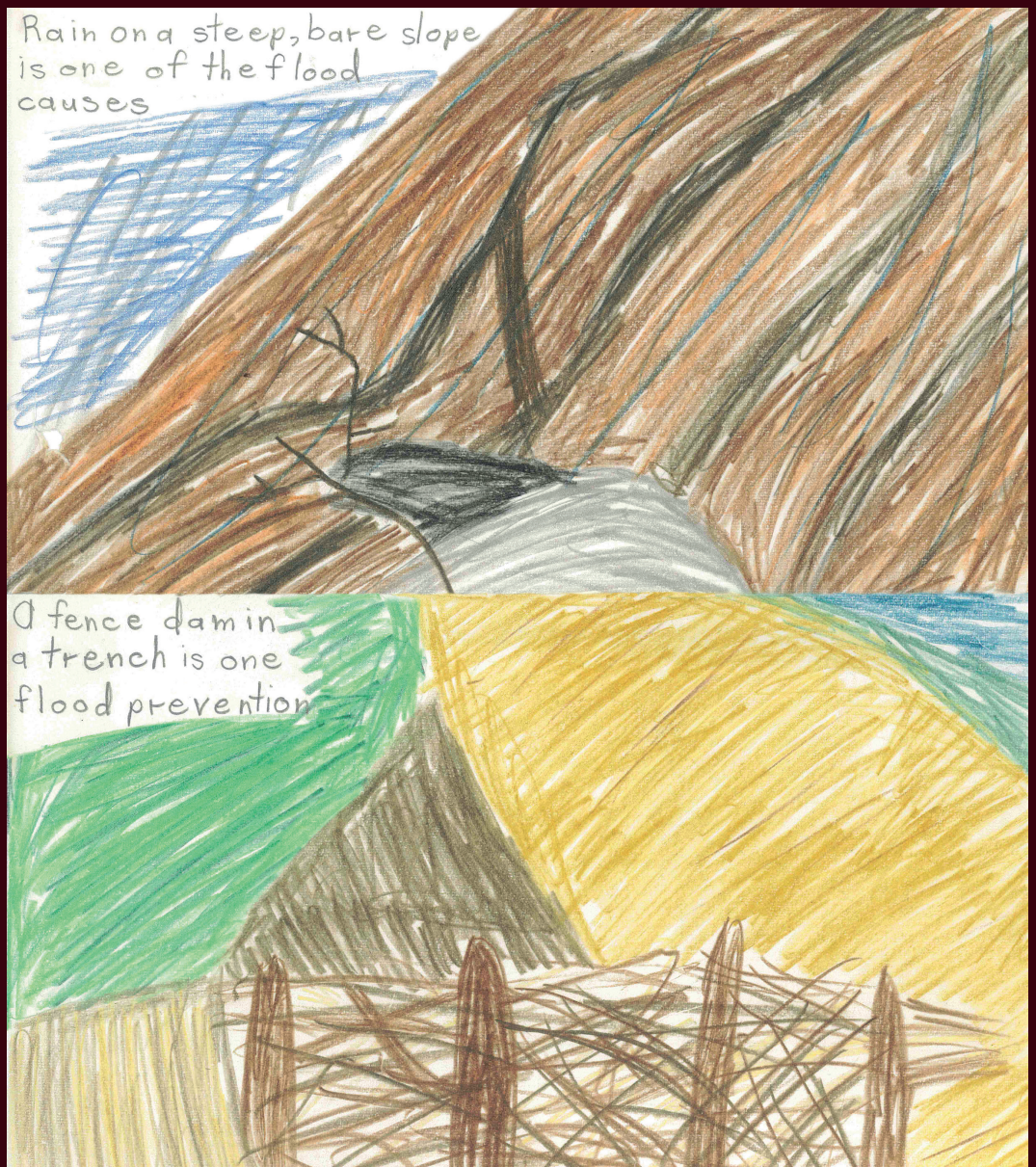
McDONALD INSTITUTE CONVERSATIONS

Inspired geoarchaeologies: past landscapes and social change

Essays in honour of Professor Charles A. I. French

Edited by Federica Sulas, Helen Lewis & Manuel Arroyo-Kalin



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Inspired geoarchaeologies: past landscapes and social change

Essays in honour of Professor Charles A. I. French

Edited by Federica Sulas, Helen Lewis & Manuel Arroyo-Kalin

with contributions from
Michael J. Allen, Andrea L. Balbo, Martin Bell, Nicole Boivin, Christopher Evans, David Friesem, Kasia Gdaniec, Lars Erik Gjerpe, Michael Gill, Martin Green, Ann-Maria Hart, Robyn Inglis, Martin Jones, Gabriella Kovács, Helen Lewis, Johan Linderholm, Roy Loveday, Richard I. Macphail, Caroline Malone, Wendy Matthews, Cristiano Nicosia, Bongumenzi Nxumalo, Innocent Pikirayi, Tonko Rajkovaca, Rob Scaife, Simon Stoddart, Fraser Stuart, Federica Sulas & Magdolna Vicze

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On the cover: *Hand drawn illustration by Charly French, aged around 10 years old. Courtesy of Kasia Gdaniec.*

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Mike's (BSc, PhD, MCIfA, FLS, FSA) research and geoarchaeological interest was originally based around the analysis of colluvium and land snails, including in the South Downs, Dorchester, Cranborne Chase, Stonehenge and Avebury in particular; these were the subject of both his undergraduate and PhD research. He has combined a career dominated by commercial archaeology with involvement in university research projects and as a staff lecturer at Sussex, Bournemouth and Oxford Universities. He was Environmental Manager at Wessex Archaeology for twenty years and for fifteen years has run his own geoarchaeological consultancy from a purpose-built bespoke lab, where he is involved in research designs and coordination of environmental archaeology from fieldwork to publication. Projects have been as diverse as intertidal zone research and Maltese prehistoric temples. His interests now lie principally in landscape archaeology and the development and creation of landscapes through prehistoric human intervention. He has worked with – and still is working with – Charly French in Cranborne Chase, the Stonehenge Riverside Project, and both recent Avebury landscape projects. He is vice-president of the Conchological Society, and as founding editor of the Prehistoric Society Research Papers has seen ten peer-reviewed volumes through to publication.

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Following his PhD at the University of Cambridge (2008), Andrea conducted geoarchaeological research at the Spanish Research Council (CSIC) and at the University of Hamburg. Since 2019 he has been employed at the ALIPH Foundation for the protection of heritage in conflict areas, based in Geneva, where his main focuses are the linkages between climate change, conflict and cultural heritage protection, and the role of documentation and ICT in cultural heritage protection. Co-founder and CEO of Platform Anthropocene Ltd., Andrea leads the development of a comprehensive interdisciplinary web repository on the Anthropocene. He also maintains university teaching in archaeology, heritage and human-environment interaction and acts regularly as a scientific evaluator, rapporteur, and monitor for the European Commission.

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Christopher was the executive director/director of research of the Cambridge Archaeological Unit (CAU), University of Cambridge until 2021. Having worked in British archaeology for over forty years – with his initiation to Fenland archaeology coming at Fengate – following on from the Haddenham Project, he co-founded the CAU with Ian Hodder in 1990. He has directed a wide variety of major fieldwork projects, both abroad – Nepal, China and Cape Verde (the latter sometimes involving Charly) – and in the United Kingdom. A fellow of the Society of Antiquaries of London, in 2018 he was elected a fellow of the British Academy. He has published widely, including monographs arising from both his own landscape projects and those of earlier-era practitioners in the CAU's 'Historiography and Fieldwork' series (e.g. Mucking in 2016). Together with Tim Murray, he edited Oxford University's *Histories of Archaeology: A Reader in the History of Archaeology* (2008).

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David is a senior lecturer of environmental archaeology at the Department of Maritime Civilizations, University of Haifa, and a research member of the Haifa Center for Mediterranean History. He combines field archaeology, geoarchaeology, ethnography, and social theory in order to study human ecology, technology, and social interactions, and reconstruct the often-missing small-scale perspective of human-environment interactions. His research interests include human adaptation during the Late Pleistocene, the emergence of complex societies, and hunter-gatherer anthropology.

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Lars has a Masters and PhD in archaeology from the University of Oslo, with a thesis on Iron Age settlement and property rights in southeastern Norway. He has directed several large-scale heritage management excavations for the Museum of Cultural History at the University of Oslo, mainly targeting Iron Age burials, settlements and agricultural remains, while including other periods and relics. As a result, he has been editor and main author of publications on cemeteries (*Gravfeltet på Gulli*, University of Oslo 2005) and Iron Age settlements. Interdisciplinary cooperation and environmental archaeology, including archaeometric analysis (e.g. seeds, charcoal and soil), have been an integrated part of these projects. He has also been editor for the journal *Primitive tider* and academic editor of Trond Løken's 2020 *Bronze Age and Early Iron*

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Martin began a fieldwalking survey as a lad on Cranborne Chase in the latter 1960s. Following experience gained on a number of field projects, he began excavating independently in the region in 1976. He joined Richard Bradley's and John Barrett's Cranborne Chase Project the following year, contributing four site excavations to *Landscape, Monuments and Society* in 1991. He continued independent fieldwork in the early 1990s in collaboration with Mike Allen, in particular on the Fir Tree Field shaft which revealed a remarkable sequence of deposits dating from the late Mesolithic to the Beaker period, and worked with Charly French on the Upper Allen Valley Project 1998–2003, contributing four further site excavations to *Prehistoric Landscape Development and Human Impact in the Upper Allen Valley, Cranborne Chase, Dorset* (2007). Since that time, he has continued independent research, also in collaboration with Josh Pollard and Southampton University, on the Dorset Cursus, on Down Farm and in the Knowlton environs whilst continuing to increase the biodiversity on his small farm. He was made an FSA (Fellow of the Society of Antiquaries) in 2004 and received an honorary Doctor of Science degree from Reading University in 2006.

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Robyn is a geoarchaeologist interested in the formation of the archaeological record and its impact on our understanding of Palaeolithic dispersals. After receiving her BA in Archaeology and Anthropology from Cambridge, she gained her MSc in Geoarchaeology from Reading. Her PhD in the McBurney Laboratory focussed on the micromorphological reconstruction of sedimentation at the Haua Fteah, Libya, and its implications for understanding human/environment interactions. From 2011–8 she led geoarchaeological survey in Saudi Arabia to further understand the Palaeolithic occupation of the Red Sea littoral and its role in hominin dispersals, first as part of the DISPERSE project at the University of York, and later as a Marie Skłodowska-Curie Global Fellow (University of York and Macquarie University). She now works in research development at the York Environmental Sustainability Institute, University of York, and is an Honorary Research Associate in the university's Department of Archaeology.

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Martin was the first George Pitt-Rivers Professor of Archaeological Science at the University of Cambridge. He works on archaeobotany and archaeogenetics, in the context of the broader archaeology of food. In his earlier career he explored the development of agriculture in later prehistoric and Roman Europe, after which he was very much involved in the development of biomolecular approaches within archaeology. These he applied to research into the spread of farming of both major and minor crops across Asia, most recently in the context of the Food Globalization in Prehistory Project. His latest project is exploring the co-evolution and Eurasian biogeography of crops and bees.

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Gabriella (PhD) is a museologist and soil micromorphologist at the Hungarian National Museum National Institute of Archaeology. Her main interest is the Middle Bronze Age tell settlement of Százhalombatta-Földvár, under the framework of the international SAX (Százhalombatta Archaeological Expedition) project. Besides this site, other Bronze Age settlements of Hungary are also part of her research interests, regarding the comparison of single and multi-layered settlements of the period, mainly the so-called Vatya Culture. She focuses on the use of space and building techniques via soil micromorphology to add details to traditional archaeological methods.

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Helen is an associate professor at University College Dublin School of Archaeology. Her background is in archaeology and anthropology (BA University of

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Johan trained in archaeology and chemistry, specializing in soils and archaeology (BSc and MSc Umeå University). His PhD dealt with soil chemical aspects on settlement organization over time and general human impact on soils. He has been working with research and contract archaeology in several large projects over the last thirty years, mainly in Scandinavia but also in Gibraltar, Italy, France and the UK. Currently he holds a position as associate professor at Umeå University and is conducting research related to reflectance spectroscopy at the Environmental Archaeology Laboratory (MAL), University of Umeå.

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Richard trained in geology and geography, specializing in soil science (BSc Swansea University). An MSc in pedology and soil survey (Reading University) prepared him for a soil science PhD on podzol development on heathlands (Kingston Polytechnic). An English Heritage-funded archaeological soil contract at the Institute of Archaeology (University College London) provided further training and international research opportunities were developed, including working with the Soil Survey of England and Wales and Macaulay Institute, UK, the CNRS, France, and the Soprintendenza, Italy. This led to the publication of *Soils and Micromorphology in Archaeology* (with Courty and Goldberg; Cambridge University Press 1989), the founding of the International Archaeological Soil Micromorphology Working Group, and training weeks at UCL. As a result, *Practical and Theoretical Geoarchaeology* (Blackwell 2006; Wiley 2022) and *Applied Soils and Micromorphology in Archaeology* (Cambridge University Press 2018), both with Goldberg, were written. Macphail is a recipient of the Geological Society of America's Rip Rapp Award for Archaeological Geology (2009), and is a fellow of the Geological Society of America. He is also the 2021 co-awardee (with P. Goldberg) of the International Union of Soil Sciences Tenth Kubiëna Medal for Soil Micromorphology. The paper included here also reflects more than two decades of research across Scandinavia.

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Wendy is a specialist in Near Eastern Archaeology and geoarchaeology, focusing on micromorphology of the built environment and long-term perspectives on sustainability (MA Edinburgh 1984; PhD Cambridge 1992, 'Micromorphology of occupational sequences and use of space in a Sumerian city'). She was a research associate and fellow of the McDonald Institute (1993–2000) and is an associate professor in Archaeology at the University of Reading, following a semester as visiting lecturer at UC Berkeley. She was a member of the *Çatalhöyük* team and steering committee, Turkey (1993–2017). She co-directs the *Central Zagros Archaeological Project* investigating the Neolithic of the Eastern Fertile Crescent, Iraq, Iran (2007–), and has conducted research in Syria and Bahrain. She has co-supervised twenty-two PhD students and teaches modules on past, present and future sustainability; micromorphology; and Mesopotamia. She co-designed a new prehistory gallery at the Slemani Museum with Iraqi and Reading colleagues, with sustainability as a central theme.

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Francis has studied the archaeology of the Fens since 1971. His major excavations in the region took place near Peterborough at Fengate, Maxey and Etton. In 1982 his team's survey of fenland drainage dykes revealed the timbers of a waterlogged Bronze Age timber platform and causeway at Flag Fen, which was opened to the public in 1989. He was a member of Channel 4's long-running series *Time Team*. He has written many popular books including *Seahenge* (2001), *Britain* BC (2003), *Britain* AD (2004), *The Making of the British Landscape* (2010), *Home* (2014), *Stonehenge* (2016) and *The Fens* (2019). His most recent book is *Scenes from Prehistoric Life* (Head of Zeus 2021).

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Tonko is chief research laboratory technician in geoarchaeology at the University of Cambridge. Involved in archaeology since his childhood, he held posts of archaeological site director and museum curator in Serbia (pre-1994) before moving to the UK to specialize in the late Upper Palaeolithic archaeology of ex-Yugoslavia via an MPhil (2004) at the University of Cambridge, and a PhD at the University of Ljubljana (2017). After four years at the Cambridge Archaeological Unit, he took up the post of geoarchaeology technician at the Department of Archaeology in 2008, and since then he has been working at the McBurney Laboratory of Geoarchaeology. He has directed and managed several archaeological projects, field and laboratory training in the UK and eastern Europe. He has authored several volumes and articles, including a monograph on preventive archaeology in ex-Yugoslavia published by Belgrade's Institute of Archaeology (2019) and a manual of archaeological excavation (co-authored with J. Appleby, 2015).

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Rob is a visiting professor of palaeoecology and environmental archaeology at the University of Southampton, and an honorary research associate of the McDonald Institute for Archaeological Research at the University of Cambridge. His first degree was in geography with geology, and an interest in the Pleistocene led him into palynology. He investigated the Late and Post-glacial vegetation changes of the Isle of Wight for his PhD (King's College London). Subsequently, he worked at the Institute of Archaeology, London, and the Ancient Monuments Laboratory at English Heritage. As a freelance palaeoecologist, he has continued to work across southern and eastern England, along with international studies in Italy, Turkey, Peru and Chile.

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Simon and Caroline have been engaged in the research of ancient landscapes for nearly forty years, with a

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Figures

Tables

Appendix to Chapter 15

Helen Lewis & Ann-Maria Hart

Table A15.1. *Soil micromorphology descriptions of buried topsoil profiles compared to the modern soil profile (percentages are estimates of visual area).*

	Structure	Porosity	Mineral components	C:f ratio	Organic components	Groundmass	Pedofeatures	Interpretation
Modern A (X587)	Single grain, intergrain microaggregate	10–15% packing pores, channels, vughs	Quartz, feldspar, amphibole, granite, basalt, chert, gravels (<1.5cm)	60:40 Sandy loam	5–10% occasional charcoal; fine roots & other residues	Gefuric: very dark brown (PPL); undifferentiated (XPL)	Strong organic staining on fine fabric; occasional Fe & Mn nodules	Ap (Ah), very dark brown (10YR 2/2) fine-medium sandy loam; gravel size-sorted by soil fauna
bL/A (X561, X567)	Single grain	10–15% packing pores		70:30 Sand	10% roots	Chitonic; brown; undifferentiated; (7.5YR 4/2 or 4/4)	Fe-replaced roots	Turf rooting zone – L/Ah (mull)
bA (X561)	Single grain	5-10% packing pores		65:35 Loamy sand	15% as above	Gefuric & chitonic; very dark brown; undifferentiated; (Munsell as above & layers of 7.5YR 2.5/1)	'Dusty' clay coatings; iron replaced roots; organic staining	Turf rooting zone – Ah (mull)
Infilling layer	Apedal	<5% packing pores; 0.02 cm thick linear void		20:80 Sandy clay loam	<5%, amorphous fragments, 'punctuations'	Close porphyric; very dark reddish brown; undifferentiated (5YR 3/2)	Organic staining	Infilled feature cut or surface; boundary with bAp
bAp (X567-8; X569B)	Single grain, intergrain microaggregate	10–15% packing pores, channels		65:35 Sand; 55:25 Loamy sand	10–15%, as above, charcoal, roots	Gefuric & chitionic; very dark brown to dark reddish brown; undifferentiated	'Dusty' & silty clay coatings & infillings; organic staining, iron stained clay coatings; X569 had Fe/Mn mottles in a rooting zone, and zones of leached coarse-medium sand	Buried ploughsoil (Ap); ard mark fills & cuts – dense infillings with low porosity (mostly micro-cracks in clay)
Ard mark cut in bAp (X561, X569A)	Apedal crack	<5% crack, 500–1000 μm wide, strongly accommodated		10:90 Clay (X561); 50:50 Loam (Fe pan at X569A cut)	<5%, amorphous fragments	Close porphyric; very dark brown (X561) to strong red (X569A); undifferentiated	Strong organic staining (X61); X569A had Fe pan at feature cut, underlain by leached zone (echoing cut)	Infilled ard mark cut
bAp-B (X562-3)	Single grain	5–10% packing pores, rare large cracks	As above, + rare chalcedonic quartz	55:45 Sandy loam	15%, as above, charcoal	Gefuric & chitonic; very dark brown; undifferentiated	Linear discontinuous infills of silty clay, possibly feature cut; 'dusty' clay coatings; organic & Fe staining	Lower A of buried ploughsoil, with possible ard mark feature; very dark grey sand, slightly loamy
Tobøl 1 A Barrow sods; upper buried A horizon (Tob A-B)	Massive (apedal channel) to crumb and vugh	20% vughs, channels	As above, some clean clay.	As above	5% as above	Mixed gefuric and chitonic; reddish brown groundmass; some clean clay inclusions.	Fe-oxide replaced root pseudomorphs; frequent Fe & Mn nodules; rare clean, reticulate striated clay fragments. Boundary between upper & lower buried A: dense 1 mm-thick Fe oxide & clay panning layer surrounded by 1-3 mm-thick zones of soil with strong Fe-oxide staining & Fe impregnation features	Barrow sods, ploughed out in modern times, possibly originating from a location with an alluvial parent material. Boundary (base of mound)

Table A15.2. *Soil micromorphology descriptions of buried B/C horizon characteristics compared to the modern soil profile (percentages are estimates of visual area).*

	Structure	Porosity	Mineral components	C:f ratio	Organic components	Groundmass	Pedofeatures	Interpretation
Modern B (X588)	Single grain	20% packing pores, channels	As modern A; gravel <5cm	70:30 Sand	5–10% charcoal & roots	Chitonic; light reddish brown; undifferentiated	Fe staining; zones of A horizon mixed in; lens of single grain sand with stipple speckled, Fe-stained groundmass, frequent Fe nodules, 'punctuations'	Dark yellowish brown (10YR 4/6) B or Bs; medium-coarse sand with gravel; frequent Fe nodules; coatings of illuviated iron-stained 'dusty' clay.
Tobøl I B (Tob B-C)	Crumb (upper); single grain (lower)	10–20% packing pores	As modern A + limestone	55:45 Sandy loam	5% charcoal & amorphous fragments, 'punctuations'	Upper: mixed types; chitonic. Lower: chitonic; light reddish brown; undifferentiated	'Agric' infills; 'dusty' clay; rare clean clay fragments.	Lower A to upper B horizons; impacted by disturbance; indicators of a clay-rich parent material
Skelhøj B (X563)	Single grain & intergrain microaggregate	5–15% packing pores	As modern A; occasional gravel (<1.5 cm)	65:35 Loamy sand	5% charcoal & roots	Enaulic & gefuric; light reddish brown; undifferentiated & stipple speckled	Fe staining: 'dusty' clay' coatings in pores	Yellowish brown (10YR 5/6) sand B horizon with occasional gravel
Skelhøj B (X568) 'wetting'	Single grain & intergrain microaggregate	5–10% packing pores	As modern A	55:45 Sandy loam	5-10% charcoal, amorphous fragments	Gefuric & close porphyric; light reddish to yellow brown; stipple speckled & undifferentiated	Fe staining, 'dusty' clay; patches of whole soil coating'	Bs (or weakly developed Bt/fe)

Table A15.3. *Micromorphology descriptions of profiles of turves and 'wetting' layers in lower construction sequence at Skelhøj (percentages are estimates of visual area).*

	Structure	Porosity	Mineral components	C:f ratio	Organic components	Groundmass	Pedofeatures	Interpretation
X74 Sod Ah(p)	Single grain, intergrain microaggregate	10–20%, packing pores, channels	As modern A	50:50 sandy clay loam	5–10% charcoal, black fragments	Brown, organic-stained, mixed enaulic, gefuric, chitonic, undifferentiated	Fragments of B horizon; 'dusty' clay infillings	Ah (old Ap) in laid turf
X74 Sod B					<5% charcoal, black fragments, roots	Light reddish brown, mixed enaulic, gefuric, chitonic, stipple speckled & undifferentiated	Fe coatings on grains; iron staining	B in laid turf
X412 A	Single grain, intergrain microaggregate	10% packing pores, channels	As modern A	50:50 sandy loam	20% charcoal, black fragments	Very dark brown; undifferentiated; close porphyric, gefuric	Coatings & infillings of fine fraction; organic staining	Disrupted A horizon (possible Ap) in laid turf
X412 boundary		5% packing pores, vughs		45:55 sandy clay loam	5% charcoal, black fragments	Orange; undifferentiated; close porphyric, gefuric	Iron coatings & staining	Compaction zone; B(fe) horizon development in laid turf
X412 lower A/A-B		As X412 A		50:50 sandy loam	20% charcoal, black fragments	Very dark reddish brown; undifferentiated; close porphyric, gefuric	Coatings & infillings of fine fraction; organic staining	Lower A or A-B horizon in laid turf
X569A Sand layer (4 mm)	Single grain	15% packing pores	As modern A	75:25 sand	<5% tiny angular black fragments	Chitonic & gefuric; fine fabric only as coatings; brown, organic-stained, undifferentiated	Fe coatings on some grains	Sorted sand/water-lain ('wash'/puddling/ crusting)
X569A Sod (2 cm)	Single grain, intergrain microaggregate (densely packed)	5% packing pores		65:35 sand (loamy)	15–20% angular black fragments	Very dark reddish brown, undifferentiated; close porphyric	Reddish brown 'dusty' clay coatings & infillings; Fe/Mn nodules (rooting)	Ah(p?) sod with grass rooting zone
X569A Sand layer (1 cm)	Single grain	10–20% packing pores		75:25 sand	<5% tiny angular black fragments	Monic, chitonic & gefuric; fine fabric only as coatings; brown, organic-stained, undifferentiated	Fe coatings on some grains	Sorted sand/water-lain ('wash'/puddling/ crusting)
See Table A15.1 for 569A/B ard mark feature and buried soil (tilled Ap, ard marks, charcoal)								
X570A sod A horizon	Subangular blocky	15%, complex packing pores, channels	As modern A	65:35 sand	5–10% black fragments, charcoal, possible insect ovum	Very dark reddish brown, granostriated, undifferentiated	Fe coatings; main groundmass coatings, cappings, pendants	Wetting & trampling sequence: disturbed A horizon in laid sod
X570A leached sand (Ea?) 1	Single grain	20–25%, simple packing pores		85:15 sand	5%, black fragments, charcoal, root tissue	Fine groundmass only as coatings of Fe & organic matter; undifferentiated; monic, chitonic & gefuric	Iron coatings, amorphous organic coatings, rare silty clay coatings; Mn/Fe nodules	Leached horizon
X570A Panning lens, 1000 μm thick	Apedal to single grain	<5%, simple packing pores		40:50 sandy loam to loamy sand	5%, as above	Mixed: a layer of chitonic, reddish brown (placic); a layer of gefuric, black (spodic). Both: undifferentiated, granostriated	Frequent Fe coatings, occasional clay coatings in placic layer; microaggregate coatings in spodic layer	Fe-stained clay, complex panning (spodic & placic) in microlayers; incipient micro-?Bs horizon
X570A Sod A horizon	Apedal channel	5–10% channels, complex packing pores	As modern A; occasional rock fragments up to 1cm, with chert	50:50 sandy loam		Very dark brown, mixed undifferentiated & granostriated	Fragments of Fe-rich clay fabric (intrusive), iron staining; linear infilling of groundmass fabric	Wetting & trampling sequence: disturbed A horizon in laid sod

Table A15.3 *(cont.).*

	Structure	Porosity	Mineral components	C:f ratio	Organic components	Groundmass	Pedofeatures	Interpretation
X570A Leached sand Ea? 2	Single grain	40% simple packing pores	As modern A	80:20 sand	As X570 leached horizon			
X570A Panning Bs?	Single grain, intergrain microaggregate	20% packing pores		75:25 sand	5%, as above	Gefuric & enaulic, very dark brown, undifferentiated	Microaggregates as coatings; rare 'dusty' clay cappings & coatings	Incipient micro-Bs? horizon
X570A Leached sand		20% simple packing pores		80:20 sand		Enaulic, some chitonic. very dark reddish brown, undifferentiated	Occasional Fe coatings	Similar to the above, but much less fine groundmass
X570B Leached (4 cm)	Single grain			75:25 sand	5–10%, as above, but with a lens of 100% organics	Monic, chitonic, gefuric; only as coatings; very dark reddish brown, undifferentiated	<1mm thick lenses of 1) Fe-replaced plant remains & charcoal; 2) very fine sand, silt & clay infillings	Sorted sand/water-lain ('wash'/puddling/ crusting)
X570B (3.5 cm)	Apedal	10–15% packing pores		70:30 sand	10%, charcoal, fine angular black inclusions	Very dark brown, undifferentiated to stipple speckled & granostriated; close porphyric	Fe & 'dusty' clay coatings and cappings	A (?laid sod)
X571 Sod Ah/p (4.5 cm)	Single grain	10% packing pores, channels	As modern A	65:35 sand	10%, charcoal	Very dark brown, strongly organic stained, undifferentiated; gefuric to chitonic	Infillings of fine fraction	Sod Ah/p at base of mound; wetting & trampling sequence
X571 Sod turf line (2 cm)	As in 573B turf	As in 573B turf		As in 573B turf	15% charcoal, tissue remains (roots)	Very dark brown, gefuric to chitonic	Fe staining & root pseudomorphs	Sod L/H turf line
X571 Leached lens (3–4 mm)	Single grain	30%, packing pores		60:40 sand	5% 'punctuations, charcoal	Dark reddish brown, granostriated; monic, chitonic & gefuric	Thin Fe/clay/amorphous organic coatings	Sorted sand/water-lain ('wash'/puddling/ crusting)
X571 Sorted infilling (1–2 mm)	Apedal	Horizontal linear void, 2000 μm thick, infilled		15:85	10% black fragments, 'punctuations'	Very dark brown, undifferentiated, close porphyric	Infilling of fine fraction	Boundary; dense fine fraction infilling; disturbance indicator
X571 Leached lenses (0.2–0.4 mm, alternating)	As X571 leached lens above			80:20 sand	As X571 leached lens above			Sorted sand/water-lain ('wash'/puddling/ crusting)
X571 Brown lenses (1 mm, alternating)	Apedal	5–10%, packing pores	As modern A	50:50 loam	10% black fragments, charcoal	Very dark brown to dark reddish brown, undifferentiated, close porphyric to granostriated	'silty' clay coatings, Fe-oxide coatings	Dense infilling; disturbance indicator. ('wash'/puddling/ crusting)
X572 Sod Ap	Single grain, intergrain microaggregate	10–30% packing pores	As modern A; possible pottery fragment	70:30 sand; 60:40 loamy sand	10–15% black fragments, charcoal	Very dark reddish brown, undifferentiated, enaulic & genfuric, some close porphyric	Fe coatings, infillings with fine fabric in zones	Wetting & trampling sequence; very mixed sod, disturbance & 'wash' indicators

Table A15.4. *Skelhøj core micromorphology: upper (from Hart 2006); blocks equate to frequency (rare, occasional, common, frequent, very frequent, ubiquitous).*

SKELHØJ CORE		**X950/1**					
Context		Border upper Fe pan from core					
Unit		Upper sod	Fe/Mn lenses	Leached lenses	Fe-replacement zone	Fe pan	Core
Microstructure		Crumb to granular	Massive	Granular	Massive to crumb	Massive	Massive to crumb
Porosity		Vughs/channels		Channels/ packing pores	Vughs		Vughs
Groundmass	C:f ratio 20µm	4:1	3:1	5:1	3:1		
	C:f related distribution	Concave gefuric to chitonic	Single-spaced porphyric	Chitonic	Single-spaced porphyric to concave gefuric	Single-spaced porphyric	
Particle size frequency	Very coarse sand						
	Coarse sand	■■	■	■■■■■	■■■	■■	■■
	Medium sand	■■■■■	■■■■■■■	■■■■■	■■■	■■■■	■■■■
	Fine sand	■■■■■	■■■	■■■■	■■■■	■■■■	■■■■■
	Very fine sand	■■■■■	■■■	■■■■	■■■■■	■■■■	■■■■■■
	Silt	■■■	■■■■■	■■■	■■■■■	■■■■■■	■■■■■■
	Clay						
Fine material	Nature	Fe-rich silty clay w/. 'punctuations'	Fe-rich clay	Silty clay	Organic and Fe-rich clay	Fe-rich clay	Silty clay w/ punctuations
	b-fabric	Stipple speckled/grano-striated		Granostriated/ stipple speckled	Stipple speckled/ poro-/ granostriated	Granostriated/stipple speckled	Stipple speckled
Organic material	Amorphous punctuations	■■■■	■■■	■■■■■	■■■■■■	■	■■■■■
	Fine material brown	■■■■	■■■	■■■■■	■■■■	■■	■■■■■
	Fine material reddish brown	■	■■■■	■■	■■■■■■■■	■■	■■
	Tissue residue	■■■■■	■■■■	■■■■	■■■■■■■■		■■■■■
	Tissue organ	■■■	■■■	■■■■	■■■■		■■■■■■
	Phlobaphene-containing tissue	■■■	■■	■■■	■■■■		■■■■■■
	Fresh plant material				■■■■		■■■■
	Fungal spores	■					■■■■
Pedofeatures	Charred plant residues	■■■					■■
	Charred wood residues	■			■■		■■■■
	Fe nodules	■■■■	■■■■■■ ■■■	■■■	■■■■■	■■■■■■■■■	■■■
	Mn nodules	■■■	■■■■■	■■	■■■	■■■■■	■■

Table A15.5. *Skelhøj core micromorphology: central (from Hart 2006); blocks equate to frequency (rare, occasional, common, frequent, very frequent, ubiquitous).*

X952	Core w/ organics preserved							
	Fe-rich organic 1	Silty clay 1	Fe-clay lense	Fe-rich organic 2	Silty clay 2	Fe-rich organic 3	Fe pan	'Brown earth'
Microstructure	Massive/crumb	Crumb	Crumb	Crumb	Crumb	Crumb	Massive	Massive
Porosity	Vughs	Vughs	Vughs	Vughs	Vughs	Vughs		
C:f ratio 20μm	3:1	4:1	4:1	4:1	4:1	4:1	3:1	3:1
C:f related distribution	Single-spaced porphyric	Single-spaced porphyric to concave gefuric		Concave gefuric	Single-spaced porphyric to concave gefuric		Single spaced porphyric	
Very coarse sand								
Coarse sand	■■■	■■■		■■■			■■■■	■■
Medium sand	■■■■	■■■■	■■■■■■	■■■■■■	■■■■■■	■■■■■■	■■■■■	■■■■■
Fine sand	■■■■	■■■■	■■■	■■■	■■■	■■■■	■■■	■■■■
Very fine sand	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■
Silt	■■■■■	■■■■	■■■■	■■■	■■■■	■■■■	■■■■■	■■■■■
Clay								
Nature	Fe- & organic-rich clay	Silty clay w/ organic punctuations	Fe-rich clay w/ organic punctuations	Fe- & organic-rich clay	Fe-rich silty clay w/ organic punctuations	Organic & Fe-rich silty clay	Fe-rich clay w/ organic punctuations	Silty clay w/ organic punctuations
b-fabric	Stipple speckled/ granostriated	Stipple speckled/ grano-/ porostriated		Stipple speckled/ granostriated	Stipple speckled/ poro-/ granostriated	Stipple speckled, grano-/porostriation	Stipple speckled/ granostriated	Stipple speckled, little grano- & porostriation
Amorphous punctuation	■■■■■■■	■■■■■■	■■■■■	■■■■■■	■■■■■■	■■■■■■	■■■■■■	■■■■■
Fine material brown	■■■■■■■■	■■■■■■	■■■■■■	■■■■■	■■■■■	■■■■■■	■■■■■	■■■■
Fine material reddish brown	■■■■■	■■■	■■■■■	■■■■■	■■■■■	■■■■■■	■■■■■■	■■
Tissue residue	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■■■	■■■■■■	■■■■
Tissue organ	■■	■■■■■	■■■■■	■■■■	■■■■	■■■■	■■■■■	■■■■■
Phlobaphene- containing tissue	■	■■■■■	■■■■■	■■■■	■■■■	■■■■■■	■■■■■	■■■■
Fresh plant material		■■■■■	■■■■■	■■■		■■■■■■	■■■■■	■■■■
Fungal spores				■				■■
Charred plant residues	■■■	■■■	■	■■■	■■■	■■■		■■■
Charred wood residues	■■	■■■	■■■	■■	■■■	■■	■■■	■■■■
Fe nodules	■■■■	■■■■	■■■■■■■■■	■■■■■■	■■■■■■	■■■■■	■■■■■■■■■	■■■■
Mn nodules	■■■	■■	■■■■	■■■■	■■■■	■■■■	■■■■■■	■■■

Table A15.6. *Skelhøj core micromorphology: lower (after Hart 2006); blocks equate to frequency (rare, occasional, common, frequent, very frequent, ubiquitous).*

	X953														
	Lower border Fe pan, upper buried A														
	Sod 1? A	Turf line	Sod 2? A	Turf line	A	Fe pan	Mn lens	Fe-rich clay lens	Fe pan	Fe-rich clay lens	Irregular Fe lens	Irregular Mn lens	Fe-rich clay lens	Irregular Mn lens	bA
Microstructure	Massive	Massive/ crumb	crumb / massive			Massive		Massive/ crumb	Massive	Massive/ crumb	Massive	Massive/crumb		Crumb	Massive/ crumb
Porosity		Vughs						Vughs		Vughs		Vughs			
C:f ratio 20µm	3:1	4:1	3:1				4:1	3:1	4:1		3:1	4:1			
C:f	Porphyric		Porphyric/gefuric			Porphyric		Porphyric/ gefuric	Porphyric	Porphyric/ gefuric	Porphyric	Porphyric/gefuric		Gefuric	Porphyric/ gefuric
Very coarse sand													■		
Coarse sand							■■	■		■■■	■■■	■■■	■■	■■	■■
Medium sand	■■■■■	■■■	■■■■■	■■■■■	■■■■■	■■■■	■■■■■	■■	■■■■■	■■■■■	■■■■	■■■■	■■■	■■■■■	■■■■■
Fine sand	■■■	■■■■	■■■	■■■■	■■■	■■■■	■■■■	■■■■■	■■■■	■■■■	■■■	■■■	■■■■	■■■	■■■■
Very fine sand	■■■■■	■■■■■	■■■■■■	■■■■■	■■■■■	■■■ ■■	■■■■■	■■■■■■	■■■■	■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■■
Silt	■■■■■	■■■■■■	■■■■■	■■■■■	■■■■■	■■■ ■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■
Clay		■■■■													
Nature	Silty clay, punctuations, v. organic	Silty organic rich clay, mostly organic l	Silty clay, punctuations, v. organic	Organic w/ silty clay, punctuations	Silty clay, punctuations	Fe rich clay	Mn/Fe rich clay	Fe rich silty clay	Fe rich clay w/ few punctuations	Fe/Mn rich clay w/ punctuations	Fe rich clay w/ punctuations	Mn/Fe rich clay	Fe rich silty clay w/ punctuations; v. clay rich	Mn/Fe rich clay	Silty Fe rich clay w/ punctuations
b-fabric	Stipple speckled			Stipple speckled, poro-/ granostriated	Stipple speckled/ granostriated	Masked by Fe	Stipple speckled, masked by Mn and Fe	Stipple speckled, poro-/ granostriated	Masked by Fe, poro-/ granostriation/ stipple speckled	Stipple speckled/ grano-/ poro-striated	Stipple speckled/ grano-/ porostriation masked by Fe	Stipple speckled/ grano-/ porostriated, masked by Mn	Grano- and porostriated/ stipple speckled, some randomly oriented silty clay bands	Stipple speckled/ poro-/ granostriated, masked by Mn	Stipple speckled/ grano-/ porostriated
Amorph..punct	■■■■■ ■■■	■■■■■■ ■■■	■■■■■ ■■	■■■■■ ■■	■■■■■ ■■	■■■■	■■■■	■■■■■■	■■■■■	■■■■■■	■■■■■	■■■■■	■■■■■■■	■■■■■	■■■■■ ■■
Fine brown	■■■■■ ■■	■■■■■ ■■■	■■■■■	■■■■■	■■■■■■			■■■■		■■■	■■■				■■■■■
Fine reddish brown	■■■■■	■■■■■■	■■■■	■■■■	■■■■			■■■		■■■	■■■				■■■■
Tissue residue	■■■■■■	■■■■■■ ■■■	■■■■■ ■■	■■■■■	■■■■■		■■■	■■■■	■■■■	■■■■■	■■■■	■■■	■■■■■■	■■■■	■■■■■
Tissue organ	■■■■■	■■■■■ ■■■	■■■■■	■■■■■■ ■■■	■■■■						■■	■■	■■		■■■■■
Phlobaphene tissue	■■■■■	■■■■■■	■■■■■	■■■■■ ■■■	■■■■										■■■■■
Fresh organic	■■■■	■■■■■■	■■■■	■■■■■■	■										·
Fungal spores	■■■■	■■■	■■■	■■■	■■■■										■■■■
Charred plant	■■■	■■	■■■		■■■		■	■	■	■■	■■■	■■■	■■■	■■■	■■■
Charred wood	■■	■■■■	■■■■	■■■■	■■		■■		■■	■■	■■■	■■■	■■	·	■
Fe nodules	■■■■	■■■■	■■■■	■■■■■	■■■■	■■■■ ■■■ ■■	■■■■■	■■■■■	■■■■■■ ■■■	■■■■■	■■■■■■ ■■■	■■■■■	■■■■■■	■■■■■	■■■■■■
Mn nodules	■■■	■■■■	■■■	■■■	■■■	■■■■	■■■■■ ■■■■	■■■	■■■■	■■■■	■■■■	■■■■■ ■■	■■■■	■■■■■ ■■	■■■■

Table A15.7. *Thin section descriptions of sods from Skelhøj mound. Mineral components are all as modern A, except where noted.*

	Structure	Porosity	C:f ratio	Organic components	Groundmass	Pedofeatures	Interpretation
X564 Sod Ah, B/C	Single grain, micrograin interaggregate	10% packing pores	55:45 Sandy loam	10–20%, brown & black fragments, charcoal, roots, fungal sclerotia	Very dark brown, strong organic staining, undifferentiated, gefuric.	Mite excrement; 'dusty' & organic-stained clay coatings, silty clay infillings, including linear infillings	Sod from grassland, but disturbed. Organic A(p) turfline (10YR 4/1); rooting zone (10YR 5/1); gravelly B/C (10YR 6/1) present but not clearly seen (upside down sod).
X565 Sod, A, B/C	Granular to crumb (turf line); granular A, B/C	10% packing pores, channels (+vughs in turf line)	75:25 Sand (turf line: silty sand)	<15%, 'punctuations', brown & red tissues, charcoal, fungal spores	Grano-/porostriated, some stipple specked; highly organic stained, Fe-rich clay; undifferentiated; gefuric to chitonic	'Dusty' clay, Fe-stained clay, organic staining, Fe & Mn nodules (increasing with depth)	Sod turf line (10YR 3/1) over leached sandy A/B material (10YR 4/1-5/1) over iron-rich B/C with gravel (10YR 7/4)
X573 Sod Ah, B/C, Fe pan	Single grain	10% packing pores	45:55 Loam (A, A/B); 70:30 Sand (B/C)	5–10% roots, charcoal; a lens of charcoal fragments & Fe/Mn-replaced roots at boundary of A-A/B	A-A/B very dark brown to dark reddish brown, undifferentiated, occasionally stipple speckled, gefuric, densely packed; B/C reddish brown, undifferentiated, chitonic & gefuric; Fe panning: placic & gefuric	A-A/B organic stained, 'dusty' clay & Fe coatings; Fe/Mn-replaced roots at boundary of A-A/B; B/C frequent Fe and clay coatings & infillings, cappings; some Fe-oxide replaced roots	Upside-down sod; Ah (10YR 5/1) over A(p)/B (10YR 6/1), over B(t/fe) (10YR 3/6); infillings suggestive of 'agric'; possibly Ah was Ap at some time; *in situ* burning of turf.
X581 Fe pan at border of 2 sods	Upper sod: crumb/granular; Fe pan: massive; leached layer: granular; lower sod: crumb/granular	Upper sod: vughs, some channels; Fe pan: vughs; leached layer: packing pores/channels; lower sod: vughs/channels;	85:15/80:20/75:25 Sand to silty sand (sods); clay loam (Fe pan around silt & sand); sand (leached layer)	<15%: all fabrics, but less in leached layer: 'punctuations', brown & red tissues, charcoal, fungal spores	Granostriated to stipple speckled (sods); granostriated (Fe pan & leached layer. Sods: dark brown to dark reddish brown, undifferentiated, gefuric to chitonic; Fe pan: as sods but porphyric to gefuric; leached layer: greyish brown, chitonic, fine groundmass as Fe pan.	Frequent Fe and Mn nodules; Fe-stained clay coatings; Fe coatings; organic staining on coatings; 'dusty' clay in sods.	Upper sod: A(p) (4 fabrics), Fe pan, leached layer; lower sod: A (1 fabric).
X585 Sod no turf; B only no gravel	Single grain, intergrain microaggregates; apedal where Fe panning	15–20% packing pores, channels (5–10% where Fe panning)	45:55; loamy sand; 70:30; sand, where Fe panning	10–15% (5% where Fe panning); charcoal, 'punctuations', roots	Very dark brown/reddish brown, undifferentiated, close porphyric related distribution (porostriated & gefuric where Fe panning)	Frequent Fe-oxide coatings (split) & infillings (segmented coatings where iron panning); 'dusty' clay infillings	(A/B) B with iron panning; includes gravels, angular, subrounded 0.5–1.5 cm
X586 Sod upper mound: L/H/A, Fe pan & mottles, B/C gravelly	As X585	As 585; 5% where Fe panning	All horizons sand, except Fe panning, where same as X585	As 585	As 585 except L/H/A layer grey in PPL.	As 585; Fe panning underlain by zone of Fe oxide nodules & root pseudomorphs; Fe oxide & organic staining	Thin surface turf directly on Fe pan and B/C with oxidation mottles at upper boundary. A horizon stripped/deturfed; later turf grown on B/C

Inspired geoarchaeologies

Geoarchaeological research captures dimensions of the past at an unprecedented level of detail and multiple spatial and temporal scales. The record of the past held by soils and sediments is an archive for past environments, climate change, resource use, settlement lifeways, and societal development and resilience over time. When the McDonald Institute was established at Cambridge, geoarchaeology was one of the priority fields for a new research and teaching environment. An opportunity to develop the legacy of Charles McBurney was bestowed upon Charles French, whose 'geoarchaeology in action' approach has had an enormous impact in advancing knowledge, principles and practices across academic, teaching and professional sectors. Many journeys that began at Cambridge have since proliferated into dozens of inspired geoarchaeologies worldwide. This volume presents research and reflection from across the globe by colleagues in tribute to Charly, under whose leadership the Charles McBurney Laboratory became a beacon of geoarchaeology.

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