Institution: University of York
Unit of assessment: Archaeology (15)

Section 1. Unit context and structure, research and impact strategy

1.1 Context and structure

The Department of Archaeology has built significantly on its achievements since REF2014 and maintained its vitality and sustainability through a major increase in income generation, recruitment of high-quality staff and investment in exceptional research infrastructure and facilities. We have developed strategies which facilitate impact-orientated, interdisciplinary and international research of the highest quality through our strong network of partnerships. Equality, diversity and inclusion are at our core and we promote a collegial environment in which staff and students feel supported and valued, enabling excellent research to flourish.

The department has a long-established reputation in **Roman, Medieval and Historical Archaeology**, **Digital Archaeology** including the Archaeology Data Service (ADS), **Field Archaeology** and **Buildings Conservation and Heritage**. About 15 years ago we successfully diversified into **Bioarchaeology, Prehistory and Human Evolution**, and from 2016 4 staff from the Centre for Anatomical and Human Sciences, based at Hull York Medical School, were embedded in the department in a research capacity. More recently the department has diversified further into **African Archaeology** and **Experimental Archaeology and Artefact studies**. These areas form research clusters with many staff working in and across multiple areas.

The department leads 6 research centres facilitating strong interactions within the department, across the University and internationally with a wide range of external partners:

- **BioArCh**: a collaboration between **Bio**logy, **Ar**chaeology and **Ch**emistry, bridging the Arts and Humanities and Sciences creating a unique concentration of expertise in world-leading archaeological science
- **Centre for Applied Heritage Studies**: draws together researchers from across the heritage sector to develop cross-disciplinary and international research collaborations
- **Centre for Conservation Studies**: leads research in the conservation and management of cultural heritage working with key organisations, institutions and professionals

- **Centre for Digital Heritage (CDH)**: brings together researchers from all 3 faculties as well as the universities of Aarhus, Leiden, Lund and Uppsala to undertake interdisciplinary research in data management, analysis and visualisation
- **Centre for Human Palaeoecology and Evolutionary Origins**: brings together evolutionary anatomy, prehistory, aDNA, biodiversity, psychology, geochronology and palaeoenvironmental studies to address human evolution and environmental setting
- **York Experimental Archaeology Research (YEAR) Centre**: brings together researchers working on experimental archaeology, material culture and wellbeing

The department is a member of the Faculty of Arts and Humanities and is a partner in the faculty's 4 internationally-renowned interdisciplinary period centres: **Centre for Medieval Studies**, **Centre for Renaissance and Early Modern Studies**, **Centre for Eighteenth Century Studies** and the **Centre for Modern Studies**.

We are also a partner in the 10-year, £10m **Leverhulme Centre for Anthropocene Biodiversity (LCAB)**, funded from 2019 to research neglected societal and biological processes underpinning biodiversity gains and losses, and influencing society's response (Institutional Environment Statement (IES) 2.11d).

From the start of this REF cycle we developed a new management structure to support research. Research is led by the Chair of Departmental Research Committee (DRC) and impact by the Impact Lead. Research operations are supported by a Research Support Team made up of a Research Manager and 2 Finance Administrators (we are the only Arts and Humanities department at York to invest in research support in this way). Regular meetings support strategy and REF:

- DRC: develops the research plans of the department, sets expectations (see 2.1), promotes the research culture of the department and ensures all staff contribute to fulfilment of the department's research plans. In our drive for inclusivity, all academic and research staff are members and it meets in termly Awaydays
- REQUIP (Research Excellence Quality and Integrity Panel): assesses the quality of REF outputs, meets at least once per term (see 2.7)
- Impact meetings: once a term with potential Impact Case Study leads and Research Manager
- RMT (Research Management Team): meets at least once per term, composed of Head of Department, Chair DRC, Impact Lead and Research Manager to discuss Research and Impact strategies, 5-year plans (see 2.1) and management of research

1.2 Strategic aims for research
In REF2014 we identified 4 research objectives. We have selected highlights to demonstrate our achievements.

Research Objective 1: To pioneer research into the historic and natural environment, its management and sustainability.
Research income of >£8m facilitated groundbreaking fieldwork and investigations on a global scale, using cutting-edge methods and leading, for example, to impacts demonstrated in REF3 "Stonehenge". Other research highlights include:

- Researching changes of demography, agricultural production and trade in Sicily through 5 regimes (ERC-Adv, 2016–21)
- Investigating changes in settlements, religious, commercial and political centres alongside cultural and environmental changes in south-west Europe (AHRC 2018–22)
- Contributing archaeological insights in the co-design of agricultural soil erosion mitigation in Tanzania and Ethiopia (AHRC/GCRF, 2019–21)

Research Objective 2. **To be a centre for the interpretation and management of cultural heritage around the world**.

Research income of >£1.4m has built capacity and pioneered new methods for interpretation and management of cultural heritage leading to impacts around the globe as demonstrated in REF3: "Digital Heritage". Other research highlights include:

- Promoting and protecting marine cultural heritage on the east African coast (AHRC/GCRF, 2017–20)
- Working with some of the poorest communities in Brazil to show how tangible heritage including traditional fish traps are influencing challenges of food security and poverty alleviation (British Academy, 2015–16)
- Working with indigenous communities in Ecuador to show how intangible heritage such as belief systems offer solutions to development policies that are sensitive to indigenous and minority people's health needs (EC, Schofield, 2016–19)

Research Objective 3. **To develop new methods to make archaeological data as broadly accessible as possible**.

Research and consultancy income of >£3.5m has facilitated development of our digital research, the impacts of which are demonstrated in REF3 "ADS". Other research highlights include:

- Producing the widely-acclaimed Roman Rural Settlement database and interactive map-based interface (Leverhulme, 2015–17)
- Providing an open access visual database for the Corpus of Anglo-Saxon Stone sculpture (AHRC, 2017–21)
- Collaborating across Europe to create a new transnational portal presenting UK data at a European level (EC, 2019–23) and bringing archaeologists and data management specialists together to create resources setting the agenda for archaeological archiving across Europe (COST Association, 2019–23)

Research Objective 4. **To effectively integrate the latest bioscience technologies into archaeological science**.

Research income of >£6m has facilitated major methodological breakthroughs in bioarchaeological research leading to impacts demonstrated in REF3 "Stonehenge". Other research highlights include:

- Exploring historic human-associated microbiota encased in parchment (British Academy, 2014–19; EC, 2017–19)
- Using DNA, proteomic and isotope analysis to investigate changes in marine ecosystems (EC, 2015–17, 2019–22)
- Applying biomolecular, spectrometric and microscopic techniques to mineralised human dental plaque to investigate how past environments impacted human diet and health (Wellcome Trust, 2015–17, 2018–21; Philip Leverhulme Prize, 2017–19)

1.3 Future strategic aims

Our research foci are well-established and remain broadly similar, but in the context of the developing interests of established staff and new appointments our aims for the next 5 years have been refined:

Strategic Aim 1: to conduct pioneering research projects in the historic and natural environment. We will continue to develop field projects which deploy innovative techniques to answer global challenges. Our strengths in a range of practice from excavation to buildings and landscapes provide opportunities to develop projects aligned with our strengths in Human Evolution and Prehistory, Roman, Medieval and Historical, and African Archaeology.

Strategic Aim 2: to develop and deploy new digital data management, analysis and visualisation techniques to interrogate the archaeological record and make archaeological data sustainable and accessible. Our strength in digital technologies through the Digital Archaeology research cluster is bound closely to ADS and CDH; two foundational centres which lead the sector in data archiving and accessibility, analysis and visualisation.

Strategic Aim 3: to develop new directions in bioarchaeological and biomolecular research as leading aspects of archaeological science. Having been a pioneering exponent of new methods in biomolecular techniques and their application in a broad range of contexts we will continue to develop advances supported by our investment in staff and infrastructure at BioArCh (see 3.3).

Strategic Aim 4: to develop new research into material culture and experimental archaeology. This new research aim reflects recent appointments, the development of the research cluster in this subject, and investment in new facilities and infrastructure (see 3.3).

1.4 Strategic objectives for impact
The department enables the achievement of impact through 5 strategic objectives set out in our Impact Strategy.

Impact Objective 1. To communicate the importance and nature of research impact to all staff. Impact is embedded in staff 5-year plans and the University's progression framework (IES 3.21) and promoted through tailored events (e.g. Impact Awayday), discussion at DRC, and engagement with University-wide events (e.g. termly impact forum).

Impact Objective 2. To build awareness of the needs of the non-academic community and establish and maintain effective relationships with key organisations. We maintain close links with the non-academic community through research collaborations and contributions to regional, national and international bodies (see 4.1, 4.6). Key organisations are represented on our Departmental Advisory Board (see 4.2).

Impact Objective 3. To support the translation, application and adoption of our research to novel areas: to influence individual behaviour, organisational practice and/or policy. Academic 5-year plans map out support required. Funding is awarded on a competitive basis from internal and external sources.

Impact Objective 4. To provide support for staff to effectively capture and evaluate impact activities. The University provides an impact toolkit comprising resources for the capture and evaluation of impact. Support is provided by our Research Manager and Faculty Impact Administrator.

Impact Objective 5. Appropriate documentation of impacts. All impacts are recorded in the University's research information system with evidence collected, indexed and stored in accordance with GDPR.

Our Impact Strategy is reviewed annually by DRC and RMT, enabling us to shape and adapt our plans to ensure future vitality and sustainability. Looking forward we will target 3 key areas:

- **Public Understanding** of the past is essential in shaping the future. We will work with collaborators in cultural heritage institutions and the private sector in the UK and internationally to provide visitor experiences and resources, making creative use of conventional and digital technologies to enhance public understanding of our research for diverse audiences.

- **Infrastructure**: development attendant on national demand for housing and infrastructure projects, such as HS2, produce a prodigious amount of new archaeological data. We will

develop new ways of archiving and presenting that data to diverse audiences supporting the Open Access and Open Data agendas while working internationally to foster the development of digital infrastructure overseas.

- **Policy**: influencing decision-making at the highest level whether at home or abroad is essential for the archaeological resource and for the management of cultural heritage. Working within interdisciplinary groups (such as LCAB) we will extend our impacts into policy, with a focus on environmental sustainability and resilience.

Our approach to achieving impact is reflected in REF3.

In **"Stonehenge"** we illustrate the value of translating our research for diverse audiences. Responding to the needs of users is evident in the provision of teaching resources reflecting the introduction of Prehistory into the UK National Curriculum. Influencing organisational practice is demonstrated in the pioneering exhibition format influencing decision-making at the site.

In **"ADS"** we respond to the needs of the professional sector in its increasing obligations to make data available and re-usable. We are influencing organisational policy and practice through the extension of the Grey Literature Library and OASIS and maintaining effective relationships with key organisations supporting digital archiving worldwide.

In **"Digital heritage"** we demonstrate how we support the translation of our innovative digital research for the benefit of heritage presentations, such as the use of chatbots to enhance visitor engagement at Çatalhöyük. We show how we are influencing individual behaviour and organisational practice at heritage sites in Egypt and the UK.

1.5 Supporting interdisciplinary research

Our Research Strategy (2013–2023) advocates core disciplinary activity and the encouragement of interdisciplinary research as complementary processes, promoting, in particular, the integration of science and the humanities. We support engagement with University Research Themes and challenge-led interdisciplinary centres (IES 1.4, 4.42–45) through collaborative projects such as investigations with Health Sciences into Autism Spectrum Disorder perspectives on the built environment, and the origins of healthcare in its social context.

In the faculty we promote interdisciplinarity through leadership and participation in internationally renowned thematic and period-based centres (see 1.1), fostering interdisciplinary research partnerships. The Humanities Research Centre (HRC, see 3.3) hosts regular fora, including 'Lightning Rods', to stimulate new cross-disciplinary research ideas. In the department, interdisciplinarity is promoted by mentors, through the promotion of interdisciplinary networks and centres, and shared appointments of 5 staff with Environment and Geography and the Hull York Medical School.

Our approach has resulted in significant grant income arising from interdisciplinary research. "EUROTAST" a Marie Skłodowska-Curie ITN, for example, brought together expertise from, amongst others, the Institute of Molecular Pathology and Immunology (University of Porto), Faculty of Legal Medicine (University of Santiago de Compostela) and the Wilberforce Institute for the Study of Slavery and Emancipation (University of Hull). Research impact has been strengthened by interdisciplinary collaboration (see 4.5) and we have produced significant interdisciplinary publications (REF2, see 4.1). Our approach also provides interdisciplinary learning for our research students, contributing to the sustainability of the role of archaeology in addressing future global challenges. In the REF cycle at least 12% of awards were the result of interdisciplinary collaboration.

New awards promote the sustainability of our interdisciplinary approach over the next 5 years, for example, "SEACHANGE" (ERC-Synergy) will explore the impact of major cultural transitions on marine ecosystem functioning and biodiversity in collaboration with the Institute of Geosciences

(Mainz), Life and Environmental Sciences (Exeter), Natural History Museum of Denmark (Copenhagen), School of Molecular and Life Sciences (Perth) and the School of Earth and Environmental Sciences (Brisbane).

1.6 Open research environment
Open Access (OA) is fundamentally important and our focus is on producing rigorous research that can be scrutinised and communicated to key stakeholders. Our department is at the forefront of championing open science practices in the University; Richards was the founding chair of the University's Research Data Management Group. The department has gone beyond the basic professional ethic of accessible archival data by hosting ADS and establishing the first OA archaeology journal, *Internet Archaeology*, nearly 25 years ago. The ADS is the only accredited digital repository for heritage data in the UK, and described by the UKRI as: **"a world-leading digital heritage data archive that has been leading the development of digital preservation since 1996."**

In addition to making use of institutional OA funds, DRC manages an annual budget to fund Author Processing Charges and data deposit charges. Articles in *Internet Archaeology* can be published with seamless links to supporting data in ADS. The department has also made extensive use of the new OA White Rose University Press (IES 2.16). Star Carr (REF2) was the press' first monograph (over 28,000 views and downloads since 2018 and almost 1000 views within the first 3 days); now followed by Sheffield Castle (REF2). Meanwhile Landscape and Settlement in the Vale of York (REF2) presents major excavations undertaken in advance of York's Heslington East campus in an OA monograph published by the Society of Antiquaries. All three have Open Data archives with ADS.

Within the University, Archaeology is second only to Chemistry in having the largest number of data-sets recorded in the York Research Database. Staff are expected to register for ORCIDs, and data-sets are provided with DOIs. Our research students are given training in research data management and, where appropriate, they are expected to develop Data Management Plans, monitored via the Thesis Advisory Panels (see 2.6).

1.7 Supporting a culture of research integrity
Our departmental Ethics Committee supports our strong culture of research integrity with processes embedded within faculty and University structures and policies (IES 2.14). Data collection requires explicit approval; we have integrated guidelines for social media use and international collaboration. We work jointly with Biology to ensure rigorous ethical research in bioarchaeology. All research funding proposals are subject to ethical review. Our committee is supported by the Arts and Humanities Ethics Committee which reports to the University's Academic Ethics Compliance Committee (AECC). It produces an annual ethics return for AECC highlighting issues and best practice, analysing results and action plans.

In pioneering Open Data, open research, and the implementation of the FAIR data principles, the University subscribes to the UK Research Integrity Office; we are compliant with the UUK Concordat codes of practice on research integrity, principles of good ethical governance and research misconduct.

Section 2. People

2.1 Staff development strategy

The University offers a structured programme for staff development at all career points (IES 3.22).

All staff undertake departmental induction including training in unconscious bias, equality, diversity and GDPR. An online handbook provides detailed guidance and support. All new academic staff are placed on a 2-year University probation when progress is monitored and reviewed by their line manager twice a year. On completion, staff move to annual Performance and Development Reviews (PDRs). All staff have a mentor and may specify gender. Staff are supported through PDRs and one-to-one meetings to produce high-quality research outputs, develop grant applications and pathways to impact.

Research expectations are available in our online handbook. Staff can access the requirements for all grades enabling them to plan their development. Our expectations were established through inclusive discussion at an Awayday and have been adopted by the University as best practice. Concurrently, the department introduced 5-year plans, encouraging staff to plan their outputs, grant applications, conference participation and impact activities, enabling DRC to provide guidance and support. Expectations and 5-year plans feed into PDR, where both long-term and 12-month objectives are set and reviewed. Administrative roles are assigned by the HoD in consultation with staff, and ensuring equality of opportunity. They are reviewed after 3 years.

Staff career development is aligned with the Concordat to Support the Career Development of Researchers, leading to the following example initiatives:
- 10 days/year (minimum) are made available through our workload model for professional development. Resources include the award-winning University Research Excellence Training Team (IES 3.32). Nine (7F, 2M) academic staff have completed leadership training. Development and training are also provided within the department, e.g. CVs for Promotion', led by Milner who has been recognised for championing female promotion across the University.
- An academic staff member is our Careers Liaison Officer, chairing a departmental committee, planning and providing resources and events in partnership with the careers service, including CV workshops for fellows, postdocs and research students
- Research Associate status is offered to PhDs and research staff leaving at the end of fixed-term contracts to extend access to emails and e-resources as a stepping-stone to career development
- We seek to retain and develop staff through evolving current roles, mentoring, secondments and promotions. Research-related secondments over the REF cycle include: Acting Director HRC, Acting Associate Dean for Research, 2 x WRoCAH Directors

2.2. Staffing and recruitment policy

We aim to recruit the best research active staff in order to sustain our competitive strength by providing a stimulating research environment, underpinned by a commitment to equality, diversity and inclusion (Research Strategy 2013–2023).

In accordance with our Concordat implementation plan our job descriptions now minimise unconscious bias and we explicitly consider the gender balance during selection, interview panels and informal tours/lunch/meetings with department staff etc. Our EDI values encourage fair, transparent and merit-based recruitment (see 2.7). Our policy is to appoint on open contracts wherever possible.

Within this framework we welcome opportunities to appoint junior colleagues who can learn and develop their skills and expertise at York. A particular focus in identifying the best candidates who can contribute to our long-term research and impact environment is the encouragement of externally-funded fellows. In the REF cycle **we hosted 32 Marie Skłodowska-Curie Individual Fellows**, **3 British Academy Fellows, 1 Wellcome Trust Fellow** and **1 Newton Fellow**.

Reflecting the effectiveness of our policy, 4 of our 11 lecturer appointments in the REF cycle (6F, 5M) were former Marie Skłodowska-Curie Fellows. In order to retain a balanced department in terms of seniority and contribute new perspectives we have also appointed 2 professors (1F, 'Inspirational Research Leaders' programme, IES 3.20; 1M). A total of 85.8% of submitted staff FTE are on open contracts at the census date (only externally-funded research staff are on fixed-term contracts).

Our appointments have contributed >£2.3m to our research income. They have developed new research strengths, opening up collaborations and funding opportunities. The shared appointment of Stump (2018) with Environment and Geography allowed us to build our strength in African Archaeology and formalise a strategic collaboration. The appointment of Bickle (2014) facilitated underpinning research leading to impacts at Stonehenge (REF3).

Taking into account staff retirements and departures, in this REF cycle our **Category A FTE (excluding research-only) has increased from 19.6 to 24.8** (Figure 1). Our **gender balance has remained consistent at c.50%F** while our policies for staff development and recruitment have led to greater gender balance at senior levels, doubling our number of female professors and almost doubling our female senior lecturers through internal promotion, with the aim of achieving parity across all grades. Female staff have taken leadership roles including HoD, Deputy HoD and have been nominated for membership of University committees, e.g. Academic Promotions and Faculty Board. Throughout the REF cycle we have retained a balanced demographic in terms of seniority enabling us to provide leadership whilst also planning the succession of senior leaders and sustainability of the department through the mentorship of junior colleagues.
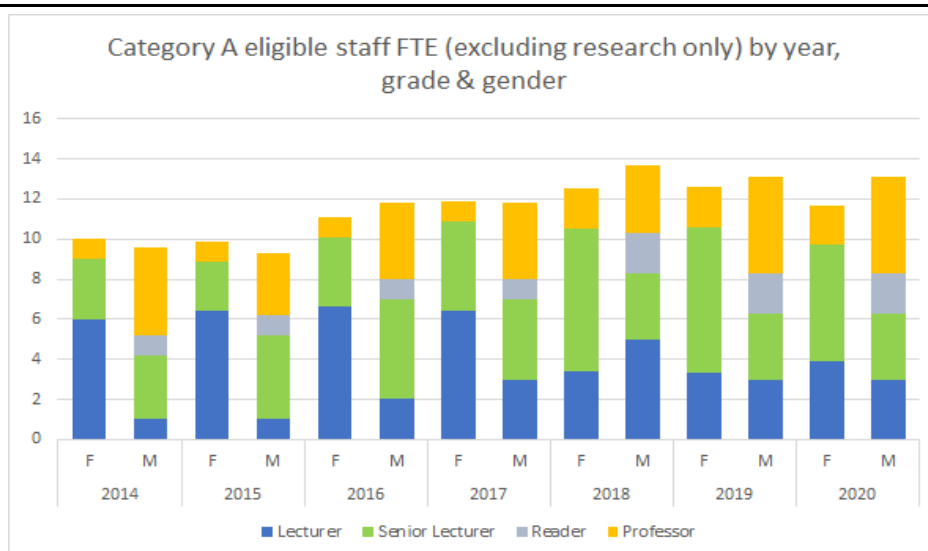
Figure 1. Category A eligible staff FTE.

2.3 Support for and integration for individuals at the beginning of their research careers
All new lecturers, postdocs and fellows undertake induction, probation and the PDR process with their PI/mentor (see 2.1) and are eligible to apply for departmental research funding.

We have created the role of Academic Liaison Officer who holds termly meetings with our postdocs and fellows to discuss career development, mentoring, grant support, publications and impact strategies. All staff are invited to weekly meetings and new appointees are asked to present their research at termly events to which all researchers are invited.

New lecturers are guaranteed a 600-hour reduction in their teaching load over the course of the first three years (300, 200, 100) to allow them to develop their research plans and profiles. In addition, they receive a further 50-hour reduction for each new module they develop.

Postdocs and fellows have made substantial contributions to the success of the department in the REF cycle, contributing to >30% of outputs (REF2) and establishing, for example, a botanical reference collection and new facilities such as the YEAR Centre (see 3.3).

2.4. Policy for research leave
In the REF cycle, research leave was raised to 1 year in 4 for all academic (research and teaching) staff, including part-time staff. Flexibility allows staff to spread this time over the 4-year period, or to take different terms, where possible. Leave is integrated into individual 5-year plans and PDR long-term objectives. A plan of work is submitted to the Research Management Team in advance and the mentor has regular catch-up sessions throughout the period. Research leave is also supported through external funding and fellowships including a *Pro Futura Scientia* fellowship (Swedish Collegium for Advanced Study, (2015–17), EURIAS Senior Fellowship (2016–17) and John Templeton Foundation (2016–17).

2.5 Recognising and rewarding staff
The department recognises and rewards staff in its support for promotion (see 2.1–2, 2.7), ensuring implementation of the University's promotions policy (IES 3.21) in relation to equality, diversity and inclusion, taking account of e.g. part-time working, caring responsibilities, long-term ill-health, inability to travel etc. In the REF cycle **16 staff have been promoted (9F, 7M)**.

All successes, whether being shortlisted for a prize, awarded a fellowship, or a new publication, are highlighted on our webpage, via social media and in our weekly staff meetings. Staff who have published books are offered a book launch. At the end of each term staff who have won grants

are celebrated in a presentation by the Chair of DRC. All staff receive a reward of 20 hours on the workload model for each grant submitted the previous year.

The department supports and enables its staff to achieve impact from their research through 3 key mechanisms (see also 1.3):
- Time - our workload model provides a 40% allocation for all academic (research and teaching) staff to undertake research and impact
- Support - the department has established an Impact Lead (who receives 100 hours on the workload model), supported by the departmental Research Manager, Arts and Humanities Faculty Research Impact Manager and Administrator, and University Impact Manager
- Funding - departmental funding complements external and institutional-level funding supporting pathways to impact such as the Feast exhibition (REF3 "Stonehenge") and evaluation of the impact of the ADS (REF3 "ADS")

2.6 Research students
We recruit doctoral research students on academic merit, fit to research expertise and aptitude, assessed through written work, transcripts and interviews. Since 2016, we have offered 2 Distance Learning PhD tracks in Archaeology and in Conservation Studies in response to a demand from professionals and international students.

The department competes for funding from the White Rose College of Arts and Humanities (WRoCAH), the AHRC Doctoral Training Partnership for the universities of York, Leeds and Sheffield. All WRoCAH applications are anonymised and gender specific pronouns removed to avoid unconscious bias.

We have hosted **68 studentships from major funding bodies** including 20 funded through WRoCAH, 14 Research Council studentships (9 AHRC, 1 EPSRC, 4 NERC), 2 Wellcome-funded and 6 through ERC projects. Ten studentships have been awarded through Marie Skłodowska-Curie ITNS. Sixteen studentships have been awarded under the AHRC CDA/CDP schemes promoting engagement with non-academic partners including York Archaeological Trust (2), City of York Council (3), Leeds Museums and Galleries (2), Council for British Archaeology (2), Historic England (1), English Heritage (1), British Museum (1), Natural History Museum (3) and National Museums Scotland (1).

All research students are provided with induction and an online handbook. Lecturers who have not supervised a PhD to completion are required to co-supervise with an experienced member of staff and complete the University's 'Being an Effective Supervisor' tutorial (IES 3.32). Supervisions are provided every 4–6 weeks, and recorded in Skillsforge, the University's online platform for supporting student development.

Every 6 months research students attend a Thesis Advisory Panel (TAP) consisting of chair, supervisor, and an independent member, the purpose of which is to discuss progress and training needs and to give advice on the direction of research and professional development (IES 3.31). Written work is provided in advance and progress assessed. Students complete tutorials on 'Being an Effective Researcher' and 'Research Integrity' before their first TAP and, where relevant, produce a data management plan (see 1.5).

A progression panel, independent of the supervisor(s), reviews progress annually. Year 1 students present their research to an audience of staff and peers in a Progression Symposium.

A total of **79.8 (REF 4a) PhDs have been awarded** over the period (only 1% failed progression).

The department, faculty and University provide support to research students for skills development and preparation for their future career in accordance with the Researcher Development Framework. All first-year research students complete a Professional Development Plan (PDP) underpinned by a Training Needs Analysis. Example training opportunities include:

- Online 'Employability' tutorials and tailored employability provision provided by the Careers Office including the York Learning and Teaching Award programme
- Resources/training provided by the University's Research Excellence Training Team alongside specialist department training such as CV workshops, presenting research, and developing a social media presence (IES 3.32)
- The opportunity to train and work as a Graduate Teaching Assistant and undertake the Postgraduate Certificate in Academic Practice
- Gaining experience of presenting research in our weekly Research Forum
- Opportunities/support to apply for external funding as well as 3 departmental funding competitions (>£27k awarded): conferences and pump-priming; Open Access Publication; and Data Curation
- WRoCAH students are provided with a bespoke training programme, focussed on research management, employability and internationalisation

The HRC also offers an annual programme of training for PGR students across the faculty, including giving a conference paper, getting published, applying for project funding, and designing and managing questionnaires for research.

2.7 Equality, diversity and inclusion

We achieved **Athena Swan Bronze** at department level in 2018, reflecting a long-standing commitment to gender equality, and are aiming for Silver in 2022. The action plan is embedded within the processes of all departmental meetings. Feedback from Athena Swan praised existing measures, recognising intersectionality and the role of disability and age.

Since 2013 the departmental Equality, Diversity and Inclusion (EDI) committee has met at least once a term, led by our Equality Champion, and including student representation. It covers all protected characteristics and it serves a dual role: implementing national and University policy and driving forward departmental initiatives. It produces an annual EDI survey of all staff and students, analysing the anonymised results and action plans are discussed at staff meetings.

There are many illustrations of departmental implementation of the University's Equality and Diversity in Employment Policy, e.g.:
- Development of a Code of Conduct made available in departmental handbooks and flagged at induction
- Flexible/home working (including pre-Covid) promoting a healthy work-life balance
- Ensuring promotions are on merit and not self-promotion, all staff submit CVs for annual review. Five staff have been promoted who would otherwise not have applied (4F, 1M). Our policy has been rolled out across the faculty as best practice
- Supporting parental/caring leave, including research leave for returning staff. Private spaces for breast-feeding/expressing have been offered both on campus and in the field
- Scheduling committee/research meetings within core hours, ensuring staff with caring responsibilities can attend. Individual staff can request restrictions which are 'hard-coded' into their timetable
- Personal support plans for students and staff including supporting government "Access to work" applications and provision of specialist IT equipment
- Supporting bottom-up department initiatives including the Archaeology Dyslexia Network, Women's Group, LGBTI Network and Ethnic Diversity Network and University initiatives such as the Athena SWAN Forum, INCLUDE and Race Equality Forum, which includes two members of the department EDI committee (IES 3.36)
- Mental Health training for staff and encouraging wellbeing through the use of the University Health Assured employee assistance programme; instituting a policy that departmental emails are sent within working hours (staff are asked to use the 'schedule send' facility during evenings and weekends)
- Provision of a prayer room
- Provision of an all gender toilet

The department's REF submission has been led by REQUIP, comprising the Chair of Research Committee, Head of Department, Impact Lead, Athena Swan lead, Research Manager and senior staff with substantial experience of publications and impact, including 2 Emeritus Professors: this panel comprises 40% women and 36% part-time. Throughout the process REQUIP has monitored our submission for all known protected characteristics. Selection has been subject to regular equality impact assessments, in accordance with the Code of Practice, overseen by the University's REF Strategy Group. Analysis of the data relating to Category A staff on the census date shows **a balance by gender** of outputs per researcher (1.5F, 1.7M); **by age** our submission includes outputs from researchers across a 50-year age bracket; and **by disability** an average of 4 outputs per researcher with a declared disability compared with 1.7 outputs for staff with no declared disability.
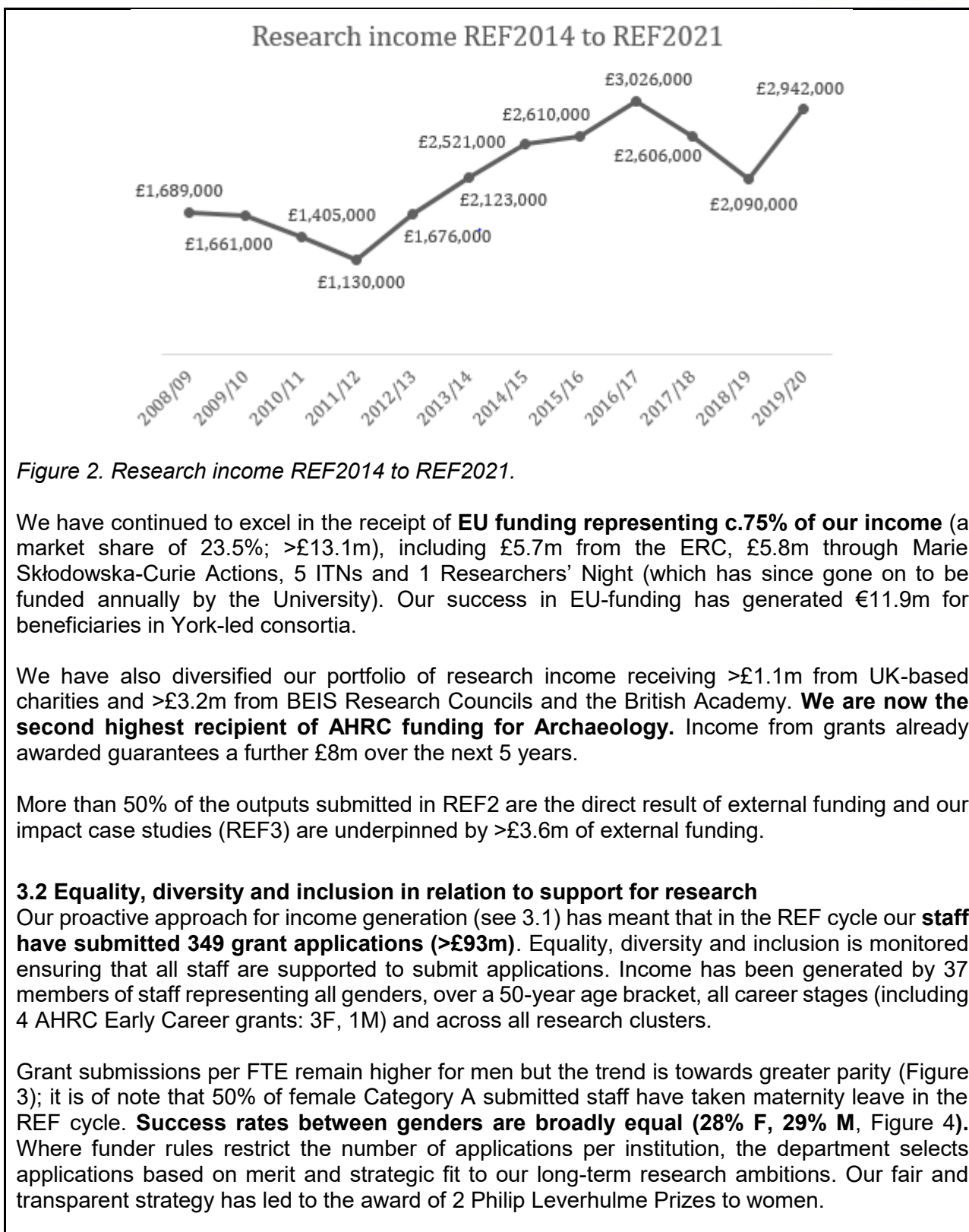

Section 3. Income, infrastructure and facilities

3.1 Research funding and strategies for generating research income
Our Research Strategy is founded on the ethos that all staff have equal access to support for research which is monitored by our EDI committee. Grant applications are written into our research expectations and staff are required to identify their income generation targets through 5-year plans. All staff are encouraged to attend University grant-writing bootcamps. A library of successful grant applications is accessible to all staff. During the REF cycle, DRC has established a grant review team, comprising senior staff and the Research Manager. Every grant application is reviewed by at least 2 reviewers. Mock interviews are also organised for ERC/NERC bids involving experienced staff from across the University.

Internal funding to develop research ideas is awarded on a competitive basis by the University. Over £150k has been awarded to the department supporting 14 projects investigating diverse subjects including plastic pollution in the Galapagos and medieval wall-paintings in Stratford. DRC disburses additional funds, e.g. £3k for pilot fieldwork in Sicily leading to the award of a €2.9m-ERC Advanced grant (2016–2021) and all academic staff receive £750/year to prime new research activity.

Research income over the REF cycle was £17.9m (REF4b) compared to £7.6m in REF2014 and representing **a 135% increase** (Figure 2). We have the largest research income in the faculty. Income/academic FTE reached a high of £151,200 in 2016/17 (source: HESA), second in the UK, with an average across the REF cycle of £88,711 reflecting recent staff expansion (Section 2). We have **a market share of at least 10% of sector research income** (minimum 15% of Russell Group research income).
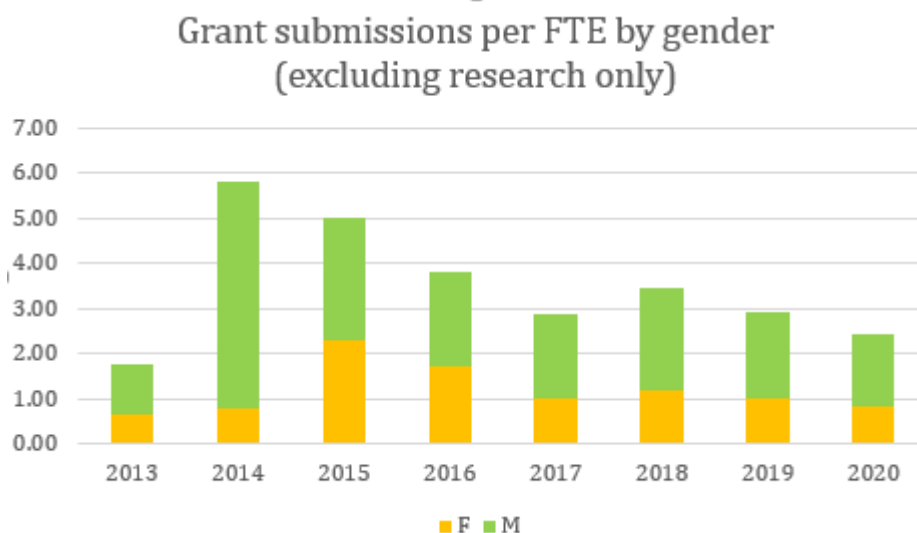
Figure 2. Research income REF2014 to REF2021.

We have continued to excel in the receipt of **EU funding representing c.75% of our income** (a market share of 23.5%; >£13.1m), including £5.7m from the ERC, £5.8m through Marie Skłodowska-Curie Actions, 5 ITNs and 1 Researchers' Night (which has since gone on to be funded annually by the University). Our success in EU-funding has generated €11.9m for beneficiaries in York-led consortia.

We have also diversified our portfolio of research income receiving >£1.1m from UK-based charities and >£3.2m from BEIS Research Councils and the British Academy. **We are now the second highest recipient of AHRC funding for Archaeology.** Income from grants already awarded guarantees a further £8m over the next 5 years.

More than 50% of the outputs submitted in REF2 are the direct result of external funding and our impact case studies (REF3) are underpinned by >£3.6m of external funding.

3.2 Equality, diversity and inclusion in relation to support for research
Our proactive approach for income generation (see 3.1) has meant that in the REF cycle our **staff have submitted 349 grant applications (>£93m)**. Equality, diversity and inclusion is monitored ensuring that all staff are supported to submit applications. Income has been generated by 37 members of staff representing all genders, over a 50-year age bracket, all career stages (including 4 AHRC Early Career grants: 3F, 1M) and across all research clusters.

Grant submissions per FTE remain higher for men but the trend is towards greater parity (Figure 3); it is of note that 50% of female Category A submitted staff have taken maternity leave in the REF cycle. **Success rates between genders are broadly equal (28% F, 29% M**, Figure 4**).** Where funder rules restrict the number of applications per institution, the department selects applications based on merit and strategic fit to our long-term research ambitions. Our fair and transparent strategy has led to the award of 2 Philip Leverhulme Prizes to women.

Grant submissions per FTE by gender (excluding research only)

Figure 3. Grant submissions per FTE by gender.
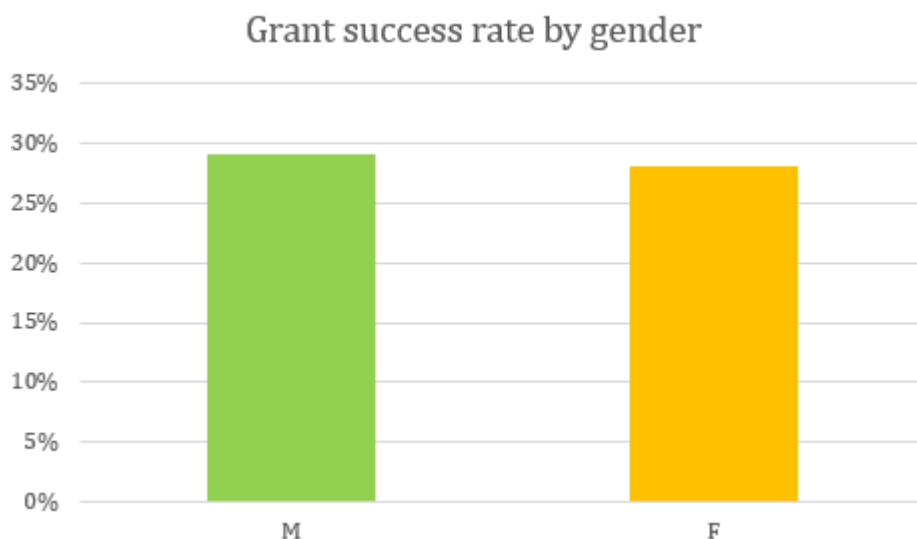
Grant success rate by gender

Figure 4. Grant success rate by gender.

The department has provided co-funding for 3 PhDs from sub-Saharan Africa, promoting access to training that otherwise would have been impossible. We have also awarded additional research leave and funding for equipment and proofreading to support staff declaring equality-related circumstances.

3.3 Organisational, operational and scholarly infrastructure supporting research and impact
Over this REF cycle, the department and University have invested heavily in our **Heritage Science** facilities and staff dedicated to ensuring the vitality of our research environment and sustainability of our ambitions and objectives into the future (see 1.3).

Technical staff
Over the REF cycle we have invested in technical support with the development of 4 new technical posts, taking the total to 9 posts covering laboratories, IT and fieldwork.

Laboratories
We have 4 **digital, imaging, and computing labs** providing infrastructure to facilitate VR modelling, 3D multiscale laser imaging, 3D printing, materials testing, microscopy, high-end computing and facilities for laser, CT and MRI image segmentation, reconstruction, virtual manipulation, morphometrics, finite elements and multibody dynamic analyses. We have a

dedicated photographic lab which provides access to immersive 360° cameras, an RTI dome, professional lighting, accessories and photogrammetry equipment.

We have a suite of environmental and post-excavation labs (**Environmental**, **Archaeobotanical**, **X-Ray and pXRF**, **wet and dry materials)** offering a range of equipment for the preparation of osteological, metallographic, ceramic, and environmental samples, soil thin-sectioning equipment, x-radiography machine for osteological and artefact investigation, handheld XRF equipped for environmental and metals analysis, magnetic susceptibility equipment, a high temperature furnace for preparation of samples for environmental analysis and inverted light, metallographic and petrographic microscopes.

Through over a decade of sustained investment (within this cycle >£1m on equipment), the **BioArCh facility** is a world-class laboratory for archaeological science. A £12m state-of-the-art **Environment building** (opened in 2017), co-locates BioArCh with a range of environmental scientists. The facility includes a suite of custom-built laboratories for **archaeological chemistry**, **organic residue analysis**, **stable isotope analysis**, **microscopy**, **palaeoproteomic and palaeogenomic analysis**, including a gas chromatogram and three GC mass spectrometers dedicated for the separation and identification of compounds from archaeological artefacts and sediments. BioArCh also houses the **Light Stable Isotope Facility**, the largest of any archaeology department globally, with 5 isotope ratio mass spectrometers allowing elemental analysis-IRMS of carbon, oxygen, nitrogen and sulphur from organic materials, as well as GC-IRMS of C, H and N individual compounds.

The proteomic researchers have access to **York's Centre of Excellence in Mass Spectrometry** providing a series of tandem and hybrid mass analysers (e.g. Orbitrap MS, MALDI-TOF/TOF, LC-MS/MS, Qh-FT-ICR) with liquid chromatography and MALDI interfaces that have benefited from a further £1.5m invested over this REF cycle. These are used for protein sequencing of bone, dental calculus and organic residues and peptide mass fingerprinting of bone collagen fragments for ZooMS analysis; the latter for which we have semi-automated through the purchase of a pipetting robot to increase sample throughput.

BioArCh also includes a purpose-built **palaeogenomic laboratory** to recover ancient DNA from archaeological and historic specimens. This consists of a UV irradiated lab under positive pressure with laminar flow cabinets and facilities for DNA extraction and quantification. There is a separate DNA lab for working on modern samples and amplified products with equipment for DNA amplification and quantification and a separate lab for sample preparation (with enclosed stations for drilling, cutting, grinding, sand-blasting), weighing and an FTIR instrument.

Since 2018, we have invested >£320k bringing together our Archaeology and Hull York Medical School staff in a new facility, **PalaeoHub**, housing some of the imaging laboratories, our human and animal bone collections, plus a new suite of **Artefacts and Material Culture** laboratories including a **microscope laboratory for microwear analysis** with a new Benchtop SEM equipped with EDX.

Many of these different scientific strands of our research use the **York Experimental Archaeology Research (YEAR) Centre** established in 2015, and officially opened by Ray Mears in 2018.

Collections

We have a large number of specialist collections for our research community and visitors:

- A **human skeletal assemblage** of over 500 skeletons and 60 cremated bone assemblages, including a unique palaeopathological reference collection, including rare examples of venereal syphilis, tuberculosis and trauma.
- One of the most significant **zooarchaeological reference** resources in the country (plus public-facing database online), with almost 2000 specimens from over 550 species, plus the Baker veterinary pathology collection of over 150 specimens.
- An extensive **CT collection** of a wide range of **fossil and recent hominins** and **mammals**, plus historical collections of mammals that include old world monkeys, apes, bovids and rodents.
- Our environmental labs host extensive **botanical reference collections** for plant macro remains, a herbarium, microscopy slides, and an archaeological reference collection of seeds, fruits and wood from archaeological sites in York.
- An extensive **artefact replica collection** covering all periods and a **flint microwear** reference collection developed through experimental work.
- We also host **material reference collections** of: 60 species of plant and animal fibres from around the world; plants used as containers; textile processing tools (e.g. looms and spindles); over 120 natural and artificial pigments and dyes.

Fieldwork equipment

The department is well equipped with a wide range of buildings and landscape survey equipment. Over the REF cycle we have invested >£170k in specialist field equipment including a laser scanner, 6 Total Stations, 3 GPS units, portable XRF, an electrical resistance unit, magnetic susceptibility meter and metal detector, specialist cameras, 2 quadcopters and specialist software for processing data.

Libraries and archives

As well as the University Library, the King's Manor library provides specialist collections of books and slides on architecture, landscape design, conservation, heritage management, and the medieval period and 18th century. The specialist collections at the Borthwick Institute for Archives and York Minster Library are used extensively by our researchers.

Interdisciplinary infrastructure

The Humanities Research Centre (HRC) is a shared facility with associated staffing providing opportunities to engage with and beyond the faculty, hosting networking events, training, and co-ordinating interdisciplinary funding bids. Archaeology has also partnered with Chemistry in the NERC recognised amino acid geochronology facility driving forward analytical advances in amino acid research.

We have benefited from collaborations with York's Digital Creativity Labs, a 5-year £18m project funded by UKRI, university and external industry partners (IES 2.11). For example, DC Labs programmers provided support for our Discovering England's Burial Spaces project, helping develop mobile applications for grave memorial recording by community groups.

We have used our Digital Heritage facilities extensively to support impact activities, for example in the creation of the award-winning Viking VR (see image above), a collaboration between DC Labs, CDH and the Yorkshire Museum. This project changed the museum's exhibition strategy, leading to the development of a follow-on VR Dinosaur experience and attracting heritage managers from Historic Environment Scotland who wished to learn from the experience.

Similarly, in Stratford-upon-Avon, we highlighted the potential of surviving antiquarian records to inform cutting-edge virtual reconstructions and physical conservation of nationally-significant schemes of medieval wall-painting known to Shakespeare. Using computer tablets we provided, visitors to the Guild Chapel can now once again see the medieval wall paintings removed by Shakespeare's father.

Section 4. Collaboration and contribution to the research base, economy and society

4.1 Research collaborations, networks and partnerships
Our success in academic research collaborations is reflected by research connections with 20 out of 28 University departments, across all 3 faculties, and through this we have been able to contribute projects to 5 of the University's 7 Research Themes (IES 1.4). The department has extensive research connections with universities worldwide. The majority of our returned outputs demonstrate collaboration with at least one non-York author. The Star Carr project exemplifies this, with over 70 specialists contributing to the Star Carr monographs (REF2).

Support for external collaborations is provided by the University's Global Engagements and Research Knowledge Exchange and Contracts teams and at department level by DRC and the recent creation of a Director for Partnerships. Over 30% of the department's research income in this period was the result of collaborative applications: 62.1% with HEIs, 15.3% with charities

and not-for-profits, 11.8% with government sources and 3.4% other sources. Collaborators are spread over 21% of the world's countries (Figure 5).
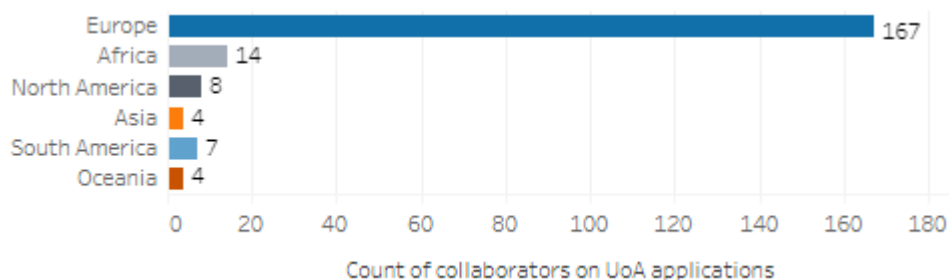

Figure 5. Count of geographic collaborations on UoA applications.

In the assessment period we have established 16 Memoranda of Understanding including York Conservation Trust; Jersey Heritage; Aix Marseille University; Korean National University for Cultural Heritage; University of Dar es Salaam; and Defense POW/MIA Accounting Agency; and made >50 Honorary Research Appointments. The department has awarded >£100k to staff and students to attend key conferences, undertake research visits and host >100 national and international visitors. A further £124k has been awarded from external sources including the AHRC and Newton Fund to host visitors and workshops.

4.2 Relationships with key research users leading to impact
Our Department Advisory Board was established in 2012, comprising key stakeholders from the public and private sectors. It meets annually but provides advice throughout the year. Part of its remit is to share intelligence regarding opportunities and developments that might affect the work and research focus of the department, enabling us to respond to the changing priorities of key research users. Similarly, our research centres and clusters draw on collaborations with key non-academic users in the co-production of research (see 4.1) and our staff provide advice to a range of external organisations (see 4.6). For example, Richards leads the COST Action Saving European Archaeology from the Digital Dark Age (SEADDA), which is building capacity for digital archiving across 31 partner countries, he chairs the working party on access for UK-RIHS, the database working group for the PAS (British Museum), and is a board member for Digital Antiquity (Arizona State University). Key users advise ADS via its Management Committee, with stakeholder representatives drawn from UK archaeology departments, university libraries, national heritage agencies and UKRI. Together, these relationships have facilitated the impacts highlighted in REF3 "ADS".

4.3 Wider contributions to economy and society and engagement with diverse audiences
Beyond those examples highlighted in REF3, the department has made significant other contributions to diverse communities and publics in the UK and overseas.

Reflecting our research strength in Buildings Conservation and Heritage, Giles' work with Stratford Town Trust and King Edward VI Grammar School directly informed 2 successful HLF awards: King Edward VI Grammar School's £1.4 million 'Shakespeare's School' project and Stratford Town Trust's £100k 'Death Reawakened'. As a result of Giles' research and the work undertaken in these awards, a new visitor attraction, Shakespeare's Schoolroom and Guildhall, was opened to the public in 2016. In 2017 it won Best Visitor Attraction in Coventry and Warwickshire Tourism and Culture Awards and the Sir John Betjeman Award in 2018.

Research at Star Carr highlighted the lack of public, and especially local, visibility of the site which was deemed by English Heritage to be a matter of considerable concern. To remedy this, a key research objective was written into the project design "To identify and implement best practice for improving public understanding of the Mesolithic period and Star Carr and to ensure long term public benefit". As a result, since 2014 research at Star Carr led to the creation of educational resources, loans boxes, animated reconstructions, videos and films hosted on a YouTube channel (>67,426 views), a MOOC (attracting >5000 participants with a course rating of 4.8/5 and >350 reviews), >40 public talks, and 4 co-curated museum exhibitions at the Yorkshire Museum (x2), Rotunda museum and Cambridge Museum of Archaeology and Anthropology attracting >600,000 visitors in total. These activities, as well as many developed by others inspired by the project, such as TV and radio programmes, magazine and newspaper articles, have led to the site being described by the publicly-contributed Wikipedia as "comparable in archaeological importance to Stonehenge".

In 2017 one of its now iconic antler headdresses took its place alongside Avebury Stone Circles and Skara Brae on a Royal Mail stamp celebrating Ancient Britain. Alongside substantially greater public awareness of the site, the research has changed the approaches of museum curators regarding the display of the Mesolithic and been referenced in Parliament, evidencing the fragile nature of waterlogged Mesolithic sites which may be damaged around Stonehenge.

Research in Field Archaeology methods undertaken by Roskams and Morgan led to partnership between American Veterans Archaeological Recovery and Breaking Ground Heritage and in 2019 the team worked with American and British veterans to recover the remains of American service members who were killed when their B-24H Liberator bomber crashed in southern England during World War II.

Our strength in African Archaeology has led to impacts at Kilwa and Songa Mnara in Tanzania where Wynne-Jones has designed bilingual site brochures and produced site details for the Tanzanian Wildlife Authority website (http://www.tawa.go.tz/). These provide the only informational resources on the archaeology of the sites and incorporate local community voices on local understandings and uses of the sites as well as guidance on how to be culturally sensitive. They have been distributed and used by nearly 3,000 visitors. In Zanzibar, working with local stakeholders Wynne-Jones has supported successful funding applications for a visitor centre and secured funding for a podcast designed to showcase Zanzibar's heritage for the 180,000 tourists that visit the archipelago each year as well as providing a resource for tour guides.

4.5 Contribution to the sustainability of the discipline, interdisciplinary research, and responsiveness to national and international priorities

The department has secured major, interdisciplinary research funding enabling us to address national and international priorities. For instance, working across Europe, Bailey chaired a 4-year international COST Action, working with marine geoscientists, archaeologists, cultural heritage managers, government organisations and industrial companies to address the research and management of the submerged landscapes of the continental shelf. The network included 100 members from 25 states in Europe and led to change in Flemish governmental policy and legislation (coming into force in 2014), introducing new legislation in Belgium such that, for the first time, heritage is a factor in discussions regarding maritime spatial planning of the North Sea. As a result, three wreck sites have already obtained heritage status and >20 finds have been reported to the receiver of cultural heritage. In its final evaluation report the

Domain Committee of COST with the aid of international peer-reviewers noted that "It would not be an exaggeration to say that this COST Action has shifted attitudes to submerged heritage in the EU and has had a positive global impact."

Research funded by the EC and UK Global Challenges Research Fund (GCRF) has tackled the role of soil erosion exacerbated by weather-related events and climate change as one of the most serious threats to current world food production. Through fieldwork in Tanzania and Ethiopia we identified previously undocumented soil and water conservation techniques, with subsequent recognition of similar practices in southern Europe, South America and the Middle East. This led to policy recommendations regarding the co-design of sustainable development initiatives that were presented at the British Houses of Parliament in November 2017, and to ongoing GCRF-funded projects that are working with agricultural NGOs and local communities to define the social, economic and environmental costs and benefits of these local practices.

4.6 Wider influence, contributions and recognition
Staff regularly review academic publications and research proposals for a wide range of journals and funding bodies around the world. In the assessment period our staff have contributed to over 40 different editorial boards including **editorships** of *Royal Society Open Science*, *Medieval Archaeology*, *Mesolithic Miscellany*, *British Institute in Eastern Africa Monographs*, *Cambridge Monographs in African Archaeology*, *Geoarchaeology*, *Emania*, and *Journal of Conflict Archaeology*; and **Director and Trustee**: *Internet Archaeology* and *Antiquity*.

Five members of staff have participated in AHRC and ERC grant review panels and in 2016 Bickle received a gold letter from the AHRC for "outstanding contribution to the work of the Peer Review College". Three members of staff have been elected **British Academy Fellows** (Collins 2017, Milner 2019, Carver 2020).

Our staff and students have been awarded **38 prizes** and shortlisted for a further 20. Prizes include:
- Montgomery (PhD): 'Orgullo de mi Pais' award by the Nicaraguan Embassy in London, for his work on Pre-Hispanic Nicaraguan heritage
- Khalid al Asmari (PhD): Abdul Rahman Al-Ansari Archaeological Award for Young Saudi Archaeologists by the Saudi Commission for Tourism & National Heritage, for his work on Arabian Prehistory
- Zander (PhD): EAA Student Award for her paper on the Pleistocene-Holocene transition in Northern Europe
- ADS: Best App at the Heritage in Motion New Multimedia Competition on European Heritage for ArchAIDE (2019)
- Bailey: Prehistoric Society Europa Prize (2017)
- The Star Carr project: Current Archaeology Research Project of the Year (2014 and 2020); Best Innovation Prize in the British Archaeological Awards for the *Internet Archaeology* article on the Star Carr Pendant (2016)
- Carver: 17th European Heritage Prize of the European Association of Archaeologists (2015)

We have contributed to the vitality of the discipline through **>800 conferences and workshops** and given **>500 invited lectures/keynotes worldwide**.

Our staff are invited advisors to or sit on committees of regional and national bodies including the Science Museum, English Heritage (Heritage Skills Task Group), NERC (Chair of Life Sciences Mass Spectrometry Committee; Panel member), the A303 Scientific Committee advising Highways on the proposed road alterations in the Stonehenge environs, and the consultation for HS2 Archaeological Impact. We also contribute to international bodies around the globe including the Scientific Advisory Board of the Max Planck Institute for the Science of Human History and the British Institute in Eastern Africa Governing Council.