RIA Acadamh Ríoga na hÉireann
Royal Irish Academy

Nowlan Digitisation Grant

Recipient name:	Professor Gabriel Cooney
Discipline and subject area:	Nowlan Digitisation Grant
Year awarded:	2022
Title of project:	The Irish Stone Axe Project (ISAP) Digital Collection: Digital assets to support the development of an online ISAP website

Introduction:
The Irish Stone Axe Project (ISAP) has established a database incorporating contextual, morphological and petrological information on over 21,000 stone axeheads with an Irish provenance. Significant funding from the Heritage Council in the 1990s - early 2000s enabled the primary period of fieldwork and research. The data is complemented by photographs, drawings and photographs of petrological thin sections. This project created a number of digital objects/assets for 366 axeheads to be made available as the first tranche of an ISAP collection through the Digital Repository of Ireland (DRI), as a publicly accessible repository. The longer-term objective is to create an easy-to-use online ISAP website, providing academic and public awareness of this major national source of archaeological information.

Please outline the objectives of the project.
ISAP is a long-term project has been running since the early 1990s. There are over 21,000 axeheads on the ISAP database, making it by far the largest and most comprehensive archaeological database covering a specific artefact type at national level. The multidisciplinary approach and information technology utilized by ISAP was state of the art by the early 2000s. Twenty years later the project remains a benchmark against which artefact studies, specifically stone axe studies, are measured internationally. A recent focus of work has been on facilitating research and public access to the dataset and accompanying data assets by make the ISAP database available online. However, currently no data from the project is widely available to the public or other researchers. The current project aimed to bring added value and recognition of the ISAP project and its approach by making a set of important assets available digitally on the DRI.

Specific objectives
- Deposition of an ISAP media collection and associated metadata with the Digital Repository of Ireland.
- Making key and significant assets of ISAP; axehead drawings, photographs and photographs of thin sections available as accessible public assets, enabling further research use.
- Protecting the future of the physical archive.

The digital assets will reduce the requirement for access to the original artefacts and thus improve their preservation. The ability to reuse the digital objects within the DRI through DOIs will enable the ISAP collection to be integrated and reused within future archaeological tool development and data assimilation. The metadata and data

management of the objects in the ISAP DRI collection provides a model for the future and sustainable management of archaeological data, specifically artefactual data.

Please outline the findings of your research and/or milestones achieved.

• Deposition of the ISAP media collection and associated metadata with the Digital Repository of Ireland.

The ISAP collection adds to the archaeological collection holdings in the DRI, creating a digital archive of international value to stone axe studies. A collection of digital assets for 266 axeheads [366 axehead drawings, 2-4 photographs of each axehead totalling 1169 photographs and 1-3 photographs of thin sections totalling 758 thin-section photographs] which have been cored for microscopic petrological (and geochemical) identification as part of the ISAP programme of research will now be available on DRI. This will form a significant collection of archaeological images on the DRI.

• Making key and significant assets of ISAP, axehead drawings, photographs and photographs of thin sections, available as accessible public assets, enabling further research use.

The decision to focus the ISAP digital collection on axeheads which had been cored facilitates public and academic accessibility to those axeheads with an Irish provenance, which have the greatest amount of research information, as a knowledge and research resource. These axeheads have played and continue to play an important role in ISAP research and publications to date. Their wider availability will enable further and wider research use. As proof of concept of the value of this resource it will provide a foundation for a more substantial grant application to update the ISAP database and make it accessible as a website.

• Protecting the future of the physical archive.

The digital assets will reduce the requirement for access to the original artefacts and thus improve their preservation. The ISAP digital collection on the DRI makes the information about this important data set publicly available. The axeheads themselves are primarily from the collections of the National Museum of Ireland and the Ulster Museum. The physical archive of drawings, photographs of the objects, thin sections extracted from the axeheads and the photographs of these thin sections are currently housed in the School of Archaeology, University College Dublin. The ISAP digital collection on the DRI will reduce the requirement for access both to the objects and the associated archive. As a direct outcome of the project and in recognition of the value of the ISAP physical archive, the Irish Antiquities Division, National Museum of Ireland are currently considering housing the archive with the full agreement of the UCD School of Archaeology. This would be an appropriate location and recognises the national value of this archive.

• The ability to reuse the digital objects within the DRI through DOIs will enable the ISAP collection to be integrated and reused within future archaeological tool development and data assimilation.

The ISAP digital collection will provide academic and public awareness of this major national source of information on the most significant archaeological object type from Irish prehistory. The ability to access digital assets on a cumulative or individual basis using digital object identifiers (DOIs) will enhance the value of ISAP as a vehicle for archaeological research and should also stimulate further research, for example on data assimilation.

• The metadata and data management of the objects in the ISAP DRI collection provides a model for the future and sustainable management of archaeological data, specifically artefactual data.

The current project facilitated a rigorous data management structure being put in place. At a national level this provides a model for the management of archaeological data. At a more specific level in the context of ISAP, such a data management structure is essential to any further or larger applications for funding. The ultimate objective is to create an easy-to-use ISAP website. This would be directly linked to the DRI ISAP collection.

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Please describe the methodology used in conducting the research

The methodology was based on the DRI Depositor Manual (https://guides.dri.ie/depositorguide/index.html). Using DRI terminology the Principal Investigator was the Authorized User. Mr Anthony Corns, Technology Manager, the Discovery Programme (under whose auspices the collection will be published in the DRI) acted as the Manager User. Dr David Stone, now of the Discovery Programme, provided research assistance. The Principal Investigator and Mr Corns worked in collaboration with the research team (specifically Dr Stephen Mandal - work on petrological thin sections and Dr Bernard Gilhooly - liaison with the National Museum of Ireland).

The methodology adopted recognised that long-term digital preservation of data is an essential part of Open Access, and the FAIR data principles of findability, accessibility, interoperability and reusability.

1.Evaluation of Collection

The assets in the ISAP collection that were assessed consisted of:

- Drawings of 2,300 axeheads in the ISAP database.
- Photographs of 800 axeheads in the ISAP database.
- Photographs of 500 plus polished thin sections from axeheads that were cored to obtain microscopic petrological identification.

Following on from the evaluation a decision was made to focus on the 500 plus axeheads that have the greatest potential in terms of digital assets, namely the axeheads that had been thin-sectioned. For these axeheads the following digital assets could be developed and delivered: drawings, photographs and photographs of thin sections.

2. Data Preparation

Best practice guidelines (provided by the DRI) were followed in terms of digital formats and metadata creation to allow interoperability and to enhance discoverability. Working with the DRI and the Discovery Programme, recommended formats to facilitate the ingestion of data to the DRI were adopted. The information on the axeheads that had been cored was reviewed. Digitisation of assets had been carried out several years previously. The quality of the previous digitisation was assessed- including image quality, resolution, bit depth and file formation. The copyright and reuse status of the collection was reviewed.

A programme of digitisation of missing assets was carried out. This resulted in the 366 axeheads that were identified for ingestion onto the DRI. This leaves over 140 axeheads that have been cored as part of the ISAP programme of research for a subsequent and further stage of work.

3. Ingest Digital objects/assets

The appropriate mechanism for data ingestion to the DRI was followed. In line with the development of metadata standards a DRI collection was created before ingestion. The ISAP collection organizes the digital assets by type (axehead drawings, photographs and thin-section photographs), each accompanied by metadata. These are linked to specific axeheads via the ISAP number identifier.

NOTE: It is anticipated that the database will also be ingested as a file onto DRI.

To follow:

4. Publish the ISAP collection

The ISAP collection is included in the Discovery Programme of material to be ingested by DRI in 2023. The collection will be reviewed to ensure that appropriate access restrictions, copyright statements and licences (if needed) were set. The metadata for each digital asset has been reviewed to ensure it is appropriate and accurate. At this stage the Advisory Manager will publish the collection. DRI will then mint a digital object identifier (DOI) for each digital object and the collection will be made available to end-users in accordance with the access permissions set. All metadata will be available through CCO licence.

5. Preservation and Reuse

Once the ISAP collection is published on the DRI platform, the digital objects/assets will be stored for reliable long-term access and preservation. It is intended that the licence attached to the digital objects will allow others to reuse these digital objects for their interest and research. It is intended that the ISAP collection will be dynamic and that additional objects will be added to the collection if/when funding facilitates further work. The second tranche of 140 axeheads that have been cored by ISAP and have the richest research value will be ingested as soon as possible.

During Stages 4 and 5 there will be a programme of awareness raising led by the Principal Investigator to stimulate interest and to highlight the content and availability of the ISAP collection on the DRI, at national and international level. It is anticipated that this will include a piece in Archaeology Ireland and contact with colleagues in relevant international fora, such as the Implement Petrology Group (UK and Europe) and the Quarries Interest Group of the Society for American Archaeology (North America).

Please provide details of the dissemination of the outcomes from this project.

When the ISAP collection is published on the DRI platform there will be a programme of awareness-raising led by the Principal Investigator to stimulate interest and to highlight the content and availability of the ISAP collection on the DRI, at national and international level. It is anticipated that this will include a piece in Archaeology Ireland and contact with international colleagues in relevant international fora, such as the Implement Petrology Group (UK and Europe) and the Quarries Interest Group of the Society for American Archaeology (North America).

The Principal Investigator was involved in the SEADDA (Saving European Archaeology from a Digital Dark Age: EU-Funded) workshop hosted by the Discovery Programme and held in the Royal Irish Academy in May 2023. This provided the opportunity to meet and engage with colleagues from the DRI and Irish and international colleagues in this field about the ISAP digital collection.

How will you continue to communicate the results of your project and what are your publication plans?

When the ISAP collection is published as noted and detailed above there will be a programme of awareness-raising led by the Principal Investigator. The Discovery Programme and the School of Archaeology have committed to feature publication of the collection on their respective websites and to feature it in their social media outputs. It is intended to submit a piece on the collection to Archaeology Ireland.

Immediate publication plans relate a paper on the Eagle's Nest, Lambay stone axehead quarry site which will be submitted in September 2023 to World Archaeology; an international peer-reviewed journal published by Routledge. A number of porphyritic andesite axeheads from this quarry site are included in the ISAP DRI digital collection and are relevant to the discussion in the paper. The focus of the ISAP DRI digital collection is on stone axeheads cored in the 1990s as part of the programme of research by the Irish Stone Axe Project to provide microscopic petrological information, and geochemical information. The public availability of the data in the collection provides a timely

opportunity for a review of that work thirty years on. This would be submitted to an international peer-reviewed journal.

How did the bursary enhance your professional development (e.g. in terms of specific opportunities, opportunities for enhancing skills, collaboration with others etc.)?
The project provided a key opportunity for collaboration with appropriate colleagues and institutions to sustain the digital and physical archive of the Irish Stone Axe Project and the potential to renew a programme of ISAP research.

What plans (if any) do you have to further your proposal/project?
This project created a number of digital objects/assets for 366 axeheads to be available as the first tranche of an ISAP collection through the Digital Repository of Ireland (DRI), as a publicly accessible repository. There will be a second tranche to ingest the remaining 140 axeheads that have been cored as part of the ISAP research programme with potential further tranches. The longer-term objective is to create an easy-to-use online ISAP website, providing academic and public awareness of this major national source of archaeological information.