PATHWAYS
Palaeoceanographic Pathways in the North Atlantic-Arctic Ocean

SUMMARY
The overall goal of PATHWAYS is to test the hypothesis that tectonic activity can exert a critical influence on global climate through the modification of thermohaline circulation patterns at oceanic gateways. This will be effected through an examination of the linkages between changes in palaeoceanographic pathways and tectonism within the North Atlantic-Arctic region and over Cenozoic timescales (<65 Ma). The North Atlantic-Arctic region represents an ideal study area, not only because there is ample evidence of tectonic movements, but because it contains a Cenozoic stratigraphic record from which geological and geophysical data have been acquired over several decades of scientific exploration and, more recently, deep-water hydrocarbon exploration. The intention of the project is therefore to take advantage of the wealth of available geological and geophysical information within a critical region, in order to examine changes in the operation of several Earth systems (oceanographic, tectonic, climatic) at appropriately large spatial (and temporal) scales.

PROJECT OBJECTIVES
PATHWAYS addresses a regional-scale problem of Earth system dynamics and seeks to stimulate the exchange of ideas and information, thus establishing a basis for longer-term research initiatives. The project involves a multidisciplinary approach, in which an understanding of the sedimentary processes governing drift deposits, as well as of Cenozoic changes in tectonism and in climate, are combined with geological and geophysical analyses to test a model for changes in oceanic pathways in the study region. The goals of the project are:

• To undertake a critical review of information available on the post-rift tectonic history of the region, both the plate kinematics recorded by deep-ocean records of seafloor spreading and the epeirogenic (differential vertical) movements recorded by subsidence/uplift analyses of the continental margins, in order to identify tectonic phases of regional significance.

• To make a compilation and systematic correlation of relevant information available from deep sea drill-sites along the Atlantic-Arctic oceanic corridor, both academic (e.g. IODP) and commercial, in order to identify regionally extensive unconformities and to establish a stratigraphic framework for the major changes in oceanographic circulation.

• Guided by the regional tectono-stratigraphic framework and an understanding of the modern current system, to identify key areas of interest for a more detailed examination of the stratigraphic record of change preserved in deep-ocean sediment drifts, and to undertake seismic stratigraphic analyses of the evolution of deep-water circulation, ideally at several widely separated sites, in order to allow a regional comparison and correlation of the results.

• To develop a regional model for the palaeoceanographic evolution of the North Atlantic deep-water circulation system over the Cenozoic, underpinned by independent evidence for changes in tectonic activity and in climate.

• To seek evidence for coeval changes in deep-ocean circulation near at least one other oceanic gateway, in order to evaluate the significance of changes in the North Atlantic-Arctic region at a global scale, either by a review of the literature or through contact with other research groups.

• To form the nucleus of a research network, by establishing contacts with other institutions and researchers with active interests in oceanic gateways in order to promote the exchange of information and ideas.

INTERNATIONAL COLLABORATION
Patrick Shannon, Department of Geology, University College Dublin, Ireland
Daniel Praeg, Department of Geology, University College Dublin, Ireland
Jan Sverre Laberg, University of Tromsø, Norway,
Martyn Stoker, British Geological Survey, Edinburgh, UK
Tove Nielsen, Geological Survey of Denmark and Greenland, Copenhagen, Denmark
David Piper, Geological Survey of Canada-Atlantic, Bedford Institute of Oceanography, Canada
Michele Rebesco, Istituto Nazionale di Oceanografia e Geofisica Sperimentale - OGS – Trieste, Italy
Emanuele Lodolo, Istituto Nazionale di Oceanografia e Geofisica Sperimentale - OGS – Trieste, Italy