MATHEMATICS OF PLANET EARTH
BRIEF OVERVIEW

Mathematics of Planet Earth (MPE2013) represents an international effort by the mathematics community to make lasting contributions to the well-being of Planet Earth.

The goals of the MPE project are to:

1. Encourage progress in solving problems related to planet Earth through world-class, interdisciplinary research;
2. Increase public awareness of the unique contributions that mathematics can make in tackling global problems;
3. Provide resources for educators to highlight the vital role of mathematics and potential career paths to students interested in sustainability and global issues.

MPE2013 will explore themes as broad as sustainability, climate change, and a multitude of dynamical systems, both natural and societal. This initiative will foster collaborations with mathematicians and researchers in the fields of medicine, engineering, physics, oceanography, finance, and economics, amongst others.

More than one hundred academic institutions and scholarly societies will partner around the world in support of the MPE2013 effort.

Activities will span:

- workshops and conferences on cutting-edge research
- museum exhibits
- public lectures
- development of curricular materials for all academic levels
- competitions to design publicly-accessible demonstrations
- long-term international programs in a breadth of fields
- interdisciplinary summer schools for young researchers

Four main MPE themes:

- A planet to discover
  (geophysics, oceans, meteorology and climate, planetary motions, etc.)
- A planet supporting life
  (ecology, biodiversity, evolution, etc.)
- A planet organized by humans
  (economic & financial systems, energy, health & social systems, management of resources, etc.)
- A planet at risk
  (climate change, sustainability, natural disasters, epidemics, etc.)

Topics surrounding the MPE2013 themes include:

- mathematical methods in modelling:
    - neurological disease
    - ecology, epidemiology, and public health
    - complex fluids
    - the dynamics of the fluid Earth
- celestial mechanics
- medical imaging
- mathematics underlying liquid crystals
- the mathematics of oceans
- biodiversity and evolution
- optimisation methods applied to:
    - combinatorial chemistry
    - structural engineering
    - computational biology
    - finance
- the dynamics of infectious diseases
- mathematical challenges facing quantum information
- materials for a sustainable energy future
- ecosystem dynamics and management

History:

The concept for the Mathematics of Planet Earth 2013 (MPE2013) initiative came from Christiane Rousseau, Vice-President of the International Mathematical Union and a former President of the Canadian Mathematical Society. After having assembled the Canadian mathematical community around several exciting ventures, she dreamed of bringing together mathematicians and other scientists to create a unique, international research effort focussed on planetary challenges. "My dream is now shared by so many scientists around the world that MPE2013 is developing on its own. This unprecedented collaboration will last beyond 2013," noted Dr. Rousseau. A passionate populariser of mathematics, Dr. Rousseau is directly involved in many of the MPE2013 outreach activities. "One of my rewards for working on MPE2013 is that I am able to share with the public the almost daily discovery of new applications of mathematics. The capacity for mathematicians to contribute to global solutions is slowly being realised, but time is pressing for the planet."