

# Contents

<b>List of Figures.....</b>	<b>xi</b>
<b>List of Tables.....</b>	<b>xiii</b>
<b>Foreword and Introductory Remarks.....</b>	<b>xiv</b>
F.1. Egypt <u>is</u> the Nile.....	xiv
F.2. The Effect of ‘Drought’ upon the River .....	xv
F.3. The Effect of Excess Water upon the River .....	xv
F.4. Scientific Evidence of Irregular Water Supply.....	xvi
F.5. Rationale, Hypotheses and Goals.....	xvii
F.6. The A.R.I.D. Hypothesis – an outline .....	xviii

## Part A: Environment, Society and Culture

<b>1. Climate and Society in the Old Kingdom .....</b>	<b>3</b>
1.1. Egypt and the Nile .....	3
1.2. A Developing Riverine Civilisation.....	3
1.2.1. Egyptian versus Mesopotamian Irrigation .....	5
1.3. Impact of Climate on Old Kingdom Society .....	5
1.3.1. The End of the Old Kingdom.....	6
1.3.2. Relating Science and Environment to Art and Culture .....	7
1.4. Ecological Principles Applied to History.....	7
1.4.1. Introducing Ecosystems .....	8
1.4.2. Changes to Ecosystems .....	8
1.4.3. Succession: Tracing Ecosystem Change .....	9
1.4.4. Applying Ecological Succession to Art.....	9
1.5. Summation: A Changing Environment Changes Society?.....	10
<b>2. Art, Society and the Environment .....</b>	<b>11</b>
2.1. Egyptian Representations of the Environment .....	11
2.2. Art, Society and Culture.....	12
2.2.1. Art as Evidence .....	12
2.2.2. Art as a Branch of Archaeology .....	13
2.2.3. Environmental Influence on Art and Culture .....	13
2.3. Using Art to Make Inferences about Nature .....	14
2.3.1. Patterns of Change .....	14
2.4. The Method.....	15
2.4.1. Chronology.....	16
2.5. Summation: Tomb Decoration Change as Artistic Narrative?.....	17

## Part B: The Ecological Background

<b>3. The Ecology of Rivers .....</b>	<b>21</b>
3.1. Aspects of Riverine Ecosystems .....	21
3.1.1. Factors within Riverine Ecosystems .....	21
3.1.2. Food Chains and Food Webs.....	21
3.2. Physical Factors in Riverine Ecosystems .....	22
3.2.1. Volume, Flow Rate and Nutrient Transport .....	22
3.2.2. Erosion and Secondary Channels.....	22
3.2.3. Turbidity, Light Penetration and Heat Exchange .....	23
3.3. Chemical Factors in Riverine Ecosystems.....	24
3.3.1. Salinity .....	24
3.3.2. Acidity of the Waterways .....	24
3.3.3. Oxygen Availability .....	25

3.4. Biological Factors in Riverine Ecosystems .....	25
3.4.1. Nutrient Availability and Changing Habitats .....	25
3.4.2. Food Web Considerations .....	25
3.5. Rivers and ‘Drought’ .....	26
3.5.1. Flow Rates Determine Habitat and Biodiversity .....	26
3.5.2. Sediment Transport and Nutrient Supply .....	26
3.5.3. Temperature Changes and Evaporation Rates in Weaker Rivers .....	27
3.5.4. Characteristics of Weakened Rivers.....	27
3.6. Summation: Can a River Experience ‘Drought’? .....	27
<b>4. The A.R.I.D. Hypothesis: A River In ‘Drought’ .....</b>	<b>29</b>
4.1. Nilotic Ecosystem Response to ‘Drought’ .....	29
4.1.1. Nile Wetland Classification.....	29
4.1.2. Ecological Impacts of a Low River.....	29
4.2. Aquatic Plants’ Response to ‘Drought’ .....	30
4.2.1. Fundamental Vegetation Types .....	31
4.3. Papyrus and A River In ‘Drought’.....	31
4.3.1. Responses to Changing Physical Factors.....	32
4.3.2. Response to Changing Chemical Factors.....	32
4.3.3. Responses to Changing Biological Factors.....	32
4.3.4. Ecological Implications for Papyrus in ‘Drought’ .....	33
4.4. Phragmites and A River In ‘Drought’ .....	33
4.4.1. Responses to Changing Physical Factors .....	33
4.4.2. Responses to Changing Chemical and Biological Factors.....	33
4.4.3. Ecological Implications for Phragmites in Drought.....	33
4.5. Cattails and A River In ‘Drought’ .....	34
4.5.1. Responses to Changing Physical Factors .....	34
4.5.2. Responses to Changing Chemical and Biological Factors.....	34
4.5.3. Ecological Implications for Cattails in Drought .....	34
4.6. Lotus and a River in ‘Drought’ .....	35
4.6.1. Responses to Changing Physical Factors .....	35
4.6.2. Responses to Changing Chemical and Biological Factors.....	35
4.6.3. Ecological Implications for Lotus in Drought .....	35
4.7. Low River Habitat and Food Web Changes.....	35
4.7.1. Food Web Impacts.....	36
4.8. Nile Valley Rain: Even More Nutrients? .....	37
4.8.1. Alluvial versus Pluvial Events .....	37
4.8.2. Rainfall Events and Impacts.....	37
4.8.3. Do Rainfall Events Encourage More Marshlands? .....	38
4.9. The Nile in ‘Drought’: a Re-Interpretation? .....	38
4.9.1. Does ‘Drought’ Encourage Marshlands? .....	38
4.10. Summation: Excess Nutrients Cause some Plants to Thrive?.....	39

### Part C. The Cultural Response

<b>5. Changes in Tomb Wall Scenes .....</b>	<b>43</b>
5.1. Papyrus: Art Suggesting Riverine Change?.....	43
5.1.1. Marshlands Become a More Crowded Place .....	43
5.1.2. Fishing and Fowling in Crowded Marshlands .....	44
5.1.3. Swampweed and Boats .....	45
5.2. Tomb Decoration: Patterns of Change .....	45
5.2.1. The Sample: Distribution and Abundance of Artistic Themes.....	46
5.2.2. Old Kingdom Scene Types: An Overview .....	46
5.2.3. New Iconographical Scenes: Mid-Fifth Dynasty .....	47
5.2.4. Niuserre: A Changing Emphasis?.....	48
5.2.5. New Iconographical Scenes: Sixth Dynasty Onwards.....	48
5.3. A Shifting Artistic Imperative? .....	48
5.3.1. Tomb Decorations: Proportion as a Variant over Time .....	48
5.3.2. Pre- and Post-Sixth Dynasty: The Impact of ‘Drought’ .....	49

5.3.3. Some Result Limitations .....	50
5.4. Resources: A Need to Re-arrange the Data? .....	51
5.4.1. A Resource-based Analysis May Be Needed .....	51
5.4.2. Theme Proportion Changes and A River in Drought .....	54
5.5. A Changing Emphasis in Tomb Decoration? .....	54
5.5.1. Fishing and Fowling in the Marshes in A.R.I.D times.....	55
5.6. Summation: An Unfolding Ecological Narrative? .....	55
<b>6. Cultivation's Failure and A River In 'Drought' .....</b>	<b>57</b>
6.1. Cultivation's Declining Importance.....	57
6.1.1. Changes to the Proportion of Representation of Agriculture.....	57
6.1.2. Cultivation and A River In 'Drought' .....	58
6.1.3. Barley versus Wheat .....	58
6.1.4. Barley More Reliable Than Wheat?.....	58
6.1.5. Flax Failures? .....	59
6.2. Gardens, Orchards and A River In 'Drought' .....	59
6.2.1. Gardens and Orchards at the End of the Old Kingdom .....	60
6.2.2. The Growing of Lotuses.....	61
6.3. The Keeping of Records .....	61
6.3.1. The Storage and Distribution of Food Types .....	61
6.3.2. Indicators of Food Stress: Punishment Scenes.....	62
6.3.3. Indicators of Food Stress: Granary Shape Changes.....	63
6.4. Summation: Changing Climate = Changing Cultivation? .....	63
<b>7. Fishing and A River In 'Drought' .....</b>	<b>65</b>
7.1. Fishing: Techniques and Related Technologies .....	65
7.1.1. Spearfishing.....	65
7.1.2. Techniques and Technologies.....	65
7.1.3. Adaptations to Fishing Performance and Practice .....	67
7.2. The Narrative of the Nets.....	67
7.2.1. Dragnetting.....	68
7.2.2. Large Nets Set from Boats .....	69
7.2.3. The Need to Re-classify all Large Nets used for Fishing?.....	69
7.3. Angling, Trapping and Small Nets.....	70
7.3.1. New Scene Types: New Techniques and New Technologies.....	70
7.3.2. Smaller Traps Take Advantage of New Channels.....	70
7.4. Fighting Boatmen.....	71
7.4.1. Boatmen and A River In 'Drought' .....	72
7.5. Catfish, Drought and Art .....	72
7.5.1. Upside-down and Top-down/Both-eyes Catfish Scenes .....	73
7.5.2. Catfish Depictions and A River In 'Drought' .....	73
7.6. Summation: An Increasing Reliance upon Fishing? .....	73
<b>8. Waterfowl and A River In 'Drought' .....</b>	<b>75</b>
8.1. Avian and Associated Attestations .....	75
8.1.1. Poultry Proportions .....	75
8.2. The Parable of Proliferating Poultry .....	76
8.2.1. Waterfowl Depictions and A River In 'Drought' .....	76
8.2.2. Poultry Becoming a More Significant Resource.....	77
8.3. Avian Predators .....	77
8.3.1. The Genet and the Mongoose .....	77
8.3.2. Avian Predator Depictions and A River In 'Drought' .....	77
8.4. Changes in Art: Fowling in the Marshes.....	78
8.4.1. Fowling Scenes and a Cluttered Papyrus Thicket.....	78
8.4.2. Poultry Farms.....	78
8.5. Summation: A Perception of Predominating Poultry? .....	79
<b>9. The Rise of Cattle and A River In 'Drought' .....</b>	<b>81</b>
9.1. The Developing Importance of Cattle.....	81
9.1.1. Cattle Depictions and A River In 'Drought' .....	82

9.2. Fording Scenes and A River In ‘Drought’.....	82
9.2.1. Fording Impacts .....	82
9.2.2. Immersion Levels.....	83
9.2.3. Swamps, Marshes and Channels .....	84
9.2.4. Travelling North to the Delta .....	85
9.2.5. Foraging Impacts.....	85
9.3. Small Cattle: Goats .....	86
9.3.1. Goats in Trees: an Indicator of Environmental Deterioration? .....	87
9.3.2. Goats AND Trees .....	87
9.3.3. Goat Attestations and A River In ‘Drought’.....	87
9.4. But ... Where are the Pigs?.....	88
9.4.1. Pigs and Early Egypt.....	88
9.4.2. Pigs and Old Kingdom Society .....	88
9.4.3. Pigs and A River In ‘Drought’.....	89
9.5. Increasing Reliance on a ‘Mobile’ Economy? .....	89
9.5.1. The Rise of the ‘Cattle Barons’ .....	89
9.5.2. Move your Ass: Donkeys and their Increasing Role in Society.....	90
9.6. Summation: An Emerging Status of Cattle, Goats and Donkeys?.....	91
<b>10. The Desert and A River In ‘Drought’ .....</b>	<b>93</b>
10.1. The Desert Hunt.....	93
10.2. The Desert Hunt as a Tomb Decoration Theme.....	93
10.2.1. Scene Development.....	94
10.2.2. Non-Royal Depictions of the Desert Hunt: Dynasty 4 → 6.....	94
10.3. Changing Decoration Variants .....	94
10.3.1. Increasing Complexity of Desert Hunt Scenes .....	94
10.3.2. Desert Hunters.....	96
10.3.3. The hunter as Archer .....	96
10.3.4. Increasing Artistic Prioritization of Depicting the Desert Hunt? .....	97
10.4. Desert Resources and A River In ‘Drought’.....	97
10.4.1. Hunting or Domestication in a Time of a Changing Climate?.....	98
10.4.2. A Deepening Dependency on the Desert.....	98
10.5. Summation: An Increasing Necessity to use Desert Resources?.....	98
<b>Part D: Discussion and Conclusions</b>	
<b>11. Art Imitating Life? Niuserra to the First Intermediate Period.....</b>	<b>103</b>
11.1. The Ascent of the Marshland Economy? .....	103
11.1.1. Resources Change in Response to a Changing Environment .....	103
11.1.2. Dietary changes in A.R.I.D. Times: Fish, Fowl and Cattle .....	103
11.1.3. The Persistence of the Hippopotamus Hunt .....	104
11.1.4. Back to the Past: Return to a Semi-subsistence Existence? .....	105
11.2. Tomb Decorations in pre-A.R.I.D. Cemeteries .....	105
11.2.1. Pre-Niuserra Cemeteries: Tehna and El-Hammamiya .....	105
11.3. Ra Setting... Osiris Rising in A.R.I.D. Times?.....	106
11.3.1. Osiris in the Ascendant? .....	107
11.3.2. A Moral Re-alignment at the End of the Old Kingdom? .....	107
11.4. Trade, Warfare and Foreign Relations.....	107
11.4.1. Fall of the Cities in the Levant .....	108
11.4.2. Trade or Conquest?.....	108
11.4.3. Foreign Relationships in A.R.I.D. Times .....	109
11.5. Chronological Re-Appraisals? .....	110
11.6. Reign of Niuserra: A Re-Alignment?.....	110
11.7. Summation: Re-adjusting for a New ‘Normal’? .....	111
<b>12. The A.R.I.D. Project: Extending the Investigation .....</b>	<b>113</b>
12.1. Middle Kingdom Tomb Decoration Programmes.....	113
12.1.1. Art Succession and A River In ‘Drought’ .....	113
12.1.2. Art Databases Plotting the Evolution of Artistic Themes .....	114

12.2. Geoarchaeology: Messages in the Mud? .....	114
12.2.1. Geoarchaeology.....	114
12.2.2. Archaeobiology .....	115
12.3. Human Archaeology: Beacons in the Bones? .....	116
12.3.1. Dental Health .....	116
12.3.2. Skeletal Health .....	117
12.3.3. Parasites.....	117
12.3.4. Anaemia.....	118
12.4. Identifying A Changing Pattern of Health?.....	119
12.4.1. Dietary Considerations.....	119
12.4.2. Meat, Dairy, Diet and Health Indicators .....	120
12.4.3. À la Famine? .....	120
12.4.4. Future Explorations.....	121
12.5. Network Analyses .....	121
12.5.1. Tracing Change .....	122
12.5.2. Continuity, Change or Collapse during A River In Deviance? .....	123
12.6. Summation: An Ongoing (or never-ending?) Investigation? .....	123
<b>13. Conclusion: Resilience, <u>not</u> Regression .....</b>	<b>125</b>
13.1. Riverine Ecosystems and A River In ‘Drought’ (A.R.I.D.) .....	125
13.2. Tomb Decoration Analyses Suggest a Changing Ecology.....	125
13.3. A Developing Pictorial Narrative within Tomb Decorations .....	125
13.4. New Depictions of Fishing Indicate its Increasing Significance .....	125
13.5. Increased Depictions of Waterfowl suggest Thriving Birdlife .....	126
13.6. Cattle in Marshlands taking Advantage of New Feed Sources.....	126
13.7. Desert Hunt Scenes Imply a Rising Reliance on the ‘Wild’ .....	126
13.8. A Partial Reprise of the Herder-Forager Lifestyle? .....	126
13.9. Final Statements: Innovation and Invention, NOT Inertia.....	126
<b>Bibliography .....</b>	<b>129</b>

A.R.I.D. Appendix - Distribution and Abundance Old Kingdom Tomb Decoration Themes is available at  
<https://doi.org/10.30861/9781407358109/appendix>

