

Messages in Paint

An archaeometric analysis of pigment use in
Aboriginal Australia focusing on the production
of rock art

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This thesis is submitted for the Degree of Doctor of Philosophy
of the University of New England

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I certify that any help received in the preparing this thesis and all sources used have been acknowledged herein.

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification.



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December 2014

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For Fred, Astro-Charlie and Bella Bug.

With thanks to the Mikes (Smith and Morwood) for helping engage the 'big picture'.

Table of Contents

Acknowledgements for Graphics	m
List of Tables	o
List of Figures	q
Abstract	i
Acknowledgements	ii
Statement of Authorship	v
Forward	vi
A Note on Nomenclature	vii
List of Abbreviations	viii

Chapter One - Introduction	1
1.1 Archaeological Investigations of Ochre	4
1.1.1 Australian Ochre studies	10
1.2 Re-examining the Provenance Postulate	19
1.2.1 Previously Unseen: Geochemical Evidence of Cultural Context in Rock Art Production	21
1.2.2 Issues of Scale	23
1.3 pXRF in Archaeology	24
1.3.1 pXRF and Rock Art Research	26
1.4 Research Aims and Regional Context	28
1.4.1 The Rock Art Assemblages	30
1.4.1.1 The Sydney Basin	31
1.4.1.2 The Northwest Kimberley	31
1.4.2 Archaeological History: Geochemical and Archaeological Implications	38
1.4.3 Regional Environment	39
1.4.3.1 The Sydney Basin	40
1.4.3.2 The Northwest Kimberley	43
1.4.4 Geochemical and Archaeological Implications of Regional Palaeogeographies	47
1.5 Research Aims	49
1.5.1 Thesis Structure and Case Study Specific Research Aims	50

PART I

Chapter Two

Huntley, J. (2012). Taphonomy or Paint Recipe: *In situ* portable X-ray fluorescence analysis of two anthropomorphic motifs from the Woronora Plateau, New South Wales. *Australian Archaeology*, 75 (December), 78-94. ISSN: 0312-2417

Preface to the article	57
Abstract	57
2.1 Introduction	58
2.2 Complex Physical Interactions – Some Issues Associated with in situ pXRF Analysis of Rock Art	59
2.3 Orientation - Browns Road 29	62
2.3.1 Taphonomic Context of Rock Art at BR29	65
2.4 Application of in situ pXRF at BR29 (Research Aims)	68
2.5 Methodology	66
2.6 Results and Discussion	71
2.6.1 Trends in Overall Compositional Data	71
2.6.2 Trends in Indicator Elements	76
2.6.3 'Visibility' of Indicator Elements with pXRF	81
2.6.4 Archaeological Implications of Geochemical Data from pXRF Analysis at BR29	82
2.7 Summary	82
Acknowledgements	82

Chapter Three

Huntley, J. and C. Freeman (in press). Evaluating non-invasive X-ray techniques for material science investigations of rock art: Community driven Australian research. In *Paleoart and Materiality: The scientific study of rock art*, Robert G. Bednarik, Danae Fiore and Mara Basile (eds). Archaeopress: Oxford. Accepted for publication March 2013. ISSN: TBA

Preface to the book chapter	87
Abstract	87
3.1 Introduction	88
3.2 pXRF: background, example and evaluation	90
3.2.1 pXRF methodology	91

3.22 Case study: evidence for geomorphic processes (chemical weathering) in sandstone shelters containing rock art; pXRF as a novel conservation and management tool	92
3.2.3 Evaluating pXRF for rock art and associated material science applications	97
3.3 μ CT: background, examples and evaluation	98
3.3.1 μ -CT methodology	99
3.3.2 Case study: structure of ochres and mineral accretions; integration of μ -CT in the analysis of rock art materiality	100
3.3.3 Evaluating μ -CT for rock art and associated material science applications	104
3.4 Community-driven material science	104
3.4.1 Future prospects for non-invasive x-ray techniques in Aboriginal-directed programs	105
3.5 Summary	106
Acknowledgements	106

Chapter Four

Huntley, J., K. E. Westaway, D. B. Gore, M. Aubert, J. Ross and M. J. Morwood (under review). Non-Destructive or Non-Invasive? The potential effect of X-ray fluorescent spectrometers on luminescence age estimates of archaeological samples. *Journal of Archaeological Science: Reports*. ISSN: 2352-409X

Preface to the Article	111
Abstract	111
Graphic Abstract	112
4.1 Introduction	112
4.2 Materials and Methods	115
5.3 Results	118
4.4 Discussion	121
4.5 Conclusions	123
Acknowledgements	123

PART II

Chapter Five

Huntley, J. (under review 2014) Looking Up and Looking Down: Pigment Chemistry as a Chronological Marker in the Sydney Basin Rock Art

Assemblage, Australia. *Rock Art Research*

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Preface to the article	126
Abstract	126
5.1 Introduction	127
5.1.1 Dingo and Horned Anthropomorph	129
5.1.2 Yengo 1	130
5.1.3 Other Relevant Background	131
5.4 Methodology	134
5.4.1 Instrument Parameters	134
5.4.2 Data Collection Protocol	135
5.4.3 Data Analysis and Chemometrics	136
5.5 Results and Interpretations	137
5.6 Discussion	142
5.6.1 Taphonomic Implications	143
5.6.2 Chronological Implications	144
5.6.3 Behavioural Implications	144
5.7 Conclusions	145
Acknowledgements:	146
Supplementary Material	146

Chapter Six

Huntley, J., M. Aubet, J. Ross, H. E. A. Brand and M. J. Morwood (in press).

One Colour, Two Minerals: A study of Mulberry Rock Art Pigment and a Mulberry Pigment 'Quarry' from the Kimberley, Northern Australia.

Archaeometry doi: 10.1111/arcm.12073, published online December 2013.

ISSN: 1475-4754

Preface to the article:	149
Abstract	150
6.1 Introduction	150
6.1.1 The Kimberley Study Area	152
6.1.2 Previous Mulberry Pigment Characterisation in the Kimberley	154

6.1.3 Other Mulberry Pigment Characterisations	156
6.1.4 Previous Mineral Accretion Characterisation in the Kimberley	156
6.1.5 Calcium-Oxalate Minerals in Other Rock Art Regions	157
6.1.6 The Archaeology of Mulberry Pigments in Northern Australia	157
6.2 Analytic Methods	158
6.2.1 pXRF	160
6.2.2 SEM-EDAX	161
6.2.3 Powder Diffraction	161
6.4 RESULTS	161
6.4.1 pXRF	161
6.4.2 SEM-EDAX	164
6.4.3 Powder Diffraction	167
6.5 DISCUSSION	167
6.6 CONCLUSIONS AND FURTHER WORK	169
ACKNOWLEDGEMENTS	170

Chapter Seven - Summary 173

7.1.1 Archaeological implications: the Sydney Basin	175
7.1.2 Archaeological implications: the northwest Kimberley	176
7.2 Evaluation of pXRF for Archaeology and Rock Art Research	176
7.3 Caveats for in situ pXRF Analysis of Rock Art	178
7.3.1 Selecting Analyte Locations	178
7.3.2 Instrument Parameters	179
7.3.3 Data Processing	180
7.4 Novel methods for in situ pXRF analysis of Rock Art	180
7.5 The Future for Archaeological Pigment Studies in Australia	181
7.6 Conclusion	183

References Cited 185

Appendix A 209

Protocol of *in situ* pXRF analysis using a Bruker Tracer III-V spectrometer

Appendix B 211

Publication offprints of **Chapters Two** and **Six**:

Huntley, J. (2012). Taphonomy or Paint Recipe: In situ portable x-ray fluorescence analysis of two anthropomorphic motifs from the Woronora Plateau, New South Wales. *Australian Archaeology* 75(December): 78-94.

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Appendix C

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Huntley, J., A. Watchman and J. Diben (2011). Characteristics of a Pigment Art Sequence: Woronora Plateau, New South Wales. *Rock Art Research* 28(1): 85-97.

Preface to the article: 253

Appendix D

Publication offprint of:

J. Huntley, H. E. A. Brand, M. Aubert and M. J. Morwood (2014). The first Australian Synchrotron powder diffraction analysis of pigment from a Wandjina motif in the Kimberley, Western Australia. *Australian Archaeology* 78(June): 33-38.

Preface to the article: 269

Appendix E

279

Supplementary online material for the journal article presented as **Chapter Five** (now hosted at <http://www.ifrao.com/auranet-library/>).

List of Tables

Table 1.1	Cage determinations obtained for the Kimberley rock art	33
Table 1.2	OSL dating of mud wasp nests in Brremangrey, Upper Lawley and Lower Mitchell Falls site complexes, northwest Kimberley.....	33
Table 2.1.	Summary of geochemical trends	72
Table 2.2.	Net Peak Area (NPA) values	73
Table 3.1.	pXRF Net peak area data.....	95
Table 3.2.	Evaluation of pXRF	97
Table 3.3.	μ -CT scan parameters.....	99
Table 3.4.	Evaluation of μ -CT.....	104
Table 4.1.	XRF irradiation conditions	118
Table 4.2:	Raw pOSL counts.....	119
Table 5.1.	Provenance of excavated pigments, Dingo and Horned Anthropomorph	130
Table 5.2.	Subsurface ochres from Yengo 1, Square 4A after McDonald 2008:98.....	131
Table 6.1.	Compounds of minerals discussed in the text	155
Table 6.2.	Summary of samples analysed	160
Table 6.3.	Net Peak Area pXRF Data.....	163

List of Figures

Figure 1.1. Watercolour painting by Thomas Bock, 1837 'Manalargenna' .Top right: close up of the Toolburnner ochre quarry Tasmanian. Bottom: Overview of the Gog Range Tasmanian, the location of the Toolburnner ochre quarry.....	7
Figure 1.2. Overview of Sahul showing sites mentioned in the text.....	11
Figure 1.3 Case study locations with rock art.....	30
Figure 1.4. Overveiw of mud-wasp nest dated using OSL.....	34
Figure 1.5 Case study locations with landscape overviews	40
Figure 1.6 Ochre quarries in Booderee National Park, NSW.....	42
Figure 1.7 Kaolin seam on the Frenleigh Track,Newcastle, NSW.....	42
Figure 1.8 Examples of geological weathering, northwest Kimberley, WA	44
Figure 1.9. Rock art panels in the northwest Kimberley showing the complexity of precipitate accretions.....	46
Figure 2.1. Illustration of critical depth penetration with light element optimised pXRF	60
Figure 2.2. Location of BR 29 (AHIMS 52-2-1643).....	62
Figure 2.3. Plan and section drawing of Browns Road 29	63
Figure 2.4. Overview of rock art panel showing the location of pXRF spectra.....	64
Figure 2.5. Detail of the rock art panel.....	64
Figure 2.6. Hawkesbury Sandstone Control Block.....	70
Figure 2.7. Dendrogram of pXRF analysis	75
Figure 2.8. PCA Plots - 3 projections of the first three components.....	76
Figure 2.9. Cavernous Weathering Indicator Elements	77
Figure 2.10. Clay Indicator Elements.....	79

Figure 2.11. Precipitous Mineral Indicator Elements.....	80
Figure 3.1. Overview of non-invasive x-ray techniques	89
Figure 3.2. Location of the Kimberley and Sydney Basins showing the case study areas	89
Figure 3.3. Overview of yellow and black bichrome rock art panel at Browns Rd 29 showing the location of pXRF analysis	94
Figure 3.4. pXRF NPA data for cavernous weathering indicator elements, BR29	96
Figure 3.5. μ -CT ‘fast scan’ of ochre surface finds.....	101
Figure 3.6. spectral overlay of red ochre nodule (light grey) and mulberry ochre quarry (dark grey)	102
Figure 3.7. μ -CT ‘fast scan’ (four projections), mineral accretion from Kangaroo Shelter, northwest Kimberley	103
Figure 4.1 - The portable units utilized in this study.....	115
Figure 4.2 The materials tested.....	117
Figure 4.3 Results: (a) Increased luminescence counts for loose quartz grains. (b) A similar plot on a reduced scale to provide more detail for materials with lower OSL counts. (c) Bleaching of quartz grains after pXRF.....	120
Figure 5.1. Location of Dingo and Horned Anthropomorph and Yengo 1.....	127
Figure 5.2. Montage of archaeological pigments examined.	128
Figure 5.3. Excavation profile southern overhang excavation, Dingo and Horned Anthropomorph	130
Figure 5.4. Unweathered Hawkesbury sandstone control block.....	136
Figure 5.5. Multivariate projections, light element profiles.....	139
Figure 5.6. Multivariate projections, heavy element profiles.....	141
Figure Pref 6.1 Portable Raman spectra, K1 sample (the location of the exfoliated panel is illustrated in the Graphic Abstract of Chapter Five).....	150

Figure 6.1. Sites sampled, northwest Kimberley, Western Australia	152
Figure 6.2. Detail of rock art sampled	153
Figure 6.3. Plan of LMR01a showing the location of RRS and other archaeological features...	159
Figure 6.4. Sample KSMA	160
Figure 6.5. PXRf spectral overlay, MM20 (left) and K1 (right).....	162
Figure 6.6. SEM secondary electron images cross-sections K1 (left) and RRS.....	164
Figure 6.7. SEM, Secondary Electron Images of RRS Zircons.....	164
Figure 6.8. Element Maps: K1 motif and rock shelter substrate (left); KSMA (right).....	166
Figure 7.1. Location of pervious projects. Red text shows studies funded by the AIATSIS Rock Art Protection Program.....	182

Abstract:

Anthropogenically modified pigments are held to be some of the earliest, most unambiguous and persistent evidence for behavioural modernity, frequently (and often tenuously) invoked as material expression of symbolic thought and action. Recent finds, increases in the sophistication of analytic techniques and theoretical frameworks have renewed interest in ochre, reflected by a spike in actualistic studies, investigations of pigment morphology and geochemistry. Archaeological studies continue a bias towards Pleistocene pigments, while archaeometric research continues to focus on ochre from known source locations, and in Australia, ethnographically documented mines. Here I take a different tack, targeting Holocene ochres, focusing on pigments with at least one known, indisputably symbolic function—the production of rock art. As part of the physical and metaphorical (cultural) landscape, rock art offers a unique pigment archive as it remains in the location in which it was created.

A decade since the first published application of portable X-ray Fluorescence (pXRF) to rock art there has been an absence of critical scrutiny and methodological development. Aiming to redress this, I use conventional and Synchrotron X-ray Diffraction, Micro Computed Tomography and Scanning Electron Microscopy to explain and evaluate pXRF. I develop novel methods of using geochemical data to identify paint mineralogy (including differentiating between paints of the same colour), recognise the chemical signatures of taphonomy and compare ochres from excavated contexts with rock art. Interpreting the resultant elemental profiles relies on understanding the complex taphonomy of pigments and the chemical expression of non-cultural phenomena, something not adequately addressed previously. This work therefore offers a non-invasive means by which large scale studies of archaeological pigments can be undertaken.

By expressly separating characterisation from the assignment of provenance, I describe and interpret pigment geochemistry within the frameworks of object biography and intentionality. I demonstrate how pigment characterisations make available additional strands of chronological and behavioural evidence within regional prehistories. In the Sydney Basin, I report the first archaeological identification of calcite rock art paint at Yengo 1 shelter, where I show calcite pigments are present from 1,500 BP. I provide the first archaeological description of a mulberry ochre quarry in northern Australia—showing these pigments are available locally within the King Leopold formation of the northwest Kimberley and that ochre quarries occur in sites with large rock art assemblages. Ultimately, this work demonstrates that it is not always the highest resolution scientific data that produces the most insightful archaeological findings.

KEYWORDS: pigment characterisation; geochemical analysis; rock art; ochre; mineral pigment; pXRF; Sydney Basin; Northwest Kimberley

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Statement of Authorship:

This thesis is composed of my original research. The nature of scientific enterprise such that it is, often takes many people to pull together a successful program of archaeometric investigation. Consequently, a number of the published chapters in this thesis required the input of various colleagues involved in the C&C Project. Credit, in the form of co-authorship and/or acknowledgement has been given where credit is due. Two forms appear at the end of co-authored chapters (**Chapters Two to Six**). One contains a statement of originality, the other a statement of contribution by others (quantifying the contribution of co-authors).

Unless otherwise stated in the form of co-authorship, citations and acknowledgements contained within this thesis, authorship is entirely my own. As the primary author of all published materials I accept responsibility for any errors or omission (if contained) within.

The content of this thesis (including the appendices) result from work I have carried out since the commencement of my research higher degree candidature at UNE. None of the material presented has been previously submitted (in whole nor part) for a degree at this, or any other, institution. I have clearly stated which parts of this thesis have drawn on published data from research submitted for my previous qualification (BA Hons, Australia National University – c.f. in **Chapter Two** and **Chapter Five**, published data is presented as Appendix C).

Jillian Huntley

December 2014

Forward

'nani gigantum humeris insidentes'

I have felt the presence of an ANU/UNE academic heritage through my short research career. This is particularly evident to me in the work of Isabel McBryde and Mike Smith. Here I want to single out the two key papers that have shaped my understanding of archaeological pigment use, long distance trade and exchange, and the material expression of cultural landscape. These articles have been an anchor whenever I have felt like I am drowning in the complexity of archaeological ochre use. Their conceptual richness and depth of narrative exemplify why the analytical effort required in investigating archaeological ochres is so worthwhile:

'The cultural landscapes of Aboriginal long distance exchange systems: can they be confined within our heritage registers?' (McBryde, 1997a)

The theoretical concepts woven into this manuscript have been the single biggest influence on my conceptualisation of the behavioural implications of archaeological ochre use. McBryde's work humanised the provenance postulate for me, articulating the archaeological value of understanding trade and exchange and perhaps more importantly, how we might recognise archaeological expression of conceptual spaces such as cultural landscapes.

'The Changing Provenance of Red Ochre at Puritjarra Rock Shelter, Central Australia: Late Pleistocene to Present' (Smith et al., 1998)

This seminal paper has rippled throughout archaeometric ochre research globally because of its clarity in not only demonstrating, but also clearly communicating, the archaeological importance of ochre research. This study was the first to prove the potential outlined by Mulvaney (1976) in regards to accessing insights from the material indices of trade and exchange. That Smith could draw such a well reasoned narrative from the archaeometric analysis of just 4% of the Puritjarra ochre assemblage is a testament to the central place of archaeology within this style of research. The reach and longevity of this paper, its continued global impact, speaks to the fact that the strength of its archaeological stance is yet to be replicated.

A Note on Nomenclature:

The nomenclature of rock art styles, specific graphic motif forms, sites, site complexes and landscapes used in this thesis is the end product of consultation with the Aboriginal stakeholders of the Sydney Basin and the Traditional Owners in the northwest Kimberley. Aboriginal custodians of the respective case study regions have reviewed and approved all publication outputs prior to their submission.

The terminology adopted for the northwest Kimberley is in accordance with the Memorandum of Understanding between members of the *Change & Continuity: Chronology, Archaeology and Art in the Northwest Kimberley, Northwest Australia* (ARC Linkage Grant No. LP0991845) project team and the Wunambal Gaambera Aboriginal Corporation.

I thank the Kandiwal Aboriginal Corporation, the Native Title Group at Kalumburu and the Wunambal Gaambera Aboriginal Corporation for their guidance. I am indebted to Chief Investigators: the late Michael J. Morwood and June Ross for initiating and coordinating the Aboriginal consultation. I owe June particular thanks for her continued management of all consultation for the project.

The following is adapted from terminology compiled by Donaldson (2012:13):		
Welch (1996a, 1999)	Walsh (2000)	Present Nomenclature
Archaic Period	Irregular Infill Animal	Irregular Infill Animal
Tasselled Figures	Tassel Bradshaws	Mambi Gwion
Bent Knee Figures	Sash Bradshaw	Yowna Gwion
Dynamic Figures	Elegant Action Figures	Dynamic Gwion
Straight Part Figures	Clothes Peg Figures	Wararrajai Gwion
Painted Hands	Clawed Hands	Painted Hands
Wandjina	Wandjina	Wanjina
Contact Period	-	Contact Period

List of Abbreviations:

AINSE	Australian Institute of Nuclear Science and Engineering
AIATSIS	Australian Institute of Aboriginal and Torres Strait Islander Study
ANSTO	Australian Nuclear Science and Technology Organisation
C&C	Change and Continuity Project (ARC LP LP0991845)
D&HA	Dingo and Horned Anthropomorph Rockshelter
ENSO	El Niño-Southern Oscillation
FTIR	Fourier Transform Infrared spectrometry
LA-ICPMS	Laser Ablation-ICPMS
LGM	Last Glacial Maximum
ICPMS	Inductively Couple Plasma Mass Spectrometry
μCT	micro-Computed Tomography
MURR	Missouri Nuclear Rector, University of Missouri
NAA	Neutron Activation Analysis
NPA	Neat Peak Area (Relative Abundance)
MSA	Metropolitan Special Area (Chapter Two)
PCA	Principle Components Analysis
PIXE/PIGE	Particle Induced X-Ray Emission/Particle Induced Gama-Ray Emission Analysis
PD	Powder Diffraction
pXRF	portable X-Ray Fluorescence spectrometry
SEM-EDXA	Scanning Electron Microscopy-Energy Dispersive X-Ray Analysis
XRD	X-Ray Diffraction
XRF	X-Ray Fluorescence spectrometry
Y1	Yengo 1 Rockshelter