoire sur l'iteration des fonctions rationnelles, Journal de mathematiques pures et appliques 8eme serie, tome 1 (1918), p. 47-246.) concerning the iteration of a rational function  $f$ . Julia gave a precise description of the set  $J(f)$  of those points for which the  $n$ th iterate of  $f(z)$  stays bounded as  $n$  increases to infinity. These sets  $J(f)$  are now known as Julia sets even though Julia was probably never able to visualize them. Robert L. Devaney's book titled Chaos, fractals, and dynamics, Computer experiments in mathematics (Addison-Wesley 1990) provides detailed explanations of algorithms that can be used to visualize Julia sets and also makes a point regarding the cpu-intensive nature of these algorithms. This student project aimed at using MPI programming on SHARCNET clusters to produce high-resolution images of Julia sets, with a special focus on the load-balancing issues that arise during the computations. For more information on Dr. Ilias Kotsireas or his research please visit:

<http://www.wlu.ca/science/physcomp/kotsireas/research.html>