

Institution: University of Sheffield
Unit of Assessment: C-15 Archaeology
1. Unit context and structure, research and impact strategy

1.1 Unit context and structure, overall strategy

Context: The Department of Archaeology at the University of Sheffield is a single unit within the Faculty of Arts and Humanities. It has an international reputation for integrating scientific, social and humanities-based approaches to explore archaeology's 'big questions': what it means to be human, our place in nature, and our relationship with technology in the long term. Increasingly, our interdisciplinary research addresses the emerging global challenges of food security and sustainability, environmental and climate change, migration and displacement, cultural identity, and health and social inequality. This requires collaborative partnerships with academic, commercial, community and public bodies, which we have expanded through a culture of research excellence combined with an active strategy of external engagement. We regard the creation of knowledge as multi-faceted, and have invested in knowledge exchange (KE) with a large number of stakeholders.

Strategy: Our REF2014 research plans were to advance these big questions and emerging challenges: using grant capture, including early career researcher (ECR) schemes, to facilitate high-quality research and scholarship; disseminating our research through high-quality outputs; enhancing the integration of all our researchers; and working with user-communities towards co-production of new knowledge and methodologies. These plans have been implemented during 2014-2020 through the following **integrated research and impact strategy**:

S1 Participation of our whole research community from undergraduate and Masters students to ECRs (PhD and postdoctoral) and established staff members.

S2 Collaboration and co-production with external partners in both academic and non-academic user-communities.

S3 Embedding impact into research projects from initial design to final outcomes.

S4 Diversification of funding sources, supported by Departmental and University initiatives for the development of research ideas and impact pathways.

S5 Dissemination of our research through high-quality outputs for both academic and public audiences.

Structure: Since 2014, we have reshaped our research clusters to maximise opportunities in six key areas: 'Landscape archaeology', 'Bioarchaeology', 'Funerary archaeology', 'Medieval Europe', 'Cultural materials' and 'Mediterranean archaeology'. All clusters share a common research and impact strategy, and both people and projects regularly operate across clusters, fostering an interdisciplinary approach. The examples below demonstrate our implementation of this strategy in each cluster.

Unit-level environment template (REF5b)

1.2 Our research over the assessment period

Landscape archaeology

The successful implementation of our research and impact strategy is illustrated by the **UK Palaeocave Survey**, an archaeological-palaeoanthropological survey of Palaeolithic British cave sites, through GIS desktop survey, field reconnaissance and excavation (Kuykendall, Merrony, Ayala, Johnson). Undergraduate and Masters students participated in this project (S1), supported by University funding and with the close collaboration of Creswell Crags and commercial archaeologists from Sheffield Hallam and Manchester Universities. Public engagement during the project includes a heritage festival, public displays, and the BBC 'Digging for Britain' programme (S2,3). Kuykendall serves on the World Heritage Site Nomination Committee for Creswell Crags.

Prehistoric Landscape and Kinship: Johnston's externally funded landscape projects have culminated in his book 'Bronze Age Worlds', exploring the shaping of past *cultural identities* (S5). Underpinning research includes recent collaborative projects in Snowdonia and Skomer Island, Pembrokeshire (with national and local funding), three externally funded PhDs, and two AHRC grants for co-production of knowledge in heritage (S2). University support included Faculty pump priming/advice for grant applications and impact, an Arts Heritage grant, and departmental study leave for writing the book (S4).

Bioarchaeology

The processes driving the **origins and spread of agriculture** were investigated through ERC-, NERC- and Leverhulme-funded multidisciplinary projects (Jones, Wallace, Longford), using cutting-edge techniques of geometric morphometrics, ancient DNA, experimental ecology, and stable isotope analysis, employing 12 postdoctoral researchers at Sheffield and elsewhere during the assessment period, providing career opportunities and training for the next generation of researchers (S1,4). Our European network has expanded, and impacted the international research community through new academic collaborations in south-east Turkey, and development-focussed collaboration with research institutes in Jordan (through University pump-priming GCRF funding, promoting *sustainable rural cultures, food security* and biodiversity) (S2). Multidisciplinary collaborative research into the **early husbandry, intensification, and ritual use of animals**, funded by a British Academy Mid-Career Fellowship (Albarella), the Leverhulme Trust and an ERC early-career Marie Curie fellowship, combined zooarchaeological evidence with genetics and isotopic analysis, deploying ethnography to understand human behaviour (S1). Halstead's monograph on traditional Mediterranean farming practices provides ground-breaking ethnographic insights into decision-making relating to early crop management and *food security*, while Albarella's ethnographic fieldwork on livestock in Sardinia and Corsica led to a public exhibition, co-organised with an ECR, and a television documentary (S3,5).

Funerary archaeology

This cluster exemplifies KE, non-academic collaborations and public engagement, as in the investigation of **charnel practices in medieval England** (Craig-Atkins, Hadley), that gained insights into the role of human remains in medieval religious practice, through collaborative research at Rothwell Charnel Chapel (Northampton), with the Church, Heritage Centre and commercial archaeologists. The University-funded launch of the chapel website and a series of one-day events, public talks and hands-on workshops with human remains, enhanced public interest and understanding of the chapel, receiving very positive feedback and much media interest (S2,3). Analyses of human remains and grave goods from **Anglo-Saxon and medieval burial grounds** (Hemer, Willmott) have identified, through laser spectroscopy and isotopic analyses,

Unit-level environment template (REF5b)

high-status burials with European connections at 5-6thc. AD Scremby; and used bacterial bioerosion to identify differential treatment of the dead in the hospital cemetery and a mass grave (the first evidence of Black Death burials outside London) at Thornton Abbey (Lincolnshire). Academic and non-academic collaborations were fundamental to both projects and to the excavations at St. Patrick's Chapel Pembrokeshire, one of our impact case studies, where an extensive public-engagement programme attracted high media coverage (S2,3). These projects explored issues of *health, inequality, and identity*.

Medieval Europe

Excavations and archival research at **Sheffield Castle** (Moreland, Hadley, Jones, Albarella) have revealed a rich history dating back to the original motte-and-bailey castle, with a major impact on local government policy concerning development of the site and its surroundings. In partnership with commercial archaeologists, architects, Sheffield City Council, community groups and local businesses, a shared vision is being developed for tackling urban *inequality* through regeneration of the area, informed by its cultural heritage (S1,2,3). A diverse funding base, active programme of public engagement, and publication of Moreland and Hadley's co-produced book on the Castle, ensure sustainability of the project, which is another of our impact case studies (S4,5). Survey and excavation of the Saxon settlement of **Little Carlton**, Lincolnshire (Willmott), first brought to academic attention by a metal detectorist reporting findings to the Portable Antiquities Scheme (PAS), has influenced national policies on archaeological practice: methodologies from this model of collaboration between amateurs, heritage professionals and academics have been incorporated into revised guidance being developed by the PAS and British Museum (S2,5). The project received a Current Archaeology Award, voted by its readers an outstanding contribution to archaeology.

Cultural materials

In the investigation of **humans, nature and technologies** (Day, Doonan, Jackson, Iles) we have engaged fully and critically with radical shifts in theoretical approaches to the evolution of living and social systems, the place of material culture in the construction of human worlds and *cultural identities* and the elucidation and transmission of production technologies, through cutting-edge methods of laser ablation ICP-MS, portable X-ray fluorescence spectroscopy, radiography, experimental archaeology and ethnography. The assessment period saw the culmination of the **NARNIA project** (Jackson, Day, Doonan), a collaborative research network between nine private/academic partners, training young researchers to integrate innovative scientific techniques with traditional approaches to ancient materials, in a live project on Eastern Mediterranean history/archaeology (S1,2). Training courses, in six countries from the UK to Jordan, on pottery, glass, metals and architectural materials, provided opportunities to interact across disciplines. Sheffield trainees have proceeded to: Director, Yale Initiative for the Study of Ancient Technology; Postdoctoral Researcher, Ecole Française de Rome; Laboratory manager, Center for Materials Research in Archaeology and Ethnology, Massachusetts; Marie Skłodowska-Curie Fellow, University of Barcelona.

Mediterranean archaeology

The EC FP7 collaborative project, **Mediterranean Mountainous Landscapes (MEMOLA)** (Day, Doonan) integrates archaeology, history, and ethnography in promoting *sustainable agriculture* and agrotourism, and mitigating *environmental and climate change*. MEMOLA engaged local communities with educational animations on water, soils and cultural heritage and the EU Commission used it as an example of best practice in impact (S2,3). It won a Hispania Nova Award

Unit-level environment template (REF5b)

for Good Practice in Landscape Conservation, and was selected by the EU Humanities Scientific Committee as one of five top innovative research projects. Research on **Black Sea fortification and political networks** explores cultural integration and engagement associated with ancient Greek settlement around the Black Sea, embedding the south coast into broader Black Sea narratives through funerary and landscape archaeology as well as excavations at the Greek settlement of Sinop (Rempel, Sherratt, Merrony). This has involved a diverse range of local partners, academic institutions, and international funding, and University support for ECRs (S1,2,4), complemented by development of animated and 3D visualisations of the Sinop fortification wall (a cultural-heritage and tourism focus) to engage the public in a new understanding of early colonial *migration*.

Overview

The examples above demonstrate successful implementation, through the integration of scientific and humanities approaches, of our 5-point research and impact strategy across all research areas. We have maximised the diversity of our funding (strategically using local, national, and international sources) and supported researchers at all career stages (undergraduates and ECRs to established staff), through University and departmental financial and advisory initiatives (e.g. University-funded student projects, University public engagement support), contributing to the research vitality and sustainability of the Department and the discipline. Our policy of embedding impact strategy into research planning from the outset has enhanced collaboration with a diverse range of non-academic and academic partners. Support for individual scholarship and publication, through strategic use of study leave and externally-funded fellowships (e.g. British Academy and Leverhulme to Albarella, Halstead, Iles, Longford, Sherratt), has also been key to our tackling major archaeological questions, and maximising our research impact in areas where archaeology can make a vital contribution to current global challenges.

Our commitment to a deep time perspective has led to publications on early hominins (Kuykendall), medieval *migration* (Hemer), a major theoretical critique on the human impact of volcanic activity and *environmental determinism* (Moreland), and reconstruction of the environmental context of field and terracing systems, water management and soil quality (Johnston, Ayala, Doonan, Day). Bioarchaeological research on food sharing and storage (Halstead), crop diversity (Jones) and breed improvement (Albarella) have significantly contributed to understanding of long-term *food security and agricultural sustainability*, while investigations of burial practices, commemorations and human osteology have addressed issues of *health and social inequality* (Hemer, Craig-Atkins) with a particular emphasis on early life, enhanced by Carroll's monograph on 'Infancy and Childhood in the Roman World', and the 2016 establishment of the Sheffield Centre for the Archaeology of Childhood, reflecting a distinctive speciality which lays the foundation for future research. Targeted research has produced a plethora of high-quality outputs on construction of *identity* through production and consumption of material culture as diverse as clothing, silver, and architecture (Carroll, Sherratt, Jackson, Rempel, Moreland, Hadley), or its deconstruction (e.g. Willmott's *Dissolution of the Monasteries* monograph).

Open access and research integrity

We are committed to an open research environment, with both staff and students encouraged to maximise impact by making all output types openly available via the 'green route' of our repository shared with the Universities of Leeds and York, which also ensures compliance with copyright and other publisher stipulations. Our deposit rate over the last five years (through all open access routes) is 88% for journal articles (plus the majority of book chapters), with three over 30,000

Unit-level environment template (REF5b)

downloads. Albarella's monograph on the zooarchaeology of central England and Moreland and Hadley's book on Sheffield Castle are open access publications for maximum impact and interest.

We support a culture respecting the importance of ethics and integrity, with all colleagues aware of relevant legal and professional frameworks and their related obligations. Our dedicated departmental ethics contact oversees ethical review of research involving human participants/personal data in line with University policy, ensures reviewers undertake appropriate training, and updates colleagues on changes to ethical or legal requirements. A range of mechanisms are in place to enable researchers to discuss and challenge research findings and share good practice, contributing to a broad culture of research integrity.

1.3 Strategic objectives for 2021-2025

Our commitment to multi-disciplinary collaborative research, integrating scientific techniques into ambitious archaeological research designs, continues to shape our future objectives. These will focus on specific research areas, integrating varied approaches within and beyond the Department, and taking advantage of the Grantham Centre for Sustainable Futures and newly-constituted Flagship Institutes that pool expertise across the University and its partners: particularly the Healthy Lifespan Institute (building on our deep-time understanding of life histories, bioarchaeology, disease and health), and the Institute for Sustainable Food (bringing our broad chronological perspective to domestication, agriculture, the human-animal relationship, irrigation, landscape and sustainability). Within these initiatives, we are positioning ourselves as the obvious choice to coordinate interdisciplinary projects tackling big questions with a historical perspective:

Health, life histories and identity: New research harnessing innovative analytical approaches in ancient DNA, proteomics, radiography and histology will advance understanding of behaviour, life history evolution, past health and lifestyles, while novel interrogation of funerary evidence will illuminate embodied experience and identities in life and death. We will deepen our focus on early life by expanding our Centre for the Archaeology of Childhood and collaborations with the cultural/heritage sectors, while investment in a Forensic Science and Human Osteology appointment will bring a new dimension to this research area, extending our acknowledged expertise beyond the medieval world to explore the impact of social change, inequality, and technological advancement on health and wellbeing from the origins of humanity to the present.

The archaeology of food production: Our long-standing focus (combining study of ancient plants, bones, molecules, field systems and soils with ethnography) on cultures of food production and their environmental impacts will expand geographically to the Black Sea littoral and Caucasus. We will respond to the current global environmental and climatic crisis, by increasingly harnessing our archaeological and ethnographic insights into ancient and recent farming regimes to promote sustainable land use and animal husbandry, from Wales to Georgia, in the face of environmental change, growing ethical concerns and emerging opportunities for 'heritage' products. To this end we will build on our links with the University's Institute for Sustainable Food and Animal and Plant Sciences and Biomedical Sciences departments through joint research, funding initiatives and PGR students, and on collaborations with national and regional bodies in the UK and overseas.

Sustainable living landscapes: Our research will bridge disciplinary boundaries by striving to understand the long-term dynamics through which humanity has made and been made by environments and landscapes. We will expand the range of disciplines with which we collaborate, focussing on links with environmental humanities, geographical sciences, and visual arts – building on participation in the AHRC's Creative Landscape Futures network. We will foreground societal resilience and sustainability within narratives of environmental change, strengthened by a new post

Unit-level environment template (REF5b)

in Archaeology of the Environment and Sustainability. Our research will inform the future of vulnerable landscape heritage in partnership with major conservation agencies, including Creswell Crags and the Carneddau Landscape Partnership. A recurring theme will be the dynamic relations between people, land, and water, which we will progress through GCRF projects studying water management and NERC-funded research on sea-level change.

Cultural materials: We will grow our current approach of grounding analytical approaches to materials within a strong archaeological context across a greater temporal scale in order to understand changing identity over time, especially in periods of dynamic population movement building, for example, on Willmott's artefact studies in Lincolnshire and Rempel's in the Black Sea region. We will expand our use of digital technology and 3D-modelling (e.g. reimagining Sheffield Castle for urban planning) within the material and built world, for use in the heritage industry. Our extensive understanding of ancient materials recycling will be deployed through collaborative funding initiatives (e.g. Innovate UK) with Hallam University to inform modern manufacturing industries (ceramics, cement, glass), enabling them to reduce costs and improve sustainability.

We will further invest in the Department's future vitality by strengthening our period-based research through a new appointment in Iron Age/Roman archaeology, while an appointment in global heritage and archaeology will enhance the research element of our established success in heritage teaching and further strengthen our public engagement and impact activities. These two posts will create synergies with the two new science-based appointments (above), offering new opportunities for grant capture and for PDRA and PGR recruitment.

2. People

2.1 Research culture

Our strong, closely-knit research community values rigour, integrity, collegiality, and inclusion, and supports excellence in research through strong cooperation and an ethically based culture of enquiry across the Department, from training at PGT level, through our active PGR community to academic and specialist technical staff, underpinned by a committed professional services team. Our supportive, inclusive and participatory research culture is evidenced in our weekly PGR-led research seminars hosting internal and external speakers, our successful monthly staff seminars which report research progress and future developments, and the organic development of PGR-led reading groups (e.g. Old World, zooarchaeology, archaeomaterials). We have hosted >30 visiting researchers, important to our community, for stays of more than three months, including senior academics who co-produced research. Fixed-term staff and ECRs participate fully in strategic planning and serve on our Research and Innovation Committee, while postdoctoral researchers contribute to team-based PGR supervision, enhancing research vitality and career development. Our active community of honorary research fellows and emeriti contributes extensively to research projects and doctoral supervision. Six-month affiliate status for graduated PGRs cements future collaboration and extends our community internationally.

2.2 Staffing strategy and staff development

Recruitment strategy

Our long-term recruitment strategy is to consolidate and grow our distinctive strengths (e.g. bioarchaeology/health, landscape/environment, heritage) and appoint dynamic researchers offering methodological innovations (e.g. ECRs Hemer - isotope analysis, Iles - archaeology of

Unit-level environment template (REF5b)

Africa/sustainable landscapes). Staff retention since REF2014 has been high: our permanent 15 T&R staff include 8 professors, 5 senior lecturers and 2 lecturers, with one retirement, two departures and one long-term secondment (British School at Athens). We will take the opportunity of these changes to reinvigorate our staffing profile allowing us to reshape our research strategy, introduce new approaches, and ensure sustainability. To support our strategic objectives for 2021-2025, approval has been given for four new lectureships in: Archaeology of the Environment and Sustainability; Forensic Archaeology and Human Osteology; Global Heritage and Archaeology; Iron Age/Roman Archaeology.

We invest in training the next generation of researchers through postdoctoral recruitment, as an entry point for ECRs and to maintain a healthy diversity in career-stage and expertise amongst staff. We have successfully recruited 27 postdoctoral fellows and 5 postdoctoral assistants (PDRAs), through Marie Skłodowska-Curie IEF and the hosting of Leverhulme, British Academy, Gerda-Henkel, and de Velling Willis fellows, and a Vice-Chancellors Fellow (now senior lecturer). This vibrant, high-quality community ensures the critical mass fundamental to the coherence and vitality of our research groups, brings new synergies and techniques, and collaborates with us after departure (e.g. Salvagno, Corbino, Groot with Albarella; Gilstrap, del Pino, Tenconi with Day; Forster, Longford, Wallace with Jones; Orengo with Halstead). Underpinning these successes, we have also invested in four new specialist research technicians to keep abreast of cutting-edge methodologies to provide laboratory support and management, specialist training (freeing academic time) and essential research support, and to expand our research collections.

Staff development, support, and mentoring

Our strategy prioritises support for researchers to produce high-quality individual and collaborative research. Our Research Committee mentors colleagues in planning research, provides a robust system for reviewing draft outputs, KE activities and funding applications, and directs researchers to other sources of support (technical; financial; University and beyond), resulting *inter alia* in six monographs this assessment period. All research-active staff have an annual Research Support Meeting with the Head of Department, departmental Research and Innovation (R&I) Director and a senior colleague, with input from the departmental KE/Impact Director, to ensure tailored support for research aims, design and completion.

Mentoring and peer review especially target ECRs and early-career transitions. New colleagues receive mentors, and probationers are reviewed annually, in addition to the usual Staff Review and Development Scheme (see REF5a). All researchers have a programme of induction and those entering open-ended T&R contracts have a probationary period with reviewing milestones, supported by the Head as mentor/line manager and the R&I Director. New T&R staff have a staged 75% reduction in teaching and administration in Y1, to 25% in Y3. Fixed-term staff are similarly supported in research by the R&I Director. Staff-led research groups (e.g. Archaeobotany, Zooarchaeology, Cultural Materials), involving PGRs and postdocs, provide a catalyst for novel directions and opportunities for mentoring and career development.

Research leave is strongly encouraged (one semester in seven), targeted to applications/outputs (e.g. Johnston's monograph), sometimes extended by external funds (four British Academy/Leverhulme grants and an alumni donation, resulting in three monographs, plus two in preparation). Our workload model assigns 33% research activity per FTE, with dedicated blocked time for T&R staff, and teaching loads are structured to facilitate research productivity.

A new Faculty Research Hub facilitates review and support mechanisms, while Faculty support for KE and public engagement has been substantially enhanced, including a new Peer Review Committee and regular notification of funding opportunities for PDRAs and teaching buyouts. The

Unit-level environment template (REF5b)

University is committed to fully supporting staff and PGRs through the Think Ahead programme for continuous professional development, and parenting networks.

Reward and recognition

Promotion is a key element of career development and institutional reward and recognition procedures are aligned with the Concordat to Support the Career Development of Researchers. The new Academic Career Pathways (see REF5a) recognises key research components: outputs, income, impact, KE and professional standing, in combination with excellent research. Six staff were promoted since 2014: to senior lecturer (SL) (Craig-Atkins), professor (Jackson, Day); three more than once, highlighting the efficacy of our support structures: reader/professor (Albarella), SL/reader/professor (Sherratt), Vice-Chancellor's Fellow/lecturer/SL (Hemer). Our postdocs also advanced: one to an ECR starter grant, four to T&R academic posts, four to commercial posts, 12 to research posts, three to research administration. The Technician Commitment, which Sheffield joined in 2017, informs University support for research technicians, alongside departmental mentoring to enable these specialists to progress (e.g. one to a lectureship, one to a consultancy directorship).

2.3 Research students

We prioritise a supportive inclusive environment, sufficient resources and guidance, to nurture a dynamic research community, ensuring well-being and enhancing career prospects. Since REF2014, 79 PGR students commenced research, maintaining a consistent community of 35 FTE, and 60 completed successfully.

Recruitment strategy

We recruit PGRs strategically to our strengths and emerging research areas, including through major EU awards, and from our specialist PGT programmes (65% of our PGRs derive from our PGTs – 45% non-UK). Quality is reflected in studentships gained: 28 AHRC/NERC (36% of our total, representing a 186% increase from REF2014), including three Collaborative Doctoral Awards, with three more starting in 2020; 14 University scholarships; and four funded from international and industry sources. Our community is global and diverse: 13% aged under 24, 35% over 30; 53% non-UK (25% outside the EU); 75% female; 19% with known disability; 3% self-declared minority ethnic; 20% part-time; and from diverse specialisms (e.g. biology, medicine, philosophy, computer science, as well as humanities disciplines). PGRs are involved in decision making through representation on Faculty Executive Board and departmental meetings.

Monitoring and support

Prospective PGRs develop projects within our research clusters with potential supervisors and an admissions committee. Team supervision provides interdisciplinary and specialist expertise, and an independent pastoral tutor. In this assessment period eight PGRs have been cross-disciplinary (with the Animal and Plant Sciences, Geography, Mathematics and Statistics, Computer Science, Physics, and Medicine departments), and five with external partners through AHRC and NERC Collaborative Doctoral Awards, and partnerships/networks (plus three in 2020); others are jointly supervised with other universities (e.g. Leeds, Brussels) to mutual benefit. The PGR Experience Survey (PRES2019) showed >94% were satisfied with their supervisors' skills, knowledge, feedback and direction. Supervisions are timetabled at least monthly, while twice-yearly reports and annual review meetings include 'live' training needs analysis, updated regularly and checked annually to ensure appropriate support and training. Confirmation reviews in Y1 allow reflection and feedback from independent non-specialist colleagues. PGRs have dedicated study rooms co-

Unit-level environment template (REF5b)

located with staff offices, and share our newly built laboratory facilities, enhancing intellectual exchange and a sense of community.

Skills training and career preparation

Specialist training is variously one-to-one or through courses. Our Doctoral Development Programme provides training in research ethics, KE, public speaking, committee organisation, application writing, transferable skills and career opportunities, while the Modern Language Teaching Centre offers language support. In Y1 and Y3 (FT), PGRs present to peers and staff in a supportive conference. 88% considered they had appropriate skills, methodologies, techniques and could critically evaluate their results, and 88% had developed an understanding of research integrity (PRES2019). Students across our Faculty organise a well-attended Writing Retreat. AHRC-funded students receive funding for conferences and research, and training in KE and employability; and Jackson co-authored the successful 2017 White Rose (Leeds-Sheffield-York) bid to AHRC DTP2.

The annual departmental 'Careers Week' provides tailored training events, meetings with employers, practice interviews and funding advice. Employability is enhanced through placements, teaching experience, publishing, presenting, and collaboration. 88% of PGRs had developed contacts/professional networks (PRES2019).

Public interaction and career enhancement

Knowledge exchange is key to our strategic agenda, and we facilitate PGR engagement with community and strategic partners. *Archaeology and Ale* public lectures (typically 50 attendees, plus podcasts (6,200 downloads/year, >750/lecture)); the annual *Woodland Heritage Festival* with Sheffield City Council; and *Archaeology in the City*, a volunteer-led outreach programme of activities making archaeology accessible. *Dig It!*, involving PGRs, trains school students in practical archaeology, as does *Arts Enterprise*, Faculty-led civic engagement with local/regional partners. PGRs, trained by storytellers, publicly presented research in *Tales from the Ivory Tower*. These connections increase research impact and facilitate employability.

Outcomes

Our PGRs flourish, enhancing our standing through national/international conference presentations (37 students), and organising 19 external workshops/conferences and three student symposia (Early Medieval Archaeology 2020; Experimental Archaeology 2020; Society for Medieval Archaeology 2015). Ten have won prizes (e.g. best posters: Society of Archaeological Sciences, EAA). They have published >70 outputs (book chapters and journal papers, e.g. *Journal of Archaeological Science*, *Antiquity*, *Post-Medieval Archaeology*, *Quaternary International*), 20 co-authored with staff; and run the journal *Assemblage*. Their excellent training is reflected in career destinations including postdoctoral fellowships (e.g. Gerda Henkel, British Academy, Marie-Curie: Munich, Barcelona, Vienna); lectureships (Bristol, Yale, Cardiff); laboratory manager (MIT); specialists/managers in UK/overseas commercial units. Their success enhances the discipline, and continuing collaborations contribute 25% of REF-submitted outputs.

2.4 Equality, diversity, and inclusion (EDI)

Our EDI strategy tailors recruitment, support and development to harness diverse talent and perspectives in developing our research clusters. It is embedded operationally through a departmental EDI Director and EDI committee, who report to departmental meetings ensuring that all staff share responsibility for EDI in key decisions. Our recruitment addresses bias through role-

Unit-level environment template (REF5b)

requirement job descriptions, debiased advertising language, unconscious bias training for all staff and independent scoring of candidates against essential job criteria.

Our department was actively engaged with gender equality through the pilot for rolling out the Athena SWAN scheme in humanities subjects, and gained successive Bronze Awards in 2014 and 2018, while the University achieved a Silver Award in 2019. We have an exceptional record of recruiting and supporting female staff - 61% of academic staff are female (7M:8F T&R and 4M:4F professors) and 2M:2F technical staff. We appointed our first female Head in 2014 and second in 2018. We support staff following illness and parental leave (3M+2F) or with caring responsibilities, by flexible working (through timetabling/no expectations outside core hours), reduced teaching/administration and part-time contracts (17% of staff). Workloads, promotion criteria and leave allocation are scaled proportionately for part-timers. The Women Academic Returner's Programme supported one researcher after following maternity-leave by providing a PDRA, while keeping-in-touch days supported paid return to work *ad hoc*.

Institutional commitment to eliminating discrimination and promoting diversity includes active support for LGBTQ+ staff/students, and led to ranking 23rd in the Stonewall *Top 100 Employers* 2019 survey (one of four universities). We have LGBTQ+ representation on EDI and staff/student committees, and support trans-equality (gender-neutral bathrooms, shared pronouns). The University's BAME action plan targets transformational change in under-representation, progression and attainment, supports staff/student BAME networks, and shares good practice in decolonising curricula and research tackling migration and identity. One-third of our T&R staff are foreign nationals and three are non-native English speakers, promoting a vibrant and inclusive departmental culture. The University is a Level 2 Disability Confident Employer with a supportive University Disabled Network. Our technical team facilitates personalised support for lab and equipment access.

The University's REF Code of Practice ensures equality and diversity in our submission. Our departmental REF team is gender- and seniority-inclusive, with a breadth of expertise and training in EDI and the countering of implicit bias. Outputs were selected on ranked quality, with due consideration of authors' protected characteristics. The University's equality impact assessment of our scoring found no evidence of bias. We follow the University process for disclosing equality-related circumstances, and ensure that staff are aware of available support. Ranking and selection of outputs will not be used in recruitment, review, promotion or any way detrimental to staff.

3. Income, infrastructure and facilities

3.1 Research income

Mentoring has resulted in all 32 staff members (including 10 temporary) submitting funding applications, achieving external research grants awarded in the period of c.£2.2m, (£148k per Category A FTE) from at least 45 different funders across all our research clusters. Our largest grants were European: EU Horizon 2020/FP7 ('COMEX Bronze Age Commodity Exchange' (Day), 'HUBIR Human-Bird Interactions' (Albarella) including seven new Marie Curie Fellows) and European Commission/ERC ('MEMOLA Mediterranean Landscapes' (Doonan, Day), 'ADAPT Life in a Cold Climate' (Jones)). RCUK, Leverhulme and British Academy also supported our research, e.g. 'Digital Engagement for Heritage' (Moreland, Hadley), 'Mobilisation of Resources' (Carroll), 'Connected Communities' (Johnston), 'Black Sea Fortifications and Political Networks' (Rempel, Sherratt).

Unit-level environment template (REF5b)

To ensure sustainability, we also diversified our sources nationally and internationally to include e.g. Harvard University (Loeb), Gerda Henkel and Wenner-Gren, as well as British Institute in Ankara, Nineveh Charitable Trust, Peak District National Park Authority, Society of Antiquaries, Innovate UK and HEIF. Awards have supported major monographs (Albarella, Halstead, Sherratt), fieldwork and post-excavation analysis (all staff), and postdoctoral positions. We received additional funding for conferences (e.g. Thyssen Foundation, Japanese Institute of Anatolian Archaeology, Academica Sinica, Taipei, British Association for Biological Anthropology and Osteoarchaeology (BABAO), Experimental Archaeology (EXARC)); postdoctoral positions paid in kind (e.g. Basque Government, Grau); excavations (e.g. Roman Society, Carroll; local Greek Government, Halstead); analyses (NERC Isotope Facility, Hemer). These examples demonstrate the success of our strategic focus on applying scientific approaches to complex problems across disciplinary and national boundaries, engaging both academic and commercial sectors.

Generous funding from alumni and other supportive donors has benefited all research areas. A local £122k bequest funded research on Sheffield Castle ahead of regeneration of the area, including employment of PDRAs and publication costs (see *Sheffield Castle* impact case study); the Archaeology of Childhood including conferences (*Maternitas* in Rome, Carroll) and Carroll's monograph on *Infancy and Childhood in the Roman World*; and dating a charnel chapel (Craig-Atkins). Donors have also funded ECRs in bioarchaeology (Wallace, 3-years) and Aegean prehistory (Tomkins, 2-years). Conference sponsorship (e.g. Van Walt, Keyence Microscopes, AlphaGeoUK, Equinox, Antiquity) supported the AEA and Early Medieval Student symposia.

Our large ECR cohort has diverse funding sources, including Marie-Curie (13 new and continuing), Leverhulme (Iles), BA (Hemer, Longford), Gerda Henkel (Salvagno), building capacity in training the next generation in our bioarchaeology, landscape, funerary, materials, Mediterranean and medieval clusters. Many contribute to research income (e.g. Wenner-Gren, Nineveh, Corning Museum, Antiquaries) and applications (ERC, UKRI Future Leaders Fellowships, Wellcome, Leverhulme). Our supervisory expertise and analytical resources have won collaborative doctoral awards: four AHRC (English Heritage/Albarella, *Livestock and landscape*; MOLA/Craig-Atkins, *Social impact of foetal-perinatal mortality during industrialisation*; Snowdonia National Park/Johnston, *Snowdonia's early landscapes*; Historic England/Willmott, *Evolution of Audley End*; Historic England/Jackson, *Medieval glazing industry*; two NERC ACCE (RCAHMW/Johnston, *Late Holocene coastal landscapes in north Wales*); two AHRC networks (Albarella, Johnston); Grantham Centre for Sustainability/Doonan, *Entropy and coupling between the natural and engineered world*).

Our successful engagement with strategic and other partners includes joint funding bids and commercial contracts, particularly in bioarchaeology (e.g. zooarchaeology £47k; Sheffield Archaeobotanical Consultancy £109k), employing several ECRs. 31 successful short courses (e.g. Understanding Zooarchaeology, Introduction to R, Ceramic Petrography, Human Osteology) have attracted diverse participants and generated £167k over the assessment period. These collaborative, commercial and KE activities exemplify several aspects of our integrated research strategy (section 1.1).

3.2 Infrastructure and facilities

The Department's 2017 relocation to Minalloy House (new offices, PGR and social spaces; accessible storage for collections) and Ella Armitage Building (re-named after female local archaeologist; new laboratory space and equipment including furnaces, freezers, cold storage, roller racking for extensive teaching collections) represented University investment in archaeology of £1.5m. We use the Humanities Research Institute dedicated space for one-off research talks,

Unit-level environment template (REF5b)

workshops and conferences: e.g. our annual PGR conference; EXARC 2020; and 'Nigerian Field Society contributions to Archaeology' 2018. Alumni grants have also funded new laboratory equipment benefiting all clusters: an analytical pXRF, isotope-analysis preparation (sectioning equipment, freeze drier) and laboratory remodelling (£18k), and a Leica GS15 Total Station with twin antennae for surveying (£21k), plus expansion of the bird skeletal reference collection (£5k) enhancing our Centre for study of Archaeological Bird Bones.

Our extensive reference collections greatly enhance our research capability in bioarchaeology and materials science, and the range of research projects we can undertake and PGR topics we can offer. The breadth and depth of these collections also attract external users. Our online animal bone collection is linked to an open access national resource (2,238 visits/13,186 downloads since April 2017). Our human skeletal collection is accessed by UK and international researchers from across Europe and North America, and by commercial users, while our digital radiographs collection is the basis of a large planned aDNA collaboration with the Crick Institute, and our archaeobotanical, ceramic thin-section and metals reference collections are used extensively by visitors. Our national and international collaborations provide access to additional cutting-edge analytical facilities, collections and expertise at minimal or in-kind cost, extending our research capacity beyond our own estate.

3.3 Mechanisms in place to support income generation

University and Faculty coordinated research and impact services provide advice on budgets, cross-faculty initiatives, and inter-University opportunities, and 20 pump-priming grants funded buyouts/PDRAs resulting in successful applications: e.g. Society of Antiquaries (Hemer/Willmott; *Medieval Europe*); AHRC Cultural Engagement Fund and Next Generation of Immersive Experiences (Moreland; *Medieval Europe*); Society for Promotion of Roman Studies and BA/Rust Family Foundation/Roman Society (Carroll, *Mediterranean Archaeology*); and HLF for National Park (Johnston; *Landscape*). Particularly Johnston's pump-primed work in 'at risk' cultural landscapes (joint with Geography/York, Lincolnshire Wildlife Trust and part of a White Rose collaboration) was funded by Arts Enterprise, Snowdonia National Park Authority and AHRC/NERC studentships. Faculty bursaries for pre-application visits by prospective postdoctoral research fellows yielded two Marie-Curie fellows (Albarella/Groot, Halstead/Polo for *Bioarchaeology*) and GCRF pump-primers two larger GCRF applications. Five *On campus placements* have enabled students to co-produce research (e.g. with Rempel at Sinop and, subsequently, BA/Leverhulme, National Endowment for the Humanities, British Institute at Ankara). The Learned Societies Fund also provided up to £700/head annually for conference attendance, over the last seven years enabling equal numbers of staff and PGRs to present at 147 events.

This support extends to dissemination of research to the community, facilitating impact and KE, and includes the Faculty's innovative KE team, where our dedicated liaison is a community engagement expert from beyond HE. We work closely with, and have been generously resourced by, these services. The Department ensures dedicated staff time for impact planning and delivery (with a designated impact/engagement lead). Hemer and Moreland received administration buyouts to support impact activities (St Patrick's chapel and Sheffield Castle). Devolved HEIF funding for impact and engagement of at least £5k/year has supported: e.g. the *Woodland Heritage Festival*; Kuykendall's development of our high-impact partnership with Creswell Crags; and visits by researchers from Kazakhstan to establish collaborations. This enables grass-roots development of new ideas and partnerships for future impactful research. Impact is prominent in all research planning, including staff research-support meetings; mentorship and advice are given especially to ECRs on its development.

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

4.1 Academic collaborations, networks, and partnerships

In line with our integrated research and impact strategy (Section 1), collaboration with diverse partners (academic, public heritage organisations, commercial units/consultancies - national and international) is fundamental to our research. Much of our research is interdisciplinary and so intrinsically collaborative, applying scientific approaches to humanities research questions. We have intensified fruitful collaborations across the University: Hemer, Craig-Atkins, Nystrom and Hadley with Medicine to develop the application of DNA and isotope analyses to study of diet, mobility and disease; Albarella, Halstead and Jones, with Animal and Plant Sciences, with particular emphasis on ecological approaches to crop and animal husbandry and evolution; Jackson, Day and Doonan with Materials Science and Engineering in determining mechanical and thermal properties of ceramics and reconstructing raw material choice in the manipulation of glasses and ceramics.

A major priority has been to strengthen national and international collaborations to ensure the vitality of our research environment, and is integral to our research strategy. We have collaborated with >70 UK and overseas universities and research institutes in various research areas (Section 1), and in collaborative PGR training (e.g. with Universities of Barcelona, Thessaloniki, Thrace, York; English Heritage, Museum of London, Snowdonia National Park). We have also expanded links with European institutions through major research projects, consortia, training networks, information exchange and mentoring of ECRs. As well as collaborations on specific research projects, we have been a member of several research networks targeted at KE: e.g. the EU-FP7 NARNIA project; the AHRC Research Networks on *Floods: Living with water in the past, present and future* and *Faith in Food and Food in Faith* (with Leeds and York; addressing environmental change, food security and identity); as well as the University-funded International Mobility Scheme to establish research collaborations with Nanjing University, China. A major benefit of international collaborations and networks is the opportunity for ECRs to gain experience, and acquire new skills, at another institution.

Active collaborations with research institutes, such as NCSR 'Demokritos' (Athens) and the University of Barcelona, have been strengthened, affording free access to partners' complementary analytical facilities, frequent three-month exchanges of PGRs for training and joint research (four incoming to Sheffield during the assessment period), leading to 15 co-authored papers involving Sheffield. Graduate and postdoctoral Erasmus work placements have extended the reach and impact of our research, notably in zooarchaeology and ceramics: ECRs from Granada, Barcelona, Tarragona, Thessaloniki, and Wroclaw worked with zooarchaeology, while others from Leuven and Thessaloniki spent internships improving ceramic comparative collections. Hosting these researchers brings vibrancy to the research culture of the Department.

4.2 Engagement with research users for the benefit of economy and society

A key strength of archaeology at Sheffield is the degree to which impact is embedded in our overall research strategy so that both elements develop hand-in-hand throughout our projects. At a local level, we have benefited from consultation with our Sheffield Archaeology Strategic Board, constituted in 2016 as a forum for strategic discussion with key external organisations in professional archaeology and allied fields (currently: Peak District National Park, Wessex Archaeology, ArcHeritage, The National Trust, Derbyshire County Council, Historic England). This

Unit-level environment template (REF5b)

board advises on design and resourcing of collaborative research and facilitates communication of our research directly to local industry and both local and national heritage organisations.

A major new strategic partnership, underpinning our impact case study on Sheffield Castle, is that between the University, Sheffield City Council, Wessex Archaeology, and local businesses with the central aims of enhancing the vibrancy of the city centre and ensuring Sheffield's cultural resources are protected and promoted within wider political agendas. This acts as a vehicle for broader agendas of advocating for the North of England in a political context, challenging social and economic inequalities. KE with community groups has also been ensured through projects such as *Roots and Futures* (Craig-Atkins, Johnston), a collaborative investigation of heritage and place linking staff in the Department with the local industrial museum and two Sheffield-based community groups, using co-production methods to create new understandings of Sheffield's built and buried heritage. Focusing on industrial areas of Sheffield, it engages the local communities in a collaborative exploration of shared heritage, reflecting on aspects of the archaeology and history of these areas that are important and meaningful today.

We are also committed to creative means of public engagement including performance. Hadley worked with Point Blank theatre company to develop a successful performance in a tented venue in Sheffield city centre that led to an Arts Council grant for the show to tour around South Yorkshire. In collaboration with a local Friends group and the City Council, Doonan's *Roots of Iron: Ancient Oak to Sheffield Steel* engaged young people in exploring, enjoying and sharing the rich landscape and cultural heritage of Woolley Woods and Wincobank Hill, Sheffield. Our collaborative commitment extends to our PGR community that has been very successful in developing and running (with Sheffield City Council) the *Woodland Heritage Festival* since 2015, which celebrates our research, introducing the public to various crafts, including metalwork, pottery-making, leather- and stone-working (c.1,200 participants over two days). A graduate student won a Barzun Prize to carry out public engagement work ensuring participation of local 16-18-year-olds in archaeological fieldwork within the Elsecar Heritage Action Zone.

Further afield, Hemer's collaboration with multiple partners in excavating an early medieval cemetery, with exhibitions at St Patrick's Chapel and St David's Cathedral, Pembrokeshire (during which the Cathedral had >70,000 visitors), and production and screening of a documentary film of the project, is the basis of one of our impact case studies. This has been highly successful in increasing the diversity of audiences, and offering representation in the wider heritage field to more peripheral areas of the UK, in particular promoting engagement with the Welsh language and bringing accessible science-based archaeology to a neglected Welsh-speaking audience. Albarella's collaborative research and design scheme for his project *People and Animals at Norton Priory* worked with the Priory Museum and Gardens Trust to facilitate a new partnership between the Department and the Trust. Under Kuykendall's lead, we are currently investing in active partnerships with Creswell Crags to develop advocacy for this unique and ancient heritage site that makes our local region internationally significant, presenting Creswell effectively to the public and advancing international recognition of the site that will increase tourism and boost the local economy.

Internationally, we have developed a focus on the Mediterranean, Levant, and Black Sea, using the geographical and cultural specialities of staff members, their long-standing collaborations with regional academic, public and commercial partners to operationalise our vision, and extend engagement with museums and heritage organisations beyond the UK. In the Black Sea, collaborating in plans with Sinop city and Sinop Museum to promote cultural heritage and tourism by developing local historic sites, Rempel and Sherratt have developed visualisations of the Sinop fortification wall for public display, while public lectures in Sinop, the UK and USA have increased

Unit-level environment template (REF5b)

wider public knowledge of this early Greek colonial settlement. Equally, adding cultural value to cash crops can enhance social, cultural, and economic sustainability, and Jones and Halstead have worked with villagers in the eastern Mediterranean (Jordan, Greece), who have responded to recent economic crises by growing 'new' cash crops (including primitive cereals) or collecting native food plants (e.g. herbs, spices), which they brand in terms of their 'antiquity'.

Through MEMOLA (Day and Doonan), Sheffield was involved in development of EU Commission Policy Briefings on *Agrobiodiversity as Mediterranean European Heritage*, *Soils as Cultural Heritage* and the *Impact of European Water Policy on Cultural Heritage*. This was achieved by integration of archaeology, history, and ethnography; engagement with communities through seminars, schools, universities; and sponsorship of local business launches for sustainable food and promotion of sustainable agritourism (involving 326 meetings with local administrations, 50 with regional bodies, 16 national and 5 with EU Policy bodies). The project's success in reshaping EU policy, while addressing local concerns relevant to people's every-day lives, reflects our strategy of applying high-level scientific research to the resolution of current, real-world problems of ecological, economic, and cultural sustainability. Similarly, current PGR and PGT research is informing the historical context and local sustainability elements of the Greek government's 2021 bid (linked to the 1821 Revolution Bicentenary) for UNESCO Cultural Landscape listing of the mountainous Zagori area.

4.3 Contributions to research base

Sheffield archaeological staff play an active role in national and international academies and learned societies. For example, as a Fellow of the British Academy, Jones served as member of the governing Council (Trustee); Hemer is President of the Society for the Study of Childhood in the Past; Willmott a Council member for the Royal Archaeological Institute, President of the Society for Church Archaeology and Archaeological Adviser to the Diocese of Sheffield; Kuykendall a member of the Board of Trustees at Creswell Crags Museum & Heritage Centre and of the World Heritage Site Nomination Committee for Creswell Crags; Jackson on the managing committee for l'Association Internationale pour l'Histoire du Verre; Jones a Vice-President of the British School at Athens (BSA); and Moreland participated in the Archaeology Forum at the British Academy, a small group charged with considering the state of archaeology as a subject today.

Staff have held prestigious fellowships at a number of overseas institutes (Day, Margo Tytus Fellow, University of Cincinnati; Carroll, Hugh Last Fellow, British School at Rome (BSR); Rempel, Research Fellowship at University College Roosevelt in the Netherlands; Carroll, Charles Eliot Norton Memorial Lectureship, Canada) further strengthening our international profile. They have also served on several national and international grant awarding panels including: the ERC Starting Grant evaluation panel and British Academy Fellowship Scheme (Jones); as Chair of the Academy of Finland's Research Council for Culture and Society Archaeology panel (Moreland); as the archaeologist on the Wellcome Medical Humanities review panel (Craig-Atkins); on academic appointment panels for several Greek HEIs (Day, Halstead, Bennet); and the NERC peer review college (Jones), as well as undertaking external reviewing for more than 30 national and international funding bodies.

During the assessment period, Sheffield hosted seven international conferences in a broad range of research fields: BABAO (2015); Together, Connected Communities Heritage Network (2015), Contemporary and Historical Archaeology in Theory Group (2015); Society for Post-Medieval Archaeology (2016); the Sheffield Centre for Aegean Archaeology (SCAA) Round Table (2016); the Association for Environmental Archaeology (2019), the Society for the Study of Childhood in the Past (2019). Our staff have delivered over 80 invited lectures during the assessment period,

Unit-level environment template (REF5b)

including more than 50 conference keynotes, high-profile lectures and invitations to institutions outside the UK (in Europe, Near and Far East, Australasia, North and South America): e.g. 60th Anniversary Mycenaean Seminar keynote (Bennet 2014); Society for American Archaeology 'Itinerant Matters and Hybrid Objects' symposium (Day 2015); BSR 'City of Rome' keynote (Carroll 2016); Crossroad Archaeology in memoriam K Randsborg, Copenhagen (Moreland 2017); Society for Study of Childhood in the Past, Mexico (Hemer 2017); 'Interregional Networks in the Eastern Mediterranean 900-600 BCE', Chicago (Sherratt 2018); 'Glass in Archaeology: Economic and Artistic Exchanges' conference, Taiwan (Jackson 2018); Accordia Lecture, London (Albarella 2019); Shandong University Summer School (Halstead 2020).

Our staff are on the editorial boards of 15 journals including the *Annual of the British School at Athens* (Bennet, Sherratt (editors), Halstead); *Journal of Archaeological Science* (Jones); *Medieval Archaeology*, *Archaeometry* (Jackson); *Anthropozoologica* (Albarella); *Childhood in the Past* (Hemer); *Oxford Journal of Archaeology*, *Journal of Greek Archaeology* (Sherratt). Since 2014, The SCAA (ECRs and established staff) has published three volumes arising from its Round Tables, with a fourth in press. Staff have reviewed for c.100 journals with scientific, anthropological, and archaeological focus, reflecting our research's interdisciplinary nature: e.g. *American Journal of Physical Anthropology*, *Antiquity*, *Current Anthropology*, *European Journal of Archaeology*, *Evolution*, *Holocene*, *Journal of Hellenic Studies*, *Nature Plants*, *Paleorient*, *PNAS*, *Proceedings of the Prehistoric Society*, *Science and World Archaeology*.