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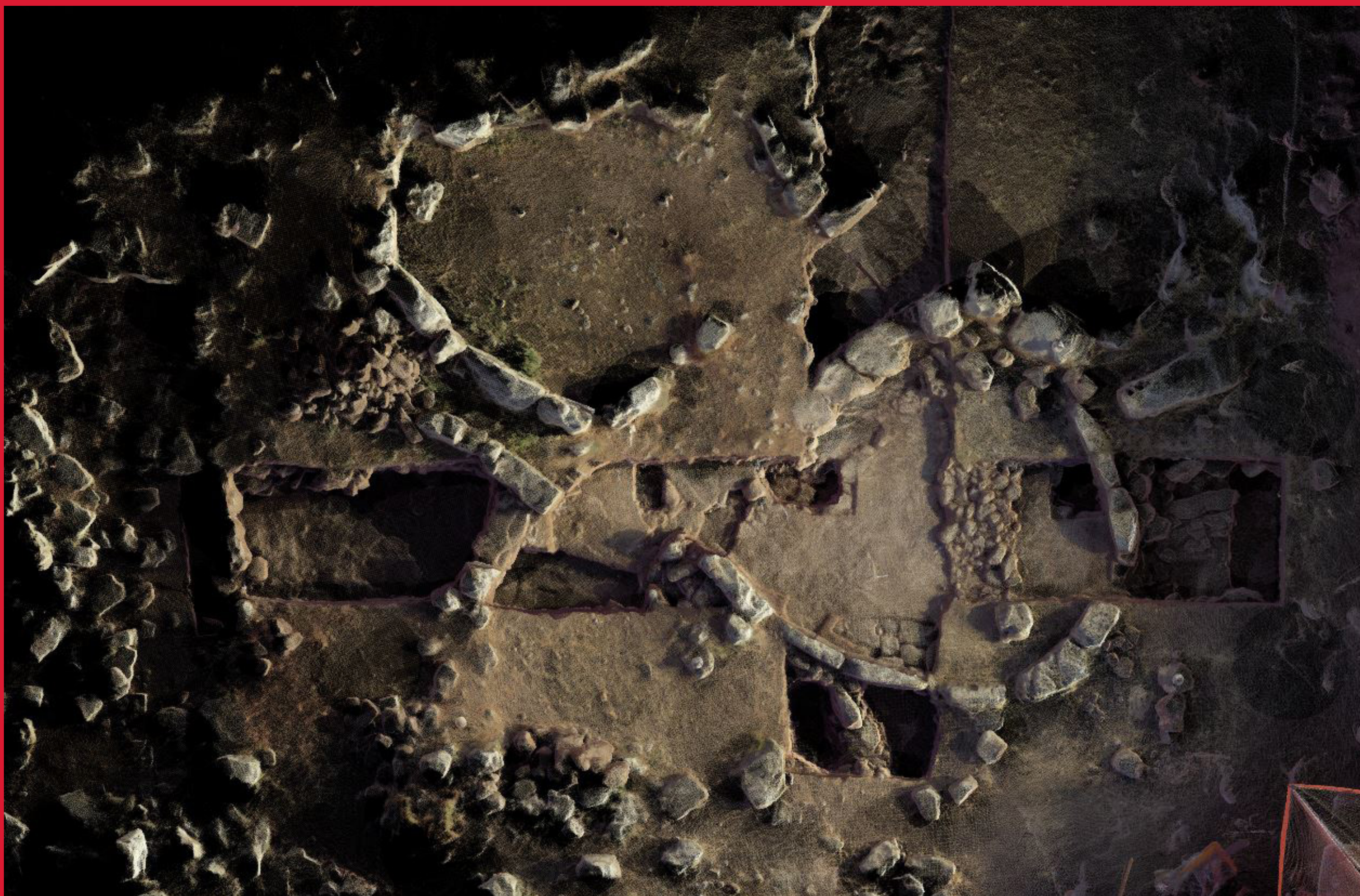
Temple places

Excavating cultural sustainability in prehistoric Malta

By Caroline Malone, Reuben Grima, Rowan McLaughlin, Eóin W. Parkinson, Simon Stoddart & Nicholas Vella



Volume 2 of Fragility and Sustainability – Studies on Early Malta, the ERC-funded *FRAGSUS Project*

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With contributions by
Stephen Armstrong, Jennifer Bates, Jeremy Bennett, Anthony Bonanno,
Sara Boyle, Catriona Brogan, Josef Caruana, Letizia Ceccerelli, Petros Chatzimpaloglou,
Nathaniel Cutajar, Michelle Farrell, Katrin Fenech, Charles French, Christopher O. Hunt,
Conor McAdams, Finbar McCormick, John Meneely, Jacob Morales Mateos,
Paula Reimer, Alastair Ruffell, Ella Samut-Tagliaferro, Katya Stroud & Sean Taylor

Illustrations by
Steven Ashley, Caroline Malone, Rowan McLaughlin, Stephen Armstrong,
Jeremy Bennett, Catriona Brogan, Petros Chatzimpaloglou, Michelle Farrell,
Katrin Fenech, Charles French, Conor McAdams, Finbar McCormick, John Meneely,
Alastair Ruffell, Georgia Vince & Nathan Wright

FRAGSUS

Volume 2 of Fragility and Sustainability – Studies on Early Malta,
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This project has received funding from the European Research Council (ERC) under the European Union's Seventh Framework Programme (FP7-2007-2013) (Grant agreement No. 323727).

Published by:
McDonald Institute for Archaeological Research
University of Cambridge
Downing Street
Cambridge, UK
CB2 3ER
(0)(1223) 339327
eaj31@cam.ac.uk
www.mcdonald.cam.ac.uk

ISBN: 978-1-913344-03-0

Cover design by Dora Kemp and Ben Plumridge.
Typesetting and layout by Ben Plumridge.

On the cover: *Digital scan of the Kordin III excavation in 2015, by John Meneely.*

Edited for the Institute by James Barrett (*Series Editor*).

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Contributors

Stephen Armstrong
Archaeology, College of Humanities, University of Exeter, UK
Email: sa622@exeter.ac.uk

Stephen Ashley
Norfolk Museums Service, Shirehall, Market Avenue, Norwich, UK
Email: steven.ashley@norfolk.gov.uk

Dr Jennifer Bates
Dept. of Anthropology, Penn Museum, University of Pennsylvania
Email: jenbates@sas.upenn.edu

Jeremy Bennett
Department of Archaeology, University of Cambridge, Cambridge, UK
Email: jmb241@cam.ac.uk

Prof. Anthony Bonanno
Department of Classics & Archaeology, University of Malta, Msida, Malta
Email: anthony.bonanno@um.edu.mt

Dr Sara Boyle (now Stewart)
Ordnance Survey of Northern Ireland, Land & Property Services, Lanyon Plaza, 7 Lanyon Place, Town Parks, Belfast, Northern Ireland

Dr Catriona Brogan
14 Glenmanus Village, Portrush, Antrim, Northern Ireland
Email: cbrogan03@qub.ac.uk

Dr Josef Caruana
Head Office Heritage Malta, Ex Royal Naval Hospital, Kalkara, Malta
Email: josef.caruana@gov.mt

Letizia Ceccarelli
Department of Chemistry, Materials and Chemical Engineering 'G. Natta', Politecnico di Milano, P.zza Leonardo da Vinci, 32, 20133 Milano, Italy
Email: letizia.ceccarelli@polimi.it

Dr Petros Chatzimpaloglou
Department of Archaeology, University of Cambridge, Cambridge, UK
Email: pc529@cam.ac.uk

Nathaniel Cutajar
Head Office Heritage Malta, Ex Royal Naval Hospital, Kalkara, Malta
Email: nathaniel.cutajar@gov.mt

Dr Michelle Farrell
Centre for Agroecology, Water and Resilience, School of Energy, Construction and Environment, Coventry University, Coventry, UK
Email: ac5086@coventry.ac.uk

Dr Katrin Fenech
Department of Classics & Archaeology, University of Malta, Msida, Malta
Email: katrin.fenech@um.edu.mt

Prof. Charles French
Department of Archaeology, University of Cambridge, Cambridge, UK
Email: caif2@cam.ac.uk

Dr Reuben Grima
Department of Conservation and Built Heritage, University of Malta, Msida, Malta
Email: reuben.grima@um.edu.mt

Sheila Hamilton Dyer
Department of Archaeology and Anthropology, Bournemouth University, Bournemouth, UK
Email: shamiltondyer@bournemouth.ac.uk

Prof. Christopher O. Hunt
Faculty of Science, Liverpool John Moores University, Liverpool, UK
Email: c.o.hunt@ljmu.ac.uk

Prof. Caroline Malone
School of Natural and Built Environment, Queen's University, Belfast, Northern Ireland
Email: c.malone@qub.ac.uk

Conor McAdams
Centre for Archaeological Science School of Earth and Environmental Sciences, University of Wollongong, New South Wales, Australia
Email: cm065@uowmail.edu.au

Dr Finbar McCormick
Emeritus, School of Natural and Built Environment, Queen's University, Belfast, Northern Ireland
Email: f.mccormick@qub.ac.uk

Dr Rowan McLaughlin
School of Natural and Built Environment, Queen's University, Belfast, Northern Ireland
Email: r.mclaughlin@qub.ac.uk

John Meneely
School of Natural and Built Environment, Queen's University, Belfast, Northern Ireland
Email: j.meneely@qub.ac.uk

Dr Jacob Morales Mateos
Departamento de ciencias historicas, Universidad de Las Palmas de Gran Canaria, Spain
Email: jacobmoralesmateos@gmail.com

Dr Anthony Pace
UNESCO Cultural Heritage, Valletta, Malta
Email: anthonypace@cantab.net

Dr Eóin Parkinson
Department of Classics & Archaeology, University of Malta, Msida, Malta
Email: ewparkinson24@gmail.com

Prof. Paula Reimer
School of Natural and Built Environment, Queen's University, University Road, Belfast, Northern Ireland
Email: p.j.reimer@qub.ac.uk

Dr Alistair Ruffell
School of Natural and Built Environment, Queen's University, University Road, Belfast, Northern Ireland
Email: a.ruffell@qub.ac.uk

Ella Samut-Tagliaferro
Formerly of the Superintendence of Cultural Heritage, Malta

Prof. Patrick J. Schembri
Department of Biology, University of Malta, Msida, Malta
Email: patrick.j.schembri@um.edu.mt

Dr Simon Stoddart
Department of Archaeology, University of Cambridge, Cambridge, UK
Email: ss16@cam.ac.uk

Katya Stroud
Head Office Heritage Malta, Ex Royal Naval Hospital, Kalkara, Malta
Email: katya.stroud@gov.mt

Dr Sean Taylor
Department of Archaeology, University of Cambridge, Cambridge, UK
Email: st435@cam.ac.uk

Prof. Nicholas C. Vella
Faculty of Arts, University of Malta, Msida, Malta
Email: nicholas.vella@um.edu.mt

Dr Nathan Wright
School of Social Science, The University of Queensland, Brisbane, Australia
Email: n.wright@uq.edu.au

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Dedication – in memoriam
John Davies Evans David Hilary Trump

Malta may be small in scale but it has had a rich and important archaeological past which has been explored and enjoyed by many past scholars. A visit to the Archaeology Museums of Malta and Gozo testifies to a long history of collecting, scholarship and passion dating back to the early to mid-nineteenth century. It is a heritage that is beloved by Malta and its visitors alike.

The editors of this volume wish to pay tribute to two remarkable 'visitors' to Malta, each of whom, in their own way, made great contributions to our present appreciation of the islands' ancient past and supported our early researches, teams and ideas. Now we want to record our debt as some of the continuing scholars of Maltese prehistory, since we cannot imagine where we could have begun our current quest to take the story onwards and deeper without their prior work.

On behalf of the whole *FRAGSUS* team, we wish to dedicate this volume to their enduring memory.

Professor John Davies Evans (OBE) (1925–2011) arrived in Malta in 1952 from Cambridge to commence the task of organizing the war-damaged museum collections in preparation for a synthesis of Maltese prehistory. His task was enormous, and involved a new assessment of the pottery and material culture sequence of Maltese prehistory. He prepared his now classic study *The Prehistoric Antiquities of the Maltese Islands*, published in 1971, which has remained the primary compendium of reference to this day. Together with carefully targeted excavations, John Evans set in train the many questions that inspired not only David Trump, his successor, to explore and challenge the complex story of Malta's prehistoric past, but also ourselves over the last 35 years. John noted important aspects of sequence, material connectivity and, of course, the temples. These he recorded and described in such detail that his work remains vitally important today.

David Hilary Trump (OM) (1931–2016) succeeded John Evans, having already experienced Maltese prehistory in the field with him, and became the Curator of the Museum of Archaeology for five years until 1963. In that short time, he too made an enormous impression on the understanding of prehistoric Malta. His work at Skorba (as we discuss in Chapter 7) was inspired and informed, and it too set the direction for the future explorations of prehistory in the islands. David Trump maintained his interest in Malta throughout his career, leading regular study tours to the island and latterly, with ourselves, undertaking the sustained programme of fieldwork at the Xagħra Brochtorff Circle (1987–9). He wrote numerous books and papers on Malta's prehistory, popular and academic; and his contribution has been widely acknowledged through museum displays, the award of the Order of Merit of Malta and an Honorary Degree from the University of Malta for which he felt hugely honoured. But back in the United Kingdom, from whence both these scholars came, there has been less mention of their work on Malta. Evans moved eastwards to Crete in his research interests, and has been identified mainly with that work; whilst Trump, a retiring and extremely modest individual, did not promote his achievements on Malta during his teaching years at Cambridge, which was arguably too theoretical to fully appreciate his remarkable contribution.

Figure 0.1. *David Trump and John Evans together at the Deya Conference, Mallorca (*c. *1983) (reproduced with permission of Judith Conway, niece of John Evans).*

Acknowledgements

Firstly, the *FRAGSUS Project* is the result of a very generous research grant from the European Research Council (Advanced Grant no. 323727), without which this and two partner volumes and the research undertaken could not have taken place. We heartily thank the ERC for its award and the many administrators in Brussels who monitored our use of the grant. The research team also wants to record our indebtedness to the administrators of the grant within our own institutions, since this work required detailed and dedicated attention. In particular we thank Rory Jordan in the Research Support Office (Queen's University Belfast – QUB), Laura Cousens (Cambridge University – UoC), Glen Farrugia and Cora Magri (University of Malta – UM), the Curatorial, Finance and Designs & Exhibitions Departments in Heritage Malta (HM) and Stephen Borg at the Superintendence of Cultural Heritage (SCH).

All archaeological excavations described in this volume were carried out using standard methods, in accordance with the policies of the SCH, in particular the guidance given in the document *Operating Procedures and Standards for Archaeology Services – February 2013*. Permits to enable excavation, survey, sampling and study were granted through the SCH and we are especially grateful to Anthony Pace and Nathaniel Cutajar for their unstinting efforts to ensure fieldwork was enabled.

Taċ-Ċawla

The Taċ-Ċawla excavations were directed by Prof. Caroline Malone, and the crew consisted primarily of students and staff from UoC, UM and QUB, supervised by Stephen Armstrong, Jeremy Bennett and Conor McAdams, with additional supervision from Dr Simon Stoddart, Dr Sara Boyle and Dr Emily Murray. We are also very grateful for Dr George Azzopardi who sought out accommodation for the project, assisted on site, and with his colleagues in HM enabled access to space for storage, environmental sampling and finds processing in Rabat. John Cremona and his colleagues in the Ministry for Gozo also played an important role in enabling site clearance and facilities at Taċ-Ċawla, and in securing the site following our work, with the long-promised surrounding wall. We also acknowledge a great number of local Gozitan businesses, hardware stockists, JCB drivers and cafe and restaurant owners, who supported our work in so many ways.

Santa Verna

The Santa Verna excavations were directed by Prof. Caroline Malone, assisted by Dr Simon Stoddart and Dr Rowan McLaughlin. The crew consisted primarily of a number of students and staff from UoC, QUB and UM, supervised by Stephen Armstrong, Jeremy Bennett, Dr Catriona Brogan and Eóin Parkinson. Dr Evan Hill wet-sieved the soil samples using flotation and the site was sampled for soil micromorphology and geochemistry by Prof. Charles French, Dr Sean Taylor and Conor McAdams. During the excavation, our understanding of the extant megalithic structure was improved by the superb plan produced by Stephen Ashley. Tiomoid Foley conducted a condition survey of the megalithic remains, the results of which were incorporated into an MSc project. Rupert Barker made a short film of the excavations – *A Day on a Dig* (https://youtu.be/cGNOGpq746I). Digital laser scanning was undertaken by John Meneely. Individuals whose efforts are warmly acknowledged include Stephen Armstrong, Dr Catriona Brogan, Dr Bela Dimova, Dr Paola Filippucci, Dr Reuben Grima, Laura James, Lottie Stoddart and Dr Sean Taylor, who supervised trenches, organized field assistants and gave logistical support to the running of the project. At Santa Verna, we particularly thank Dr George Azzopardi (HM) for his invaluable logistical help at the start of the excavations and insightful comments made throughout, and Ella Samut-Tagliaferro, Cristian Mifsud, Mevrik Spiteri and Daphne M Sant Caruana, who accommodated the wet-sieving and flotation operations at the Ġgantija World Heritage site visitor centre. This was facilitated by Prof. Nick Vella and Chris Gemmell (UM), who organized and set up the sieving system. We acknowledge the interest taken in our work by other organizations including Xagħra parish council, Wirt Għawdex, and the staff and pupils at Gozo College. Indeed, the *FRAGSUS* team was delighted by the level of interest in the excavations shown by local residents and other visitors to the site. We particularly acknowledge the help, understanding and patience of the residents who offered us the use of their garage to store tools and equipment overnight, and the local farmer who provided gifts of bananas and kindly offered the use of his pumphouse as a tool shed. We especially thank Joseph Attard Tabone for his interest in and support of all our work, especially at Santa Verna.

Ġgantija

The Ġgantija excavations in 2015 were directed by Prof. Charles French, Dr Simon Stoddart, Dr Sean Taylor and David Redhouse, assisted by Stephen Armstrong, Jeremy Bennett, Dr Catriona Brogan, Conor McAdams, Aran McMahon, Eóin Parkinson, Jacob Pockney and Mariele Valci. Flotation of soil samples was undertaken by Dr Evan Hill. Digital laser scanning was undertaken by John Meneely. The field researchers comprised the geophysical survey team in 2014 under the supervision of David Redhouse and Dr Alistair Ruffell with assistance from Jeremy Bennett. Dr Sara Boyle and Jeremy Bennett undertook initial survey of the WC section area in 2014.

We thank especially HM and its staff on Gozo, who enabled access and provided much assistance at this busy World Heritage Site (the most visited ancient site in the islands), namely George Azzopardi, Daphne M Sant Caruana and Nicolene Sagona.

Kordin III

The excavations were directed jointly by Prof. Caroline Malone and Prof. Nicholas Vella, assisted by Dr Reuben Grima, Dr Rowan McLaughlin, Ella Samut-Tagliaferro and Dr Simon Stoddart. The crew consisted mainly of students from UM, who participated as part of their annual training excavation. They were supervised by Jeremy Bennett, Dr Catriona Brogan, Rebecca Farrugia, Dr Reuben Grima, Tore Lumsdalen and Eóin Parkinson. Flotation of soil samples was undertaken by Dr Evan Hill. Digital laser scanning was undertaken by John Meneely and Jeremy Bennett. We also acknowledge the kind assistance of Fondazzjoni Wirt Artna, the Malta Heritage Trust, who granted access to the site.

Skorba

The excavations were directed by Prof. Caroline Malone and Dr Rowan McLaughlin, who were assisted by Stephen Armstrong, Jeremy Bennett, Dr Catriona Brogan, Emma Hannah and Eóin Parkinson. OSL profiling and geoarchaeological sampling was performed by Prof. Charles French, Dr Timothy Kinnaird (University of St Andrews), Dr Simon Stoddart and Dr Sean Taylor. The site was laser scanned by Jeremy Bennett. We thank HM for enabling access to the site and Dr Josef Caruana and Katya Stroud for supporting the work.

In-Nuffara

The excavations were directed by Dr Simon Stoddart and Dr Rowan McLaughlin, who were assisted by Stephen Armstrong, Stephen Ashley, Robert Barratt, Donald Horne, Katie Hutton, Christina O'Regan and Leslie Torwie. Many thanks to Dr George Azzopardi (HM) and Ella Samut-Tagliaferro (SCH) for their logistical support. John Meneely laser scanned the silos and analysed the volumetric data. We thank Dr Anthony Pace and Nathaniel Cutajar and their staff from the SCH for enabling access to the site.

Post-excavation

The Department of Classics and Archaeology, UM, kindly offered storage space during the project and accommodated the post-excavation team in the sunny courtyard where pottery and finds were studied. We thank Chris Gemmell in particular for his invaluable help throughout the project, but especially in enabling storage of material and access to it for the project team and the logistics on various sites and for his skilled assistance in setting up the flotation processing. In Belfast, Emma Hannah undertook data entry, sample sorting and volume indexing, and Georgia Vince assisted with data entry and logistics and produced many of the excavation plans and section drawings used throughout this volume. She also archived and scanned the project records along with the original Cambridge Gozo Project, and these are now housed in the National Museum of Archaeology, Valletta. In Malta, pottery was studied by Stephen Armstrong, Stephen Ashley, Prof. Anthony Bonanno, Dr Catriona Brogan, Prof. Caroline Malone, Lisa Coyle McClung, Rowan McLaughlin, Eóin Parkinson and Dr Simon Stoddart. We thank Prof. Nicki Whitehouse for her enthusiastic support and advice on environmental matters. Thin section slides were produced by Dr Tonko Rajkovača of the McBurney Laboratory, Department of Archaeology, University of Cambridge. We are very grateful to Sharon Sultana (Curator) of the Museum of Archaeology for not only housing the study material but also providing access to it in 2017. Stephen Ashley and Prof. Caroline Malone illustrated the pottery and small finds. Dr Catriona Brogan assisted in the production and editing of this volume. We also wish to thank Ben Plumridge, Production Editor, for seeing this and the two companion volumes through the arduous process of publication. Thanks too, to Jason Hawkes (copy editing), Olivia Shelton (references) and Emma Hannah (indexing) for their careful work on the volume.

Permits and access

The *FRAGSUS* team is very grateful to the heritage bodies of Malta, namely HM and the SCH and their officers, who enabled access to sites and provided the permissions and opportunities to study the buried archaeology. It cannot be over-emphasized just how privileged the *Project* has been in having access to excavate and examine the exceptional sites of prehistoric Malta. Not only is the entire category 'Maltese Temple' protected, but most sites are also inscribed within the UNESCO World Heritage Site listing for Malta. Some readers may wonder why very small trenches and sondages were permitted at all, whilst others may query the value of small investigations. This volume presents a range of scales of study from the small to the large across prehistoric sites and assesses the value of particular data sets that have been collected. Together with Volume 1, which examines the wider landscapes and environments of early Malta, and Volume 3, which examines the bones and lives of the ancient individuals, this volume fills the middle ground – the sites themselves, and we thank all our collaborators and volunteers in this venture. In particular, we thank the willing site assistants, volunteers, surveyors, cooks and illustrators who gave their time and energy to the archaeological work, and we list them below:

Spring and Summer 2014, Gozo – Taċ-Ċawla, In-Nuffara, Ta' Marżiena, Ġgantija, Gozo landscapes

UoC	Dr Simon Stoddart	CI/Direction
UoC	Prof. Charles French	Geoarchaeology
UoC	Dr Sean Taylor	Geoarchaeology
UoC	Jennifer Bates (MRes)	Soil sieving
UoC	David Redhouse	Technical staff
UoC	Hettie Hill	Field assistant
UoC	Angus Knight	Field assistant
UoC	Theo Arnold Foster	Field assistant
UoC	Rosanna O'Keefe	Field assistant
UoC	Kate Wilson	Field assistant
UoC	Louise Green	Field assistant
UoC	Emma Brownlee	Field assistant
UoC	Dr Letizia Ceccarelli	Pottery study
HM	Dr George Azzopardi	Landscape archaeology
HM	Katya Stroud (MA)	Field/survey assistant
HM	Joanne Mallia (MA)	Archaeology/archives
HM	Iona Muscat (MA)	Archaeology/archives
HM	Marie Elena Zammit (MA)	Archaeology/archives
Norfolk CC	Steven Ashley	Illustration
Indep	Phil Wright	Field assistant
Indep	Dr Rebecca Enlander	Field assistant
Indep	Lottie Stoddart	Catering/illustration
QUB	Prof. Caroline Malone	PI/Direction
QUB	Conor McAdams	Field assistant
QUB	Stephen Armstrong	Field assistant
QUB	Lorraine Barry (MSc.)	Survey/technical
QUB	Dr Sara Boyle	Research coordination
QUB	Jeremy Bennett	Field/survey assistant
QUB	Dr Alastair Ruffell	GPR survey
QUB	Alix Baxter	Field assistant
QUB	Eóin Parkinson	Field assistant
QUB	Dr Emily Murray	Staff supervisor
QUB	Anastasia Boomsma	MSc. training
QUB	Deborah Schroeter	MSc. training
QUB	Claire Privilege	MSc. training
QUB	Laura Patrick	MSc. training
QUB	Joel Goodchild	MSc. training
QUB	Michael Lavery	MSc. training
QUB	Naomi Finn	Catering
QUB	Tiomoid Foley	Field assistant
QUB	Jake Morris	Field assistant
QUB	Jonny Small	Field assistant
QUB	Dr Michelle Farrell	Environmental PDRA
QUB	John Meneely	Digital scanning
QUB	Conor Graham	Survey/technical
QUB	Michael Armstrong	Field assistant
Rome	Mariele Valci	Field assistant

Swansea	Lucy Stoddart	Ecology assistant
UM	Dr Reuben Grima	Fieldwork direction
UM	Dr Nick Vella	CI/Direction
UM	Dr Katrin Fenech	Environmental analysis
UM	Prof. Patrick Schembri	Environmental direction
UM	Nicole Micaleff	Field assistant
UM	Jessica Scicluna	Field assistant
UM	Luke Brightwell	Field assistant

UM	Tamsin Kingman	Field assistant
UM	Kay Mallia	Field assistant
UM	Karl Cachia	Field assistant
UM	Cecilia Zammit Endrich	Field assistant
UM	Annalise Agius	Field assistant
UM	Joseph Grima	Field assistant
UM	Dean Galea	Field assistant

April 2015, Gozo – Santa Verna, Ġgantija, In-Nuffara

UoC	Dr Simon Stoddart	CI/Direction
UoC	Jeremy Bennett (MSc.)	Survey supervisor
UoC	Dr Letizia Ceccarelli	Ceramics and finds
UoC	Prof. Charles French	Geoarchaeology
UoC	Dr Sean Taylor	Geoarchaeology
UoC	David Redhouse	Survey supervisor
UoC	Robert Barratt	Digital recording
UoC (CAU)	Donald Horne	Site supervisor
UoC (CAU)	Katie Hutton	Site supervisor
UoC	Laura James	Site supervisor
UoC	Dr Paola Filippucci	Student training
UoC	Dr Bela Dimova	Student training
UoC	Charles Barker	Student training
UoC	Tansy Branscombe	Student training
UoC	Imogen Coulson	Student training
UoC	Olivia Crawford	Student training
UoC	Louise Green	Student training
UoC	Josie Howl	Student training
UoC	Isaac Lawton	Student training
UoC	Jodie Manners	Student training
UoC	Aran McMahon	Student training
UoC	Susanne Navara	Student training
UoC	Jacob Pockney	Student training
UoC	Lily Rice	Student training
UoC	Alisa Santikam	Student training
UoC	Rebecca Seakins	Student training
UoC	Finnoula Taylor	Student training
UoC	Katherine Wilson	Student training
UoC	Conor McAdams (M.Phil)	Geoarchaeology
UoC	Dr Ronika Power	Human osteology
UoC	Dr Letizia Ceccarelli	Pottery study
INDEP	Rupert Barker	Filmmaker

Norfolk CC	Steven Ashley	Illustration/planning
QUB	Prof. Caroline Malone	PI/Direction
QUB	Dr Rowan McLaughlin	Senior site supervisor
QUB	Eóin Parkinson (MSc.)	Site supervisor
QUB	Dr Catriona Brogan	Site supervisor
QUB	Stephen Armstrong (M.Arch.Sci.)	Site supervisor
QUB	John Meneely (MSc.)	Digital survey/ technical
QUB	Dr Sean Pyne O'Donnell	Coring
LJMU	Dr Chris Hunt	Coring
QUB	Dr Rory Flood	Coring
QUB	Dr Michelle Farrell	Coring
QUB	Dr Finbar McCormick	Zooarchaeology
QUB	Tiomoid Foley (M.Arch.Sci.)	Survey assistant
QUB	Rory Sutton (M.Arch.Sci.)	Field assistant
QUB	Claire Holmes (M.Arch.Sci.)	Field assistant
QUB	Dr Evan Hill	Environmental
IAC Ltd.	Christina O'Regan (MSc.)	Field assistant
RDS	Charlotte Stoddart (MA)	Field assistant
Indep.	Rupert Barker	Film maker
ROME	Mariele Valci	Field assistant
SCH	Ella Samut-Tagliaferro (MA)	Site supervisor
SCH	Bernardette Mercieca (MSc.)	Human osteology
UM	Gillian Asciak	Student training
UM	Stephanie Parisi	Student training
UM	Maja Sausmekat	Student training
UM	Leslie Torwie	Student training
UM	Dr Reuben Grima	Landscape

June–July 2015 – Kordin Temple

UoC	Dr Simon Stoddart	CI/Direction
UoC	Jeremy Bennett (MSc.)	Survey
UoC	Dr Letizia Ceccarelli	Ceramics
UoC	Matthew Greenhill	Field assistant
UoC	Beth Whitlock (MPhil)	Field assistant
MEPA	Tony Zammit (MSc.)	MEPA
MEPA	Joseph Magro Conti (MSc.)	MEPA
QUB	Prof. Caroline Malone	PI/Direction
QUB	John Meneely (MSc.)	Survey
QUB	Dr Rowan McLaughlin	Principal supervisor
QUB	Eóin Parkinson (MSc.)	Site supervisor
QUB	Dr Catriona Brogan	Site supervisor
QUB	Dr Finbar McCormick	Zooarchaeology
QUB	Dr Evan Hill	Molluscs/sieving
SCH	Ella Samut-Tagliaferro	SCH
Swansea	Lucy Stoddart	Field assistant
UM	Chris Gemmell	Logistics
UM	Rebecca Farrugia	Site supervisor
UM	Dr Sean Taylor	Geoarchaeology
UM	Prof. Anthony Bonanno	Ceramics
UM	Dr Nicholas Vella	CI/Direction
UM	Dr Reuben Grima	CI/Direction
UM	Adrian Camilleri	Field assistant
UM	Aidan Lehane	Field assistant

UM	Anne Marie Schembri	Field assistant
UM	Gavin Borg	Field assistant
UM	Gillian Asciak	Field assistant
UM	Prof. John Betts	Survey
UM	Leanne Azzopardi	Field assistant
UM	Luke Briitghtwell	Field assistant
UM	Maja Sausmekat	Field assistant
UM	Daniela Formosa	Field assistant
UM	Mara de Richter	Field assistant
UM	Maria Serpina	Field assistant
UM	Melanie Debono	Field assistant
UM	Nico Muscat	Field assistant
UM	Nicole Micaleff	Field assistant
UM	Nidia Lisic	Field assistant
UM	Rachel Grillo	Field assistant
UM	Sefora Borg	Field assistant
UM	Tamsin Kingwell	Field assistant
UM	Tore Lomsdalen	Field/survey assistant
UM	Sandy Pirani	Field assistant
UM	Tamsin Cauchi	Field assistant
UM	Ryan Grech	Field assistant
UM	Gabriel Farrugia	Field assistant
UM	Dwayne Haber	Field assistant
UM	Dean Galea	Field assistant

April 2016 – Skorba excavation

UoC	Dr Simon Stoddart	CI/Co-Direction
UoC	Jeremy Bennett (MSc.)	Field assistant
UoC	Eóin Parkinson (MSc.)	Field assistant
HM	Dr Josef Caruana	Heritage assistant
QUB	Prof. Caroline Malone	PI/Direction
QUB	Dr Rowan McLaughlin	Assistant direction

QUB	Dr Catriona Brogan	Field assistant
QUB	Stephen Armstrong (M.Arch.Sci.)	Field assistant
QUB	Emma Hannah (MPhil)	Field assistant
SCH	Ella Samut-Tagliaferro	Field manager
Univ. St Andrews	Dr Timothy Kinniard	OSL/geomorphology

Summer 2016 – Pottery and finds analysis (University of Malta)

UoC	Dr Simon Stoddart
Norfolk CC	Steven Ashley
QUB	Prof. Caroline Malone

QUB	Dr Rowan McLaughlin
QUB	Stephen Armstrong
QUB	Dr Catriona Brogan

June 2017 – Pottery analysis (University of Malta and National Museum of Archaeology)

UoC	Eóin Parkinson (MSc.)
QUB	Dr Rowan McLaughlin
QUB	Prof. Caroline Malone

QUB	Dr Catriona Brogan
QUB	Dr Lisa Coyle McClung

Foreword

Joseph Magro Conti

Consider, 5000 years ago you are on one of the smallest islands in the Mediterranean, which has no water sources, dependent on brief winter rain showers, shallow soil patches, with only stone, clay and salt as natural resources, perhaps a few trees and shrubs. How would you live in such environment? This second volume of the *FRAGSUS Project* (2013–18) provides readers with fresh information achieved through high quality scientific research on palaeoenvironmental analysis, radiocarbon dating, human and faunal bone studies as well as on ceramics, lithics, domestic contexts and monuments, fully addressing five main questions targeted by the project. The support of the European Research Council has been transformative in making this new knowledge about Maltese prehistory more understandable and accessible, as a reader will discover throughout this and the other two volumes.

The coming of *FRAGSUS* was a long journey. Twenty-seven years passed since I first met the main protagonists of this project, Prof. Caroline Malone and Dr Simon Stoddart. They left a long-lasting positive impression on me. I was an archaeology undergraduate at the University of Malta in 1993, under the academic guidance of Prof. Anthony Bonanno, with colleagues Nicholas Vella (now Professor, and former Head of the Archaeology Department at the University of Malta) and Dr Anthony Pace (my predecessor as Superintendent of Cultural Heritage). I was on my first archaeological research excavation by an Anglo-Maltese mission at the unique Neolithic mass burial site of the Xagħra Brochtorff Circle in Malta's sister island of Gozo. A couple of decades later I had the opportunity to participate on other research digs in Malta with Malone-Stoddart, this time as part of *FRAGSUS* at Kordin III Neolithic temples in Malta, a site about which I had long endeavoured to raise awareness for its better understanding and management.

The Temple Period is renowned for the monumental megalithic structures (presumed temples) and the associated underground mass burial places, which offer an aura about the Neolithic mindset, belief system, organisation, ritual and physical capabilities in engineering and art. But what should be further intriguing to the reader is another aspect of human life – how the early people lived? What evidence is there for this aspect from the Temple Period? Previously, such questions were largely without much evidence except sporadic discoveries of typical deposits and material culture, but which were very lacking in data to advance site prediction and environmental data collection. The very few huts so far discovered and interpreted as domestic were ephemeral and thus prone to unrecorded destruction during building construction. I was pleased to contribute my knowledge of domestic sites to the publication of the Gozo study in 2009, and delighted to write this Foreword. This work records the next stages of discovery of the inhabitation record of the Maltese islands, most notably at Taċ-Ċawla, a site preserved from development by the action of the Superintendence.

In the past fifty years, the Maltese Islands have undergone successive building booms, each significantly endangering Malta's historic environment. In my quest as an applied archaeologist/heritage manager for over two decades at the Planning Authority and for the past two years as Superintendent of Cultural Heritage, I have endeavoured to collaborate with disparate stakeholders to save or mitigate impacts on the fragile remains of the past, and to raise awareness. The findings from *FRAGSUS* will be an especially useful source of information for policy makers, heritage managers, regulatory agencies and conservation scientists in their quest to preserve and understand Malta's past. The study enables them to make informed decisions about future human impacts on the archaeological heritage, mainly caused by

Figure 0.2. *Joseph Magro Conti at Kordin.*

building development on the small island environment and its island society and economy.

This volume is a seminal interdisciplinary study, not only for Maltese prehistory but also a milestone in world prehistory more generally. As prehistory pre-dates the invention of writing, the approach of *FRAGSUS*'s research agenda turns archaeo-environmental data into 'words' by digging deep into the embryonic matrix of garden soils on which the temples builders sustained themselves. The project can now explain queries about this sustainability, a theme that is still relevant to modern generations. With the use of multidisciplinary and multinational teams of specialists, the study placed innovative scientific approaches at the fore, and addressed silent aspects that go beyond the traditional art-historical basics of Grand Traditions. The investigations into the core essence of life five millennia ago belong to new scientific approaches.

The *FRAGSUS Project* has addressed lacunae and used unconventional approaches in theory and method to obtain robust scientifically-backed results that have filled in significant gaps in the research agenda of Maltese prehistory and beyond. Equally, the results have surely raised many questions for future research agendas. I look forward to further collaboration, and I am eager to see more collaborative projects between Maltese veterans and upcoming academics and our overseas colleagues.

Joseph Magro Conti
Superintendent of Cultural Heritage, Malta
September 2020

Chapter 2

Dating Maltese prehistory

Rowan McLaughlin, Eóin W. Parkinson,
Paula J. Reimer & Caroline Malone

2.1. Introduction: chronology building in the Maltese islands

Radiocarbon dating and the prehistoric chronology of the Maltese Islands have been pivotal in the history of European prehistoric research. The importance of the islands in the first attempts to chart European prehistory in the early twentieth century has had an enduring impact on their place within modern studies on prehistoric Europe. Even within their regional setting, the well-defined chronological sequence for prehistoric Malta has been an important yardstick for chrono-cultural sequences in neighbouring Sicily and southern Italy, where the application of radiocarbon dating has been limited. Ironically, Malta's own prehistoric sequence was founded on relatively few radiocarbon dates and has received little critical re-evaluation in the five decades since it was established. A central objective of the *FRAGSUS Project* has been to establish a robust multi-proxy chronology that combines environmental landscape dating with archaeological sites and the human, animal and plant remains from those sites. The *Project*'s dating programme achieved a total of 155 new radiocarbon determinations on archaeological deposits for the Maltese Islands. This work has achieved a much more refined chronology and thus enabled a thorough reassessment of Malta's prehistory and its phasing in relation to wider events and changes.

2.1.1. Malta and megalithismus

The Maltese Islands were central to the development of the first systematic attempts to understand Europe's prehistory and chronology. These relied on diffusionist models that envisioned the spread of civilization from east to west. Early in the twentieth century, pioneering archaeologists had begun to acknowledge that the Maltese monuments were prehistoric and dated to the Neolithic (Ashby *et al.* 1913; Mayr 1908; Zammit 1910). These same archaeologists also challenged the chronological position of the diffusionist paradigm of the times and instead sought to explain Malta's individual island culture. Similarly, the chronology of the end of the Temple Period and beginning of the Bronze Age in Malta was present in the mind of Themistocles Zammit during his excavations at Tarxien (Zammit 1930; §2.3.9). As noted above (§1.2, 1.3, 2.1.2), the retrieval of dateable materials from David Trump's 1960s excavation of Skorba coincided with a moment of reflection and vigorous debate within archaeology. At the heart of this debate was the questioning of culture-historical models that had dominated the discipline since the nineteenth century (Elliot Smith 1915; Fergusson 1872; Perry 1923).

The subsequent work of Colin Renfrew (1973) challenged these traditional interpretations of European prehistory, specifically those of the origin and diffusion of megalithic monuments. Gordon Childe (1925, 1930) had employed the general notion of civilization spreading westwards and northwards. Although he included the recent Maltese discoveries in his wide scope, he was still inclined to argue for a Mycenaean origin for Europe's megalithic monuments. Renfrew, fresh from research in the early Aegean area (Renfrew 1972) and armed with scientific understanding of the relatively novel approach of radiocarbon dating, immediately identified the power and potential of the early dates emerging from Neolithic Malta. Renfrew's (1973) calibrated radiocarbon dates became a lynch pin to his argument against diffusion. Instead, the chronology supported his argument for independent innovations across the Mediterranean and west European region. The emerging absolute dates for both the Maltese Temple Culture and megaliths firmly showed them to be almost two millennia earlier than the megaliths at Mycenae. This excluded any possibility that Mycenae could have influenced the building of megaliths on Malta or, indeed, elsewhere in western Europe.

2.1.2. Malta and the Mediterranean: the development of absolute chronologies

Trump's (1966) excavations at Skorba and his application of radiocarbon dating were a watershed moment that helped refine the Maltese prehistoric sequence. The chrono-cultural sequence developed by Evans (1953, 1959) remained tied to the culture-historical model and placed emphasis on influences from the eastern Mediterranean and Aegean. A lively debate on Malta's cultural sequence ensued between Bernabò Brea (1960) and Evans (1960). This debate centred on the end of the Temple Period and whether Malta had a Neolithic culture parallel to the Sicilian Diana-Bellavista culture. These issues are still as relevant today as they were 60 years ago. The first field seasons at Skorba supported Bernabò Brea's (1960) position on the latter point, with Trump (1961) announcing the discovery of a parallel Diana ware and thus tying the Maltese Islands into a regional chronological framework. As such, one of the most important questions for the Maltese prehistoric chrono-cultural sequence is establishing the absolute dating of the Għar Dalam and Skorba phases of the pre-Temple Period early Neolithic, and their relationship to parallel traditions in Sicily and southern Italy (Chapter 10, §10.3.1, §10.4.1). Initially, Trump (1966) achieved eight conventional radiocarbon dates for Skorba, Mġarr and Tarxien phases in the first programme of dating. Later, two dates were added for the Għar Dalam layers from Skorba (Evans 1971) and a further three by Renfrew (1972) for the early Bronze Age Tarxien Cemetery phase at Tarxien. The result was a chronological framework that has remained largely intact ever since (see Malone *et al.* 2009, 1; Trump 2002). This work was fundamental in reorganizing Evans' (1959) sequence. It added new terminologies for the individual phases based on type-sites, two new phases represented by 'Grey Skorba' and 'Red Skorba' ceramics, and established the priority of the Żebbuġ phase over the Mġarr phase (see Chapter 10). Perhaps the greatest outcome of Trump's work was his identification of a break in the sequence between the Temple Period and succeeding Bronze Age between 2500–2000 BC (Trump 2002). This built on Zammit's discovery of a sterile layer between the late Neolithic Temple and Bronze Age cemetery layers at Tarxien, which had originally been interpreted by him as representing an abandonment phase (Zammit 1930; §2.3.9).

No new radiocarbon dates were added to the original suite until the Cambridge Gozo Project commenced in 1987 (§1.3; Volume 3, Chapters 1 & 3). That project focused on the dating of episodes of the emerging Temple Culture as represented in the burial site of the Xagħra Brochtorff Circle. It also added nineteen AMS radiocarbon dates (one of which was intrusive Byzantine material redistributed from the upper Northern part of the site) derived from human and animal bone to the chronological database (Malone *et al.* 2009). This initiative also produced viable determinations of stable carbon and nitrogen isotopes, adding the potential to examine diet and environment (Stoddart *et al.* 2009a). Two AMS radiocarbon dates from human bones were also acquired for the Bur Mgħeż and Ħal Saflieni Temple Period burial sites (Mifsud 1999). The publication of the Xagħra Brochtorff Circle (Malone *et al.* 2009) was significant in adding greater resolution to the Temple Period, specifically closing the gap between the end of the Temple Period and Bronze Age to approximately 2400–2000 BC (Malone *et al.* 2009). Key questions, however, still remained, namely the dating of the elusive Mġarr and Saflieni phases of the fourth millennium BC, and the resolution of Malta's pre-Temple Period early Neolithic and its initial occupation.

Since the work at Xagħra took place, an important development for the chronology of later prehistoric Malta has been the increasing identification of Thermi ware. This is a new ceramic style and associated phase positioned between the Tarxien and Tarxien Cemetery phases that holds stylistic similarities with third millennium BC Aegean wares (Lamb 1936). The presence of Thermi ware on the Maltese Islands was acknowledged throughout much of the later twentieth century (Evans 1953, 68; Malone *et al.* 2009, 238–9; Trump 1966, 46). Yet, discussions about this ceramic style have gained considerable momentum in the last decade following the analyses of the excavated materials from Tas-Silġ. These analyses have identified the occurrence of Thermi-style wares in association with Tarxien phase ceramics (Cazzella & Recchia 2012; Copat *et al.* 2012; Recchia & Cazzella 2011). The recent work at Tas-Silġ, whilst not yet accompanied by published absolute dates, has the potential to add much nuance to our understanding of the end of the Temple Period and to tackle the issue of contemporaneity or distinct phasing.

In the years since the publication of the Cambridge Gozo Project (Malone *et al.* 2009), the need for greater clarity of the phases on either side of the Temple Period has become more pressing. Equally as pressing has been a growing awareness of the need to interrogate an understanding of human time with the tempo of the changing environment. A potential linkage between the two was demonstrated through the increasing use of pollen studies and other palaeoecological approaches that highlighted phases of significant change within the prehistoric timescale (see Volume 1). With these opportunities emerging, coupled with the questions posed by *FRAGSUS*, the current programme of research focused on: establishing the early occupation of Malta; improving the dating of the succession of cultural evolution and eventual decline of the megalithic Temple Culture; and understanding the relationship between that decline and the succeeding early Bronze Age.

2.2. Methodology

2.2.1. Sources of data

Chronology building begins at the trowel's edge. The *FRAGSUS Project* excavations were performed with the express aim of refining the cultural sequence of the Maltese islands. So, at each site, the excavation and sampling strategies that we adopted were influenced by the need to obtain good samples for radiocarbon dating and the meaningful Bayesian analysis of their results. Indeed, an entire excavation season (Chapter 7) was devoted to testing the hypothesis that the chronology uncovered at Santa Verna (Chapter 4) could be verified at another site. In Bayesian analysis of radiocarbon data, as in any form of archaeological analysis, we are constrained by what survives and the field sampling strategy that is used. Despite best efforts, this is often a matter of luck. Samples from each archaeological layer, ranging in volume from 1 to 60 litres, were subjected to flotation and wet-sieved. The resulting flots were then sorted for plant remains, charcoal and other dateable items. Although the organic content of many samples was relatively low, suitable material for AMS dating was present in virtually every soil sample. Here, we benefited from the fact that AMS dates can be obtained from very small objects such as individual cereal grains. Once identified by a specialist, charred seeds were the first preference for AMS dating, followed by small fragments of charcoal. Charcoal, although susceptible to an 'old wood effect', is a very reliable material. Animal bones, once identified as a certain species, were also used to obtain radiocarbon dates. It should be noted, however, that the failure rate of these samples was very high due to taphonomic processes and, perhaps, the nature of ancient Maltese butchery and cuisine (see Chapter 9).

In addition to dating material from sites that were excavated by the *FRAGSUS Project*, we attempted 88 new AMS radiocarbon dates from the Xagħra Brochtorff Circle, and collaborated with colleagues on the ERC-funded *Time of Their Lives* (ToTL) project to include the results of 29 successfully dated samples from ToTL in our models (Malone *et al.* 2019; Volume 3, Chapter 3). We also obtained two new AMS radiocarbon dates from seeds held in the National Museum of Archaeology from Zammit's Tarxien Cemetery deposits, and five from human tooth samples from the Xemxija tombs. In the case of Xemxija, the bones had become divorced from their original stratigraphic context. As such, the dates, although valuable in themselves (see Chapter 12, Volume 3), were not useful in refining the cultural sequence at that site.

Legacy radiocarbon data for Malta were obtained from Malone *et al.* (2009b), Malone *et al.* (2019) and Tycot (2020), and were recorded in a database. Comparative data from elsewhere in the central Mediterranean were sourced from a paper by Parkinson *et al.* (under review).

2.2.2. AMS radiocarbon dating

All radiocarbon dating work (excepting paired bone samples in the ToTL project, which was undertaken at Oxford, see above) was performed using AMS in the ^{14}Chrono Centre, Queen's University Belfast. The samples that comprised charcoal, charred seeds and human or animal bone were all from terrestrial sources and from species with a known carbon ecology. The samples were prepared as described by Reimer *et al.* (2015). No input from marine carbon sources was detected in any of the samples, so the radiocarbon ages were calibrated using the terrestrial northern hemisphere IntCal20 database (Reimer *et al.* 2020). A total of 193 samples from archaeological contexts were submitted. Of these, 36 were bone samples that failed to produce enough collagen for a reliable date, and two were modern cases of charred seeds that had intruded into prehistoric layers. Thus, the number of 'useful' archaeological dates was 155 (Table 2.1). As discussed below and in the chapters that follow, many of these were from 'residual' material that had become reworked though the stratigraphy by taphonomic processes. Nevertheless, all carry useful information about Malta's past.

Also completed as part of the *FRAGSUS Project*, but not reported here, is a sequence of 21 radiocarbon measurements taken from modern and Roman period land snail shells (Hill *et al.* forthcoming) and 121 dates from sediment cores (see McLaughlin *et al.*, Volume 1, Chapter 2).

2.2.3. Bayesian phase modelling

Bayesian analysis combines data and 'prior' hypotheses, calculating 'posterior' beliefs that are informed by both. In the context of radiocarbon dating, the data consist of the calibrated radiocarbon dates, or rather their probability distribution functions; and the 'priors' are information about their relative chronological order (identified though analyses of stratigraphy in the field) or the cultural phase they are associated with (gleaned though analysis of associated material culture). The advantages of the Bayesian approach to archaeological chronology are manifold. Of particular relevance here is that 'empty' phases, whose existence might be inferred archaeologically, but not directly associated with any dates, can be modelled and their start and end points guessed through the analysis of the patterning of data from preceding and succeeding phases.

Table 2.1. *Number of archaeological radiocarbon dates from various contexts and materials obtained by the* FRAGSUS Project.

Site	Charred seeds	Charcoal	Animal bone	Human bone	Total useful dates
Taċ-Ċawla	19	1	9 (+7 failed)		29
Santa Verna	18 (+1 modern)	2	1 (+2 failed)	1	22
Ġgantija	1	1	0 (+9 failed)		2
Xagħra Brochtorff Circle				74 (+ 14 failed)	74
In-Nuffara	4	1			5
Xemxija				5	5
Skorba	4	1	0 (+1 failed)		5
Kordin III	5 (+1 modern)	4	2 (+3 failed)		11
Tarxien	2				2
Total useful	53	10	12	80	155

For the *FRAGSUS Project*, the prior information was formally defined using OxCal 4.3 (Bronk Ramsey 2009) and used in a number of Bayesian chronological models, each of which made different assumptions about what the archaeological data *actually* mean. These models did not differ significantly when data or underlying assumptions were changed slightly, indicating that they are reasonably robust. The 'preferred model', elaborated upon below, is our best-guess at how the data can be most meaningfully represented. The chronology of each excavation site is also discussed separately in Chapters 3–8. Dates derived from Bayesian phase models are quoted here in italics at 95% probability. Further Bayesian modelling and analysis of these dates was done on a context-by-context basis where relevant, to answer specific questions about each site (see Chapters 3–8).

2.2.4. Density modelling

Much archaeological research involves counting things – animal bones, pot sherds, cereal grains and so on. Often, these counts are developed diachronically or in a time series, and are interpreted as proxies of economy or settlement intensity. The same can be done with radiocarbon dates, although this is only successful with two important provisos. First, because of their expense and norms of archaeological practice, radiocarbon samples tend to be much fewer in number than other types of find, and are not necessarily gathered without bias towards certain types of context. Therefore, any statistical approach to their distribution in time must account for this, or at least not over-interpret the results. Second, the posterior probabilities of radiocarbon ages have rather complex mathematical properties and cannot, for example, be assigned to a certain century using a point estimate (such as the weighted mean or mode, see Telford *et al.* 2004) without committing an unacceptable number of mistakes. Despite these issues, the modelling of radiocarbon data as a time series can reveal valid trends in settlement or population intensity in a defined research area. This is because the models are derived ultimately from objective scientific measurements, rather than from subjective assessment and expert interpretation, as is the case for traditional forms of archaeological typochronology. Density models, whether or not they are interpreted as population proxies, are also very useful in comparing datasets between different regions. This is because hundreds or thousands of separate radiocarbon measurements can be combined into models that allow for the identification of relative change in archaeological activity that are averaged over the myriad methodological and taphonomic constraints of individual sites, landscapes and archaeological excavations.

For this study, we used custom radiocarbon calibration and Monte Carlo simulation (*rowcal,* McLaughlin 2019) to develop radiocarbon measurements into a time series using Kernel Density Estimation (KDE). A KDE is similar to the more familiar summed probability distribution (SPD) of radiocarbon dates. Yet, rather than summing each calibrated age probability, the KDE method sums a set of Gaussian 'kernels' whose means are points in time randomly drawn from the calibrated age probabilities. In doing so, we follow the prior belief that human activity identified at one point in time is also indicative of a degree of activity before and after the thing that was dated, since all things are part of a continuum of cause and consequence. The strength of this belief is expressed by the standard deviation of the kernel, also known as the 'bandwidth' of the KDE. This can be set at a defined value (for example, 30 years, to model inter-generational change), calculated using heuristics, or optimized using a search algorithm. The uncertainty in radiocarbon determinations caused by laboratory errors and the calibration process is expressed in the KDE by 'bootstrapping' a confidence interval for the KDE. This averages thousands of individual runs of the Monte Carlo process until a stable pattern emerges that conveys the maximum amount of information.

To ensure that well-sampled sites such as the Xagħra Brochtorff Circle did not cause errant artefacts in the KDE, we used hierarchical cluster analysis to identify unique site phases, and selected only one date per phase using the algorithm provided by McLaughlin *et al.* (in press). Computer scripts for replicating the analyses presented in this chapter are available upon request.

2.3. Results[1]

2.3.1. Early Neolithic Għar Dalam and Skorba phases

The earliest identified form of material culture found on the Maltese Islands is Għar Dalam pottery. This is named after a cave in southern Malta that contained a richness of this impressed pottery type, and was identified as representative of the earliest Neolithic phase in Malta by Trump during his excavations at Skorba (Trump 1966). Unlike Trump, however, we did not encounter any strata containing only this ceramic type unmixed with later types at our own excavations at Skorba, Santa Verna (which also had a substantial early Neolithic settlement), or Taċ-Ċawla (where deposits were too mixed). Our preferred Bayesian model of the cultural sequence therefore begins at the so-called 'Skorba' phase, which we have determined began at some point between 5510 and 5240 cal. BC. For the preceding Għar Dalam phase in the late sixth millennium BC, we can turn to other lines of evidence, namely: comparison with adjacent regions in the central Mediterranean; and palaeoecological signals of agricultural disturbance that pre-date the earliest strata uncovered during our archaeological excavations (Volume 1).

The Għar Dalam pottery style (and presumably also the people who first brought it to the Maltese Islands), can be related broadly to the Stentinello wares of Sicily and Calabria, which are considered as a developed form of other early Neolithic impressed wares or 'Cardial' cultures. This cultural grouping was associated with the rapid western expansion of Neolithic agriculture from the Balkan peninsula, which, as discussed below (§2.3.13), reached Southern Italy, Sicily and Sardinia at around or slightly before 6000 BC (Natali & Forgia 2018; Volume 1, Chapter 6). By 5500 BC, the culture had reached the shores of Iberia, indicating that its spread was rapid. Indeed, it appears to have spread more rapidly than the contemporary northern expansions of the Linear Pottery culture (LBK) and related cultural groups that were also occurring over the course of the sixth millennium BC (see Bocquet-Appel *et al.* 2012). It is likely that this was because of the Mediterranean Sea itself, which enabled sea-faring agriculturists to open up new horizons for colonization and settlement more quickly than their contemporaries in continental terrestrial contexts. Given this situation, we should expect to find the earliest indicators of Neolithic settlement in Malta within a century or so of the Neolithic settlement of Southern Italy and Sicily. Our radiocarbon data from archaeological contexts in Malta are, unfortunately, not related to this phase. Interesting dates, however, are provided by palaeoenvironmental evidence gathered by our project and discussed at length by Hunt and Farrell (e.g. Volume 1, Chapter 11). Fungal spores, indicating livestock dung, and cereal pollen indicating the cultivation of wheat and barley, both occurred at around 6000 cal. BC. This date has been estimated robustly through Bayesian modelling of the accumulation rates of deposits found in sediment cores, and is consistent with the expansion of Neolithic settlement elsewhere in the central Mediterranean, as discussed below (§2.3.13; Volume 1, Chapter 6)

As for the Skorba phase, which is defined by the occurrence of monochrome pottery with a distinctive speckled fabric (§10.4), there is copious archaeological and palaeoenvironmental evidence for a significant amount of settlement, farming, land clearance, soil erosion and fire episodes occurring all over the landscape (Volume 1, Chapter 3; Marriner *et al.* 2019). Twelve dates from *FRAGSUS Project* excavations at Santa Verna and Skorba, incorporated in a Bayesian phase model, estimate the start of this phase at 5510–5240 cal. BC and its end at 4980–4690 cal. BC. We found a mixture of both Red and Grey Skorba wares in our excavations, and so we have not attempted to separate Skorba into two distinct phases.

Unrelatable to any archaeological deposit, but indicative of the overall scale of activity during this phase, is a charred cereal grain dating to 5020–4845 cal. BC (UBA-37861, 6041±34 BP) that was retrieved from the Salina Deep Core.

2.3.2. Fifth millennium hiatus

What came next is something of a mystery. At the time of writing, there are no well-dated archaeological finds from the islands between the Skorba and Żebbuġ phases, i.e. until around 3800 BC. The only radiocarbon date from our excavations that can tentatively be assigned to this phase is a piece of unidentified charcoal from Skorba, found in a later context, that dated to 4700–4500 cal. BC (UBA-35590, 5756±35 BP). The palaeoenvironmental record indicates patchy cereal cultivation and a continuation of grazing throughout the period (Volume 1, Chapter 3). As such, it is possible that rather than abandonment, the human population was reduced to small numbers; or, as some of our colleagues argue (see Volume 1), the landscape was completely reorganized. The long-term settlements of Skorba, Taċ-Ċawla and Santa Verna, however, were abandoned and not occupied again until the Żebbuġ phase. Radiocarbon evidence from before and after this hiatus can be used to estimate its duration. An 'empty' phase is defined in our Bayesian model as one that forms part of a sequence but is not associated with any radiocarbon dates. In our preferred model this 'empty' phase begins between 4980–4690 cal. BC and ends between 4150–3640 cal. BC.

2.3.3. Żebbuġ phase

The Żebbuġ phase is very well represented in the pottery from across the islands. Yet, strata containing this material in its primary depositional contexts are few and far between. In our model, the Żebbuġ phase is dated by three radiocarbon determinations from Santa Verna, and constrained by the timing of the subsequent Mġarr phase. The earliest date, UBA-33706 (4945±87 BP) was from a charred cereal in a pit under the temple floor and likely to be from a pre-monument settlement (see Chapter 4); the modelled date for this sample is 3910–3640 cal. BC. Overlying this, a charred cereal from the foundation of the earliest Temple floor, a layer associated with Żebbuġ pottery exclusively, was dated to 3730–3640 cal. BC (UBA-31041, 4908±37 BP). This sequence, and one other determination from elsewhere on the Santa Verna site, constituted the Żebbuġ phase. In our preferred model, the phase begins at 4060–3640 cal. BC and ends at 3695–3540 cal. BC.

Several dates from *Project* excavations at Taċ-Ċawla fall within with this range, but came from contexts that also contained significant quantities of later pottery styles (see Chapter 3) and so were not included in the model of this phase. Also excluded were the dates of human bone samples from the rock-cut tomb (previously interpreted as a 'Żebbuġ' tomb) at the Xagħra Brochtorff Circle complex. These fall too late in time to be associated with the Żebbuġ cultural phase (see Chapter 3, Volume 3). All of these determinations, however, were used in the radiocarbon density model discussed below.

2.3.4. Mġarr / transitional Ġgantija phase

From the perspective of material culture, following the Żebbuġ phase, there was a degree of variation in the pottery types used at the 'temple' sites excavated by the *FRAGSUS Project*. On Gozo, layers yielding Ġgantija phase pottery (see Chapter 10) occur immediately above Żebbuġ layers. At Kordin III however there were several contexts that contained a relative wealth of the distinctive Mġarr style sherds. Three dates from the site were used in our Bayesian model of the cultural sequence. One of these dates was not associated directly with Mġarr pottery, but was sealed beneath a Ġgantija-phase floor and was broadly contemporary with the other two. The model suggests that the phase began at 3695–3540 cal. BC and ended at 3600–3200 cal. BC. Alternative models can constrain this phase better, but these rely on early Ġgantija phase material from Santa Verna. This clearly overlaps with the transitional Mġarr phase and may represent an early development of this pottery form on Gozo, which later became more widely adopted throughout the Maltese Islands.

2.3.5. Ġgantija phase

Our excavations at the megalithic complex at Kordin III (Chapter 6), where surviving extant structures date to the Ġgantija phase, and at Santa Verna (Chapter 4) where several successive Ġgantija-phase structures were examined, unearthed a wealth of Ġgantija pottery. Our excavations at the eponymous site of Ġgantija (Chapter 5) also produced significant amounts of this pottery, although none in direct association with material that could be radiocarbon dated. Therefore, seven dates from layers containing material directly associated with a fully developed Ġgantija material culture at Kordin III and Santa Verna were used to model the date of this cultural phase. The results suggest that the Ġgantija phase began at 3600–3200 cal. BC, and ended at 3080–2760 cal. BC. The relatively imprecise dating of these phase boundaries is due to the lower visibility of Mġarr and Safileni phases in our excavations. Though here we note that some individual contexts and structures at Kordin III, Santa Verna and Taċ-Ċawla are very precisely dated (Chapters 3, 4 and 6), as are the burials of this phase at the Xagħra Brochtorff Circle rock-cut tomb.

2.3.6. Saflieni phase

Much like the earlier Mġarr phase, strata definitively belonging to the Saflieni phase eluded us during fieldwork. As such, there are no radiocarbon dates associated unequivocally with this phase. The chronology of the Saflieni phase was thus estimated in the Bayesian model by defining an empty phase between Ġgantija and Tarxien. The results indicate a chronology that starts at 3080–2760 cal. BC and ends at 2850–2660 cal. BC. Early Tarxien dates from the Xagħra Brochtorff Circle are identifiable as outliers on the basis of their agreement score in the preferred Bayesian model, and can be considered part of this cultural phase, as could the dated burial from Ħal Saflieni Temple itself (Mifsud 1999). Either way, the cultural and chronological boundary between the Saflieni and Tarxien phases is not particularly distinct, as previously noted (Malone *et al.* 2009; Chapter 11).

2.3.7. Tarxien phase

The Tarxien phase is well represented in data from both the Xagħra Brochtorff Circle and *FRAGSUS Project* excavations at the site of Ġgantija. Two dates from Ġgantija, five from Taċ-Ċawla, and a random selection of 24 dates (selected for computational expedience) from the Xagħra

Brochtorff Circle were used to model the timing and duration of this phase. The results indicate the phase began at 2850–2660 cal. BC and ended at 2445–2340 cal. BC. The start of this phase is somewhat later than has been suggested previously, and in this model the phase is not of a particularly long duration. Although here, and as we note above, the origins of this phase may have been indistinct from what came previously.

2.3.8. Thermi phase

As discussed by Malone *et al.* in this volume (Chapter 10), an assemblage of early Bronze Age pottery from Taċ-Ċawla represents an intermediate phase between the Temple Period and the Bronze Age. Four radiocarbon dates from contexts (163) and (241) at Taċ-Ċawla can be associated with this cultural phase (with the caveat that none of the material from that site was particularly stratigraphically secure) and be defined as indicative of a separate phase in our Bayesian model. On the basis of their work at Tas-Silġ, Cazzella & Recchia (2012, 2015) argue persuasively that the Thermi phase occurs in the final Temple Culture levels of the Neolithic temple on the site. The dates cited appear to align closely with the AMS chronology achieved on Gozo at both the Xagħra Brochtorff Circle and at Taċ-Ċawla. The phase is represented by distinctive geometrically decorated grey-black pottery (Chapter 10; Figs. 3.33 & 3.34), not by the equally distinctive Tarxien Cemetery style of pottery that seems to occur some centuries later. In our model, the date range of this phase is from 2445–2340 cal. BC to 2475–1980 cal. BC. Significantly, this overlaps with the latest human burials that occurred at Xagħra Brochtorff Circle (Volume 3, Chapter 3), which were associated with a scatter of Thermi style pottery sherds (Trump *et al.* 2009, 239).

There is an apparent hiatus before the Tarxien Cemetery phase gets underway. Similar signals of archaeological discontinuity have emerged from several dated prehistoric sites in Malta. For instance, Taċ-Ċawla was abandoned at this time; burial at the Xagħra Brochtorff Circle complex ended (although the site was reoccupied after 1800 BC); and Tas-Silġ may have a discontinuous occupation (Cazzella & Recchia 2012, 2015).

We have, therefore, included another empty phase in our model, which we have estimated to have begun at some point between 2475 and 1980 cal. BC. This spans the well-known climate anomaly that occurred at around 2200 BC, although it is still unclear how the central Mediterranean was affected by this global event (Bini *et al.* 2019). This model re-opens the case for a phase of abandonment in Malta in the late third millennium, but not one that occurred at exactly the same time as the transition to the Bronze Age.

2.3.9. Tarxien Cemetery phase

Better dating of the Tarxien Cemetery phase has long been a priority for archaeological research in Malta, but the requisite samples are few and far between. Our project was fortunate to obtain permission to date two charred faba beans from Zammit's original excavations at Tarxien. These results have been incorporated into a phase model also including a date for the Tarxien Cemetery deposits at Xagħra Brochtorff Circle, which were obtained during earlier work (Malone *et al.* 2009).

The archaeological context of the Tarxien seeds is fascinating. These were from an irregular layer of dark, ashy soil found by Zammit in the south temple at Tarxien. The layer was approximately 30 cm thick and buried 1.2 m below the pre-excavation ground level. Aside from the seeds and other charred plant remains, the deposit contained human bones with varying degrees of cremation, axes, daggers and awls of copper, beads and other small items of jewellery, figurine fragments, smashed pottery and charred textiles (Evans 1971, 149–66). It is possible that the deposit was formed of material derived from a pyre, when human bodies were cremated together with their grave goods, although it is debatable whether the burning occurred *in situ* or not. Zammit (1930) noted traces of burning on adjacent megaliths, but this did not seem to be from fires of the intensity expected for cremation. In any case, this context has been central to many debates in Maltese archaeology ever since its discovery. Sandwiched between the cremation deposit and the floor of the temple lay a relatively sterile layer of soil. Zammit (1930) was of the impression that this layer had formed naturally, with the soil having been washed in by wind and rain, thus being indicative of a period of abandonment. Evans, however, pointed out that this layer was not present elsewhere on the site and could equally have been a floor or surface of sorts, deposited deliberately in advance of the funerary activates and covering the uneven ruins of the temple.

Two dates from these beans, one from previous work at the Xagħra Brochtorff Circle complex, and one from a cattle bone associated with Tarxien Cemetery pottery at Borġ in-Nadur (Tanasi & Tykot 2020), enable us to estimate that this phase began at 2170–1830 cal. BC and ended at 1920–1670 cal. BC.

2.3.10. Borġ in-Nadur phase

FRAGSUS Project excavations at In-Nuffara (Chapter 8) resulted in five radiocarbon dates from the basal fills of a large rock-cut pit, or 'silo'. To our knowledge, these are the first radiocarbon dates to be obtained from the classic stage of this cultural phase, which place it, as expected, around 1100–900 cal. BC. As the data for the Bronze Age are sparse, this part of our model is poorly constrained, with large amounts of time remaining open to accommodate this phase. It is possible that the Tarxien Cemetery phase lasted until as late as 1375 cal. BC, or that it finished as early as 1920 cal. BC and another hiatus ensued. The latter scenario is the approach we have taken with our preferred model, which estimates the Borġ in-Nadur phase to have begun at some point between 1880 and 1375 cal. BC and ended at 1090–720 cal. BC. This time frame is consistent with the traditional eighth-century date for the arrival of Phoenician colonists. Two radiocarbon dates from the final Borġ in-Nadur / early Baħrija contexts at Qlejgħa tal-Baħrija and Borġ in-Nadur itself have recently been published by Tanasi & Tykot (2020). These been incorporated into our model of this phase but are equally consistent with Baħrija-like pottery representing a slightly later style than the material we found at our excavations at In-Nuffara.

2.3.11. Preferred model summary (95% confidence limits)

The overall indices of agreement of our model were A_{model}=88.3 and $A_{overall}$=85.5.

The CQL2 model specification used by OxCal is provided in Appendix A2.2. The 95% confidence intervals of the cultural phases are provided in Table 2.2 and visualized in Figure 2.1.

2.3.12. Kernel density model

Using KDE, a model of overall data density and dynamic growth is produced (Fig. 2.2). Rather than dividing prehistory into defined phases, this analysis treats the whole interval as a continuum; which, of course, is how each generation of people originally experienced it. The KDE evinces a similar 'boom-bust' dynamic of the early Neolithic, similar to what is known from elsewhere in Europe (Shennan *et al.* 2013). This analysis reveals statistically significant

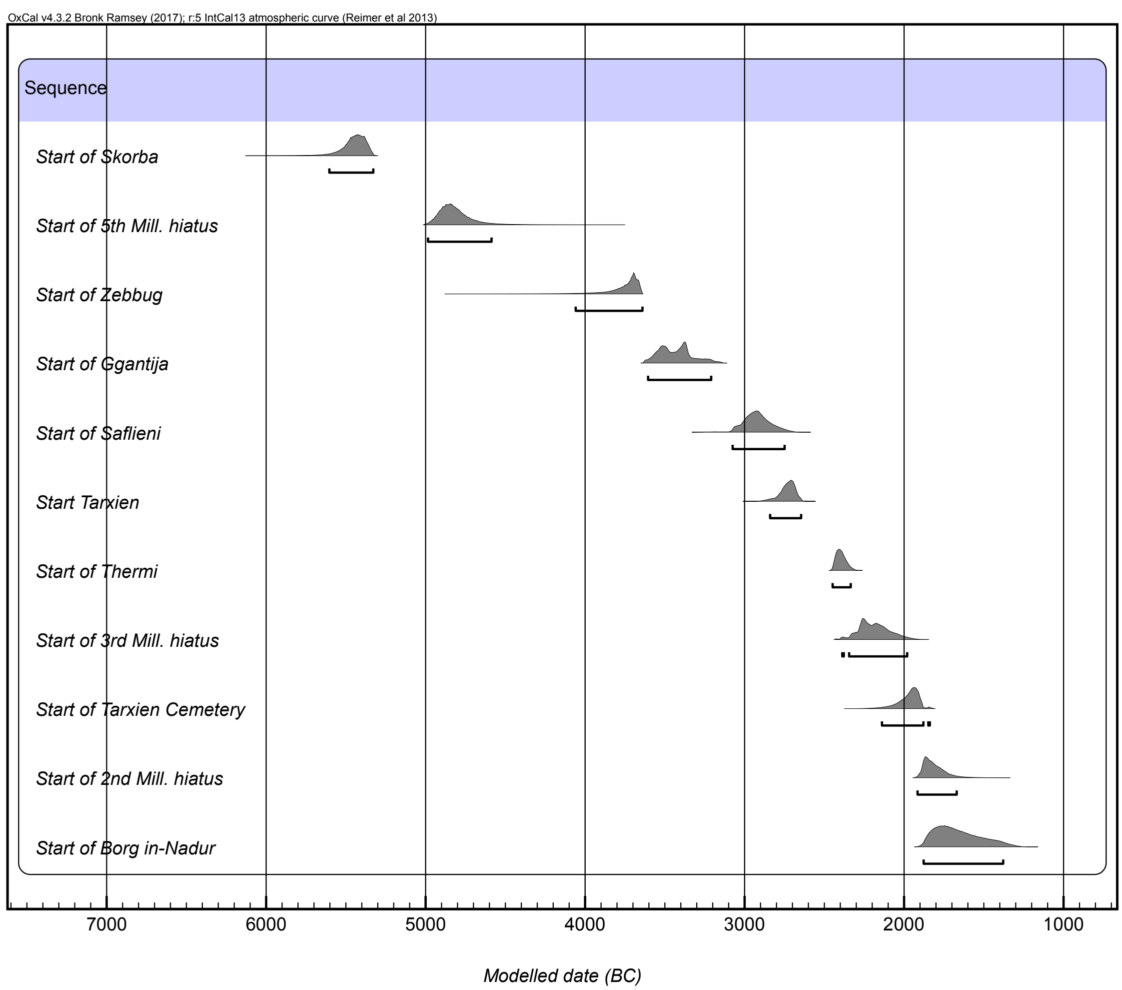

Figure 2.1. *OxCal plot of the posterior probability distribution of the boundaries between the various phases of Maltese prehistory.*

annual growth of 0.8±0.3% in the Skorba phase, and 0.6±0.2% in the Żebbuġ phase. The rate of decline at the end of the Skorba phase was −0.4±0.2% and a rather drastic −0.7±0.1% at the end of the Tarxien phase. Overall activity levels fluctuated between the Żebbuġ and Tarxien phases, with a slight downturn between 3500 and 3000 cal. BC, although this observation is not statistically significant according to the algorithm described by McLaughlin *et al.* (2021).

Another relevant use of the KDE is to compare the density of dated archaeological phases and the frequency of charcoal in sediment cores. The latter are not necessarily anthropogenic, but charcoal in sediment cores does indicate both burning and a degree of instability in the landscape (see Volume 1, Chapter 2). The comparison (Fig. 2.3) reveals two peaks in sediment charcoal, the first coinciding with the flurry

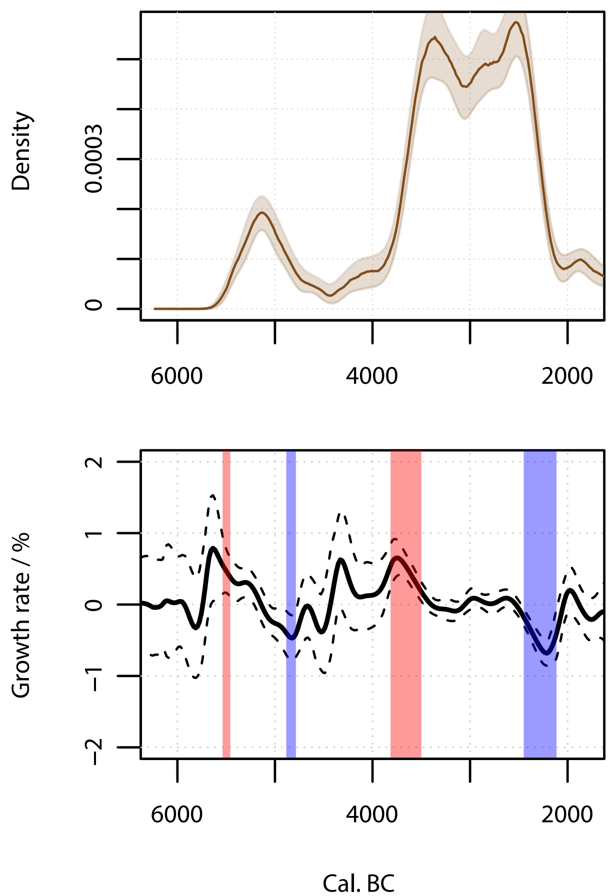

Figure 2.2. *Kernel density estimates (100-year bandwidth) for radiocarbon-dated phases of Maltese prehistoric sites. The top panel is the total density, the bottom panel is its derivative annualized growth rate, with statistically significant (at 95% confidence) phases of growth and decline highlighted.*

Table 2.2. *95% confidence intervals for the modelled dates of phase boundaries.*

	Start (cal. BC)		Duration (years)	
	Lower	Upper	Lower	Upper
Early Neolithic	5570	5340	405	853
Fifth millennium hiatus	4975	4645	712	1294
Żebbuġ	4060	3640	0	472
Mġarr	3695	3540	0	432
Ġgantija	3600	3200	0	756
Saflieni	3080	2760	0	355
Tarxien	2850	2660	240	470
Thermi	2445	2340	0	394
Third millennium hiatus	2390	1990	0	419
Tarxien Cemetery	2170	1830	0	384
Second millennium hiatus	1920	1670	0	418
Borġ in-Nadur	1675	1225	199	844
End of Borġ in-Nadur	900	660		

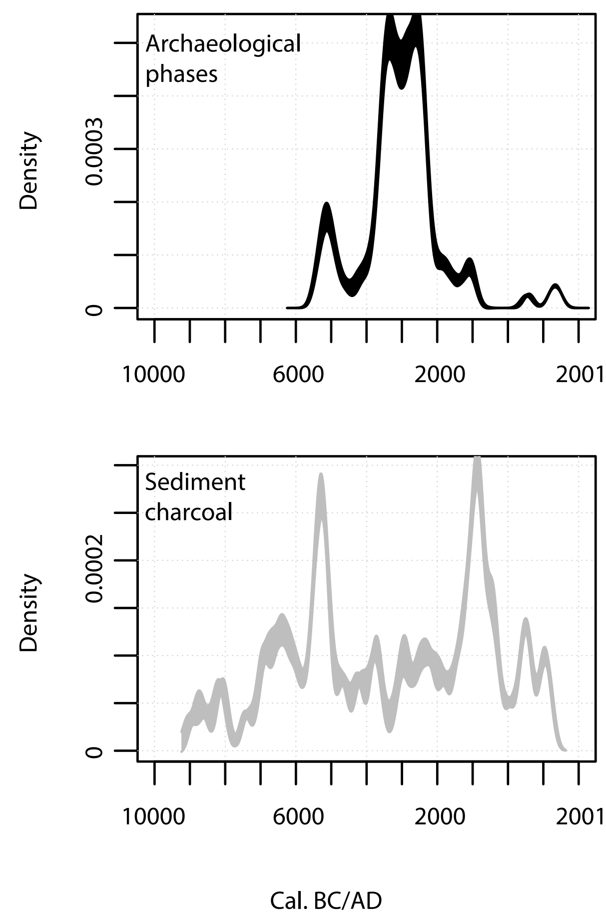

Figure 2.3. *KDE models (150-year bandwidth) of archaeological phases and the density of dated charcoal from* FRAGSUS Project *sediment cores.*

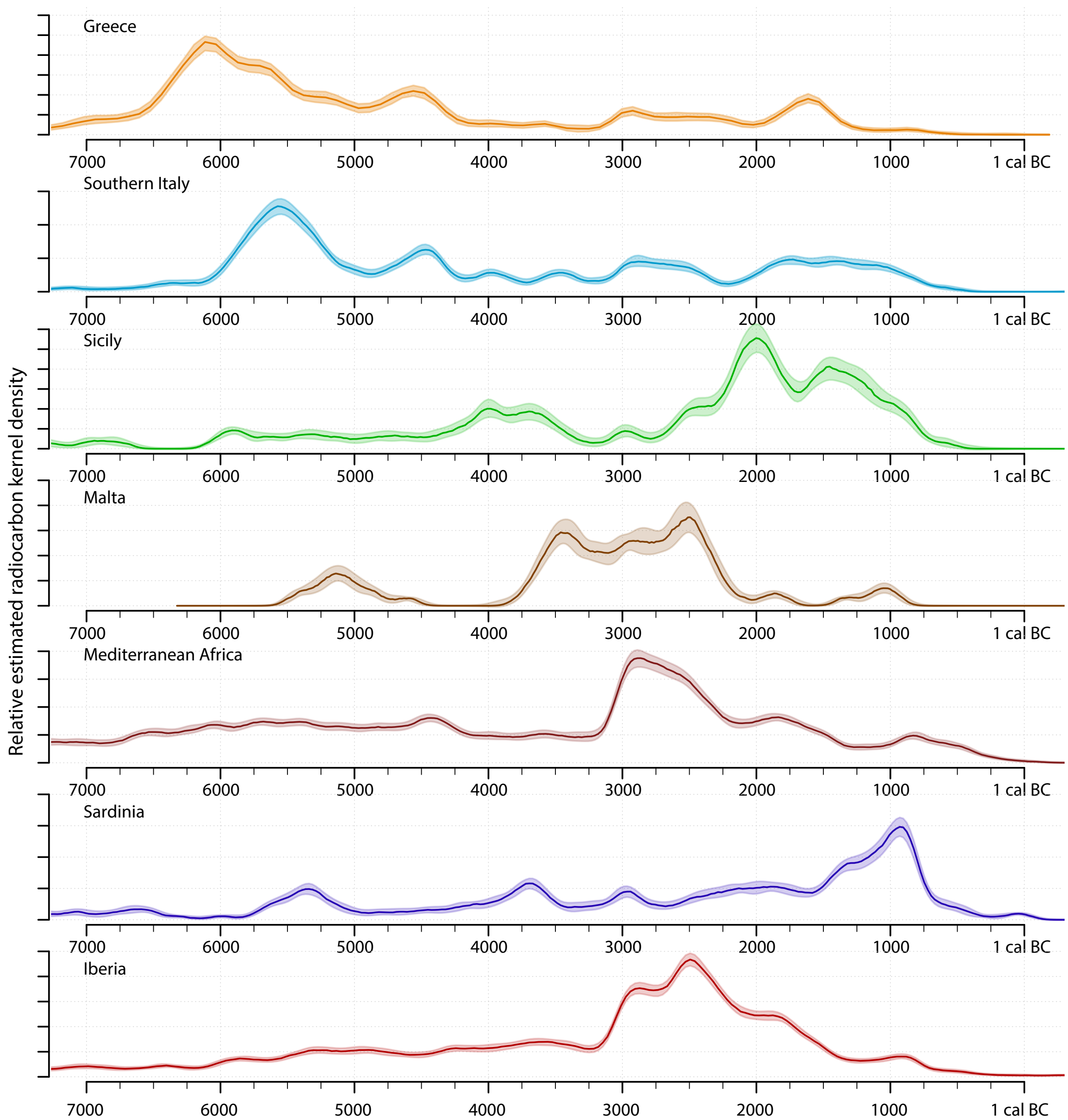

Figure 2.4. *KDEs (75-year bandwidth) of the temporal distribution of 216 radiocarbon dates from Malta compared with 6128 dates from other regions (R. McLaughlin).*

of Skorba-phase activity centred on 5200 BC; and the latter occurring at around 1000 BC, at the height of the Borġ in-Nadur phase. The Temple Period is relatively quiet, presumably because of the careful management of the landscape (McLaughlin *et al.* 2018).

2.3.13. Comparison with other regions

Using ensembles of radiocarbon dates from other Mediterranean regions (Parkinson *et al.* under review) we can compare the overall dynamics of the Maltese islands with other places. Interpretation of the results of this kind of analyses addresses factors common to the prehistoric cultures of the various regions, such as shared origins, similar patterns of cultural evolution, and economies influenced by the same changes to climate and environment. Also entangled in these data are biases of visibility and research tradition. Full consideration of these factors would require discussion, although there are some striking patterns apparent in the data at face value that require some initial comment. In Figure 2.4, KDE plots summarizing 216 dates from archaeological contexts in Malta are compared to 632 dates from Greece (Hinz *et al.* 2012), 425 from Southern Italy (Parkinson *et al.* under review), 246 from Sicily (Parkinson *et al.* under review), 1588 from North Africa (Lucarini *et al.* 2020), 257 from Sardinia

(Parkinson *et al.* under review), and 2980 from Iberia (Hinz *et al.* 2012; Kneisel *et al.* 2013).

These models clearly demonstrate that the 5100 cal. BC 'boom' in Neolithic activity in Malta is relatively late compared with those of Greece (peaking at 6200 cal. BC), Southern Italy (5700 cal. BC), Sicily (*c.* 5900 cal. BC, although this region is poorly powered with radiocarbon dates in comparison with others) and Sardinia (5300 cal. BC). The slight upturn in activity in Malta from 3000 cal. BC, reversing a decline during the Saflieni phase, is also mirrored in all of the other regions. This is especially the case in Iberia and Mediterranean Africa, which, among other developments, reflects the development of early dynastic Egypt. Following this crucial moment in world history, the acme of activity during the Tarxien phase on Malta was synchronous with a similar peak of activity in Chalcolithic Iberia, and its decline occurred during a coeval phase of rapid growth in neighbouring Early Bronze Age Sicily. The end of the Bronze Age saw the Maltese Islands incorporated into a cosmos of Phoenician growth (Broodbank & Lucarini 2020), which was unprecedented in the context of the northwest African settlement history, and strongly contrasted with declining activity throughout continental Europe around 800 cal. BC (Parkinson *et al.* under review). Assessing the significance of these observations will make for interesting multidisciplinary work in the future. The models also express the prominence of the archaeological cultures that various regions of the Mediterranean are famous for – the early Neolithic settlement of the Tavoliere in Southern Italy, the extraordinary expansion of Chalcolithic settlement and burial across Iberia and the Balearics, the temples of Malta, the *Castelluccio* funerary traditions of Sicily, the dawn of Egyptian civilization and the *nuraghi* of Sardinia. In a sense, the archaeological survival of these cultures is, in part, a result of their individual extraordinariness. Prehistory was the *longue durée* of slow cultural, economic and demographic growth, punctuated with localized phases of great intensity and cultural fluorescence, such as we find in Malta between 3800 and 2300 cal. BC.

2.4. Non-prehistoric dates

As discussed in Chapter 4, we radiocarbon dated a medieval human tooth found in backfill at Santa Verna to exclude the possibility that it was prehistoric in date. There were also medieval and modern charred seed grains from Santa Verna that had somehow worked themselves into prehistoric contexts. Similarly, a grain of modern charred rice was found buried in a prehistoric stratum at Kordin III and dated in the hope it may be ancient. A grape seed from the Marsa 2 sediment core was dated to the Phoenician period (UBA-29444, 2584±28 BP, 810–600 cal. BC).

2.5. Discussion

One priority for future work would be the archaeological dating of an Għar Dalam phase settlement. Coastal settlements of this period are now under several metres of water, which is a potential problem. Yet, Trump's excavations at Skorba and the wealth of material of this phase found at Santa Verna indicate that there is a likelihood that such deposits survive (albeit in protected places) in the Maltese landscape, and await future research.

The hiatuses have been included in our Bayesian models following a subjective assessment of the archaeological record, changes in ceramic style, and initial assessment of the chronological patterning of the dates. The results indicate that the data are consistent with this model, but it is important to note that this does not constitute independent evidence of the correctness of the model. Bayesian analysis cannot prove that a model is correct, only that it is wrong. Readers are encouraged to develop their own models of Maltese prehistory and use tools such as OxCal to explore whether our data are consistent with them.

The gap, or hiatus, between the Skorba and Żebbuġ phases will likely remain a point of debate. This is because tentative signals of continuous occupation can be read from the pollen which also suggests significant landscape reorganization and a move on to the Globigerina Limestone plateau landscape around the Grand Harbour (Volume 1, Chapter 11). The maxim 'absence of evidence is not evidence of absence' certainly applies here. The lack, however, of any identifiable ceramic culture at sites continuously occupied before and after this gap (at Skorba, Chapter 7; Santa Verna, Chapter 4; and Taċ-Ċawla, Chapter 3) must somehow be explained. The AMS dating programme has identified residual material from Skorba-phase occupation at the first two sites within Żebbuġ- and Ġgantija-phase strata. Yet, nothing from the fifth millennium BC was found at either site. Taċ-Ċawla, despite being noted for its early material in the past, produced no dates earlier than Ġgantija. This discontinuous pattern is consistent with a phase of abandonment, or at the very least a much-reduced population. This population may have been confined to settlements near the shore where they would be more likely to leave palynological traces of their existence in the sediment cores that have been studied. Other evidence for discontinuity can be inferred from the marked stylistic contrast between Skorba and Żebbuġ pottery (Chapter 10); and, indeed, in the very DNA of the Temple Period people, whose lineage appears to have closer affinities with continental Neolithic populations than they do with 'Cardial' ones (Volume 3, Chapter 11). This suggests a second wave of colonization, separate from the initial Neolithic. From the cultural sequence we can infer this most likely occurred at the start of the Żebbuġ phase. Future archaeological, palaeoenvironmental and palaeogenomic work will have the opportunity to test this hypothesis.

The KDE models demonstrate the overall intensity of the Temple Period, and only a slight oscillation in activity over the 1500 years of its span. The growth rates of 0.6% and 0.8% derived from the KDE for both the Skorba and Żebbuġ phase expansions are consistent with natural population growth for pre-industrial agrarian societies (see Parkinson *et al.* under review). This, however, does not exclude the possibility of continuous immigration to Malta, which would have bolstered population growth still further.

As a final note, failure rates for the dating of animal bones were very high (Table 2.1), varying between 43% and 100%. As noted by McCormick (§9.4.2) animal bones from Maltese sites are highly fragmented and may have been boiled prior to being discarded. This activity, and the harsh semi-arid environment, are not conducive to the survival of collagen. We can however recommend charcoal and especially charred seeds (which unlike charcoal are always short-lived and hence have no built-in age) as reliable samples for radiocarbon dating, especially if the context from which they derive is well sealed.

Table 2.3. *Simplified cultural phases. The uncertainty still associated with the Mġarr and Saflieni phases results in a sequence open to revision and alternative versions have been proposed elsewhere in* FRAGSUS Project *publications. Compare with Tables 13.1 and 13.2, as well as with Volume 1.*

Period	Phase	Start	End
Neolithic	Għar Dalam	6000 BC	5400 BC
	Skorba	5400 BC	4800 BC
	Fifth millennium hiatus	4800 BC	3800 BC
Temple Period	Żebbuġ	3800 BC	3600 BC
	Mġarr / transitionary phase	3600 BC	3400 BC
	Ġgantija	3400 BC	3100 BC
	Saflieni	3100 BC	2800 BC
	Tarxien	2800 BC	2400 BC
Bronze Age	Thermi	2400 BC	2200 BC
	Third millennium hiatus	2200 BC	2000 BC
	Tarxien Cemetery	2000 BC	1700 BC
	Second millennium hiatus	1700 BC	1500 BC
	Borġ in-Nadur / Baħrija	1500 BC	750 BC
Historic	Phoenician / Punic	750 BC	218 BC
	Roman / Byzantine	218 BC	AD 870
	Arab / Norman	AD 870	AD 1530
	Knights	AD 1530	AD 1798
	Modern	AD 1798	Present

2.6. Conclusion

It is, perhaps, inevitable that many questions remain about the details of the cultural sequence of the Maltese Islands. Yet despite this, there can be little doubt that the *Project*'s programme of research has brought the chronology of Maltese prehistory into sharper focus, and has enabled us to provide an updated table of the sequence of chronological phases (Table 2.3). The islands now contain several of the best-dated prehistoric sites in the central Mediterranean. We stress, however, that although the various distinctive cultural phases have been highly refined, it is imperative that future work considers radiocarbon dating of materials found on sites as matter of top priority. Placing finds on an absolute timescale is the only way to make sense of them, even if they can be readily ascribed to a distinctive typochronological phase. For example, a Tarxien-phase pot may date to 2800 BC or 2400 BC, the former a time of artistic and cultural elaboration, the latter a period of acute social and environmental stress. Individual archaeological discoveries, if they are to mean anything, must be mapped onto the dynamic of the cultural and environmental context from whence they came. Also, part of this process is a wider contextualization. Through comparison with data from neighbouring regions and some further afield we can see how 'Temple Period' developments on Malta occurred against a background of similar dynamics playing out in Iberia and Egypt. This could reflect the influence of climate change, such as the end of the African Humid Period, or could indicate a shared trajectory of cultural evolution and demographic expansion. Similarly, the third millennium hiatus in settlement on Malta and Gozo can now be associated more closely with the '4.2kya event' at around 2200 BC and, importantly, not coupled with the disappearance of the Temple Culture. This paradigm of synergistic work between archaeological and palaeoecological research channels has been fundamental to the work of the *FRAGSUS Project* and we hope to have provided a research agenda that can be followed and enabled thorough ever-refined chronological understanding.

Note

1. A full list of the radiocarbon dates obtained by the project from archaeological contexts is given in Appendix A2.1.

Temple places

The ERC-funded *FRAGSUS Project* (*Fragility and sustainability in small island environments: adaptation, culture change and collapse in prehistory, 2013–18*) led by Caroline Malone (Queen's University Belfast) has focused on the unique Temple Culture of Neolithic Malta, and its antecedents and successors through investigation of archaeological sites and monuments. This, the second volume of three, presents the results of excavations at four temple sites and two settlements, together with analysis of chronology, economy and material culture.

The project focused on the integration of three key strands of Malta's early human history (environmental change, human settlement and population) set against a series of questions that interrogated how human activity impacted on the changing natural environment and resources, which in turn impacted on the Neolithic populations. The evidence from early sites together with the human story preserved in burial remains reveals a dynamic and creative response over millennia. The scenario that emerges implies settlement from at least the mid-sixth millennium BC, with extended breaks in occupation, depopulation and environmental stress coupled with episodes of recolonization in response to changing economic, social and environmental opportunities.

Excavation at the temple site of Santa Verna (Gozo) revealed an occupation earlier than any previously dated site on the islands, whilst geophysical and geoarchaeological study at the nearby temple of Ġgantija revealed a close relationship with a spring, Neolithic soil management, and evidence for domestic and economic activities within the temple area. A targeted excavation at the temple of Skorba (Malta) revisited the chronological questions that were first revealed at the site over 50 years ago, with additional OSL and AMS sampling. The temple site of Kordin III (Malta) was explored to identify the major phases of occupation and to establish the chronology, a century after excavations first revealed the site. Settlement archaeology has long been problematic in Malta, overshadowed by the megalithic temples, but new work at the site of Taċ-Ċawla (Gozo) has gathered significant economic and structural evidence revealing how subsistence strategies supported agricultural communities in early Malta. A study of the second millennium BC Bronze Age site of In-Nuffara (Gozo) likewise has yielded significant economic and chronological information that charts the declining and changing environment of Malta in late prehistory.

Editors:
Caroline Malone is a Professor in the School of Natural and Built Environment, Queen's University Belfast.
Reuben Grima is a Senior Lecturer in the Department of Conservation and Built Heritage, University of Malta.
Rowan McLaughlin is Senior Researcher in the Department of Scientific Research at the British Museum, and previously Research Fellow for the *FRAGSUS Project*; he is honorary research scholar at Queen's University Belfast.
Eóin W. Parkinson completed his PhD at Cambridge University and is currently Leverhulme Research Fellow at the University of Malta.
Simon Stoddart is Reader in Prehistory in the Department of Archaeology, University of Cambridge.
Nicholas C. Vella is Associate Professor of Mediterranean Archaeology in the Department of Classics and Archaeology, University of Malta.

Published by the McDonald Institute for Archaeological Research,
University of Cambridge, Downing Street, Cambridge, CB2 3ER, UK.

Cover design by Dora Kemp and Ben Plumridge.

ISBN: 978-1-913344-03-0

ISBN 978-1-913344-03-0
9 781913 344030

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