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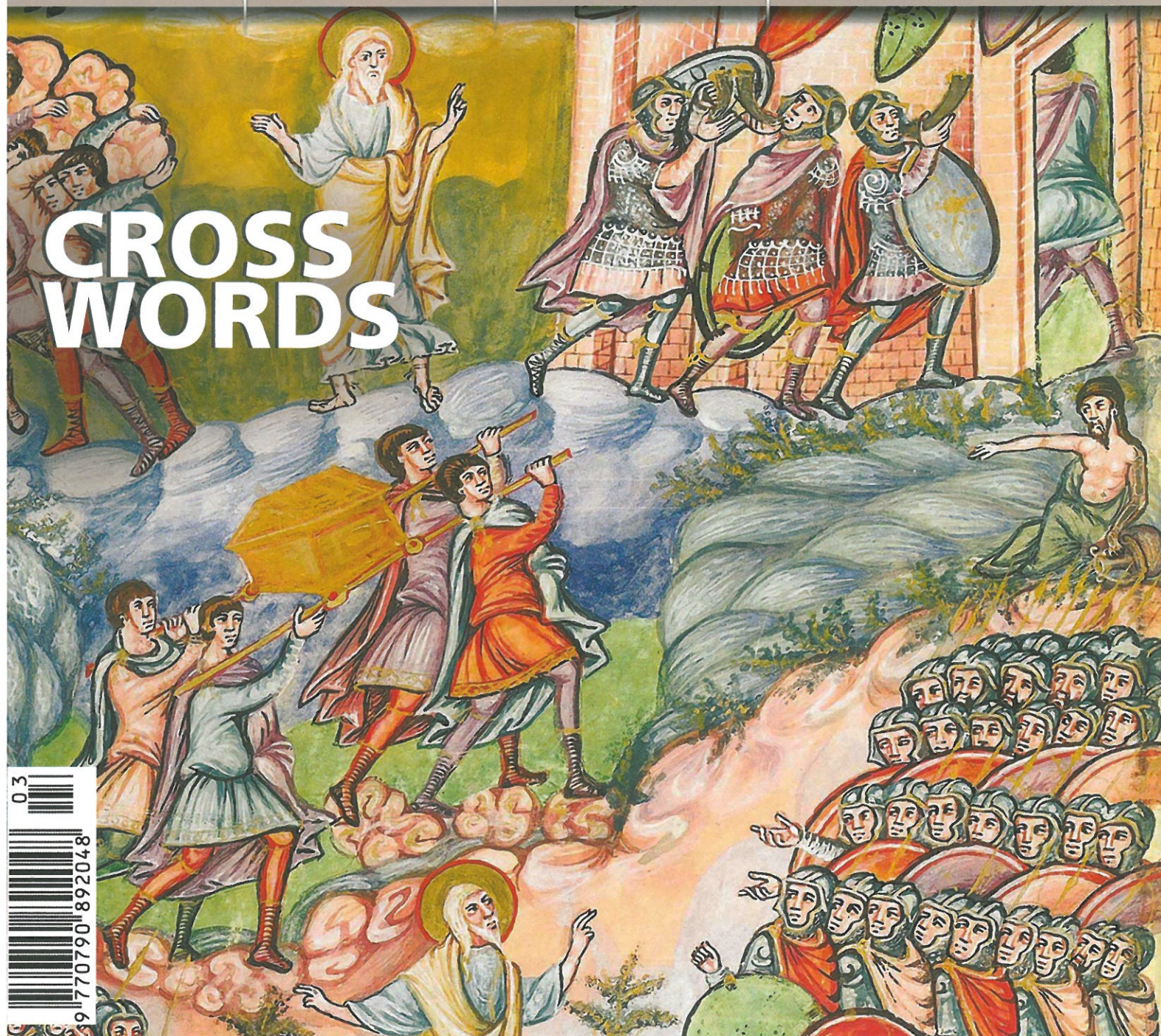
Discovery at the Hill of Tara

A major new phase of research.

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CROSS WORDS



A RENEWED PROGRAMME OF DISCOVERY AT TARA

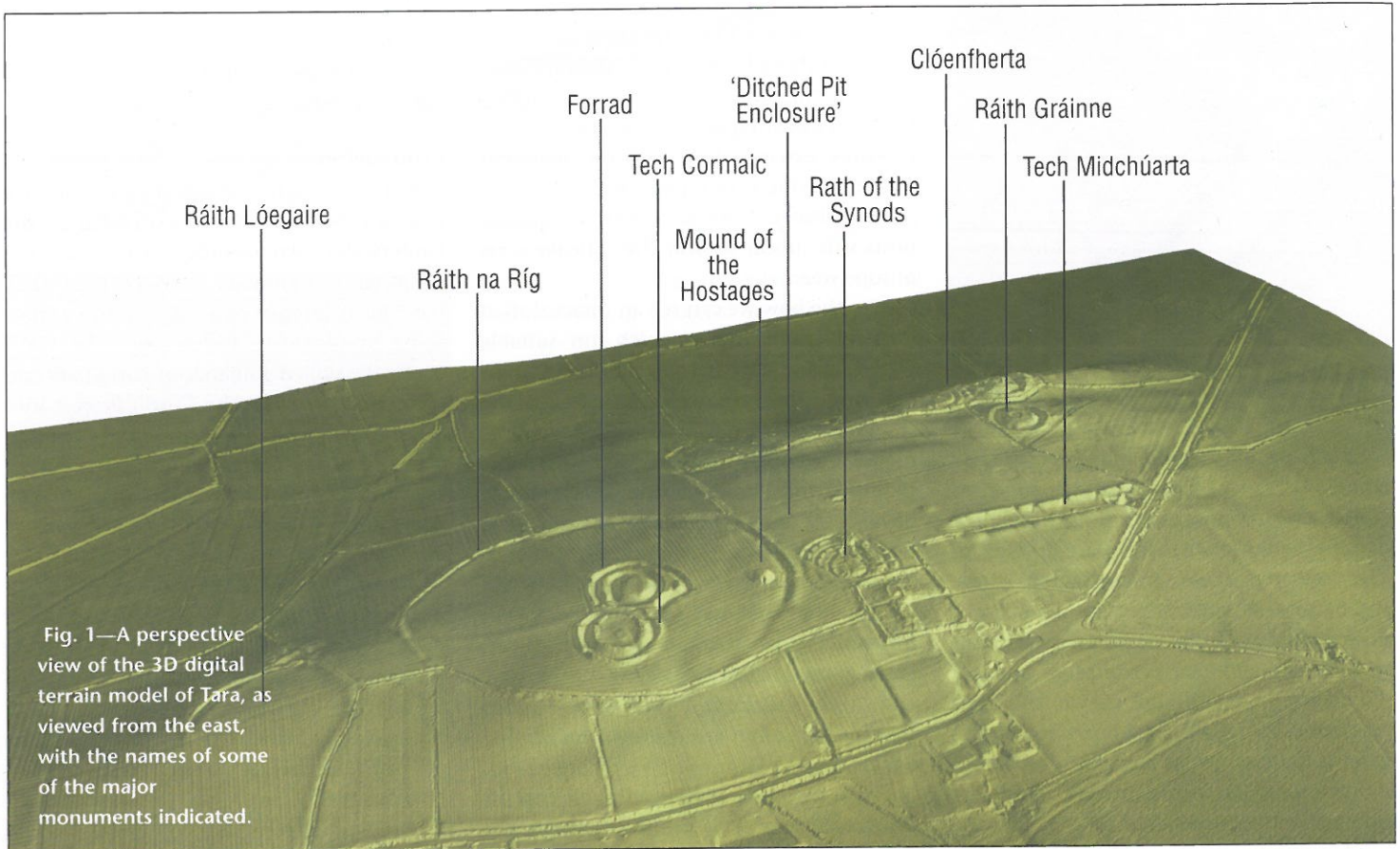


Fig. 1—A perspective view of the 3D digital terrain model of Tara, as viewed from the east, with the names of some of the major monuments indicated.

Roseanne Schot, Joe Fenwick, Ruth Beusing and Knut Rassmann report on a major new phase of collaborative research on the Tara Project, to coincide with the 25th anniversary of the establishment of the Discovery Programme.

As one of the pre-eminent icons of Irish culture and identity, Tara continues to hold a fascination for the public consciousness. To the casual visitor, its impressive ensemble of burial monuments, ceremonial enclosures and earthworks clustering on the hilltop ridge (Fig. 1) seems preserved in perpetuity—a timeless and otherworldly place, a place apart. In reality, however, Tara's landscape continues to evolve, as does our understanding of its use and significance for successive generations over more than 5,000 years. Though representing but a brief chapter in the long history of Tara, research and survey over the past 25 years (since 1991, when the Discovery Programme was founded) have generated unprecedented advances in our knowledge of Ireland's premier 'royal' site. This year marks the start of a major new phase in the Tara Project, which will bring together the results of almost fifteen years of survey and remote sensing in the Tara landscape and paves the way for renewed investigations by the

Discovery Programme and its research partners.

Tara has been a flagship project of the Discovery Programme since its inception, one in which the twin strands of archaeological and historical research were given equal prominence. This collaborative and multi-disciplinary approach, an innovation for its time, fostered a remarkably productive synergy which has reaped exceptional and lasting rewards, in addition to some occasional surprises. The resultant deeper understanding of the archaeological, historical and mythological landscapes of Tara, and the panoramic vista of insight afforded by related disciplines such as anthropology, comparative and place-name studies, has stimulated a profound realignment of preconceived ideas and prompted a wider discourse on the nature, role and broader regional significance of the great royal sites. It is these ancient landscapes that are now beginning to re-emerge.

A significant part of the early success of

the Discovery Programme's research was a willingness to apply new technologies in innovative ways and to collaborate and engage with a wide range of experts from diverse fields. Though the original Tara Project was officially concluded on the publication of Edel Bhreathnach's *Tara: a select bibliography* (1995) and Conor Newman's *Tara: an archaeological survey* (1997), in reality the research has continued, if intermittently, to the present day.

Advances in remote sensing, for instance, have seen the ground-based topographical survey of the Hill of Tara conducted in the mid-1990s superseded by an even more detailed and extensive helicopter-based LiDAR (Light Detection and Ranging) survey commissioned by the Discovery Programme in 2007 with the support of the Heritage Council. The high resolution and exceptional quality of the LiDAR data—as illustrated in the Autumn 2008 issue of *Archaeology Ireland*—have enabled a very detailed 3D modelling of the hill that continues to



Left: Fig. 2—The combined results of the magnetometer surveys undertaken on the Hill of Tara from 1998 to 2014, overlaid on orthophotography.

Below: Fig. 3—Geophysical survey at Tara in 2014 using a sixteen-channel magnetometer system (see Box 1 for more details).

collaboration between the Discovery Programme and the Department of Archaeology, NUI Galway. The 2002 survey extended the previous geophysical investigations southwards from the Ditched Pit Enclosure to include the internally ditched Iron Age enclosure of Ráith na Ríg (Fort of the Kings), and Ráith Lóegaire (Lóegaire's Fort) to its south. Further magnetometry survey was carried out in 2008 on the northern flank of the summit plateau, in the townlands of Cabragh and Jordanstown, while two additional campaigns of fieldwork in 2010 investigated the areas to the north and west of the Ditched Pit Enclosure, as well as the hill's eastern flank, as far as the Tara Hall estate. Alongside the magnetometer surveys, targeted electrical resistance and magnetic susceptibility surveys were also undertaken over several monuments, including the impressive conjoined earthworks known as the Forrad (Royal Seat) and Tech Cormaic (Cormac's House) inside Ráith na Ríg.

In 2014 there was a welcome expansion in the project team and a renewed programme of geophysical investigations at Tara, following the establishment of a joint research partnership with the Römisch-Germanische Kommission (RGK), a branch of the German Archaeological Institute (Deutsches Archäologisches Institut). This latest phase of fieldwork extended the magnetometer survey yet further out from the summit plateau, on the north, west and south. It also revisited some of the areas previously investigated using the latest cutting-edge technology at a higher survey resolution.

provide important insights into the many low-relief archaeological features at Tara, particularly when analysed in conjunction with the ever-growing body of geophysical data collected over the past two decades (Fig. 2).

Geophysical survey at Tara

The value of using non-invasive geophysical prospection methods, in particular magnetometry and electrical resistance, was clearly illustrated by the results of the initial Tara survey. This was highlighted once again, in the most dramatic fashion, by the discovery in 1998–9 of the so-called 'Ditched Pit Enclosure', a great ceremonial precinct or henge measuring 210m north/south by 175m east/west, within which the multi-period Rath of the Synods is centrally placed. Building on the success of these

investigations, a more extensive programme of geophysical survey, involving no less than five separate campaigns of fieldwork, has been under way at Tara over the past fifteen years.

Four large-scale surveys were undertaken at various stages between 2002 and 2010 as part of a long-standing



BOX 1—The advancing pace of survey at Tara

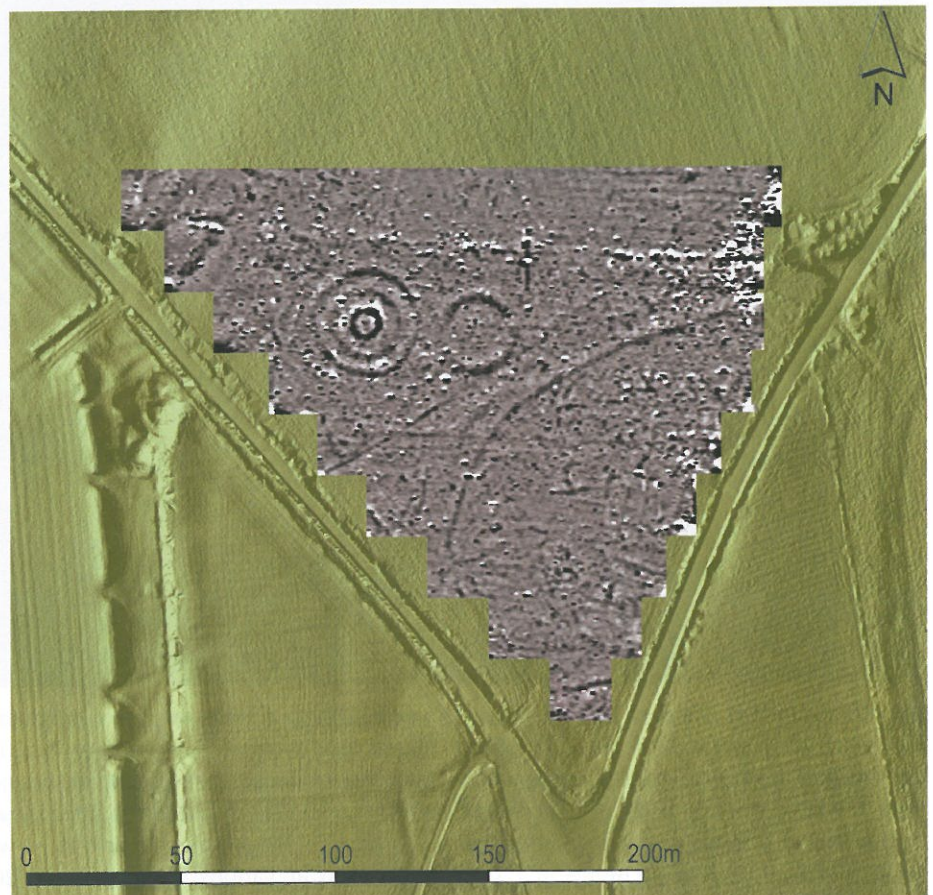
Prior to the most recent RGK survey, all geophysical investigations at Tara were conducted within the constraints of a grid of 'squares' or 'panels' aligned to synchronise with 10m multiples of the Irish Grid. The grid, therefore, provided the means by which the individual geophysical data values could be assigned to their precise locational coordinate. The original fluxgate gradiometer survey, using a Geoscan FM36 instrument, was conducted within 10m x 10m survey panels at 0.5m sample and traverse intervals to a survey resolution of 0.1nT, while the electrical resistance survey, employing a Geoscan RM15, was undertaken at 0.5m sample intervals along parallel transects set 1m apart. Subsequent surveys utilised Bartington Grad 601 single- and dual-sensor instruments within 20m x 20m panels. In this instance data were typically collected at 0.25m x 0.5m intervals, though higher (0.25m x 0.25m) and lower (0.25m x 1m) sampling strategies were also employed, depending on the nature of the area being investigated. Similarly, some follow-up electrical resistance surveys over selected areas were conducted at a 0.5m x 0.5m spatial resolution. Magnetic susceptibility surveys, using a Bartington MS2 with MS2D search loop, were carried out at either a 1m or 5m sample resolution.

The RGK survey applies an entirely different survey methodology, employing a differential GPS to provide locational control. In this instance a linear array of sixteen fluxgate gradiometers set 0.25m apart is fixed to a 4m-wide wheeled sensor frame, which is towed behind an ATV (Fig. 3). The sensor frame is positioned at right angles to a 6m-long tow-bar to avoid magnetic disturbances from the vehicle. In order to reduce vibration during operation, the wheels are attached by spring-suspension to the frame. The magnetometer system comprises sixteen FGM-650B tension band vertical fluxgate gradiometers with a 650mm sensor separation, a measurement range of ± 3000 nanoTesla (nT) and a 0.1nT sensitivity. With speeds of approximately 12–16kph and a sample rate of twenty readings per second, the system records real-time ITM/ING xyz data on a mesh of 0.25m by approximately 0.3m. The sampling density, therefore, exceeds that of previous magnetometer surveys and the speed of data capture is significantly faster. Moreover, the differential GPS (in this case a Trimble RTK-DGPS) enables the survey to proceed without the need for a pegged-out survey grid or the requirement to assign coordinates to the dataset on completion of the survey, as was the case in earlier surveys.

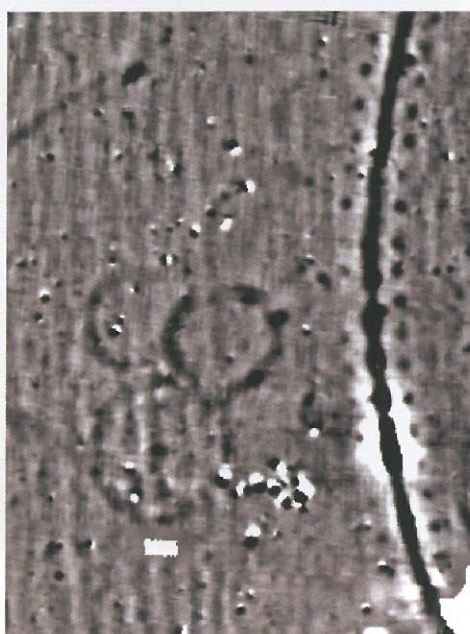
While all of the magnetometer surveys up to 2010 utilised hand-held, single- or dual-system instruments (Geoscan FM36 and Bartington Grad 601 fluxgate gradiometers), with data collected within a pre-established survey grid, the RGK operates, amongst other devices, a sixteen-channel magnetometer (SENSYS MAGNETO®-MX ARCH) towed by an all-terrain vehicle (ATV) incorporating differential GPS (Fig. 3). Over relatively flat terrain, this allows for significantly faster data capture and greater sampling density (see Box 1).

The overall scale of the geophysical investigations undertaken at Tara to date is substantial. The combined

magnetometer surveys cover an area of approximately 50ha, with maximum dimensions of over 1.4km north/south by 0.9km east/west, making this the largest detailed survey of its kind ever undertaken in Ireland. In addition to providing new insights into some of the most prominent upstanding monuments at Tara, the surveys have revealed a wealth of previously unrecorded archaeological monuments and features that lie hidden below the ground surface. These include numerous ring-ditches, which further emphasise Tara's enduring importance as a ceremonial campus and necropolis in prehistory, as well as a variety of enclosures, some of which were originally



Above: Fig. 4—The results of magnetometer survey in Cabragh townland overlaid on a relief-shaded digital terrain model generated from LiDAR data. Located just to the north-east of Tech Midchúarta (the 'Banquet Hall'), the survey revealed an intriguing array of features, including the remains of two circular enclosures or barrows and several long-running ditches. The larger of the two enclosures, measuring some 36m in maximum diameter, is defined by three concentric ditches, each probably originally surrounded by an earthen bank, forming a multivallate ring-barrow. Remarkably, although this monument exhibits no surface traces and is not recorded on Ordnance Survey maps, it corresponds almost exactly with the location proposed by George Petrie in 1839 for *Treduma Ness*, the 'triple mound (or rampart) of Ness', the reputed grave of the mother of the Ulster king Conchobar mac Nessa, according to *dindshenchas* ('lore of places'). The increased magnetic values recorded by survey over the innermost ditch of the monument suggest that it might contain burnt or fired material.



Left: Fig. 5—A comparison of the results of the magnetometer surveys undertaken around the western perimeter of the Ditched Pit Enclosure (survey location indicated on LiDAR image at top) in the late 1990s (bottom left) and 2014 (bottom right), using different survey instruments and sampling densities. As well as improving the clarity of small-scale features, such as the pits to either side of the large enclosure ditch, the high-density sampling employed by the 2014 survey has revealed the weak magnetic footprint of two additional ring-ditches directly to the north-east of the three ring-ditches previously recorded.

Tara, including the excavations conducted at the Mound of the Hostages and the Rath of the Synods in the 1950s. Notwithstanding the unprecedented increase in data and knowledge gained over recent years, however, there is still much to learn and to explore. The exceptional archaeological opportunities that Tara affords in combination with advances in geophysical and survey technologies are once again providing the impetus for a renewed programme of collaborative investigation—this time with an international dimension. ■

Acknowledgements

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Further reading

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defined by timber palisades and others by more elaborate boundaries composed of multiple banks and ditches (Fig. 4). Particularly compelling is a series of large palisaded enclosures discovered inside Ráith na Ríg, which shed new light on the complex history of activity on this part of the hill and how sacred space was structured and organised at various times in the past. Moreover, the higher sampling density employed by the most recent survey has yielded valuable new structural details as well as revealing additional archaeological monuments that had previously escaped detection (Fig. 5). These and other important discoveries represent a significant addition to the impressive assemblage of previously recorded monuments, and bring the total number of known sites at Tara to well over 100.

Critical analysis and interpretation of these data are now well under way and are set to open the door to further advances in our understanding of the composition and development of this most exceptional landscape. GIS offers a particularly effective and dynamic tool for managing and analysing the extensive suite of geophysical, aerial photographic and LiDAR data from Tara. It provides a significant aid to data visualisation and a powerful means of investigating, manipulating and modelling the various datasets towards an integrated archaeological interpretation. Publication of the results of this work will mark an important milestone in what has been a very active period of fieldwork and scholarship since the turn of the millennium, as illustrated by several major publications on the kingship, landscape and monuments of