Foreword

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Beneath the scenic skin of Ireland there lies another world. It's a world familiar only to a few – to those geologists who have quietly probed its depths, revealed its rocky basement and charted the journey of its prodigiously ancient roots. This 'land below ground' has a history that extends way beyond human lives and legends to leave a geological legacy that – for its modest size – is the most varied in the world. But this diverse geological mosaic below our feet is more than simply the bedrock underlay to the familiar wild places, farmlands and towns above. It is the economic wealth of peoples past and present and the stone furnishing of the streets and buildings we see every day. Geology may lie out of sight, but in terms of its critical importance to the modern world it is far from being out of mind.

Which is where the Tellus Project came in. This project, named after the Roman goddess of the Earth, was conceived to catalogue Ireland's hidden inventory and assess not only its contemporary value and usefulness, but also its threats and unknowns. Imagining and imaging what lies below us is a tricky business and requires a clever combination of surveying from above – magnetic, electromagnetic and radiometric mapping from low-flying specialist aircraft – and walking the ground to detect surface clues in the rocks and in the tens of thousands of soil, sediment and water samples collected for laboratory analysis.

This combined land and air offensive has been unprecedented – nowhere else on earth has been examined in such detail. As a result of over ten years of forensic examination, subsurface Ireland is probably the most intensively studied piece of geological real estate on the planet. The results have had immediate benefits in terms of promoting economic investment, unearthing valuable new information on the region's mineral resources and mapping the environmental characteristics of a much-loved landscape. The dangers presented by the rocky underworld are also now more apparent; the research highlights hot spots of natural radiation or possibly toxic contaminants leaking from deep metal-rich rocks, and appraises levels of industrial pollution in the cities.

All in all, the Tellus work is expected to have a huge impact on the economic, environmental, agricultural and health sectors. But perhaps the biggest prize of a decade of exploring hidden Ireland is a more complete understanding of the natural history of this region. It tells an epic story of how Ireland's geological past will sustain its future.

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As for the earth, out of it cometh bread: and under it is turned up as it were fire.
The stones of it are the place of sapphires: and it hath dust of gold.
Job 28: 5–6

The granitic Mourne Mountains viewed across Dundrum Bay from greywacke sandstones of St John's Point, County Down.
Photo: Travel Pictures

Directors' Foreword

The Tellus programme was conceived in the 1990s as a major geoscience project that would benefit the whole island of Ireland by providing modern geophysical and geochemical data with which to update geological mapping, stimulate investment in mineral exploration and generate an environmental baseline. It was envisaged that these data, collected on a regional scale to industry standards, would provide the coherent information needed to underpin new analyses of the geology and natural resources of Ireland. At the same time, it was recognised that these same data would define the baseline conditions against which exploration and development could be managed, in compliance with increasingly stringent environmental legislation.

Ireland is an important source of metallic ores, with over 50 years of modern mining, and is still the major European source of zinc. Other metals produced in recent history include copper, lead, silver, iron, and a range of industrial and energy minerals. Although gold is the major target of exploration companies in the north of Ireland today, there is also scope for new discoveries of base metals. Both mature and emerging economies need steady supplies of minerals and raw materials to underpin development. It makes sense, both economically and socially, to produce these minerals domestically under well-controlled environmental regulations than to import them from less robust regimes.

The first phase of the Tellus programme, in Northern Ireland, prompted a surge in exploration licensing and significant inward investment in exploration, which continues today. Funded initially by the Northern Ireland government (and co-funded retrospectively by the EU), the programme was seen as a project that would benefit all sections of the community and several sectors of the economy, in addition to that of natural resources. Benefits for agriculture, health, land-use planning and environmental monitoring were anticipated. The success of this first phase prompted further EU investment in a second phase, to extend the surveys over the border into the six northern counties of the Republic of Ireland, in a project managed jointly by the Geological Survey of Northern Ireland and the Geological Survey of Ireland, in partnership with Queen's University Belfast and Dundalk Institute of Technology. This second phase, the Tellus Border Project, was completed on time and within budget and generated a wave of research into all the areas envisaged at project conception, and many more.

Today the Tellus initiative continues in the Republic of Ireland, where the intention is to complete the surveying of half of the country by 2017 and of all of the island of Ireland by 2023, and in Great Britain, where surveys of south-west England have recently been completed.

The Tellus and Tellus Border Projects have exemplified the value of government and EU investments in cross-border multi-partner, scientific initiatives where there is a common objective and complementary skills and experience. In addition to the evident success in the original aim of stimulating exploration, the projects have demonstrated more widely the scope for prompting research and international collaboration in a wide variety of fields. The purpose of this book is to illustrate some of these outcomes and impacts, on exploration, environmental management, land-use, agriculture and research, and to underline the value of an all-island approach to such endeavours.

In the introductory section, the various programmes of survey work, data analysis and presentation are described. In Part 2, the impacts of the new data are illustrated by chapters on gold and base metal exploration and the potential for further discoveries. The scope for geothermal resources is also discussed. Part 3 presents some of the applications of the data in agricultural and ecological management. Part 4 describes how the information has been used in various areas of environmental mapping and management; these include mapping of contaminated land and the legacy of the industrial past, human health, radioactivity and radon, carbon sequestration and geoforensic investigations.

The breadth of research presented in these chapters demonstrates the wealth of information that may be derived from these regional data, their impacts on and value to various economic and environmental sectors, and the immense benefits of cross-border research collaborations between government organisations, academia and industry.

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Many years of dedicated work underpin the research described in this book. This includes the demanding airborne surveys undertaken by skilled pilots, engineers and support staff; the long seasons of geochemical sampling, often performed in uncomfortable field conditions; the meticulous analysis of samples in the laboratory; and the careful data processing consequent on all these functions. Some hundreds of individuals have contributed to the different aspects of data acquisition and processing and many more have brought innovation, imagination and skill to the interpretation of data and presentation of research. Project staff have been drawn from the Geological Survey of Ireland (GSI), the Geological Survey of Northern Ireland (GSNI), Queen's University Belfast and Dundalk Institute of Technology. The British Geological Survey and its staff provided sustained guidance and support for many functions. Many specialist contractors acquired and delivered much of the core survey data and two companies, Weber Shandwick and Morrow Communications, devised the vital communications and public relations programmes, which resulted in a wider understanding of the work throughout the north of Ireland. We are most grateful to all these individuals, companies and organisations for their essential and sustained contributions.

The project teams have been led notably by Marie Cowan, Ray Scanlon and Mairéad Glennon, with skill, dedication, tact and good judgement, and I am most grateful for their help over a long period.

Project management benefited immensely from the advice of expert steering groups, drawn from government departments with interests in the project. Chaired variously by senior civil servants including Robin McMinnis OBE, Noel Cornick, Michael Manley and Mike Thompson, the groups' sagacity and strategic perspectives contributed both to the efficiency of field operations and to the breadth of impact of the results.

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Mike Young