

Editors: Peter Coxon – Stephen McCarron – Fraser Mitchell

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Reviewer: Richard Jennings, R.P.Jennings@ljmu.ac.uk

This book is a landmark publication in Irish Quaternary studies and is a must read for all members of the archaeology community. It brings together a series of integrated themes that fully encapsulate the new directions that have come to characterise research in this highly important field over the last three decades. In particular, it evaluates the application of new dating techniques, computer models, remote sensing imagery datasets and digital terrain models of Ireland, and reports on new high precision palaeoenvironmental records for the country, at the same time highlighting the need for more of them to be developed.

After a fascinating historical perspective is put forth in the Prologue on the development of Quaternary research in Ireland - a theme that recurs frequently to good effect in many of chapters of this book – the volume begins with an insightful essay by Simms and Coxon on how Ireland's pre-Quaternary landscape shapes Ireland despite the significant impression left by a succession of ice age glacial-interglacial cycles over the last 2.6 million years. The authors take us on a journey around Ireland to places familiar and surprising, pointing out how particular bedrock geological features endured ice advances and retreats. Examples include the Blackwater, Lee, Barrow and Nore rivers in the south of the country, which retain structural elements of pre-glacial drainage networks. The authors note how erosion in upland settings and deposition in lowland settings disguises the extent of influence of Ireland's hidden pre-glacial landscape.

A chapter on Interglacial sequences by Coxon et al. highlights the paucity of evidence for warm phases in comparison with other countries such as Britain, which are not as reliant upon pollen records alone for yielding such information, as is Ireland. Researchers there use molluscs, mammals and insects as well as pollen and new dating techniques to great effect reconstruct warm phase characteristics. A reassessment of evidence for the Gortian, the most prominent interglacial phase in Ireland follows, together with compilations of pollen evidence for other less influential episodes such as the Kilfenora Interstadial.

One of the leading developments in recent years has been the realisation that Ireland was probably completely covered in ice during the last glacial. For many years, it was thought that southern Ireland escaped the effects of the Last Glacial Maximum 20,000 years ago. The employment of new digital mapping technologies such as LiDAR and dating techniques such as cosmogenic nucleotide dating has contributed to this interpretative change. These are set out thoroughly in the chapter on this subject by Meehan, who identifies all types of

landform evidence around the country that are indicative of ice expansion and retreat, such as the glacial erratics, moraines, drumlins, eskers, corries and striation lines on continental shelf.

A comprehensive review of the extent and retreat of the last ice major advance across Ireland follows in the next chapter by Ballantyne and Cofaigh. Their account weaves together dating and physical evidence from both nationwide and offshore contexts to provide the most current perspective yet on its timing, origins and extent. The book then takes a regional perspective with a case study chapter on the deglaciation in the Northern Irish Seas Basin by Knight. This is a detailed account of a critical region in the understanding of ice sheet movements in Ireland. Knight draws on a range of approaches including sediment analyses, radiometric dating and ice sheet modelling in an attempt to chart its course and acknowledges that there is considerable more research to be done yet.

Another challenging topic in Irish Quaternary Research is to model relative sea level change. This is addressed in the next chapter by Edwards and Craven, who highlight the importance of undertaking this research for understanding when Ireland was last connected to Britain, which they conclude was approximately 16,000 years ago. They state it is a complex subject owing to changing water volumes, regional variations, and the need to incorporate isostatic effects of ice sheet expansion and contraction. They also review raised beach evidence and highlight how there is debate as to whether these relate to stadial or interstadial episodes. They also state that further radiometric dating and more complex models are required.

The book then explores the impact of periglacial and paraglacial process on the Irish landscape, which is reviewed in a chapter by Wilson. He noted that such processes can be seen in areas near to glacial ice and involve sedimentation, rock frost fracture and other cold-dominated geomorphic activity. Given that Ireland must have been proximal to ice sheets and glaciers in the past then such lines of evidence are worthy of investigation.

The book comes to a conclusion with two related chapters on the evidence of Pleistocene fauna in Ireland, and on the first peopling of Ireland. Monaghan recounts the discovery of Irish fauna from historical and contextual perspectives before providing the latest data on chronology and species presence/absence and inferred habitats from different sites across the country. He reports that the oldest vertebrate fauna in Ireland date to 109 to 75 ka BP but that the two main phases when fauna is present are prior to the Last Glacial Maximum and during the Late Glacial or Woodgrange Interstadial. He acknowledges that much more work is still to be in the study of Irish fauna, and in particular in the timing of its arrival into Ireland in the Pleistocene and Holocene. This links well with Warren's review chapter on the human occupation of Ireland, which is timely owing to the discovery of a worked bone from Alice and Gwendoline Cave in Co Clare that dates to the Younger Dryas. Warren reviews the evidence of human occupation in Britain to contextualise this discovery and puts forth ideas concerning why evidence for an Irish Palaeolithic is not so apparent as in Britain.

Overall, *Advances in Irish Quaternary Studies* is an essential read for those with an interest in Ireland's natural and cultural heritage. It is well written and is richly illustrated with maps, photographs and drawings. It provides an excellent up-to-date baseline knowledge of the Irish Quaternary. The contributors are not reluctant to admit that there is still much to

learn, while at the same time acknowledging the significant advances that have been made over the last three decades in this field.