

Institution: University of Cambridge
Unit of Assessment: UoA15 Archaeology
<p>1. Unit context and structure, research and impact strategy</p> <p><u>Research structure</u></p> <p>Cambridge Archaeology has been radically reconfigured and expanded since REF2014, centred on the foundation in 2017 of a newly independent Department of Archaeology within the School of Humanities and Social Sciences (SHSS). We have seized this strategic opportunity to create an exceptionally broad interdisciplinary nexus exploring the global human past and enabling impact in the present. The Department continues to nurture its established core excellence in world archaeology, theory, method, archaeological science, and Mesopotamian and Egyptian culture and languages. In addition, it has incorporated world-class strength in human evolutionary studies and wider biological anthropology, and decisively built upon its pioneering role in heritage studies. The Department's UoA comprises 47.13 submitted FTEs, representing 52 people: 32 permanent research and teaching staff (mainly University Teaching Officers – UTOs); two archaeology curators (one permanent, one fixed term) in the Museum of Archaeology and Anthropology (MAA); one Director of Research (professorial equivalent) shared with the Needham Research Institute (NRI); and 17 research-independent postdoctoral research fellows (PDRFs, including three Senior Project Officers of the Cambridge Archaeological Unit). Our academics are supported by 23 administrative and technical staff. This integrated community aspires to be one of the widest-ranging and most dynamically successful centres for archaeology, broadly defined, across the UK and internationally.</p> <p>Alongside growth, we have achieved major rejuvenation, embracing a new generation of scholarship adapted to the widening intellectual demands of the future, from ethics to digital. Within the REF cycle, 14 long-term academic staff appointments have been made (including one in MAA), with three additional permanent posts under appointment at census. This expansion has been achieved through fresh initiatives, including two funded Chairs. Our research-led teaching has also been comprehensively revised, including a new undergraduate degree in Archaeology and redesigned Masters degrees (Heritage, Archaeological Science) that reflect our evolving research and feed into a thriving PhD programme. The size, range, diversity, aspirations, vitality and sustainability of Cambridge Archaeology have never been higher.</p> <p>Within the Department are the McDonald Institute for Archaeological Research, Cambridge Archaeological Unit (CAU), Duckworth Laboratory (one of the UK's largest collections of human and primate remains), and an extensive suite of refurbished laboratories serving material science, bioarchaeology, environmental archaeology and biological anthropology. The Department is also co-founder and home since 2017 of the inter-departmental Cambridge Heritage Research Centre (CHRC). It has excellent relations with the MAA (two curators in this UoA), Fitzwilliam Museum, Institute of Continuing Education (ICE, one staff member returned), and Needham Research Institute (the Director of which is returned). The McDonald Institute retains its roles as a: (1) generator, base, financial source and logistical enabler for strategic research initiatives; (2) support centre for all relevant Cambridge PDRFs; and (3) hub for bringing together the strength of the wider community of Cambridge-based archaeologists. McDonald membership draws in archaeologists from Classics (UoA29), Earth Sciences (one staff member returned) and Geography (UoA14). Our long-term academics are embedded in eighteen Cambridge Colleges. Research activity is organised around six strategic themes, facilitating synergies between permanent staff, PDRFs and PhD students:</p> <ul style="list-style-type: none"> • Environment, Landscapes and Settlement • Science, Technology and Innovation • Human Evolutionary Studies • Material Culture • Rethinking Complexity • Heritage.

Each is supported by one or more seminar series funded by the McDonald Institute. They provide focus and structure for our research activity, whilst being deliberately permeable and interdisciplinary.

Research goals

Cambridge Archaeology has achieved its REF2014 ambitions, realised fresh goals and set its agenda for the coming decade. Key 2014 aims were (1) expanded global coverage across the methodological spectrum, and (2) greater focus on sustainability, palaeoecology and food security.

(1) Global coverage across the methodological spectrum. We are now engaged on almost every continent (including Antarctica), usually combining fieldwork and interpretative research. In Africa, we have become a leading UK centre and aim at a transformative and partnering role; emblematic is our Ward Oppenheimer Chair (Lane) and hosting of the Director of the British Institute in Eastern Africa (BIEA, Humphris), along with research by Broodbank, Chaudhary, Foley, French, Koops, Mirazón Lahr, Papazian, Said Mohamed, Spence and PDRFs Loftus and Sulas. African research includes 12 field projects ranging from hominin palaeontology and primate technology, via landscape archaeology and historical ecology to contemporary heritage and health. High-profile projects likewise extend our engagement in South Asia (Petrie), East Asia (Crema, Janik, Martín-Torres, Mei; PDRF Gjesfjeld), Southeast Asia (Jacobs), the Americas (DeMarrais, French, Martín-Torres; PDRFs Marín-Aguilera, Ting), the Pacific (Alderson) and polar regions (Barrett, Evans; PDRF Brittain). We retain prominence in Egypt and Mesopotamia (Bunbury, McMahon, Papazian, Spence, Worthington; PDRFs Loktionov, Tsouparopoulou), and in Europe and the Mediterranean (Barrett, Broodbank, Evans, French, Hakenbeck, Joy, Miracle, Nigst, Robb, Sørensen, Stoddart; PDRFs Boyd, Brittain, Cessford, Knight). Study of the latter is enhanced by synergies with Galanakis, Launaro and Millett (UoA29). Inclusion of human evolutionary studies has hugely boosted strength in Pleistocene/Palaeolithic research across Africa and Eurasia (Miracle and Nigst, now joined by Foley, Jacobs, Koops, Mirazón Lahr and Pomeroy; also Barker [retired October 2014] at Shanidar). At the other end of the chronological spectrum, we are active in medieval and later periods (Alderson, Barrett, Carr, DeMarrais, Hakenbeck, Lane; PDRFs Cessford, Marín-Aguilera, Parkinson, Ting). Methodological breadth has expanded through appointments in materials science (Martín-Torres; PDRF Ting), computational analysis (Crema), proteomics (Collins), genetics and bioinformatics (Jacobs), osteology (Pomeroy) and health (Said Mohamed), while maintaining strengths in environmental archaeology (Barrett, French, Miracle; PDRFs Ballantyne, Hunt, Nicolaidis Ramsey, Sulas; one permanent post under appointment at census), isotopic approaches to palaeoecology (O'Connell; PDRF Loftus), landscape analysis (French; Petrie, Stoddart) and field methods (Evans, Petrie). Textual and linguistic analyses are advanced by Papazian, Worthington and PDRF Loktionov.

(2) Sustainability, palaeoecology and food security. Our enhanced focus is exemplified by: Barrett on marine historical ecology (e.g. Marie Skłodowska-Curie Innovative Training Network *SeaChanges*); Collins on ancient proteins (e.g. ERC *Beasts to Craft: Parchment as a Biological Archive*); French on Mediterranean, East African and South American farming landscapes; Jones (retired 2018) and Hunt on food globalisation (ERC *Food Globalisation in Prehistory and Leverhulme Crops, Pollinators and People*); Koops on primate behaviour and ecology; Lane on resilience in African environments; Loftus on coastal adaptations (Leverhulme Early Career Fellowship); McMahon on long-term urbanism in Mesopotamia; O'Connell on stable isotope ecology; Petrie on prehistoric and current farming resilience in South Asia (e.g. ERC *TwoRains* and GCRF *TIGR2ESS*); Said Mohamed on childhood health; Sørensen and Evans on sustainable heritage in Cape Verde; and Viejo Rose on reparations for destruction of heritage. The reach and significance of our sustainability research is exemplified by our Food Security impact case study (ICS). Work in this area is actively supported by Departmental impact and research priming funding (e.g. Cape Verde, India), provision of research leave (e.g. McMahon, Petrie) and major investments by the McDonald Institute in laboratory infrastructure and staff (e.g. Collins, appointed McDonald Chair in Palaeoproteomics).

New objectives initiated and achieved within the REF2021 cycle are:

(1) Integration and boosting of strength in human evolutionary studies and biological anthropology, and pursuit of greater synergies with Palaeolithic archaeology and archaeological science. Foley and Mirazón Lahr at senior level have been joined by new-blood appointments (Chaudhary, Crema, Jacobs, Koops and Said Mohamed), supported by a new post of Collections Manager of the Duckworth (Biers).

(2) Strategic investment in next-generation archaeological science, achieved through the appointment of Martín-Torres (Pitt-Rivers Chair; material science; theory of archaeological science), Jacobs and Collins, and by refurbishment and enhanced integration of our laboratories (see below). Contrary to the normal subdivision between organics and inorganics, we aim to encourage combined approaches, philosophies and methodologies.

(3) Enhancing intellectually driven and applied heritage research, as pioneered at Cambridge by Sørensen. This is underscored by our first dedicated post (Viejo Rose), a second post under appointment at census and further strengthening of heritage research by Carr and Janik. It is strongly reinforced by the co-founding/funding of CHRC, plus community heritage projects in the Channel Islands (Carr), East Anglia (CAU), Italy (Stoddart), Egypt (Spence), Cape Verde (Sørensen, Evans), East Africa (Lane) and the US (DeMarrais), as well as two new (awarded 2019 for an autumn 2020 start) Arcadia-funded Cambridge-led collaborative programmes of endangered heritage mapping in Africa and South Asia (Arcadia total awards £5.1m). Our ICS *Improving our Understanding of the Victims of Nazism in the Channel Islands* exemplifies the significance and reach of one of many heritage initiatives.

(4) Enhanced collaborative research by CAU in regional archaeology, primarily in Cambridge and Fenland, the latter one of Europe's outstanding preservation contexts. The West/North West Cambridge (Evans, Brittain) and Must Farm (Knight, Ballantyne) excavations exemplify the achievements of this priority, as summarised in the CAU ICS – as does the Wellcome-funded *After the Plague* project, based on CAU research at St John's Hospital Cemetery, Cambridge (Robb, O'Connell, Cessford, Mitchell).

Cambridge Archaeology has undergone its most radical transformation in decades, and our next mission is partly to embed and grow the gains, within and across existing and emerging research themes. All the objectives identified during the current cycle merit enhanced development, and several initiatives will reach fruition in the next (e.g. Heritage). Yet we also intend to develop fresh challenges over the coming decade, specifically (1) realising archaeology and biological anthropology as global deep history, critically framed and relevant today, and (2) fulfilling the potential of integrated social and scientific approaches to material culture. At a more holistic level, we aspire to a larger, integrated and interdisciplinary exploration of the global deep and recent human past and its relevance in the present. We will measure success through a combination of our own exacting expectations, external formal yardsticks and attracting many among the most interesting new generation and established researchers to work with us, with a strong emphasis on widening diversity. We will seek, by stimulating debates, collaborations and primary research, to lead ambitious new discourse and discoveries, for the benefit of the discipline and wider society.

Enabling impact

The Department has achieved impact by working directly with diverse stakeholders and enabling organisations, many having requested our assistance. Examples include grass-roots communities (e.g. descendants of victims of Nazism), corporations (e.g. Forterra Building Products at Must Farm), national agencies (e.g. Historic England and the British Academy's priority area 'Conflict, Stability & Security'), regional and national governments (e.g. Government of Punjab regarding Indian food security, Egypt's Ministry of Tourism and Antiquities on the future of Amarna's heritage), international organisations (e.g. UNESCO, International Criminal

Court) and international NGOs (e.g. ICOMOS, Heritage for Peace) (see *Engaging with Recipients*, below).

Two full-time professional staff (Outreach Officer [Bonner] and Research Facilitator [Boyle]) plus an Academic Champion (Barrett) have supported our impact agenda. Research funding newsletters, including impact opportunities, are produced monthly, and one-to-one impact development meetings nurture nascent ideas. Departmental funding for impact is provided by the McDonald Institute and in this REF cycle has supported initiatives as diverse as impact-led fieldwork (e.g. Sørensen and Evans – Cape Verde’s World Heritage Site management) and public art inspired by CAU research (at Cambridge’s new Eddington community – see ICS). The CHRC has also already proved a dynamic force, with active interventions on heritage in post-conflict contexts and engagement with international NGOs (Carr, Sørensen, Viejo Rose).

Our research grants team (see *Infrastructure Supporting Research and Impact*, below), embedded within the McDonald Institute, assists in impact-oriented applications for projects such as Petrie’s ERC-funded *TwoRains* (studying the implications of climate change and resilience in prehistoric India) and participation in *TIGR2ESS* (a cross-departmental GCRF award to support cutting-edge research addressing food security in developing countries). The University’s Arts and Humanities Impact Fund (AHIF) offers awards of £5,000 to £10,000, which we have employed for projects ranging from an educational computer game on medieval health (Robb) to rock art exhibitions/installations in Poland designed for Downs and autistic individuals (Janik), experimental archaeology (Stoddart) and a bilingual (English/Arabic) children’s book on the Egyptian city of Amarna (Spence). The University also offers an annual GCRF scheme, with grants of up to £80,000 for research addressing the problems of developing countries; presently it supports Lane’s *Community Heritage and Education for Sustainable Development in Tanzania* project. The collegiate organisation of Cambridge offers further support for impact, with an influential short film, *The Poor Man of Nippur*, delivered in Babylonian with subtitles in 19 languages, viewed >85,000 times on YouTube, financed with AHIF and College support (Worthington).

The Department considers impact linked to research excellence in its appointments strategy. For example, Lane brings extensive experience of GCRF projects and Collins successful links with industry. Said Mohamed brings collaborations with global health initiatives, and Chaudhary is applying behavioural ecology to understand community cohesion and crime rates across urban environments. Such new colleagues enhance the vitality and long-term sustainability of the Department’s impact agenda.

The Department’s impact case studies, which all benefit from the above-mentioned support, represent the intersection of strategic research priorities with user-community engagement. One (*Archaeology, Development and the Public in the East of England: The Cambridge Archaeological Unit*) is based on CAU’s commitment to the social, cultural and economic impact of field archaeology in the local region. It responds to user needs expressed by developers, urban planners, heritage managers (including museums and galleries) and artists. *Archaeological Contributions to Sustainable Farming and Food Security in China and India* derives from our engagement with global sustainability, responding to user needs from farmers, government and NGOs. *Improving our Understanding of the Victims of Nazism in the Channel Islands* is rooted in our heritage research priority, especially that focusing on post-conflict reconciliation. It responds to user needs from victims’ descendants, both local and national government and NGOs. Finally, *Developing Sustainable Heritage at Tell el-Amarna, Egypt*, combines our priorities in heritage and Egyptian/Mesopotamian research, responding to the needs of local residents, heritage managers, tourism, national government and UNESCO.

Interdisciplinary research

With research ranging from heritage and ancient languages to aDNA, via social archaeology, archaeological science, palaeoecology, human biology and evolution, the Department has exceptional intellectual and applied breadth. A major priority of the REF2021 cycle has been the generation of a suite of ground-breaking interdisciplinary, impact-rich flagship projects.

Examples such as *Beast to Craft* (Collins, ERC Advanced), *Encounter* (Crema, ERC Starter), *TwoRains* and *TIGR2ESS* (Petrie, ERC Consolidator and GCRF), *Yangshao Culture* (Sørensen, Shanghai Academy of Guyewang Studies) and *After the Plague* (Wellcome Trust) bring excitingly unfamiliar clusters of staff and research students together, across our research themes, and showcase next-generation innovative, interpretive, open-data archaeology at its broadest.

This interdisciplinarity is nurtured via seminars, away days and targeted grant support (e.g. an annual £10,000 interdisciplinary conference fund). It is also reflected in the academic profiles of recently appointed staff, especially those engaged with bioarchaeology and human cultural and biological evolution, who comfortably straddle traditionally distinct disciplines (e.g. Collins, Crema, Jacobs, Koops, Pomeroy and many PDRFs).

Our UoA has strong relations with Classics, Earth Sciences, Geography, History, Plant Sciences and Zoology – for example aDNA analysis with Willerslev (Zoology), South Asian farming dynamics (*TIGR2ESS*) with Plant Sciences, and whaling/sealing research (Barrett *SeaChanges*, Brittain *South Georgia Archaeological Project*) with the Scott Polar Research Institute. We take a leading role in Cambridge's Material Culture Forum, which draws together Archaeology, Classics, History, History of Art and Cambridge museums. We are active in three University Interdisciplinary Research Centres: Language Sciences (Foley), Data-driven Discovery (Crema), and Global Food Security (Petrie, PDRFs Hunt, Lister, Sulas). We play the lead role in CHRC. As our archaeology is inherently interdisciplinary, only publications that clearly speak innovatively to disciplines outside an inclusive definition of the subject are flagged as such in our outputs return.

Open research and data sharing

Archaeology at Cambridge is leading open research and data sharing, in line with the University's Position Statement (<https://osc.cam.ac.uk/open-research/open-research-position-statement>). It is a focus of our Computational and Digital Archaeology Lab (CDAL) and is broadly supported across the UoA. Crema has co-authored a manifesto on Open Science in Archaeology (*SAA Archaeological Record*, 17 April 2017), Collins has presented on open research priorities to Marie Skłodowska-Curie Actions (MSCA) officers in Brussels, O'Connell is an adviser to the NSF-funded IsoBank initiative, and Ting is Editor-in-Chief of the *Journal of Open Archaeology Data*. In 2018, the McDonald Institute moved to Open Access (CC BY-NC-ND) publishing of its monographs. Examples of open access research initiatives include *MedAfrica's* database of all radiocarbon dates across North Africa (Broodbank), the Southern African Radiocarbon Database (Loftus) and the *rcarbon* R package (Crema), the last downloaded >14,000 times since 2017.

Ethical research and research Integrity

The stringent research ethics and integrity promoted and adhered to across the UoA are especially pertinent because we work globally, and with human tissues through to human subjects in heritage research. PhD students receive formal ethics training and all staff access ethics guidance. Beyond compliance and engagement with University bodies (e.g. University Research Ethics Committee, Human Remains Advisory Panel) and academic best practice (e.g. the Vancouver Protocol, DORA, the Concordat to Support the Career Development of Researchers), we have our own Departmental Ethics Committee with a termly internal process for review and guidance of research by staff and students. The Duckworth Collections Manager has responsibility for ensuring sensitive handling of human remains; guided by the Director (Mirazón Lahr), she has implemented protocols for handling and sampling, and for working with indigenous communities, as evidenced by the recent highly successful return of Hawaiian *kūpuna*. Philanthropic research funding is also subject to ethical scrutiny, by the University's Committee on Benefactions and External and Legal Affairs.

2. People

Staffing strategy and staff development (i) staff development strategy

The opportunities provided by restructuring and rejuvenation have encouraged strongly proactive approaches to staff development. Our permanent research and teaching staff at census comprise nine Professors, one Director of Research (a professorial-equivalent role, held by Evans as Executive Director of the CAU), five Readers, six Senior Lecturers, nine Lecturers, one Assistant Director of Research (lecturer equivalent) and one College Teaching Officer (Bunbury). This team is strengthened by two MAA curators, the Director of the Needham Research Institute (employed by the Department of Archaeology at 0.2 FTE as a Director of Research) and 17 research-independent PDRFs (including three research-independent Senior Project Officers at CAU). Retirements since REF2014 comprise three from Archaeology (Barker, Hills, Jones), one from ICE (Oosthuizen), and two from former Biological Anthropology (Marlowe, Mascie-Taylor). Three UTOs from Biological Anthropology (Kivisild, Stock, Walsh) plus one MAA curator (Wingfield) have left for other positions. Retired staff remain closely connected, via University-level arrangements if grant-holding (e.g. Barker, Jones, Postgate, Renfrew) and as Senior Fellows of the McDonald Institute. We have been actively promoting a good gender balance through recruitment practices that focus on equality and diversity (see below). Female to male numbers at census are: core academics 14:21; REF-eligible PDRFs 9:8; PhD students over cycle 86:42. Each category is international in composition.

Promotion has been overwhelmingly successful, encouraged through appraisal and discussion with the Head of Department (HoD). In this REF cycle, there have been four promotions to Professorships (Mirazón Lahr, Oosthuizen, Robb, Sørensen; three female), four to Readerships (McMahon, O'Connell, Petrie, Stock; two female), five to Senior Lecturer (Hakenbeck; O'Connell, Papazian, Spence, Worthington; three female), and one to Director of Research (Evans, male), totalling eight female and six male promotions. Two additional promotions to Senior Lecturer are confirmed at census for October 2020 (Crema and Viejo Rose, maintaining gender balance).

New research and teaching staff join the University's induction course; those below professorial level have a probation period with benchmarks, and are assigned a mentor (the latter available to incoming professors). Probation has been passed, when due, by all such staff in this cycle, and in several cases accelerated. All UTOs have regular appraisals, usually biennial (probationary staff are reviewed annually), to discuss progress, careers and problematic issues. PDRFs are likewise assigned a mentor and have regular training through McDonald Institute and University schemes. All staff have a line manager, and are encouraged to use the University's programme of staff development offerings; Archaeology has good uptake. PDRFs are in addition supported by the University's Postdoc Academy (<https://www.postdocacademy.cam.ac.uk/>) and PostDocs of Cambridge Society (<https://www.pdoc.cam.ac.uk/>). The Department arranges and funds additional dedicated training at all levels from PhD student to permanent academic staff on important topics, such as first aid and prevention of sexual harassment in the field.

Staffing strategy and staff development (ii) effectiveness of staffing and recruitment strategy

The new Department has achieved sharp growth in core research and teaching staff numbers, from 22 to 34 (excluding fixed-term Mei), our largest in any REF cycle. New appointments are, in order: 2014: Broodbank, Joy; 2016: Crema, Viejo Rose (latter with the aid of University incentive funds); 2018: Chaudhary, Collins (0.4 FTE), Lane, Martín-Torres; 2019: Pomeroy, Said Mohamed; 2020: Jacobs, Koops. We have recruited four Professors (Broodbank as Disney, Lane as the newly endowed Ward Oppenheimer, Martín-Torres to the previously endowed Pitt-Rivers, and Collins to a McDonald Chair in Palaeoproteomics), and eight entry-level positions, the latter in pursuit of our rejuvenation strategy. Three upcoming posts (replacing Foley [retires 2020; human origins] and proleptically French [environmental archaeology] and Sørensen [heritage]) were successfully confirmed despite the current pandemic, with interviews in June/July 2020 for start dates in the 2020/21 academic year. We have further enhanced our strength with targeted sharing of leaders in key fields (Humphris, 0.23 FTE, also Director of BIEA; Mei, 0.2 FTE, also Director of NRI and expert in ancient Chinese technology). Collins' dual

posts at Cambridge and Copenhagen complement this strategy. Our success in recruiting PDRFs as both independent researchers and participants in larger projects has been outstanding, with (excluding CAU staff) 117 hosted over this REF cycle (107 employed through the University or its Colleges and 10 directly paid by their funding body). We avoid reliance on fixed-term or part-time teaching staff. When temporary staff are employed to cover brief gaps during leave or hiatuses in appointments, they are fully supported (see below).

Staffing strategy and staff development (iii) support for Early Career Researchers (ECRs)

ECRs represent a crucial component of our staff, and a cherished asset for the field's future, as we bet on youth to embrace new methodologies, ideas, numeracy and interdisciplinarity. At census, three of 34 core research and teaching staff and nine of 17 research-independent PDRFs are ECRs as defined by REF2021. All new staff, permanent or PDRF, have an induction and are paired with a mentor for pastoral advice (additional to their line manager or PI); our probationary system is tailored to their role and length of contract. New permanent research and teaching staff receive a £10,000 start-up grant from SHSS, and like all Departmental UTOs can draw upon an allocated £1000 p.a. for research support, travel, etc. ECRs, including PDRFs, can apply for up to £5000 p.a. in seed-corn funding from the McDonald's in-house grants scheme, which is open to all academic staff on an externally reviewed competitive basis. The University's Centre for Research in the Arts, Social Sciences and Humanities (CRASSH) offers an early career supplementary research leave scheme, taken up by five Archaeology staff in this REF cycle.

Extensive support is offered to PDRFs, be they research-independent postdocs or those employed on projects led by others, irrespective of ECR criteria. Many of the 117 PDRFs hosted over the REF2021 cycle have been supported by projects led by permanent staff, funded, for example, by the ERC (30), Wellcome [five] and Leverhulme (five). Others have held independent fellowships funded, for example, by H2020 MSCA-IF (23), the McDonald Institute (nine), Leverhulme (four) and Cambridge University Colleges (11). The McDonald's annual funding of a three-year Renfrew Fellowship, held jointly with a College, has proven to be a sought-after ECR post internationally, with typically 80–130 applications per year.

The McDonald acts as the primary base for all PDRFs. Thus two central responsibilities of the Institute's Director and Deputy Director are to advise on and support their progression, via individual meetings to review progress and plans, and to comment (along with our Research Facilitator) on grant and job applications. The McDonald runs a termly Postdoc Forum to discuss matters of shared concern and hosts integrative social events. All PDRFs are members of at least one research theme and seminar group, and there is funding to run seminars and conferences. Teaching experience for PDRFs is coordinated by the McDonald Institute and Departmental Teaching Committee, recently reorganised as a bespoke opt-in teaching mentoring scheme. The McDonald Institute liaises regularly over PDRF policy with the University's Postdoc Academy.

The quality of PDRFs attracted to our environment, and the effectiveness of our development strategy, is demonstrated by the high proportion proceeding to long-term posts at prestigious universities and research institutions. Of 88 leavers over the REF2021 period, 38 have gained such positions, with another 25 moving to fixed-term academic posts and seven to commercial archaeology or heritage posts (in aggregate 80% of all leavers). Examples of leaver destinations include lectureships at Bologna, Cambridge, the Cyprus Institute, Dartmouth, Edinburgh, Emory, Florida State, Graz, Haifa, La Sapienza, Leicester, Liverpool John Moores, Loughborough, Macquarie, NYU, Nottingham, QUB, Tarragona, Tübingen, UCL, Washington St Louis and Zurich. Three of our few fixed-term temporary lecturers over this cycle, plus one temporary MAA Curator, have gained long-term posts at Cambridge, Bournemouth, Leicester and the Getty Research Institute. Our ECR investment and success contributes significantly to the sustainability of the field, while increasing the long-term national and international research networks of Cambridge-based archaeology.

Staffing strategy and staff development (iv) leave policy

UTOs receive a statutory one term of sabbatical in seven. Archaeology has an additional local scheme to incentivise longer leave for ambitious research and impact, by removing all duties for the third term if two sabbatical terms are taken consecutively within a year – in effect one year every fifth. The Department actively encourages applications for competitive buyout schemes, in which it has been highly successful, e.g. Barrett's Leverhulme Major Research Fellowship; Crema's Philip Leverhulme Prize; Hakenbeck's Visiting Scholarship at Princeton's IAS; Joy's Headley Fellowship; McMahon's Visiting Professorships at La Sapienza and Paris I; Petrie's British Academy Mid-Career Fellowship; Robb's Wellcome Trust grant; Worthington's NYU ISAW Fellowship. Impact responsibilities are also incorporated into the Department's workload evaluations. Fixed-term staff (almost all PDRFs) do not have sabbaticals but are actively guided by their line managers/PIs and mentors to use their employment to maximum research and career advantage.

Staffing strategy and staff development (v) recognition and reward for impact and knowledge exchange

Impact and knowledge exchange are fully embedded in recruiting, recognising and rewarding staff. The Department seeks to appoint colleagues with portfolios including direct evidence of major real-world significance, either central to their work (e.g. Lane, Said Mohamed, Viejo Rose) or through seizing opportunities presented by important spin-offs (e.g. Collins and food forensics). Impact-achieving research by existing staff is recognised through direct financial support (including research assistance – see *Enabling Impact*, below), inclusion of research impact in the University's senior promotions process, and the prestigious Vice-Chancellor's Research Impact and Engagement Awards. Archaeology staff are encouraged and supported in applying for this recognition: in 2016 Carr won the Vice-Chancellor's Impact Award for her heritage-based work on victims of Nazism in the Channel Islands (see ICS). Key Departmental roles, such as REF Impact Champion and case-study leads, are acknowledged via the allocation of Departmental workload. Both impact and knowledge exchange are rewarded by the McDonald Institute's Field Archaeologist in Residence programme, which embeds a leading commercial archaeologist for one term; an outstanding recent example is Sadie Watson, since winner of a UKRI Future Leaders Fellowship at MOLA, and whose residence has accelerated collaboration between MOLA, CAU and the Department. Professional staff with responsibility for impact generation are likewise supported, with Research Facilitator Boyle shortlisted in 2018 for a University Professional Services Recognition Scheme award.

Research students: recruitment, support mechanisms, skills development and employment preparation

A high-quality international PhD community is a key strength of our environment. In the REF2021 cycle, 128 students from 35 countries completed their PhDs (N.B. we do not offer separate professional doctorates). Selection and funding are highly competitive, based on outstanding prior performance, a well-developed original project, references, fit with the intended supervisor and interview. Archaeology is a member of AHRC and NERC DTPs, which are complemented by additional highly competitive studentships (e.g. Gates, Cambridge Commonwealth Trust) offered through the University and its Colleges. Grant-funded PhDs (e.g. *After the Plague*; *SeaChanges*) bring benefits of participation in research teams. Of the REF2021 PhD cohorts, 66% of students were funded: 28 by UK research councils (AHRC, NERC, BBSRC), five by Gates studentships, 46 by other University and College studentships, and six by overseas funders including H2020.

Students are supported by at least one supervisor, plus an academically complementary second advisor and a College tutor. Progress is guided by the University's Code of Practice for research students, signed by student and supervisor (<https://www.cambridgestudents.cam.ac.uk/grad-code-of-practice>). All students participate in research skills workshops, covering topics such as research design, ethics, fieldwork planning, publication, etc. Additionally, they are provided with tailored training. Many take offerings in computing, data science, GIS and/or the SHSS ESRC-validated course in Social Science Research Methods. All students defend progress reports

before expert panels halfway through year 1 and submit a major pilot study at the transition to year 2, followed by further checks in year 3.

In addition, PhD students are embedded in the Department's research culture through participation in meetings, seminars, projects and laboratory groups. They regularly contribute presentations alongside UTOs, PDRFs and external speakers. They edit the student-run peer-reviewed *Archaeological Review from Cambridge* and representatives participate in Departmental committees, including Research Committee (RC). Generous funding for conference presentations, fieldwork and training is provided by University, College and Department, and students are strongly advised to take full advantage of this; many publish in journals/edited volumes before submission. Teaching opportunities are available, as TAs and tutorial supervisors. PhD students are encouraged to take advantage of Cambridge's formidable wider opportunities for research development (from the University's comprehensive programme of transferable skills training to opportunities for workshop organisation in CRASSH and Colleges), and to compete for its awards. One student won the Inclusive Teaching Award in the 2017 Cambridge Student Union competition; in 2019, two more won an Outstanding Student Contribution to Education Award for innovative MAA tours. The combination of high entry standards and highly effective training makes for a community of new-generation researchers of formidable ability and energy.

A key measure of success is career progression. Of the REF2021 total of 128, 49 have progressed to fixed-term post-doctoral research posts, 21 have obtained long-term academic posts (principally lectureships), 10 work in museums, five in other heritage posts, four in commercial CRM, and nine in academic or related administration (in aggregate 77% of the total). The remaining minority have pursued successful careers in, for example, publishing, teaching, IT, business, government and medicine. One was president of the University's Graduate Union between 2019 and 2020.

Equality and diversity (i) career pathways, study leave, flexible working, travel, fieldwork, support and well-being

We highly prioritise Equality and Diversity (E&D) issues. The University fosters an environment valuing diversity and promoting inclusive culture, reflected in its Silver Athena Swan status and commitments to promoting gender equality, closing the gender pay gap, ensuring balanced professorial promotion and signing up to the Race Equality Charter. Staff and student diversity networks provide discussion fora; a Returning Carers Scheme supports careers impacted by leave; and the Breaking the Silence campaign supports those affected by sexual misconduct – building a culture of zero tolerance. Job advertisements encourage applications from diverse/non-traditional backgrounds. Archaeology values its welcoming and supportive environment and gender balance is considered in all major research leadership roles, including membership of the Research (five female, six male) and REF (four female, five male) Committees.

The Department has prioritised E&D and established new initiatives. Starting with recruitment, strenuous efforts have been made to select the best applicants transparently and in accordance with E&D best practice. Priorities for long-term posts relative to Departmental need and strategy are debated among staff, and advertisements drafted by gender-balanced appointment committees trained in E&D and unconscious bias; they initially rank male and female applicants separately to ensure balanced shortlists. Presentations to staff and students (with feedback) are given by shortlisted candidates prior to interview. That the permanent research and teaching staff appointed in this cycle have been almost entirely our first-choice candidates, from high-quality pools, affirms our attractiveness as a place to work. Among these, four have gone to women and seven to men; new appointments underway at census include a further two women and one man. Our new colleagues are from a diversity of ethnic backgrounds. PDRF applicants are assessed following the same principles. In our 2020 Departmental survey (an initiative of our new Athena Swan/E&D Committee, with responsibility for guiding Departmental policies and practices), 86% believed that their recruitment was not affected by gender bias and only 2% stated the opposite.

The Department has placed particular emphasis on timely career progression for female staff (see *Staffing Strategy and Staff Development*, above). Almost every female UTO beyond probation has been promoted or received an exceptional pay rise during this cycle: three Professorships, two Readerships and three Senior Lectureships (a fourth is confirmed, effective from 2020–21). This career progression and resulting female leadership within the Department creates role models for younger staff (reinforced by a newly commissioned portrait of Dorothy Garrod, Cambridge's first female professor) and reflects our determined support for equal promotion, including access to University-level experienced advisors for female applicants.

Appraisals provide the opportunity to encourage promotion and funding applications, across staff of all genders and protected characteristics, including those hesitating to put themselves forward. External funding applications are universally supported by a dedicated team of Research Facilitator and Grants Administrator (one female, one male). Internal pump-priming funds are available to all UTOs and PDRFs through the McDonald Institute.

In line with our committed investment in long-term staff, we have few fixed-term appointments beyond our PDRFs (see *Support for Early Career Researchers*, above). Temporary staff, mainly those covering leave, receive mentoring, access to infrastructure and financial research support (including £1000 p.a.). Likewise, we have few part-time staff (beyond those on advantageous job shares); their workload is proportionately adjusted and they too receive full mentoring and other support. Professional staff are also regularly appraised and encouraged, if appropriate, to apply for career-enhancing training schemes, additional financial contributions and/or re-grading.

Study leave is statutory for permanent teaching and research staff. Timing is scrutinised by the HoD and Teaching Committee, for equity and flexibility relative to need, with scope for adjustment to fit requirements. The Department and University are committed to flexible (including remote) working, implemented on request for staff with childcare responsibilities; this system was in place well before being comprehensively applied during COVID-19 lockdown.

We have made full use of the University's Returning Carers Scheme to allow both core and PDRF staff to maintain external conference and fieldwork presence under early maternity conditions. Departmental space is available for childcare as needed and we have adjusted late afternoon timetables to facilitate attendance by those with childcare responsibilities. The University has generous maternity/paternity/adoption leave provision and offers a graduated return plan and flexible working arrangements. Those with disabilities receive support in terms of specialist equipment and ease of access, strong appreciation of which is demonstrated by our 2020 E&D survey. The Department has appointed two Responsible Officers and an LGBT+ champion to provide confidential guidance as needed and has introduced mandatory training for all staff and students relating to harassment, especially during fieldwork. Evaluation of diversity-related issues is integrated in our mandatory travel and fieldwork risk assessment procedures for Departmental projects.

Our workload model for teaching and administration aims to adjust responsibilities equitably, taking account of protected characteristics and special circumstances. Regular appraisal and promotion encourage personal well-being. Physical or mental health matters are addressed promptly and supported directly by the HoD, line manager or Responsible Officer, or directed to the University's Occupational Health Service and sick leave arrangements. We aim, by maintaining a community scale compatible with face-to-face interaction, regular informal subsidised social events, plus clear line-management and appraisal systems, to foster a positive culture of mutual support, vertically and laterally, between all staff categories. In the context of COVID-19 lockdown, this was achieved by dedicated social networking channels and regular online events for all.

Equality and diversity (ii) outputs

Selecting outputs for REF submission has entailed careful attention to E&D issues, including unconscious bias. The UoA worked iteratively with the University's REF office to agree a Code

of Practice regarding key procedures. These included the principle of self-nomination (all current REF-eligible staff were invited to propose and score their best outputs for consideration) and independent review (internal and/or external experts then scored the suggested works). Archaeology's outputs were chosen when scored highly by both authors and independent readers. Readers were of two genders (external: four female, two male; internal: six female, seven male). The Chair of the REF Committee moderated outputs to ensure consistency of scoring. Publications by leavers were evaluated by nomination of the UoA's REF Committee (often in consultation with the authors), followed by independent peer review. Of our REF2021 outputs, 37% (adjusted for double weighting) are contributed by women, who comprise 47% (adjusted by FTE) of our census staff. The four ICS leads are two women and two men.

3. Income, infrastructure and facilities

Funding strategies

Funding applications are a major Departmental priority, to enable research and impact at scales ranging from individual scholarship to major collaborations, both supporting existing staff and attracting new excellence. Close attention is given to the fit between Departmental strategy (as led by RC), project aims and financial means, in order to maximise successful project management, academic outputs and value for money. We emphasise support in areas consonant with our major research themes, projects developing new local, national or wider collaborations, and ones that will make a difference, whether in terms of academic and public understanding, capacity building or impact. Our funding remit engages most types of relevant grant-giving bodies, and our planning extends to strategically targeted philanthropy. Concerns over future access to EU funding have driven active scoping of alternative national (e.g. Wellcome) and global (e.g. German and Chinese) possibilities. The commercial and research-grant funding of CAU operates within the Departmental framework, with both delegated decision-making autonomy and oversight by RC (of which the CAU's Executive Director is an *ex officio* member) and the CAU's own Managing Committee.

Research expenditure has risen from an already high level of £15.46m in REF2014 to £34.78M in the present cycle. Of the 90 new externally reviewed grants received during this REF cycle, the following £million+ projects stand out: *Adapt* (ERC Consolidator; £1.3m; Stock), *After the Plague* (Wellcome Trust; £1.3m; Robb), *Encounter* (ERC Starter; £1.2m; Crema), *TwoRains* (ERC Consolidator; £1.5m; Petrie), *Yangshao Culture* (Shanghai Academy of Guyewang Studies; £1.2m; Sørensen), and two recent grants for research into endangered heritage in Africa and South Asia (Arcadia; £3.3m and £1.8m to Lane and Petrie respectively); a further ERC Advanced Grant (*Ancestors*; £1.9m; Robb) starts in October 2020. Three further ERC grants (two Advanced, one Consolidator) ran into the current REF cycle (Jones, Kivisild, Mirazón Lahr); and one ERC Starter moved to us (*Procon*; PI Gleba). We are beneficiaries within two additional ERC Advanced grants (*Beast to Craft*, Collins; *FRAGSUS*, Stoddart). Examples of other noteworthy grants include partnership in two Horizon 2020 Spreading Excellence (Twinning) projects, with Zagreb/Pisa (*MendTheGap*; Miracle) and the Cyprus Institute/Leuven (*Promised*; Broodbank) – as well as the MSCA-ITN *SeaChanges* (Barrett). We have hosted 23 MSCA-IFs since 2014. Moreover, the commercial research expenditure of CAU over this REF cycle currently stands at c. £13.1M including major funding for fieldwork at the high-profile wetland sites of Must Farm and Flag Fen. Grant overhead returns are split equally between the McDonald's infrastructural budget, the Department (for strategic investments), and the PI (for incentivisation and pump-priming).

A recent success is the development of philanthropy to significantly advance research, aided by Cambridge University Development and Alumni Relations. Archaeology raised £2.5m for its endowed Ward Oppenheimer Chair in the Deep History and Archaeology of Africa; £350,000 for (a) joint research into human origins with Witwatersrand and (b) PhD and field research on Cyprus; £210,000 for a three-year Leventis PDRF in African Archaeology; and £58,000 for an MPhil and PhD on Southeast Asian archaeology. The University's Isaac Newton Trust co-funds our Leverhulme ECFs and also supports strategic initiatives on a competitive basis.

This REF cycle has further witnessed large-scale internal financial investment by the McDonald Institute, from its endowment and grant-overhead income, in research priority areas (in addition to funding several other programmes discussed herein – from impact pump-priming to publications):

- Co-funding of £133,000 over five years, matching £207,000 from SHSS, to set up and run the CHRC
- Funding of £90,500 (alongside £451,700 from University and research grant sources) to re-equip and refurbish our archaeological science laboratories, plus £128,700 in technician salary
- Funding (0.4 FTE) Collins as McDonald Chair in Palaeoproteomics
- Funding (0.23 FTE) Humphris in partnership with BIEA
- Funding (0.2 FTE) Mei in partnership with NRI.

Organisational infrastructure

Research activity is coordinated by the Department's RC and logistically supported by the McDonald Institute. We combine strategic direction with enabling bottom-up initiatives, supporting solo scholarly excellence and group endeavour alike. The RC is our key forum for discussing priorities, informed by regular away days for academic staff to debate collective thinking on matters of strategic direction, and to enhance community cohesion and collaboration. The McDonald Institute, beyond generating major initiatives of its own, funds numerous Departmental programmes and provides support for grant acquisition, project management and realisation of impact potential.

Our research infrastructure allows different networks and foci to flourish in an organised, and yet also deliberately open-ended and creative fashion. As described in Section 1, six research themes structure our regular research activities and provide opportunities for staff and students to engage with each other. These have been collectively agreed to emphasise current priorities as well as historical and emergent foci, and to foster links across periods, regions, methods and theoretical approaches in ways that both strengthen the cohesion of our research community and foster its richness and diversity; they are elective, and not mutually exclusive. Associated with each is at least one seminar series (e.g. Human Evolutionary Studies benefits from Biological Anthropology's flagship seminar, plus the inter-departmental Pal/Meso group). We are keen that these themes neither silo our research, nor stifle crucial deep regional expertise. Many initiatives cross between research themes in innovative interdisciplinary ways (e.g. *After the Plague*). Overall, our UoA runs 15 flourishing weekly/fortnightly seminar series. Above these sits our flagship Garrod Seminar, used flexibly to address topics of current excitement. In total, in a COVID-free year, Archaeology hosts c. 150 internal academic events, involving permanent academic staff, PDRFs and visiting scholars, as well as PhD, MPhil and undergraduate students.

Cambridge Archaeology is also a major centre for conferences and workshops; 54 have been hosted since 2014, including large-scale McDonald-funded conferences (e.g. 2018 – Social Inequality before Farming, 2019 – Big Data in Archaeology). We have explored new collaborations, including with the DAAD's Cambridge hub, and the recently published *Evolution of Fragility* conference (<https://www.repository.cam.ac.uk/handle/1810/293556>) co-sponsored with the Getty Research Institute. Investment in the next generation of researchers is demonstrated by our funding of the Cambridge Annual Student Archaeology Conference. Complementing these rich offerings, the McDonald hosts a series of keynote speakers each year. Recent McDonald Annual Lectures have been delivered by Yoffee, Willerslev, Hublin, Gilchrist and Chirikure, with a growing emphasis on commitment to diversity. McDonald Distinguished Visiting Lectureships invite and embed a key thinker with us for a week, with a recent priority on building links to leading archaeologists in and of the Americas (Pauketat, Houston, Prentiss and Pillsbury).

Infrastructure supporting research and impact

Cambridge Archaeology has invested heavily in infrastructure for expanding research activities. We have a dedicated grants team consisting of an experienced Research Facilitator (Boyle), plus a Grants Administrator (Ward), as well as a Departmental Outreach/Comms Officer (Bonner). Boyle proactively scopes, collates and circulates information on upcoming grants, matching these to need/strength, and advises both academic staff and prospective external applicants. This team complements University finance and HR to guarantee effective management support for PIs.

The Department runs an extensive suite of ten laboratories plus associated facilities, covering over 677m², providing for materials analysis (metals, ceramics, lithics and glass), archaeobotany, geoarchaeology, zooarchaeology, advanced microscopy, stable isotopes, aDNA, proteomics, palaeoanthropology (including 3-D scanning) and high-performance computational archaeology, supported by six technicians and two computing officers. The Duckworth Laboratory (195m²), with its new Collections Manager, is a further centre of research and teaching in Biological Anthropology; it is an international resource accessed by c. 50 researchers p.a., and with a large-scale digitisation programme. Our laboratories are undergoing major refit for the coming decade, driven by the twin strategies of (1) pioneering integration of biological and materials science approaches, to maximise efficiency and encourage interdisciplinarity, and (2) updating equipment, especially regarding new, less invasive methods (e.g. ZooMs). Equipment acquired in this REF cycle includes state-of-the-art optical and digital microscopes, a new SEM EDS system, FTIR, 3-D scanners, a second pXRF and new stations for manufacturing thin sections and polished blocks.

Five large rooms house our major team-based projects, and another five our additional PDRF community. The Department also accommodates the CHRC and a highly active Material Culture research hub – both giving precedence to research within theoretically informed humanities and social science frameworks. Each of these last is strongly supported, with a paid administrator and funded flagship seminar series.

Our research benefits from the formidable strengths of the University libraries (including the local Haddon) and world-class museums (MAA and Fitzwilliam, where our investments in materials science and proteomics have facilitated new collaborations). Two MAA curators are embedded within Archaeology, leading to strong collaborations in research, teaching and public exhibitions. MAA is in the process of rehousing and re-recording its collections (a £8.7m University investment), as a preliminary to rolling upgrade and ambitious development of its archaeological displays, having already developed an online research portal (Designation Development Fund).

The McDonald's renowned in-house publication programme continues to thrive and evolve. The peer-reviewed *Cambridge Archaeological Journal* (editors DeMarrais and Robb) is published four times per year, with increasing high-quality submissions and expanding global authorship. The flagship peer-reviewed monograph series, edited by Barrett, has been restructured and made open access, offering routes to publication for both McDonald conferences and major Cambridge-led field projects (e.g. Niah Cave, Keros, Grand Arcade, Bradley Fen, Malta). Over 20 McDonald monographs have been published since 2014.

Infrastructure: equality and diversity

Our generous research support and infrastructural provision ensures full access conditions for all within our community. We are especially proud of investment, via our Research Facilitator, in supporting applications from a diversity of ECRs, as reflected in the successes of our PDRFs and achievements of new UTOs. Many McDonald-funded initiatives support diversity: e.g. increased interaction with African scholars, invitation of female keynote speakers, supporting the female-led CHRC and a requirement for gender balance in funded events. We regularly waive bench fees for visiting scholars from developing countries. Biers' role as Duckworth Collections Manager has enhanced respectful engagement with indigenous communities over human

remains issues (mirroring that of MAA's curators). Our estate has high levels of accessibility for those with disabilities.

Infrastructure: impact activities

As outlined in Section 1, impact activities are supported by our academic Impact Champion (Barrett), Research Facilitator (Boyle) and Outreach Officer (Bonner), with strategic input from RC (in which Barrett and Boyle participate). The CHRC also provides intellectual leadership and logistical support for impact. Pump-priming is provided by a rapid-response McDonald Institute scheme (up to £10,000 p.a.), the University's AHIF (£5,000 to £10,000) and a GCRF fund (awards up to £80,000) for research regarding solutions to problems affecting developing countries. Our impact activities have benefited from all of the above and also, where relevant (e.g. food security research), our excellent laboratories.

Collaborative use of research infrastructure and benefits in kind

We share infrastructure in the interests of collaborative synergies and collective economy. Nationally, we use the NERC Oxford OSL and radiocarbon laboratories, 14CHRONO Centre (Belfast) and SUERC (Glasgow), as well as OSL/TL facilities at Durham, St Andrews and Gloucester. Internationally, our geoarchaeologists use Tübingen's Institute for Archaeological Sciences (micro-FTIR) and Ghent's EMI magnetometry survey facility, while Collins and Willerslev (Zoology) facilitate cooperation between aDNA labs in Cambridge Archaeology and Zoology with those of the Copenhagen Globe Institute. Our Horizon 2020 Twinning grants involve lab-based partners (*MendTheGap* with Zagreb, *Promised* with the Cyprus Institute and Leuven). We also collaborate on laboratory access with directorial staff of two leading British International Research Institutes organisations: BIEA (via Humphris) and the British School at Athens (via Broodbank). Successful international laboratory collaborations also facilitate major research projects that would otherwise be impractical, such as Martínón-Torres' research at the Terracotta Army site in China and the Gold Museum in Bogotá. Shared benefits in kind are utilised whenever practicable: e.g. from the NERC Life Sciences Mass Spectrometry Facility (O'Connell, £46,000), the ISIS Neutron and Muon Source (Martínón-Torres, c. £100,000) and the NERC Radiocarbon Facility.

Within Cambridge, many cross-departmental facilities and linkages are used effectively: palynology facilities and aerial photographic collections (Geography); mass spectrometer facilities for light and heavy isotope analyses of organic and inorganic materials (Earth Sciences); scanning and transmission electron microscopy (Multi-Imaging Centre, Materials Science & Metallurgy); (LA)-ICP-MS/OES for trace elemental analysis (Earth Sciences, Geography); DNA extraction (Biochemistry) and genotyping (National Institute for Agricultural Botany); MALDI-ToF (Chemistry and Fitzwilliam); proteomics (Chemistry), UV-Vis-NIR (Fitzwilliam Museum); and advanced research computing infrastructure. The University's Micro-CT facility is shared with Zoology. Beyond science applications, we have excellent connections with the Centre of African Studies (shared PDRFs and facilities access) and Scott Polar Research Institute (whaling/sealing research). Archaeologists in Classics, integrated through the McDonald Institute, further augment our research environment.

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

Research collaborations

Our research strategy conceives of both a 'core' Cambridge Archaeology and a 'distributed' one in which we constitute a key node, central or contributory, within national and global networks. This is reflected in our pursuit of shared posts (Collins, Humphris, Mei, and Mitchell, the last primarily employed as an NHS surgeon) and Barrett's 0.2 FTE visiting professorship at NTNU Trondheim. Consonant with this model, and reflecting archaeology's interdisciplinarity, virtually all our research staff are engaged in collaboration. The aggregate scope is global. Moreover, our major institutional collaborations are driven by deeper strategic purpose, including areas of research priority, high impact and scope for exchange of ideas. Our archaeological engagements in Africa, for example, are structured around shared support of the BIEA Directorship and close links to the Turkana Basin Institute (Foley, Mirazón Lahr), Kyoto

University Primate Research Institute Nimba Field Station (Koops) and Egyptian Ministry of Tourism and Antiquities (Spence). Our Arcadia-funded African endangered heritage project (Lane, awarded 2019 with a COVID-delayed start in September 2020) is led by Cambridge, engaging with Uppsala University, three African (BIEA, Wits, Dakar) and three UK (Exeter, UCL, York) institutional collaborators, plus national heritage authorities in Botswana, Ethiopia, Kenya, Mali, Senegal, Sudan, Tanzania and Zimbabwe. Additional examples are African research and community projects funded by the GRCF (Lane), Swedish Research Council (Lane) and International Atomic Energy Agency Division of Human Health (Said Mohamed). Our engagement in South Asia is similarly ambitious, led by Petrie through *TwoRains*, *TIGR2ESS* (13 partners in India) and our second Arcadia project (Petrie, awarded 2019 with a COVID-delayed start in October 2020) works directly with government departments and universities in Pakistan and India. In China, Martínón-Torres' CHC-funded research is linked with the University of Science and Technology Beijing (USTB). Our Twinning grants with Croatia and Cyprus enhance Balkan and East Mediterranean connections. Laboratory-based collaboration in biomolecular archaeology is demonstrated by Cambridge-Copenhagen Globe Institute initiatives in evolutionary genomics and proteomics, led by world-class scholars embedded in both institutions (Collins and [in UoA5] Willerslev), and by Foley and Mirazón Lahr as visiting Professors in Copenhagen. Initial outcomes include a DNRF-funded internship programme and collaboration in the biomolecular archaeology of beeswax (involving 14 UK County Archives, as well as Chinese and Jordanian scholars). The *SeaChanges* MSCA-ITN integrates Cambridge with Copenhagen and five other European institutions focused on marine historical ecology. Martínón-Torres has helped to establish archaeological materials science laboratories at Incipit-CSIC (Spain) and USTB (China). These connections, and many others, promote exchange and debate across areas of mutual or complementary strength. The McDonald Institute actively supports the human framework for collaboration, for example through its Visiting Scholars scheme (welcoming over a hundred academics from 29 countries in the REF2021 cycle) and its new Honorary Research Associate scheme for distinguished external collaborators.

Engaging with recipients of research and wider impact

The Department achieves impact by working directly with a wide diversity of stakeholders and enabling organisations, many of whom have requested assistance. Examples include grass-roots communities, museums, corporations, national organisations, governments and international NGOs.

Grass-roots Communities. Cambridge Archaeology reaches out to and empowers communities through educational initiatives, sustainability research, community building and post-conflict resolution. Our educational work includes summer schools, archaeology-themed children's books, and research-led programmes delivered within schools. Partnering with Cambridge Colleges, the Department delivers archaeology summer schools for students entering Year 13, the feedback from which is consistently excellent. Educational children's books have been produced regarding urban life in ancient Egypt (Spence) and iron-working in Africa (Humphris). Additional learning programmes for schools draw on research regarding ancient Egypt (see ICS), coastal Tanzania, and medieval England (*After the Plague*). Sustainability and capacity building in local communities is integral to the methodology of many Departmental research projects. Key examples include Petrie's contributions to *TIGR2ESS* (noted above), Lane's GRCF work on *Community Heritage and Education for Sustainable Development in Tanzania*, and Humphris' award-winning community engagement and capacity building in Sudan. The priority is always positive relationships with local collaborators and co-production of knowledge.

Community building and post-conflict resolution is another major area of grass-roots involvement. Examples span the Department's thematic interests, from DNA to Heritage; they include Carr's research on victims of Nazism in the Channel Islands (see ICS), Scheib's (PDRF leaver 2016–17) ESRC Impact Acceleration project (*Building Dialogue between Archaeogeneticists and Native American Tribal Communities*) and McMahon's research on looting and the antiquities trade in Mesopotamia. The work of Sørensen and Viejo Rose on Heritage and post-conflict resolution is equally highly engaged at the grass-roots level. In recognition of her exceptional contributions, Sørensen received the European Association of

Archaeologists Heritage Prize in 2014. Carr was selected for the 2020 Heritage Prize in July of this year.

Museums. Archaeologists at Cambridge actively develop relationships with key research users and audiences by working with museums, as curators/consultants for exhibitions and associated pathways to impact. Cambridge-based exhibitions include those at the MAA regarding childhood in prehistory and the archaeology of Star Carr (Joy), at the Cambridge Central Library regarding destruction of historic sites and objects (Viejo Rose), at the Fitzwilliam regarding the Eddington excavations (Evans), and at Kettle's Yard regarding archaeology-inspired art (see CAU ICS). Examples of major contributions to national or international exhibitions include *The Celts* at the British Museum (Joy), *Rock Art of the White Sea* at the Ulsan Petroglyph Museum, South Korea (Janik), the new Kouphonisi Museum and Keros exhibition at the Museum of Cycladic Art, Greece (Boyd), and a reconstruction of Guernica in the town's Peace Museum (Viejo Rose), as well as *Gateway to a New World* at Brown University (Marín-Aguilera), the travelling exhibition *Getting Closer* on resilience in East African landscapes, showing in Cologne, Ghent, York and Oxford (Lane), a forthcoming *Unseen Museum* exhibition at the National Archaeological Museum, Greece (Tsouparopoulou) and exhibitions on Nazi occupation of the Channel Islands in London, Guernsey and Jersey (Carr, see ICS). Cambridge academics have taken other key advisory roles in regional, national and international museums. Examples include Peterborough Museum, involving the City Council and other stakeholders securing a permanent home for the Must Farm finds (Evans, Broodbank), the World Museum Liverpool (Pomeroy), British Museum (Joy), Science Museum of the Norwegian University of Science and Technology (Barrett), Natural History Museum of Denmark (Collins), Terracotta Army Museum, China, Gold Museum, Colombia, and Museu de Arte de São Paulo, Brazil (Martínón-Torres), and Ngaren and National Museums of Kenya (Mirazón Lahr).

Corporations. Cambridge Archaeology is actively engaged in creative, constructive collaborations with industry. The research- and impact-led rescue archaeology of CAU is a success because of strong relationships with clients such as Forterra Building Products. Through this relationship, Forterra's executive has been fully persuaded regarding the importance of archaeological sites, such as Must Farm, located within their quarries and their working practices modified accordingly (see ICS). More broadly, CAU influences developer practice by participating in the Cambridge Construction Forum (Evans). The diversity of our commercial collaborations can be encapsulated by two examples: Collins' work with FERA Science (formerly the Food and Environment Research Agency) on the application of proteomics to food authenticity verification, and Worthington's work with Warner Bros to provide the Babylonian language of the soundtrack to the feature film *Godzilla: King of the Monsters*.

National Organisations, Governments and NGOs. Many staff work closely with national heritage agencies, such as Historic England (Evans produced the Late Iron Age and Roman section of Historic England's Research Framework for the Eastern Counties), the Iraqi State Board of Antiquities and Heritage (McMahon), the Egyptian Ministry of Tourism and Antiquities (Spence) and the Cape Verdean Ministry of Culture (Evans, Sørensen). Others advise national scholarly trusts and organisations, such as the Ancient India and Iran Trust (Petrie), British Academy (Viejo Rose), UK Heritage Alliance (Janik, Sørensen), Holocaust Memorial and Learning Centre (Carr) and Spain's Consejo Superior de Investigaciones Científicas (Martínón-Torres). Several have been invited to advise government at all levels. Examples include Petrie's briefings on Indian heritage and food security to the Government of Punjab, Collins' coordination of a meeting of MEPs in Brussels to discuss the impact of Brexit on UK archaeology and Boyle's consultation by the British Academy's international team on visa eligibility for MSCA Fellows. The Department's engagement with NGOs is equally deep, with three examples indicative: Carr is a UK government appointee to the International Holocaust Remembrance Alliance; Said Mohamed works with UNICEF South Africa and the DG Murray Trust on campaigns for health in early childhood; and Viejo Rose is a member of the International Council on Monuments and Sites (ICOMOS), has advised UNESCO, the International Criminal Court and the Trust Fund for Victims, and is a board member of Heritage for Peace.

Sustainability

Cambridge Archaeology is committed to the sustainability of the discipline, from educating future leading academics and heritage/public leaders to ensuring relevance by advancing solutions to national and international priorities. It is a major provider of high-quality PhD students while promoting a large PDRF community (many in both categories gaining long-term posts that advance the field globally), operates as an international focus of research and discourse, serves as a hub of interdisciplinary collaborative research, and includes one of the most enduringly successful research-intensive commercial field units in the UK; the McDonald Institute also enables a rare degree of ambitious initiative-taking and long-term planning. Cambridge also provides high-quality research training through AHRC and NERC DTPs, and through the *SeaChanges* MSCA-ITN, as well as contributing to EU Smart Specialisation Strategy implementation through H2020 Widening Participation projects in Croatia (*MendTheGap*) and Cyprus (*Promised*). In broad terms, Cambridge Archaeology is committed to using knowledge of the past to better navigate the present towards a more sustainable common future. Paramount global challenges that we address include (1) environmental change and food security and (2) the constructive potential of cultural heritage among communities riven by hostilities (see ICSs).

Wider influence

Cambridge Archaeology is extremely influential nationally and internationally, and recognised as such. The following indices are necessarily selective, and supplement those previously mentioned. Six staff in post during this REF cycle hold FBAs, two previously (Foley, Barker, retired 2014) and four newly (Broodbank, Collins, Evans, Jones, retired 2018); 11 staff are FSAs, three FSASc and one FRHistS. Sørensen was elected Corresponding Fellow of the Deutsche Archäologische Institut and to the Kongelige Norske Videnskabers Selskab; Foley has been awarded a Turing Fellowship; Barker (retired 2014) received a CBE for services to archaeology. Staff have received a total of 15 major prizes within this cycle: Boyd with Renfrew (Shanghai Archaeological Forum for field discoveries on Keros); Broodbank (Wolfson History, Nonino); Crema (Philip Leverhulme); Evans (Baguley Prehistoric Society); Foley (Frassetto, Accademia dei Lincei), Jones (Shanghai Archaeological Forum), Knight, Ballantyne *et al.* (*Antiquity* best article), Lane (SAfA book prize); Martínón-Torres (Cuban Academy of Sciences, British Archaeology Best Public Presentation, Chinese Academy of Sciences and Technology Pineapple Award); Sørensen (European Archaeology Heritage, Felix Neubergh, Holst-Knudsens). Evans has served as Vice-President of the Prehistoric Society; Foley is President of the Society for Libyan Studies and Vice President of the *Royal Anthropological Institute*; Martínón-Torres is President of the Society for Archaeological Sciences. Our census-date staff have delivered more than 70 major named/keynote/plenary lectures over the REF cycle; highlights include those by Broodbank (Dean's, Leiden; Munro, Edinburgh; Rickman, BSR; Rostovtzeff, Yale), DeMarrais (Jane Powell Dwyer, Brown), Foley (Société d'Anthropologie de Paris), Martínón-Torres (inaugural for the Cyprus Institute) and Mirazón Lahr (Darwin, Bergen). Members of staff have lead-edited seven journals, illustrating the range of our stewardship and engagement: *Cambridge Archaeological Journal* (DeMarrais, Robb), *Iraq* (McMahon), *Iran* (Petrie), *Journal of Archaeological Science* (Martínón-Torres), *Journal of Open Archaeology Data* (Ting), *Memory, Heritage and Conflict* (Carr) and issue editorships for *World Archaeology* (DeMarrais, Lane). They serve as associate/advisory or equivalent editors for 32 additional peer-reviewed international journals, with subject coverage from the humanities to the sciences. They have refereed for over 200 journals since 2014. Foley and Lane are series editors for Cambridge University Press and Routledge respectively, and Broodbank has served as Advisory Editor for Thames & Hudson.

In the REF2021 cycle, our staff have reviewed for more than 65 grant-giving bodies, conducted over 60 external senior promotion and probation/tenure reviews, and externally examined more than 90 PhDs, globally. They are widely engaged on Research Councils, advisory boards and comparable committees. Examples include: AHRC Peer Review College (Barrett, Martínón-Torres, Papazian, Stoddart), NERC Peer Review College (Collins, O'Connell), National Environmental Isotope Facility Strategy Board (O'Connell), Max Planck Society (Collins), ERC Advanced (Jones), MSCA (Barker, Boyle, Papazian), Icelandic Research Fund (Barrett,

Martinón-Torres), Swedish Research Council (Sørensen), Institute for Aegean Prehistory (Broodbank) and NWO (Dutch Research Council) (Boyle, Martinón-Torres).

Overall, Cambridge Archaeology is enjoying a dynamic new phase in its long life as a research hub of global significance, openness, vitality, impact and sustainability, through which it seeks to make a substantial difference to the field and wider humanity.