WOVEN IN STONE

The Use of Symmetry Analysis Methodology
to Determine
Underlying Patterns of Symmetry
in the Polychrome Painted Decorations
on Some Athenian Korai

by

Ainslie Elizabeth Thomson

A thesis submitted to the Department of Classics
in conformity with the requirements for
the degree of Master of Arts

Queen’s University
Kingston, Ontario, Canada

January 2008

Copyright © Ainslie Elizabeth Thomson, 2008
Abstract

Many studies of the Archaic Greek kore focus exclusively on stylistic considerations in an attempt to date these statues more and more accurately. Other studies propose various meanings for the kore. Each of these approaches can be extremely subjective, with the result that the large body of extant literature about the kore tends to be repetitive and argumentative in nature, and, with several exceptions, does not advance the understanding of the kore to any appreciable degree past where it had developed by the 1980s. I use a different, more empirical methodology to study a small group of korai, found in the 1880s near the Erechtheion on the Athenian Akropolis.

Symmetry analysis of the patterns painted onto these korai at the time of their creation reveals both consistency of pattern use through the period of seventy years between c560 BCE and c490 BCE, as well as some anomalous patterns. I tabulate the various patterns, as well as their frequency of occurrence, and briefly speculate that there is a correlation between the pattern consistencies and anomalies and events in the known historical record, such as the mid-6th century rule by the Peisistratids and the democratic reforms of Kleisthenes. I also propose other directions in which the study of the kore could be taken using symmetry analysis.
Acknowledgements

I would like to thank my thesis supervisor, Dr. Anne Foley, for her patience and forbearance with the length of time it has taken for this thesis to see the light of day, and for her gentle guidance. My thanks go also to my cousin Dianne Thomson, whose love of all things statistical and skill with SPSS helped me to identify supplementary evidence for my conclusions. I gratefully acknowledge the tacit support of my supervisors Jane Philipps, Coordinator of Collection Development, Queen’s University Library, and Dianne Cook, her predecessor, and their relaxed attitude to the amount of time I spent attending classes and consultations. To my many friends, relations and work colleagues who encouraged me in this process and who had to put up with my scattered thoughts for such a long time, *ars longa, vita brevis*. And to Hal, my partner - it’s finished at last. Get ready to travel!
# Table of Contents

Abstract.............................................................. i

Acknowledgements. .................................................. ii

Tables. ................................................................ xii

List of Illustrations. ..................................................... xii
  Figures................................................................ xii
  Maps. ................................................................... xxii

Chapter 1 - Introduction. ............................................. 1

Chapter 2 - Historiography. ...................................... 20

Chapter 3 - Symmetry Analysis. ................................. 29
  Mathematical Principles. ........................................... 32
    Reflection. ......................................................... 32
    Translation. ....................................................... 35
    Rotation. .......................................................... 36
    Glide Reflection. ............................................... 39
Designs, Repeated Patterns and Dimensions........................................ 40
Notations for One-Colour Designs and Patterns........................................ 42
  Finite Designs.................................................................................. 42
  Notation for One-Colour, One-Dimensional Patterns............................. 42
  Notation for One-Colour, Two-Dimensional Patterns......................... 44
Colour Symmetry.................................................................................. 46
  Notation for Two-Colour Finite Designs............................................ 49
  Notation for Two-Colour, One-Dimensional Patterns........................... 50
  Notation for Two-Colour, Two-Dimensional Patterns........................... 53
Introduction to the Flow Charts.......................................................... 56
  Flow Chart for the Twenty-Four One-Colour and Two-Colour One-
  Dimensional Patterns......................................................................... 58
  Flow Charts for the One-Colour and Two-Colour Two-Dimensional Patterns
  ........................................................................................................... 63

Chapter 4 - The Korai................................................................. 67
  Acr. 593 (The Pomegranate Kore)..................................................... 68
  Acr. 678................................................................. 71
  Acr. 679 (The Peplos Kore)................................................................. 73
  Acr. 680................................................................. 76
  Acr. 682................................................................. 77
  Acr. 681 (The Antenor Kore)............................................................... 80
Chapter 5 - The Patterns. .................................................... 99

Acr. 593........................................................................... 99

Pattern 1........................................................................... 99

Pattern 2.......................................................................... 100

Design 1.......................................................................... 100

Design 2.......................................................................... 101

Acr. 678........................................................................... 101

Pattern 1........................................................................... 101

Acr. 679........................................................................... 102

Pattern 1........................................................................... 102

Pattern 2.......................................................................... 103
Pattern 4.................................................. 143
Pattern 5.................................................. 144
Design 1................................................... 144
Design 2................................................... 145
Acr. 685.................................................... 145
Pattern 1.................................................. 145
Pattern 2.................................................. 146
Pattern 3.................................................. 147
Pattern 4.................................................. 147
Pattern 5.................................................. 148
Design 1................................................... 148
NM4889.................................................... 149
Pattern 1.................................................. 149
Pattern 2.................................................. 150
Pattern 3.................................................. 150
Pattern 4.................................................. 151
Pattern 5.................................................. 152
Design 1................................................... 152
Design 2................................................... 153
Design 3................................................... 153
Design 4................................................... 154
Design 5................................................... 154
Consistent with Colour........................................................................... 229

Table 1.4. Flow Chart for Two-Dimensional Patterns with Smallest Rotation
Consistent with Colour of 180°................................................................. 230

Table 1.5. Flow Chart for Two-Dimensional Patterns with Smallest Rotation
Consistent with Colour of 90°................................................................. 231

Table 1.6. Flow Chart for Two-Dimensional Patterns with Smallest Rotation
Consistent with Colour of 120°............................................................... 232

Table 1.7. Flow Chart for Two-Dimensional Patterns with Smallest Rotation
Consistent with Colour of 60°............................................................... 233

Appendix 2 - Tables of Data................................................................. 234

Table 2.1. Akropolis korai: list of patterns with frequency and year........ 234

Table 2.2. Akropolis korai: frequency of designs and patterns by date range. 236
Tables

6.1 Akropolis korai: frequency of patterns by date range
6.2 Akropolis korai: frequency of designs by date range
6.3 Attic and Athenian vases: type and frequency of patterns by date range
6.4 Comparison of vases vs korai with respect to pattern
6.5 Geographical sample of Corinthian and other vases

List of Illustrations

Figures

1.1 Akropolis Kore 688 (from Karakasi 2003, plate 202a; Athens, ASCA Athens neg. F112: A. Frantz)
1.2 Cylinder unrolled to show a one-dimensional (band) design from a pre-Columbian stamp, Mexico (from Washburn & Crowe 1988, Fig. 2.1)
1.3 Two-dimensional pattern from a wall mosaic in the Mosque of Ahmed el-Bordeyny, Egypt (from Washburn & Crowe 1988, Fig. 5.215)
1.4 Equilateral triangle showing mirror reflection along line L (from Washburn & Crowe 1988, Fig. 2.3c)
1.5 Equilateral triangle showing rotation symmetry (from Washburn & Crowe 1988, Fig. 2.3b)
1.6 Pattern with translation symmetry (from Washburn & Crowe 1988, Fig. 2.3d)

---

1All images were scanned using Adobe Photoshop CS2 ver. 9.0 (with the exception of those downloaded from ARTstor) and adjusted using Microsoft Paint ver. 5.1.
1.7 Glide reflection (from Washburn & Crowe 1988, Fig. 2.11d)

1.8 Late Geometric Attic funerary vase, showing a mourning scene on the neck (Dipylon amphora, painted terracotta, Workshop of Athens 894, 8th century BCE; The Image Gallery, University of California, San Diego; Walters Art Gallery, Baltimore, MD, USA; WAG_48.2231; ARTstor: AMICO_CL_103799142)

1.9 Detail of the mourning scene (from Barber 1991, Fig. 16.6)

1.10 Detail of the procession of the gods and goddesses to the wedding of Peleus and Thetis; the François Vase, Kleitias, c570 BCE (Volute krater, painted terracotta, Kleitias, c570 BCE; The Image Gallery, University of California, San Diego; ARTstor: ARTSTOR_103_41822000401370)

1.11 The chiton (from Boardman 1978: 68)

1.12 The peplos (from Boardman 1978: 68)

1.13 Acr. 594 (from Karakasi 2003, plate 273; K. Kontos, Athens)

3.1 Cylinder unrolled to show a one-dimensional (band) design from a pre-Columbian stamp, Mexico (from Washburn & Crowe 1988, Fig. 2.1)

3.2 Bronze Persian gargoyle (from Washburn & Crowe 1988, Fig. 5.106)

3.3 Klamath/Modoc twined basket quiver (from Washburn & Crowe 1988, Fig. 5.123)

3.4 Achomawi twined basket hat, California (from Washburn & Crowe 1988, Fig. 5.126)

3.5 Ceramic jar, Acoma Pueblo, New Mexico (from Washburn & Crowe 1988,
3.6 Ceramic jar, Zia Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 4.45)

3.7a Points P, Q, R reflect across line L to points P’, Q’, R; (from Washburn & Crowe 1988, Fig. 2.4)

3.7b Mirror reflection across a central horizontal line (from Washburn & Crowe 1988, Fig. 2.5a)

3.7c Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 2.5b)

3.7d Mirror reflection across vertical lines (from Washburn & Crowe 1988, Fig. 2.5c)

3.7e Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 2.5d)

3.8 Perpendicular reflection lines. Tomb carving, Han dynasty, Kiating, Szechuan (from Washburn & Crowe 1988, Fig. 2.6a)

3.9 Reflection lines intersecting at 60°. Japanese design (from Washburn & Crowe 1988, Fig. 2.6b)

3.10 Translation by vector $v_-$ (from Washburn & Crowe 1988, Fig. 2.7a)

3.11 Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 2.7b)

3.12 Twofold (180°) rotation, finite design (from Washburn & Crowe 1988, Fig. 2.8a)
3.13 Ceramic design, Cochiti Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 2.8b)

3.14 Leaf-shaped element, cotton print block, India (from Washburn & Crowe 1988, Fig. 2.8c)

3.15a Two-fold rotation, one-dimensional design (from Washburn & Crowe 1988, Fig. 2.9a)

3.15b Two-fold rotation around points P and Q (from Washburn & Crowe 1988, Fig. 2.9b)

3.15c Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 2.9c)

3.16a Original position in a glide reflection (from Washburn & Crowe 1988, Fig. 2.11b)

3.16b Intermediate position in a glide reflection (from Washburn & Crowe 1988, Fig. 2.11c)

3.16c Completed glide reflection (from Washburn & Crowe 1988, Fig. 2.11d)

3.16d Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 2.11e)

3.17 Designs of type $cn$ having $n$-fold rotational symmetry but no mirror symmetry (from Washburn & Crowe 1988, Fig. 2.24)

3.18 Designs of type $dn$ having reflection symmetry as well as $n$-fold rotational symmetry (from Washburn & Crowe 1988, Fig. 2.25)

3.19a $p111$ (from Washburn & Crowe 1988, Fig. 2.26a)
3.19b \( p1m1 \) (from Washburn & Crowe 1988, Fig. 2.26b)
3.19c \( pm11 \) (from Washburn & Crowe 1988, Fig. 2.26c)
3.19d \( p1l2 \) (from Washburn & Crowe 1988, Fig. 2.26d)
3.19e \( pmm2 \) (from Washburn & Crowe 1988, Fig. 2.26e)
3.19f \( pma2 \) (from Washburn & Crowe 1988, Fig. 2.26f)
3.19g \( p112 \) (from Washburn & Crowe 1988, Fig. 2.26g)
3.20a Parallelogram (from Washburn & Crowe 1988, Fig. 2.27a)
3.20b Rectangle (from Washburn & Crowe 1988, Fig. 2.27b)
3.20c Rhombus (from Washburn & Crowe 1988, Fig. 2.27c)
3.20d Square (from Washburn & Crowe 1988, Fig. 2.27d)
3.20e Hexagon (from Washburn & Crowe 1988, Fig. 2.27e)
3.21 Colour reversals around centres A and B, and across line C (from Washburn & Crowe 1988, Fig. 3.1)
3.22 A half-turn interchanges white and black. Rug border, 16\(^{th}\) century Persia (from Washburn & Crowe 1988, Fig. 3.6b)
3.23 Two-colour (grey) pattern on white background. Painted house decoration, 15\(^{th}\) century Cairo (from Washburn & Crowe 1988, Fig. 3.2)
3.24 \( cn' \) (from Washburn & Crowe 1988, Fig. 3.7)
3.25 \( d' n, dn' \) (from Washburn & Crowe 1988, Fig. 3.8)
3.26a-q \( p'111, p'113, p'1l2, p1m'1, p'l1m1, p'l1a1, p'111, p1a'l, pm'11, p'm11, pm'm'2, pm'm2', pmm'2', p'mm2, p'ma2, p'ma'2', p'ma'2, p'ma'2', pm'a2 \) (from Washburn & Crowe 1988, Fig. 3.9)
3.27a  \( pmg \) (from Washburn & Crowe 1988, Fig. 3.27a)
3.27b  \( pm'g \) (from Washburn & Crowe 1988, Fig. 3.27b)
3.27c  \( pmg' \) (from Washburn & Crowe 1988, Fig. 3.27c)
3.27d  \( p',mg \) (from Washburn & Crowe 1988, Fig. 3.27d)
3.27e  \( pm'g' \) Washburn & Crowe 1988, Fig. 3.27e)
3.27f  \( p'.gg \) (from Washburn & Crowe 1988, Fig. 3.28f)
3.28  \( p'112 \) (from Washburn & Crowe 1988, Fig. 3.12b)
3.29  Example of motions not consistent with colour (from Washburn & Crowe 1988, Fig. 4.1)
3.30a \( pm'm2' \). Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 4.2a)
3.30b Schematic drawing of Figure 3.30a (from Washburn & Crowe 1988, Fig. 4.2b)
3.31 \( p'1m1 \). Ceramic design, San Ildefonso Pueblo, New Mexico (from Washburn & Crowe 1988, Fig. 4.19)
3.32 Tlingit twined basket, \( p111 \) (from Washburn & Crowe 1988, Fig. 4.30)
3.33 East African basket, \( plm'1 \) (from Washburn & Crowe 1988, Fig. 4.52)
3.34 Enamelled brick pattern, Palace of Darius at Susa, 6th century BCE, \( pm11 \) (from Washburn & Crowe 1988, Fig. 4.60)
3.35 Wood cup, Kuba, Zaire, \( p112 \) (from Washburn & Crowe 1988, Fig. 4.79)
3.36 Section of a Sioux calumet pipe stem, \( pmm2 \) (from Washburn & Crowe 1988, Fig. 4.79)
3.37 Painted mat, Majuro, Marshall Islands, \( pm'm'2 \) (from Washburn & Crowe 1988, Fig. 4.110)

3.38 Japanese travelling chopstick case, \( pma2 \) (from Washburn & Crowe 1988, Fig. 4.123)

3.39 Carved wood border, Hallingdal, Norway, \( p1a1 \) (from Washburn & Crowe 1988, Fig. 4.144)

3.40 Tile pavement, House of Dionysus, Antioch, \( pma'2' \) (from Washburn & Crowe 1988, Fig. 4.134)

3.41 Lattice design, 1850 CE, shop in Shaohing, Chekiang, China, \( p6m \) (from Washburn & Crowe 1988, Fig. 5.60)

3.42 Chancay-style Peruvian loincloth, 1200-1500 CE, \( pl \) (from Washburn & Crowe 1988, Fig. 5.1)

3.43 Detail of the sleeve of a woman’s dress, early 20\(^{th}\) century, Kicevija, the former Yugoslavia, \( p',l \) (from Washburn & Crowe 1988, Fig. 5.2)

4.1 Acr. 593 (from Karakasi 2003, Plate 129a)

4.2 Acr. 678 (from Karakasi 2003, Plate 137a)

4.3 Acr. 679 (from Karakasi 2003, Plate 138a)

4.4 Painted cast of the Peplos Kore, Cambridge, Museum of Classical Archaeology (from Boardman 1978, Ill. 115)

4.5 Acr. 680 (from Karakasi 2003, Plate 144a)

4.6 Acr. 682 (from Karakasi 2003, Plate 146a)

4.7 Princess of Amarna from the family of Amenhotep IV (Akhenaton), New
Kingdom, 1350-1300 BCE, painted limestone (from Stieber 2004, Fig. 21)

4.8 Composite wig of curls over plaits made of human hair; New Kingdom, Deir el-Medina (from Quirke 1992, Fig. 24)

4.9 Acr. 681 (from Karakasi 2003, Plate 148a)

4.10 Acr. 670 (from Karakasi 2003, Plate 152a)

4.11 Acr. 671 (from Karakasi 2003, Plate 160c)

4.12 Acr. 673 (from Karakasi 2003, Plate 164a)

4.13 Acr. 683 (from Karakasi 2003, Plate 167a)

4.14 Acr. 675 (from Karakasi 2003, Plate 174a)

4.15 Acr. 674 (from Karakasi 2003, Plate 178a)

4.16 Acr. 594 (from Karakasi 2003, Plate 181a)

4.17 Acr. 685 (from Karakasi 2003, Plate 189a)

4.18 NM4889 (from Karakasi 2003, Plate 114a)

5.1-4 pma2, p112, d4, d5 (from Lermann 1907, Taf. I)

5.5 pmm2 (from Lermann 1907, Taf. II)

5.6-7 p112, pm11, (from Lermann 1907, Taf. XVIII)

5.8-18 p111, p112, pm11, pmm2, p112, p111, pm11, pm11, pma2, p111, c4 (from Lermann 1907, Taf. XVII)

5.19-20, 24 p111, pm11, d8 (from Lermann 1907, Taf. XIV)

5.21-23 pmm2, pm11, p111 (from Lermann 1907, Taf. XV)

5.25-29 p112, pm11, p111, p111, d8' (from Lermann 1907, Taf. XII)

5.30-33 p112, pm11, p4m, d8 (from Lermann 1907, Taf. XIX)
5.34-39  \textit{pm11, p112, pma2, p, '4, c4, d4} (from Lermann 1907, Taf. III)

5.40-44  \textit{p111, p111, pma2, pmm2, pmm2} (from Lermann 1907, Taf. XI)

5.45-47  \textit{pma2, pm11, d2} (from Lermann 1907, Taf. XX)

5.48-55  \textit{pm11, p111, pmm2, p111, p112, pg, c8', d4} (from Lermann 1907, Taf. X)

5.56-60  \textit{p112, p'111, p112', p6'mm', d6} (from Lermann 1907, Taf. IV)

5.61-67  \textit{p112, pmm2, pm11, p112, pm11, d4, d4} (from Lermann 1907, Taf. XIII)

5.68-73  \textit{pm11, pma2, pma2, pmm2, pmm2, d4} (from Lermann 1907, Taf. VI)

5.74-87  \textit{pma2, p112, pma2, pma2, p'm11, d3, d4, c4, c6, d8, d12, d12', d16'}
\textit{d16} (from Karakasi 2003, Plates 236-237)

6.1 Detail of the procession of the gods and goddesses to the wedding of Peleus and Thetis, François Vase (volute krater), Kleitias, 570 BCE, (The Image Gallery, University of California, San Diego; ARTstor: ARTSTOR_103_41822000401370)

6.2 Lekythos, attributed to the Amasis Painter, c550-530 BCE (Metropolitan Museum of Art, New York, NY, USA; MMA_3.31.11.10; The Image Gallery, University of California, San Diego; ARTstor: AMICO_METRO_103826325)

6.3 Amphora by Lydos, depicting the fallen of Troy, Menelaos and Helen, and the murders of Astyanax and Priam, Attika, c550 BCE (The Image Gallery, University of California, San Diego; ARTstor: ARTSTOR_103_41822000405017)

6.4 Neck-handled amphora, first half of 9th century BCE, Attika (The Image xx
6.5 Jug, c750-735 BCE Attika (The Image Gallery, University of California, San Diego; ARTstor: ARTSTOR_103_41822000072577)

6.6 Jug, c735-700 BCE, Athens, 16.1 cm. (Museum of Fine Arts, Boston, MA, USA; BMFA 01.8049; ARTstor: AMICO_BOSTON_103828875)

6.7 Neck-handled amphora, c700-680 BCE, Analatos painter, Attika (The Image Gallery, University of California, San Diego; ARTstor: ARTSTOR_103_41822000398915)

6.8 Black-figure, neck-handled amphora, c530 BCE, Achilles killing Penthesilea, Attika (found at Vulci) (The Image Gallery, University of California, San Diego; British Museum; ARTstor: ARTSTOR_103_41822000399764)

6.9 Neck-handled amphora, c530-520 BCE, mask of Dionysos, Attika (The Image Gallery, University of California, San Diego; ARTstor: ARTSTOR_103_41822000399350)

6.10 Black-figure amphora, c520-510 BCE, Athens, 17.3 cm. (The Image Gallery, University of California, San Diego; Cleveland Museum of Art, Cleveland, OH, USA; CMA_.1926.241; ARTstor: AMICO_CL_103798941)

6.11 Atalanta lekythos, c510-490 BCE, Attika, 13.8 cm. (The Image Gallery, University of California, San Diego; Cleveland Museum of Art, Cleveland, OH, USA; CMA_.1966.114; ARTstor: AMICO_CL_103802508)

6.12 ProtoCorinthian aryballos, c650-640 BCE, 13.7 cm. (The Image Gallery,
6.13 Corinthian oinochoe, c640-630 BCE, 23.5 cm. (The Image Gallery, University of California, San Diego; Museum of Fine Art, Boston, Boston, MA, USA; BMFA.64.14; ARTstor: AMICO_BOSTON_103839516)

6.14 Kylix by the Arkhesilaos Painter, Laconia, c565-560 BCE (The Image Gallery, University of California, San Diego; ARTSTOR_103_41822000402022)

6.15 Boeotian low kylix by the Protome Painter, 6th century BCE, 6.7 cm. (The Image Gallery, University of California, San Diego; Museum of Fine Arts, Boston, Boston, MA, USA; BMFA.19.307; ARTstor: AMICO_BOSTON_103839516)

Maps

6.1 Kleisthenes’ division of Attika (from Ehrenberg 1968, map 4, p. 91)

6.2 Settlements in Attika (from Hall 2007, map 9.1, p. 214)
Chapter 1 - Introduction

“... Though the general type [of kore] remained constant, one can observe here ... the evolution from conventional to naturalistic forms. ... Only after this achievement was the type dissolved, since it had served its purpose.” (Richter 1968: 1)

Gisela Richter, writing in 1968, identifies a stylistic progression in the type of archaic Greek statuary known as the kore, produced between c650 and 480 BCE. This progression, she claims, is the kore’s “fundamental interest, both artistically and historically” (Richter 1968: 3). In her book Korai: Archaic Greek Maidens she analyses these stylistic developments as evidence for the evolution of style from “conventional to naturalistic” imagery. In Archaic Greek Statuary, Brunilde Ridgway writes of reshaping “our picture of the development of the kore type in Greek sculpture” (Ridgway 1977: 85), although she states that naturalism is not an aim of archaic sculptors but a result (Richter 1968: 13). Rhys
Carpenter writes that “the trend toward mimetic truth ... necessarily put an end to archaism” (Carpenter 1962: 103). And Rudolf Anthes writes, with respect to both kouros and kore, that sculptors were attempting to “make statuary more alive than before” (Anthes 1963: 64). Richter, Ridgway et al. are representative of many studies of Archaic Greek statuary that focus primarily on style. The Archaic style is seen as representative of a trend toward naturalistic or “mimetic” representation of the human body in stone, a trend that reached “perfection” in the figures decorating Athens after the Persian invasions.

Both Richter’s and Ridgway’s investigations of the kore type involve an examination of differences in areas such as pose, gesture, drapery, hair styles and geographically-based stylistic groupings. Richter’s approach leads to the inclusion of monumental stone sculpture and statuettes in her categorisation, as well as some architectural sculpture, mirror supports, plaques and jewellery in such varied media as bronze, terracotta, ivory, marble and limestone. She includes figures that differ in their degree of activity (standing, walking, gesturing) and figures that can be (tentatively) identified with a deity or that are anonymous. Ridgway’s analysis is more inclusive, in that she considers the korai ¹ predominantly in terms of their chronological distribution throughout the Greek mainland, the islands, Asia Minor, Magna Graecia and the Greek colony of Kyrene in North Africa. She also examines developments in dress (chiton or peplos), pose and hair styles in an assessment of regional traits. Carpenter’s analysis depends upon a theoretical understanding of how we see. What he calls “pictorial vision” presents objects to the eye as “colored patches within distinctively shaped

¹The plural of kore.
boundaries” and “projective gradients” - gradations in light and shadow, colour and hue, pattern and texture, size and sequence, and so on. The archaic sculptor sees shapes and patterns, rather than the “stereometric structure of solid bodies”, and reproduces them on the stone block (Carpenter 1962: 93-4).

The classification of these statues under the umbrella term kore is useful because we understand this to be the category of all archaic Greek sculptures of the standing, clothed, youthful female body. There is a consistent repetition of definitive characteristics in each kore belonging to the category of kore. For archaeologists and art historians like Richter, Ridgway and Carpenter, the significance or meaning of the kore lies in a) the essential characteristics that the individual statues have in common, and b) the fact that these characteristics do not change over time. The category depends on repetition of a set of characteristics in each example of the category and on the immutability of that set of characteristics with the passage of time.

But the very inclusiveness of the classification has until recently inhibited us from thinking about alternative interpretations; in Stieber’s words, “... what unites them is privileged over what differentiates them” (Stieber 2004: 3). Now there are other ways of looking at these statues that place them in a wider context than the purely stylistic approaches that usually dominate. I will use an investigative technique called symmetry analysis to re-examine a small group of korai, in the hope of providing another viewpoint - another context, if you will - for this most unusual Archaic Greek art form.
My discovery of this technique was serendipitous, the result of a random combination of factors. First, I had read many texts and articles that interpreted the korai with approaches that varied only in arguments about the shape of ears or the folds of drapery, for example. I felt that I had reached an impasse regarding how I would handle my chosen topic because I could not think of an investigation that would differ in any substantive way from those that had gone before. Secondly, I was following several tangential references to a book entitled *Symmetries of Culture: Theories and Practice of Plane Pattern Analysis* by Dorothy K. Washburn and Donald Crowe. Because the theoretical explanation of symmetry analysis is initially hard to grasp for those who, like me, have forgotten much of their mathematical training, it was not immediately apparent that symmetry analysis could be a useful tool for the study of the korai. To my knowledge, it is not a technique that has been used by either art historians or archaeologists to examine artefacts from ancient Greece.² The third factor was my reading of a dissertation by a recent graduate from my department. This thesis examined the stylistic progression in designs on Mycenaean pots, and while I found it to be very interesting, I was left with the same uneasiness about that approach as I had with the typical kore analysis; that is, that the basis for the analysis was not empirical enough for my tastes.

The stylistic analyses carried out on the korai typically rely more on the observers’ subjective impressions than they do on measurable quantities or mathematically precise

²With the possible exception of Washburn herself, who conducted symmetry analyses of the patterns on fragments of pottery from seven of the stratified levels at Knossos, where she tested the sensitivity of cultural change to the passage of time in a stable cultural system, and from Early and Late Neolithic sites on mainland Greece, where she tested the sensitivity of design structure to geographic factors. See Washburn (1983b).
characteristics. It is all well and good to say that the fluidity of line in the rendering of drapery becomes more naturalistic from the early to the late Archaic period, but how is this development toward naturalism to be measured? What I required was a method that was more empirical. I then recalled the analytical method developed by Washburn and Crowe, and tested it on the one characteristic of the korai that had been glossed over by many investigators: the coloured patterns, some of which are still visible, that had been painted onto the korai at the time of their creation. The method seemed to work on the test patterns that I chose, so I began to analyse the remaining patterns and to record my findings in a spreadsheet, which I hoped to convert into a statistical table at a later date. Thus I had accumulated the elements necessary for a scholarly and original examination of the patterns on the korai: a small sample of korai, accompanied by colour copies of the nineteenth-century records of the patterns that were visible on them at the time they were excavated, and a methodological approach that had not been used for such a purpose before - and this aspect I must emphasize, because my use of the methodology in this context appears to be unique.

We may ask why a study of pattern would be of value. Many areas of the world retain imagery as one of the primary means of communication. Both representational and non-representational forms embody ideas that are fundamental and core to these cultures. Representational forms include icons, statuary, religious scenes and symbols. Non-representational forms, such as abstract design and pattern, also encode important cultural beliefs and practices, but because we are often unable to decode this information, we have consigned them to the ‘decorative’ arts. Symmetry analysis will allow us to decode the
information embedded in non-representational pattern, in this case the coloured patterns that were painted on the korai at the time of their creation.

Symmetry analysis studies the geometry of pattern. Its major premise is that “cultures invest meaning in geometric arrangements” (Washburn & Crowe 2004: xi). Symmetry analysis permits us to see regularities in the structure of a regularly repeated pattern that may not be evident because of varieties in pattern elaboration. It permits us to focus on the underlying structural relationships that describe in part sociocultural organizations. In essence, symmetry analysis suggests that cultures use symmetrical relationships to “structure activities” and that cultures reinforce these relationships “by using the same symmetries to structure patterns on their material culture.” (Washburn & Crowe 2004: xviii).

Symmetry analysis uses the geometric principles of crystallography to classify the underlying structures of decoration by analysis of the manner in which design elements are repeated. This analytical method assigns the underlying structures into symmetry classes, or motion classes, that can describe any design in which the design elements are repeated in a regular way. On most decorated forms or objects, such repeated design is either planar (flat) or can be flattened or unrolled to reveal bands or strips of design (Figure 1.2 below), or as overall ‘patterns’ - the proper name for repeated designs in a plane (Figure 1.3 below; Washburn & Crowe 1988: ix).
In everyday usage, symmetry commonly means finite, or bilateral, symmetry, or mirror reflection of parts in a single finite figure. We think of the human body as having bilateral symmetry; that is, if a dividing line were drawn vertically through the centre of the human figure, there would be one ear, one eye, one arm, one hand, one leg, one foot, etc., on one side of that central axis and the same on the other side. Many objects in nature have other forms of finite symmetry, such as the radial symmetry displayed in starfish or flowers. But
these two examples of bilateral, or finite, symmetry form only a small subset of the known symmetries as defined by crystallographers. The bilateral (finite) category admits only two symmetry motions about a single point: mirror reflection and rotation (respectively, Figures 1.4 and 1.5 below).

![Figure 1.4. Equilateral triangle showing mirror reflection along line L.](image)

![Figure 1.5. Equilateral triangle showing rotation symmetry.](image)

Other categories of symmetry occur in the two-dimensional plane. One-dimensional infinite designs, such as would be found on wallpaper borders, and two-dimensional infinite\(^3\) patterns, such as on upholstery or drapery fabric, may admit of translation and glide reflection (respectively, Figures 1.6 and 1.7 below), as well as mirror reflection and rotation. Various combinations of symmetries, called motion classes, are found in all regularly repeating design,

\(^3\)The patterns would repeat infinitely if the decorative border or piece of fabric were extended to infinity in all directions.
and have been categorized in a systematic, objective way.

![Figure 1.6. Pattern with translation symmetry.](image)

At this point it may be wise to stop and ask the question: are these symmetry categories culturally meaningful, and thus are they relevant for the analytical study of human behaviour? One way to answer the first question is to examine the role of symmetry in perception. Since this falls into the areas of physiology and experimental psychology, neither of which is my field, let me refer the interested reader to Washburn and Crowe’s excellent
summary of the work carried out in both fields (Washburn & Crowe 1988, 15-24). They conclude that symmetry is a “salient feature which all peoples use, to greater or lesser degrees ... to assess forms, remember them, compare them with other forms, and reproduce them. That is, ... all peoples use symmetry as a diagnostic feature in the perception of form” (Washburn & Crowe 1988, 24). Symmetry is thus a perceptual tool for the processing of shape information. The symmetries associated with any given culture are related to that culture’s “cognitive organization map” and classification of those symmetries should provide a meaningful measure of the ways in which those who belong to that culture perceive their own social context.

Another way to search for cultural meaning in symmetry is to study the occurrence of symmetry in cultural contexts, looking for consistency in the appearance of symmetry classes in patterns. In other words, are there non-random tendencies of arranging design elements within a cultural group, or between cultural groups, and if so, what is the significance of this non-randomness in design structure? Modern studies of African art produced by different cultural groups have demonstrated that the designs can be categorized systematically by their symmetries, that design repetition occurs on many different media (cloth, dishes, masks, mats) and that the designs are characterised by different motions.4 Within the groups studied, certain symmetries predominate. Other studies indicate that it is possible to trace changes in the use of design symmetries through time. These can then be

---

4See Crowe (1971), (1975) and (1981) for studies of patterns in the art of the Bakuba, who live in the Congo, the people of Benin in Nigeria, and the Begho site in Ghana, respectively.
related to other shifts in the record of material culture (Washburn & Crowe 1988, 25-27).

Still other investigations have found that within cultural groups, design structure is used to identify “correctness” for use by artists within the group. Not all possible symmetry patterns are appropriate in any given cultural group, and the artists or artisans must use only the ‘approved’ structures for acceptance within their groups. Additionally, consistencies of behaviour have been found to express in symbolic terms a culture’s values and principles of order. These principles of order are present in many of the culture’s subsystems, such as the public spaces used in ritual and religious practice, on pottery and textiles, in marriage exchange or formal negotiations, within the structure of ceremonial language, and so on (Washburn & Crowe 1988, 29). Thus for the archaeologist, symmetry analysis of design structures provides a replicable and objective method of describing pattern arrangement that reflects behaviour patterns of cultural significance and meaning. As an analytical tool, symmetry analysis can isolate culturally significant attributes and can measure them in a

---

3Washburn’s symmetry analysis of Yurok, Karok and Hupa basket designs revealed that “traditional designs, designated as “ours” by Yurok, Karok and Hupa informants, were recognized ... as being “put together right” when they were consistently structured by two symmetries, \( p112 \) and \( pma2 \) [to be explained later]. Baskets said to be “not ours” were judged as “against the law” because, although they were also frequently structured by the two traditional symmetries, they were distinguishable by the addition of new colors and motifs” (Washburn 1986: 19).

4See Witherspoon (1977): 162-7 for a discussion of how woven patterns in Navajo rugs express movement and activity by means of diagonal and zigzag lines, by the active colours of yellow/brown, blue/green and red/pink, and by diamond shapes. A static condition is expressed by straight lines and horizontal and vertical stripes, by squares and rectangles, and by the static colours of white, black and grey. Movement is represented by a series of active-static-active-static patterns. In this way, the Navajo create \( hózhó \), or form, order, harmony, balance and beauty in their world.

5See Adams (1973) for a discussion of compositional principles in the decorated textiles of East Sumba, Indonesia and of how these are linked to the larger intellectual order of Sumbanese society.
systematic fashion.

The concept of style is often used to explain consistencies, similarities or differences in the appearance of objects. While it can provide valid observations at the descriptive level of analysis, it is not useful for general theoretical development unless it and its relationships are well and rigorously defined. What usually happens is that statistical analyses of style are able only to describe a particular style in more and better detail. They are unable to isolate or clarify the specific aspects of style that permit it to symbolise or communicate. For example, size and shape are formal properties of objects in the same way that symmetry is. However, different sizes and shapes are specific to only certain artefacts. These ‘data-specific’ units of analysis do not allow us to define general relationships, such as the relationships of decorative motifs to population groups. By contrast, the different kinds of symmetry are based on a system of classes of motion that may occur on any type of artefact with a repeated design. We can make observations regarding the consistency of the design’s occurrence within data assemblages that represent a wide range of cultures. We can discern

---

8Lechtman defines the elements of style as the physical products of human behaviours that can be identified and classified in formal arrangements and which are supported by a set of underlying values. As such, style is a form of communication in which a “shared cultural code is expressed along a variety of communication channels,” among which are behaviours and the artefacts of material culture. See Lechtman (1977).

9Roaf carried out an analysis of the style of the sculpted figures on the stone doorjambs, platforms and stairways of the palaces of the Persian kings at Persepolis in an attempt to pick out the work of individual sculptors in a series of twenty-four archers carved on the side of a staircase. His methodology involved listing a number of attributes which varied from figure to figure: hair curls, eyebrows, moustaches, beard curls, straps at the front or back of shoes, spear blade ribs, and so on. He assigned type numbers to each attribute, then classified the attributes on individual carvings by type. The number of attributes shared by two figures provided an index of similarity between them. The results were tabulated and fed into a computer, which produced a matrix indicating that there were three groups of figures. This was confirmed by the presence of sculptors’ marks and a close visual study, which indicated that the groups of figures were the work of different teams of sculptors. Beyond that, Roaf could make no determination. See Roaf (1978).
trends and make general statements about the relationships between certain structures and certain behaviours. If we wanted to include the concept of style, we could then argue that the consistent use of a given symmetry is a stylistic behaviour. Symmetry classification of motif arrangement can provide descriptions of design elements that are arranged in non-random patterns by artisans within a cultural group. It organises and presents cultural preferences in an objective manner and allows for the formulation and testing of hypotheses. The rigorous analysis of repeated design enables us to study group formation, maintenance and interaction, in an attempt to discover why people behave as they do (Washburn & Crowe 1988: 37-41).

In an ideal world it would be extremely interesting if we could subject the decorated cloth of the ancient Greeks to symmetry analysis because cloth tells us something about the organization of human social groups. However, there are few surviving examples of cloth from Iron Age Greece. With one or two exceptions, archaeologists have recovered and

---

10 It can take many shapes because of its softness and pliability. Its potential for decorative variation is vast, from the patterns produced when coloured threads are woven on a loom to embroidery, dyeing, or painting of the finished fabric. Cloth can reveal variations in sex, age, rank, status and group affiliation, or it can conceal such variety through uniforms, costumes or masks. It can function as a marker of the wearer’s ideological values or attitudes. Its semiotic potential can encompass “moral and ethical issues of dominance and autonomy, opulence and poverty, continence and sexuality.” (Schneider & Weiner 1989, 1-2).

11 Several fragments of cloth were discovered in a bronze cremation amphora dated to c1000 BCE at Toumba, near Lefkandi in Euboea, during the 1964-1970 joint excavations by the British School at Athens and the Greek Archaeological Service. Strips of decorated cloth had been folded and packed around the inside of the amphora and were very well preserved. The investigators believed it to be a robe made of two sheets of linen sewn up the sides, with a plain border and a section of shaggy weave. See Popham et al. (1982) and Popham et al. (1993) for a complete description of the excavated fabric. The few other remains of textiles from Iron Age Greece show no patterning; for example, the plain weave linen cloth in a copper vessel uncovered by the excavators of a Late Geometric grave at Eretria. The cloth showed a count of 18 by 22 threads per cm. (Bloesch 1967: 130). The much later fragment of diapered cloth from Koropi in Attika dates to the fourth century BCE (Beckwith 1955: 114-5).
preserved only fragments of actual textiles or the impressions of textiles that were wrapped around or placed under other objects. However, cloth is well-represented in image form on two other types of ancient Greek artefact: ceramic vases and marble statues. A number of large, early to mid-8th century BCE Attic amphorae depict funeral scenes in which mourners surround a dead person laid out on a bier. A patterned cloth hangs, or is held, above the body (Figures 1.8 and 1.9 below).\textsuperscript{12} By c600 BCE there are many examples on vases and small statuettes of women wearing gowns decorated with friezes of animals, chariots, gods, heroes and mythical creatures. For example, the François Vase, painted by Kleitias, depicts three goddesses, who are dressed in their finest peploi, arriving at the wedding of Peleus and Thetis (Figure 1.10 below). Some peploi are woven with all-over patterns, while others are decorated with narrow bands of figures in motion (Barber 1991, 363-372).\textsuperscript{13}

Inevitably there has been discussion about the decorative features associated with the textiles depicted on both pots and statues. Many art historians have argued that the painters invented these designs so that the statues and vases would look attractive. Only a few have thought otherwise. Schweitzer, for example, hypothesised that “Geometric style... developed alongside a lost textile art. ... The early history of the meander in the tenth century can probably not be explained satisfactorily without the hypothesis that its roots lay in textile work” (Schweitzer 1963, 30). Elizabeth Barber, who is a weaver as well as an archaeologist,\textsuperscript{12}

\textsuperscript{12}The funerary cloth covered both body and bier and was raised during the prothesis, in which the body of the dead person was revealed to the mourners who surround the bier (Barber 1991, 377-8).

\textsuperscript{13}See Figures 1.11 and 1.12 below for diagrammatic representations of the peplos and the chiton.
Figure 1.8. Late Geometric Attic funerary vase, showing a procession of mourning women on the neck; neck-handled amphora from the Dipylon Cemetery, 60 cm.

Figure 1.9. Detail of the mourning scene. Note the women tearing their hair on either side of the bier, and the checked cloth held above the bier.
Figure 1.10. Detail of the procession of the gods and goddesses to the wedding of Peleus and Thetis; the François Vase, Kleitias, c570 BCE.

Figure 1.11. The chiton: one rectangular piece of cloth is stitched into a cylinder; the top is partially closed with two sets of buttons spaced so as to allow an opening for the head and both arms.
reinforced Schweitzer’s speculation with a practical demonstration. She attempted to reproduce on her loom the meanders she had observed on the borders of Archaic Greek clothing as depicted on pots and on statues. She found that the best technique involved weaving with contrasting light and dark weft.\textsuperscript{14} Because her warp threads were white, she was unable to avoid having portions of white warp showing at intervals along the edge of the meander. She believed initially that she had failed to recreate the ancient Greek technique. But while she was looking at Acr. 594 (see Figure 1.13 below) in the Akropolis Museum, she discovered that the painter who had created the meander border on the kore’s chiton had

\textsuperscript{14}The weft is the thread (or threads) woven horizontally between the threads of the vertical warp, producing the woven cloth. As far as I know, Barber is the only person to have attempted such an experiment with respect to ancient Greek patterns of weaving. Lynn Teague was able to reproduce similar patterns and designs from Southwest Indian textiles on her loom (personal communication).
painted small white ticks along the edge of the meander. Barber concluded that the ticks on the chiton’s meander corresponded with the white warp threads revealed in her own weaving experiment and thus that she had correctly reproduced the technique used by Archaic Greek women to weave meander borders. She also concluded that the artists who decorated both vases and statues were looking at real cloth for their inspiration, rather than creating decorative motifs out of their imagination (Barber 1991, 370, note. 10).

Mary Stieber arrived at a similar conclusion with respect to the statues by more abstruse methods in *The Poetics of Appearance in the Attic Korai*. She noted that “... these statues display a concern for a kind of individuality, for a mimetic modality that can even be considered realistic, and that this modality is not necessarily exceptional for the age in which the korai were created” (Stieber 2004: 3), and argued that the korai may represent “tentative, incompletely articulated incursions into the genre of portraiture, early efforts to address the
idea of personal likeness in a representation of a human being ...” (Stieber 2004: 83). She viewed the garments worn by the korai as extremely varied, to the point that no two korai are clothed alike (Stieber 2004: 62) and that the polychrome motifs decorating the garments appear not to duplicate one another (Stieber 2004: 72). Ultimately, she felt that the korai were not generic or idealized but should be considered in the context of “observable reality” (Stieber 2004: 82). That being so, we should be able to use symmetry analysis to understand the patterns carved into and painted onto the stone in order to decipher cultural meanings that may be embedded therein.

---

15Stieber also argues that Archaic portraiture does not focus on the face alone, a theory developing out of Aristotle and his followers, who discerned the character of the individual in the configuration of the face. She believes that Socrates’ dialogue with Parrhasios on the artistic representation of character (recorded in Xenophon, Mem. 3.10.1-5) reflects earlier beliefs that signs of character are not restricted to the face (Stieber 2004: 81-2.)
Chapter 2 - Historiography

“Au temps où les travaux d’Hittorff achevaient de démontrer l’usage constant de la polychromie dans l’architecture grecque, un archéologue, adversaire résolu de la théorie nouvelle, parcourait la Grèce, très décidé à ne rien voir qui pût contrarier ses idées. Un de ses élèves, monté sur une échelle, explorait la corniche d’un temple, et le dialogue suivant s’engageait entre eux: «Trouvez-vous des traces de couleur? - Oui. - Descendez bien vite.»”


By 1903 Henri Lechat remarked:

“On a cessé depuis longtemps de contester l’application de la couleur sur les monuments et les sculptures antiques. ... Les traces de couleur, souvent peu distinctes, qu’on avait observées sur des marbres de provenances et d’époques parfois très différentes, ne permettaient guère autre chose que l’affirmation du fait général de la polychromie, mais quant aux principes et à la valeur esthétique de la décoration polychrome des statues, le champ était libre aux controverses.” (Lechat 1903: 243)\(^1\)

Cavvadias and Kawerau were in no doubt about the Greek use of polychromy when on 24 January 1886 they unearthed fourteen korai in the northwest corner of the Erechtheion precinct on the Akropolis in Athens. In addition to noting the similarity of the figures to several excavated on Delos in 1879, Cavvadias wrote:


The first important studies to emerge after the 1886 find of the fourteen korai attempted to include them within the context of other Archaic monuments that had already been discovered and studied (Karakasi 2003:11). Preeminent among those who discussed the korai were Hans Schrader (1909), Guy Dickins (1912) and Humphrey Payne and Gerard

\(^1\)K.E. Zachariä von Lingenthal (2006) wrote about polychromy in ancient sculpture and architecture as early as 1840, following his voyages to the Near East in 1837 and 1838. Lermann discussed polychrome drapery of the korai, and included colour plates, in 1907. See also Lechat (1903) and Manzanelli (1994).
Mackworth-Young (1936). In 1939, Ernst Langlotz produced a catalogue of all the Akropolis korai, which included descriptions of each as well as an attempt to explain their function. The next major catalogue was prepared by Gisela M.A. Richter (1968), and included almost all of the korai known at the time, as well as a fine selection of plates that provided images of the statues for the first time. Following Richter, Brigitte Freyer-Schauenburg (1974) studied the sculpture of Samos, including its korai. Klaus Tuchelt (1970) and Volkmar von Graeve (1983, 1985, 1986) produced comprehensive studies of the korai from Didyma and Miletos. Most of these published works provided not only an inventory of the korai but also attempts to arrange them in some sort of chronological order, for the purposes of defining their styles and assigning them to various centres of production or to specific sculptors. Countless articles as well as handbooks on archaic sculpture have also been written in pursuit of the same objectives. John Boardman’s 1978 *Greek Sculpture: The Archaic Period* and Wolfram Martini’s *Die archaische Plastik der Griechen* (1990) are only two examples. The 1987 volume of the *Handbuch der Archäologie* series on Greek sculpture by Josef Floren and Warner Fuchs is another (Floren 1987). Most of the korai from the larger sites have already been sufficiently published, and the majority of the isolated finds have been covered in more recent articles.

However, these stylistic and chronological treatments avoided dealing with other basic questions having to do with the meaning and function of these figures, with those who commissioned them and with the cultural and historical contexts in which they were created. For example, in 1907 Cavvadias proclaimed with great certitude but little solid argument that
“...wenn wir andererseits annehmen vollen, daß die Statuen eine Göttin darstellen, konnte
diese Göttin naturlicherweise nur die auf der Akropolis verehrte stadtschirmende (πολούχος)
Athena sein ...” (Cavvadias 1907: col. 28-29).

Richter restricted herself to tracing stylistic development in the korai by examining the
“rendering of drapery ... from stiff enveloping masses to sensitively modelled surfaces,
enriched by folds and assuming the proportions of the body beneath.” (Richter 1968: vii). She
classified them into six chronological groups and provided a general discussion of the features
that applied to all korai, such as the type, meaning, garments, sculptural technique and
locations at which they were found. Richter was also cognizant of the polychromy and
ornamentation of the garments. She recognized that patterns from Greek vases of the Archaic
period - meander, rosette, lotus, palmette, zigzag, rectangle, etc. - appeared on the korai as
well, and evidently reproduced those on the actual garments worn at the time (Richter 1968:
15). As for the meaning of the kore, she deemed it best “not to be too precise, and merely
to surmise that ... she represented a beautiful girl, a παῖς καλή, in the service of the goddess.”
(Richter 1968: 4).

Boardman generalised that korai, like the kouroi of the early Archaic period, were
“dedications [in sanctuaries], offering more permanent and silent service to a god than could
mortal flesh” and that their other function was as grave markers to “summon up remembrance
of the youth and vigour admired by” the kin and friends of the dead (Boardman 1978: 22).
The later Archaic korai he considered to be “symbols of unwearying service to the goddesses
whose sanctuaries they adorn” (Boardman 1978: 66). Like Richter before him, he focused on stylistic developments, specifically in the sculptor’s treatment of drapery, hair styles, accoutrements and so on, in the stated aim of proposing “a pattern by which the development [of Greek art toward realism] may be the better understood” (Boardman 1978: 7).

One major exception to this approach, published in 1975, was Lambert Schneider’s discussion of the kore’s “social function.” He incorporated extensive evidence from literary sources, particularly those of the sixth century, to bolster his argument that the korai served as idealized images meant to inspire proper conduct and behaviour in those who viewed them. He consolidated the literary evidence of young women’s participation in public festivals that appear in the works of ancient authors such as Sappho, Alkaios and Arkhilokhos and related it to the physical description of the kore as a type (Schneider 1975: 33 and 36).2

Holloway’s 1992 article “Why Korai?” attempted to discover why the kore was the overwhelming choice for major sculptural dedications of the late sixth and early fifth centuries on the Akropolis (Holloway 1992: 267). He did not discuss the appearance of the korai or the question of individuality versus type, nor did he believe that they are portraits. Instead he examined the language of the dedicatory inscriptions that accompanied them. Two groups figured prominently among the dedicators: the aristocrats and other leaders, and the business class. The first group offered kouroi, other clothed male figures, and horses and riders in

---

2“So gesehen sind aber die Korenstatuen in den Heiligtümern weniger Abbilder realer Mädchen als Wunschbilder, Vorbilder und Stimuli, sich so zu geben, wie es die Statuen anschaulich verkörpern.” (Schneider 1975: 33).
celebration of agonistic victories, political and religious office, military achievement and status. The second group made dedications related to wealth and success, as evidenced by the frequent occurrence of the words *aparkhē* (ἀπαρχή; first fruits) and *dekatē* (δεκάτη; a tenth share). According to Holloway, no dedication made by individuals who are known to be aristocrats contains either word (Holloway 1992: 271). Business-class individuals did donate korai, including Isolokhos the fisherman (see Raubitschek 1949, dedication 229), Nearkhos the potter (Raubitschek 1949, dedication 197), and Simon the fuller whose dedication may go with the feet and base of Acr. 429. From this he concluded that successful members of the merchant class, not the aristocracy, commissioned and dedicated the majority of the korai and thus that the kore represented “a generalized figure of good omen, suitable for dedications recording financial prosperity” (Holloway 1992: 272). His idea allows the Akropolis korai to be considered as a reflection of non-aristocratic values, rather than those of the aristocracy, as is usually assumed.⁴

A different approach by Hans von Steuben (1980), later adopted and adapted by Karakasi, attempted to reconstruct the historical and cultural contexts in which kouroi⁵ were commissioned, in order to understand the motivations of their donors. He arrived at new conclusions regarding the distribution and significance of kouroi, including why they were produced in different sizes in different places and at different time periods. He also theorized

---

³Nearkhos dedicated Acr. 681 by the sculptor Antenor.

⁴See, for example, Schneider (1975) and Richter (1968) for interpretations which assume that the korai were aristocratic dedications reflecting aristocratic ideals.

⁵The kouros (pl. kouroi) has generally been considered as the male equivalent of the kore.
about what they meant to those who commissioned them, whether wealthy or politically prominent members of society. Karakasi (2003), while she provides an updated inventory of korai grouped chronologically and geographically, took von Steuben’s contextual approach one step further. She tabulated details about the korai, such as external features, condition, size, kinds of marble, sculptors and workshops, and discovery sites. She considered each kore on the basis of its context (exact find spot, building history of the site, related literary and epigraphic evidence) in order to draw conclusions about the statues’ role in cult practices, their identity and function, and the motives and social positions of the people who commissioned them. (Karakasi 2003: 12). Among her conclusions is that the statues that have the most contextual evidence represent individual young women living at the time who were most likely involved in cult observances, such as during the Panathenaic ceremonies. (Karakasi 2003: 30, 51, 136).

Stieber (2004) challenged the general consensus of modern times that the korai are idealized, generic, and repetitive types representing images of female beauty. She noted that Richter’s *Korai*, while presenting a chronology of the korai that is likely to be correct because it has stood the test of time, has also had the unfortunate result of entrenching the idea of the korai as examples of a fixed and predetermined type. Stieber argued for an alternative view of the Akropolis korai, specifically that the statues “display a concern for a kind of individuality, for a mimetic modality that can even be considered realistic, and that this modality is not necessarily exceptional for the age in which the korai were created” (Stieber 2004: 3). She began with the premise that the core of realism in any work of art, whether
naturalistic or non-naturalistic in style, lies in the totality of information provided by the accumulation of detail; that is, the more information provided about the subject of a work of art, the more realistic the work of art may be considered to be. (Stieber 2004: 6-7). After defining realism, she then gathered ancient evidence to support her view that the statues, because of their accretion of detail, are realistic representations of individual young women living in Archaic Athens. (Stieber 2004: 9-10).

One element that most, if not all, commentators have in common is that they mention the korai sculptors’ use of colour and ornamentation. We have seen that even the earliest studies (see above) noted the presence of polychromy and decorative motifs. Some, such as Lechat, even speculated that these details, in addition to other elements, contributed to the individuality and life-likeness of the korai. However, after Richter’s influential study appeared in 1968, the notion of the kore as a predetermined type has resisted later attempts to present expanded “parameters of discourse” until recently (Stieber 2004: 3). As a consequence, while ornamentation and colour have been noted and commented upon, no one, with the possible exception of Mary Stieber, has examined these features closely.⁶

Karakasi included new colour photographs of many of the korai that still retain traces of pigment, as well as reproductions of Lermann’s 1907 colour plates. She noted that

---

⁶Richter reproduced in black and white the polychrome patterns illustrated in Lermann’s 1907 Altgriechische Plastik. She noted the similarity of the motifs to those appearing on Greek vases of the same time period, as noted above, and even suggested that they reproduced ornamentation found on the textiles of the time. But she merely referred her readers to the black-and-white photographs with phrases such as, “For the numerous traces of colour, cf. p. 82.” (Richter 1968: 81).
Lermann, who was permitted to inspect the Akropolis korai shortly after their discovery, determined that the painters were able to recreate the detail of the stitch technique used to produce the embroidered ornaments on the original cloth.\(^7\)

Stieber (2004) took this observation a step further. First she argued from Pausanias (5.21.1 and 5.25.1) that there was an Athenian tradition of dedicating andriantes (ανδριάντες), or portrait statues, as opposed to generic votive images, on the Akropolis. These statues served a dual function as both portrait images and votive offerings, but did not require the addition of memorializing names in order to make their function evident (Stieber 2004: 14-16). She also noted that the polychrome ornaments that decorate the garments of each individual Akropolis kore appear not to duplicate one another. There is no typical design among them. Of particular importance is the paryphē (παρυφή), which refers to the central vertical strip, or border of the chiton. The paryphē is usually pulled to one side by the left hand - or occasionally the right - of those korai displaying the gesture. The meaning of the Greek verb paryphainô (παρυφαίνω; ‘to weave at the hem or border’)\(^8\) suggests that the border or hem of a garment was a significant area for the weaver, and possibly for the wearer.\(^9\) Stieber drew no conclusions about whether the choice of ornament was systematic.

---

\(^7\)Lermann 1907: 4. The technique, still used today and termed rhaphideuto (ῥαφιδευτό), or harpatdziki (άρπατζικι) in Cyprus, stitches together two panels of fabric, just as depicted on the Phrasikleia kore (Athens National Museum 4889), found at Merenda in Attika in 1972. See also Schmaltz 1998: 3.


\(^9\)Stieber suggests that the borders and hems may have served to distinguish Athenian families, functioning in a similar fashion to the designs on Scottish tartans. Or they may have served as an indication of rank,
but expressed the opinion that their “exclusivity adds yet another particularizing dimension
to the conglomerate of meaning deduced thus far from the statues’ appearances and further
enhances the impression of mimetic realism” (Stieber 2004: 72-5).

Stieber attempts to present another way of looking at the kore:

Ornament - as sensuous, tactile surface, as the figured language of the sculptor’s art, as
universal vivifying principle, as the vehicle for artificial glitter and nonmetallic shine, as
the agitator of contours - on its own can create a sensation of aliveness in a stone image.
But the polychromed border itself, in some of the korai, is pulled into a loose sigma shape
whose sinuous path stirs the eye, in another way, to apprehend “movement”. (Stieber 2004:
75-6)

It seems to me that she succeeds - but only within the borders of the discipline of art history.
I would like to look more closely still at the polychrome ornamentation of the Akropolis
korai, not so much to “rescue the material from art historians who see material culture as an
impediment to mystic communication with the viewer” (Snodgrass 1994: 198), although that
was certainly an initiating factor in beginning this study, but rather to add another
methodology for interpreting the details to the existing discourse about the kore.
Chapter 3 - Symmetry Analysis

“Then it dawned on me that all my Western training had not prepared me to render accurately geometric patterning nor manipulate the rules of symmetry. In our own ethnoaesthetic taxonomy of affecting form, geometric art is classified as mere decorative art, fit only for rugs or pillowcases. It is not considered the stuff of “fine art”, ... the latter a precious “trophy commodity” of Veblenian ... conspicuous consumption, archetypically framed oils on canvas and bronze sculpture, emblematic of one’s monetary, social, or political power. Spatially, decorative arts are consigned to subsidiary wings of art museums along with the cutlery and furniture, the poor “applied” cousin of “pure” fine art. It suffers the stigma of functionality and is thus carefully quarantined from the defiantly “useless” art objects ... that populate our museums or art galleries (themselves so many gilded art ghettos, where we suffer both classes of affective objects to be displayed, where they languish in splendid and static isolation, to be viewed only on Sunday). Meanwhile, our homes warehouse giant piles of mass-produced “stuff”, decorated, if at all, with stereotyped printed designs, every one the product, not of our own labor or creativity, but of our last trip to the mall.

Because of this sorry state of affairs in “civilization” we, as art students, received no training in the mental and graphic manipulation of geometric tracery. Even our vocabulary to talk about symmetry operations must be borrowed from the natural sciences like crystallography and mathematics, ... not dredged out of art theory.” (Roe 2004: 239-40.)

Before beginning an analysis of the textile patterns represented on the korai of the Athenian acropolis, it will be necessary to explain in greater detail how the process of symmetry analysis works. For my explanation I rely on Dorothy Washburn’s and Donald Crowe’s Symmetries of Culture, published in 1988. There are two reasons for doing so. It is not my intention to offer a critique of the various systems of symmetry analysis developed over the years. This has been carried out by others more qualified than I in the mathematics required to prove each argument. Washburn and Crowe provide a comprehensive summary of earlier works on the topic, as well as an extensive literature review in their first chapter. For the purposes of my argument, I accept their version because its approach is of a more applied nature, being geared to anthropological and archaeological uses, rather than those of
mathematics or chemistry.¹

Secondly, having encountered *Symmetries of Culture* first in my research, and having found it to be clearly explained and intelligible, I decided to use this system in a “dry run” on the korai patterns. The results of the experiment proved to be so interesting that I subsequently narrowed my research focus to investigate this aspect of Archaic Greek archaeology and art. Its discrete and manageable size, and the apparent lack of other work in this area, have caused me to believe that not only could this research stand as an excellent thesis topic on its own, but also that others might be interested in reading about my results.

The techniques of symmetry analysis are applied to figures in a plane; that is, figures on a surface which could be flattened into a plane. The decorations on objects such as textiles, tiles, wall frescoes and the flat sides of containers are already in a plane. Decorations

¹Grünbaum & Shephard (1987) complained that Dorothy Washburn’s 1977 “theory of 2-chromatic patterns motivated by designs on the pottery of Southwest American Indian tribes” was not consistent, even though her classification system may be appropriate for its intended use. Their work, and their criticism of her methodology, was based on theoretical, mathematical considerations and on their stated aim of encouraging “geometric appreciation by the use of ‘pure’ geometric reasoning.” (Grünbaum & Shepherd 1987: vii and 464). In 2004 Grünbaum further stated that Washburn’s “attempt” to develop a theory of symmetry was not successful, probably due in part “to the fact that [she] attempted a widely applicable and quite detailed classification without making sufficiently explicit the criteria used.” He then proceeded to work out a theory of symmetry groups in what he termed a “more restricted setting.” (Grünbaum 2004: 19). The resulting article is virtually incomprehensible to the non-mathematician. To my mind, Grünbaum has missed Washburn’s aim completely; that is, to provide a sophisticated tool with which analyses of pattern symmetry within and across cultures may be carried out by social scientists, historians, archaeologists, anthropologists and others. Contributors to Washburn and Crowe’s 2004 compendium of symmetry studies have no difficulties using the system to produce intelligible and clear results. See, for example, Gerdes (2004) and Roe (2004). Even Frame, whose study of the symmetries in Nasca embroidered textiles revealed helical motions not included in the plane motion classes, was able to accept that plane pattern analysis is important, not only for classification and descriptive purposes, but also for recognition of anomalies, which may become important clues for better understanding of ancient - and modern - cultures (Frame 2004: 167-8).
on cylindrical objects, such as cylinder seals or rolling pins, can be conceptually “unrolled” to display their patterns in a plane (see Figures 3.1 and 3.2 below). A nearly cylindrical cone may also be unrolled in similar fashion (see Figure 3.3 and 3.4). Units of a pattern on a sphere may be small enough in relation to the size of the sphere that the pattern may be considered as a plane pattern. Think of a city map printed on a flat sheet of paper, even though the city itself sits on the spherical surface of the earth (see Figure 3.5). Patterns on cones or spheres often form bands around the object. The bands may be unrolled with a
minimum of distortion (see Figure 3.6) (Washburn & Crowe 1988: 43).

**Terminology and Mathematical Principles**

An assumption basic to this discussion is that all figures studied are located in a plane. The figures will be analysed by looking at their *rigid motions*. A rigid motion is a “distance-preserving transformation of the plane onto itself.” In essence, when the object moves to another position, it does not travel in other than a straight line; it does not travel in circles or following curves, it maintains its original shape, and the distance between where it starts and where it finishes never varies, no matter how many times it moves. These rigid motions are also called *motions, symmetries, or isometries* (Washburn & Crowe 1988: 44). Another starting assumption is that every rigid motion in the plane is one of four basic rigid motions:

1. reflection (in a line in the plane)
2. translation
3. rotation (about a point in the plane)
4. glide reflection

The ability to recognize each of these motions in a given pattern is the only tool required for symmetry analysis as outlined by Washburn and Crowe.

**Reflection**

A reflection in line L or across line L is also called *line reflection* or *mirror reflection*.

---

2 In mathematical terms, this means that when any points P, Q of the plane are assigned new positions P’, Q’, the distance PQ between points P and Q is the same - and always the same - as the distance P’Q’ between the transformed points P’ and Q’.

Reflection in line L moves each point P to the point P’, such that P and P’ are equidistant from the line but on opposite sides of it (see Figure 3.7a below). In this example, if these points and lines were drawn on a paper, and if the paper were then folded along line L, then P and P’, Q and Q’, etc. would be found to coincide. Any figure that can be folded in half in this way, so that one half coincides exactly with the other, admits a reflection, and the fold line is the mirror or axis of reflection. The isometry taking each point of the plane into its mirror image in line L is called reflection in line L. Points on the axis of reflection do not move - they are fixed (Washburn & Crowe 1988: 46).

![Figure 3.7a. Points P, Q, R reflect across line L to points P', Q', R'.](image)

An axis of reflection in a band or strip pattern must lie along the axis of the band, or perpendicular to that axis. There is only one “horizontal” axis of reflection for bands, but there may be many “vertical” lines of reflection. A band pattern is thus considered to be one-dimensional because there is only one horizontal axis of reflection (see Figures 3.7b-e below).
For two-dimensional patterns, the pattern units can occur in both horizontal and
vertical directions, producing more than one mirror line. When two mirror lines intersect, there is rotation of the pattern units about the point of intersection. The angle of rotation is twice the angle of intersection of the two lines. For example, in Figure 3.8 below, the mirror lines meet at right angles ($90^\circ$). There is thus a *half-turn*, or a rotation of $180^\circ$, about their point of intersection. In Figure 3.9 the mirror lines meet at $60^\circ$ angles. The rotation about the point of intersection is $120^\circ$.

**Figure 3.8.** Perpendicular reflection lines. Tomb carving, Han dynasty, Kiating, Szechuan.

**Figure 3.9.** Reflection lines intersecting at $60^\circ$. Japanese design.

**Translation**

A *displacement* or *shift* of a pattern unit by a distance $d$ along a line $L$ (or along any lines parallel to $L$) is called a *translation*; i.e., the pattern moves a specified distance along a specified line. The translation can also be defined by a vector $\mathbf{v} \rightarrow$, having length $d$ and direction parallel to $L$. In Figure 3.10 below, the pattern of triangles admits (allows) translation but no other isometries, or motions. The smallest translation takes triangle A to

---

*The mathematical naming convention for a vector usually involves a letter (any letter is acceptable, but usually a $v$) followed by a small horizontal arrow. In Figure 3.10 it is designated as $v \rightarrow$, while in Figure 3.11, it is designated as $w \rightarrow$. 

---

35
triangle B, and triangle B to triangle C, etc., along, or parallel to, line L. Another way to show this minimal translation is with the vector $v\rightarrow$. In Figure 3.11 below, a minimal translation vector is $w\rightarrow$.

![Figure 3.10. Translation by vector $v\rightarrow$.](image)

![Figure 3.11. Ceramic design, San Ildefonso Pueblo, New Mexico.](image)

A pattern admitting a translation by a vector $v\rightarrow$ also admits translations by $2v\rightarrow$, $3v\rightarrow$, etc., or translation in the opposite direction; that is, $-2v\rightarrow$, $-3v\rightarrow$, etc. In other words, if the pattern moves a specified distance along a straight line, it can also move twice or three times the specified distance and in either direction along the straight line. In Figure 3.10 above, moving each triangle three steps to the right will produce a translation by $3v\rightarrow$. Moving each triangle two steps to the left produces a translation of $-2v\rightarrow$. There are no fixed points in a translation. Every point moves the same distance (Washburn & Crowe 1988: 48).

**Rotation**

A rotation has a *centre*, an *angle of rotation* and a *sense*, or direction, of rotation
(clockwise or counterclockwise). Counterclockwise is generally admitted to be the positive sense; i.e., it is a mathematical convention that a counterclockwise turn of, for example, 90° is represented by “90°” or “+90°”, while a clockwise turn of 90° is represented by “-90°”.

The centre of rotation is the only fixed point in the rotation. Finite, or bounded, figures admit only of rotation, in addition to reflection. In Figure 3.12, the design formed by the two hooks A and B is finite and its symmetry is a twofold rotation of 180°. Figure 3.13 is a finite design, capable of a 180° (twofold) rotation. Figure 3.14 does not have rotational symmetry because it has no centre of rotation (Washburn & Crowe 1988: 48-49).

**Figure 3.12.** Twofold (180°) rotation, finite design.

**Figure 3.13.** Ceramic design, Cochiti Pueblo, New Mexico.

**Figure 3.14.** Leaf-shaped element, cotton print block, India.
If the hooks of Figure 3.12 are repeated by translation, they then form a band pattern (see Figure 3.15a below). If a band pattern formed by such a translation admits one rotation, it can also admit an infinite number of rotations, since each translation moves any centre of rotation to a new centre of rotation. Figure 3.15b shows the same symmetries using triangles. Note that the pattern also admits twofold (180°) rotations about points like P and Q. Note also that a rotation about P or Q by any angle other than 180°, or some multiple of 180°, would bend the strip away from its original position. The band of triangles or hooks would thus not match its original position. Figure 3.15c gives an example of the same band pattern with twofold rotation, from a piece of ceramic ware.

![Figure 3.15a](image1.png) **Figure 3.15a.** Twofold rotation, one-dimensional design.

![Figure 3.15b](image2.png) **Figure 3.15b.** Twofold rotation around points P and Q.

![Figure 3.15c](image3.png) **Figure 3.15c.** Ceramic design, San Ildefonso Pueblo, New Mexico.
Glide Reflection

A glide reflection is a translation (or glide) followed by a reflection in a line parallel to the direction of the translation. The reflection can take place first, followed by the glide. The result is the same. Figure 3.16a simplifies the illustration of glide reflection using triangles. Figure 3.16b gives the intermediate position, after the translation but before the reflection. Figure 3.16c indicates reflection in the dashed line $L$, where the original pattern has moved, yet still coincides with itself. Figure 3.16d illustrates another ceramic design where translation and glide reflection are the only symmetries (Washburn & Crowe 1988: 50).

Figure 3.16a. Original position in a glide reflection.

Figure 3.16b. Intermediate position in a glide reflection.

Figure 3.16c. Completed glide reflection.
Designs, Repeated Patterns and Dimensions

For the purposes of my argument I will define more precisely what is meant by design, pattern and dimension. The term figure has a more general application to drawings, paintings, sets of points, etc. in a plane. The term design applies to those figures that have some kind of symmetry. A circle is an example of a design because it has both rotation and reflection symmetry. The term pattern, or repeated pattern, applies to those designs having translation symmetry. Thus a circle or a rosette is not a pattern because, while it has reflection or rotation symmetry, it does not have translation symmetry. A pattern having translation symmetry extends conceptually to infinity, as in band patterns or wallpaper patterns. Figure 3.14 above is a “figure”, but not a “design” or “pattern” because it has no symmetry. Figure 3.13 above shows a “design” that is not a “pattern” because it does not have translation symmetry, even though it has rotation symmetry. Figure 3.15c above is a “pattern” because it has translation symmetry to its left and right, which can be extended conceptually to infinity in both directions (Washburn & Crowe 1988: 52).

If a design does not admit any translations, such as the circle or rosette above, it is called a finite design. If a design admits translations in only one direction (and its opposite),
it is called a *band, strip, frieze* or *one-dimensional pattern*. If a plane figure admits translations in two or more directions it is a *two-dimensional pattern*. Both one- and two-dimensional patterns are infinite; that is, if they admit a translation by distance $d$, they also admit translations by distances $2d, 3d$, etc. to infinity. One- and two-dimensional designs on a textile or jar are not literally infinite, in that their patterns end at the edge of the cloth or by encircling the outside of the pot. Nevertheless, it is usually clear that there are enough repetitions of the unit that forms the base of the design or pattern to indicate how it could be extended to fill an infinite band or a whole plane (Washburn & Crowe 1988: 52-3).

This leads to the rules of “minimal repetition,” which will allow us to decide whether a figure is a repeated pattern. As noted above, there must be a basic unit or “motif,” the repetition of which, by certain isometries, will generate the pattern. A one-dimensional pattern (translation in only one direction and its opposite) must contain the original basic unit and at least one copy of it by translation. A two-dimensional pattern must contain the original basic unit, at least one copy by translation and a copy of these by translation in a second direction. In other words, there must be at least two rows, each row at least two units in length (Washburn & Crowe 1988: 53). To sum up, symmetry classification is not concerned with the shape of a pattern unit, but rather with the motions that move a pattern around a point or along an axis. These motions describe the combination and arrangement of units to form a pattern, rather than the units themselves (Washburn & Crowe 1988: 55).
Notations for One-Colour Designs and Patterns

Finite Designs

We learned above that finite design can admit only reflection and/or rotational symmetry, but not translation or glide reflection. These designs fall into two categories, $cn$ and $dn$, where $n$ is some integer. Designs of type $cn$ have $n$-fold rotational symmetry but no reflection symmetry. Figure 3.17 below gives examples.$^6$ Designs of type $dn$ have $n$-fold rotational symmetry and reflection symmetry. Figure 3.18 gives examples.$^8$

\[\begin{array}{cccccc}
\text{c1} & \text{c2} & \text{c3} & \text{c4} & \text{c5} & \text{c6} \\
\end{array}\]

\textbf{Figure 3.17.} Designs of type $cn$ having $n$-fold rotational symmetry but no mirror symmetry.

\[\begin{array}{cccccc}
\text{d1} & \text{d2} & \text{d3} & \text{d4} & \text{d5} & \text{d6} \\
\end{array}\]

\textbf{Figure 3.18.} Designs of type $dn$ having reflection symmetry as well as $n$-fold rotational symmetry.

Notation for One-Colour, One-Dimensional Patterns

There are seven one-colour, one-dimensional patterns, each described by a four-symbol notation of the form $pxyz$, where $x$, $y$ and $z$ describe vertical reflections, horizontal

---

$^5$c stands for “cyclic”.

$^6$c1 has no symmetry (neither rotation nor reflection).

$^7$d stands for “dihedral.”

$^8$d1 has only bilateral reflection symmetry.
reflections or glide reflections, and half-turns, respectively.\(^9\)

- if there is a vertical reflection, \(x\) is \(m\) (for “mirror”); otherwise \(x\) is \(I\);
- if there is a horizontal reflection, \(y\) is \(m\); if there is a glide reflection but no horizontal reflection, \(y\) is \(a\); otherwise \(y\) is \(I\);
- if there is a half-turn, \(z\) is \(2\); otherwise \(z\) is \(I\).

The seven one-colour, one-dimensional patterns and their notations are illustrated in Figure 3.19a-g below (Washburn & Crowe 1988: 57-8).

---

\(^9\)There is also an abbreviated two-symbol notation developed by Senechal for one-colour, one-dimensional patterns. For further exploration, see Senechal (1975).
An explanation of the features of patterns on which the notation is based is not required in order to use the notation to identify patterns. Those who are interested may consult the discussion in Schattschneider (1978).

Notation for One-Colour, Two-Dimensional Patterns

The notation for the seventeen one-colour, two-dimensional patterns is based on that developed for the use of crystallographers in the *International Tables for X-Ray Crystallography*, Vol. 1 (Henry & Lonsdale 1952: 58-721). The full crystallographic notation consists of four symbols that identify a *primitive cell* that is associated with every pattern in two dimensions, its highest order of rotation and its symmetry axes in two directions.

---

10 An explanation of the features of patterns on which the notation is based is not required in order to use the notation to identify patterns. Those who are interested may consult the discussion in Schattschneider (1978).
A lattice of points is associated with every two-dimensional pattern. These points are obtained by taking any point of the pattern and all points obtained from it by applying translations of the pattern. Consider a parallelogram whose vertices\(^{11}\) are lattice points, but which contains no other lattice points inside it or on its edges. A translation of its pattern will completely cover the plane with copies of the parallelogram that do not overlap except at the edges. This type of parallelogram is termed a \textit{primitive cell} for the pattern. The convention for notation purposes is that a certain primitive cell is chosen for each pattern. It has rotations of the highest order at its vertices, and its left side is termed the \textit{x-axis}. There are five types of primitive cell: parallelogram, rectangular, rhombic, square and hexagonal.\(^{12}\) See Figure 3.20a-e for a graphic representation of these five primitive cells.

\begin{figure}[h]
\centering
\includegraphics[width=0.8\textwidth]{Figures/Figure_3.20.png}
\caption{Figure 3.20a. Parallelogram. Figure 3.20b. Rectangle.}
\end{figure}

\begin{small}

\(^{12}\)The cell in a hexagonal lattice is a rhombus consisting of two equilateral triangles. There are thus six sides but two of them are butted up against each other inside the figure (Washburn & Crowe 1988: 60).
\end{small}
To this point, the discussion of the four motions of symmetry in a plane have been applied to one-colour patterns. Movements in such patterns result in exact superimposition of a design or pattern on itself. If the unit is drawn in black and white, black will fall on black, and white on white. The colours are referred to as “black” and “white” even though they may be other colours such as green, blue, etc. There are, however, two categories of two-colour patterns. The first consists of patterns in which the entire plane (or an entire strip, or an entire finite region) is completely covered with two colours. This category is a *two-colour pattern*, a *two-colour design for finite designs*, a *mosaic* or a *tiling*. There must be some rigid motion of the plane in which the colours everywhere in the plane are interchanged. A checkerboard is a typical two-colour, two-dimensional example when extended on all sides to infinity.

![Figure 3.20c. Rhombus.](image)

![Figure 3.20d. Square.](image)

![Figure 3.20e. Hexagon (see note 12 above).](image)

**Colour Symmetry**

To this point, the discussion of the four motions of symmetry in a plane have been applied to one-colour patterns. Movements in such patterns result in exact superimposition of a design or pattern on itself. If the unit is drawn in black and white, black will fall on black, and white on white. The colours are referred to as “black” and “white” even though they may be other colours such as green, blue, etc. There are, however, two categories of two-colour patterns. The first consists of patterns in which the entire plane (or an entire strip, or an entire finite region) is completely covered with two colours. This category is a *two-colour pattern*, a *two-colour design for finite designs*, a *mosaic* or a *tiling*. There must be some rigid motion of the plane in which the colours everywhere in the plane are interchanged. A checkerboard is a typical two-colour, two-dimensional example when extended on all sides to infinity.

In Figure 3.21 below there is a quarter-turn (90°) about any corner point A where four squares meet. This rotation interchanges the black squares and the white. There is also a half-turn (180°) about the midpoint B of an edge of any small square. The 180° rotation also interchanges black and white squares. A third motion - this time a reflection in any line C, which contains the edge of one of the squares - will also interchange the colours. These rigid motions in which the colours are interchanged everywhere are consistent with colour. Rigid motions that move each colour onto the same colour are also consistent with colour.\(^{13}\) Thus there are two types of motion consistent with colour: those that preserve colours and those that interchange or reverse colours (Washburn & Crowe 1988: 64).

\[\text{Figure 3.21. Colour reversals around centres A and B, and across line C.}\]

\[\text{Figure 3.22. A half-turn interchanges white and black. Rug border, 16th century Persia.}\]

The second category of two-colour pattern occurs when two colours cover part of the plane, part of a strip or part of a finite region (the design itself), while the remaining part

\(^{13}\text{Grüenbaum & Shephard (1987) use the term compatible with colour.}\)
is either not coloured or is coloured with one or more different colours (the *background*). Sometimes one of the two colours of the pattern itself will also appear in the background. Figure 3.22 above gives an example in which the narrow band of white that separates the white and black floral patterns has no black equivalent. It is therefore considered to be background. The characteristic that makes these two-colour patterns is that the part of the pattern that is coloured with one colour is exactly the same as the part of the pattern that is coloured the other colour. As with the two-colour mosaic-type of pattern discussed above, there must be some rigid motion of the plane that interchanges the two colours (Washburn & Crowe 1988: 64-5).

The idea of background is important only when two or more colours are part of a pattern of the second category. In this case, if the two colours do not cover the plane, areas of background may have the same shape as the pattern motifs. In Figure 3.23 below the black, white and grey shapes are identical, but in the overall pattern there are twice as many white shapes as there are shapes of black or grey. There is no rigid motion that will move all the white shapes to coincide with all the grey shapes or all the black shapes. But there is a rigid motion that will effect an exact interchange between black and grey; for example, a 180° turn about a point of contact between a grey shape and a black one. This rigid motion also moves white to white. Thus the two colours of this two-colour pattern are grey and black, while white is the background colour (Washburn & Crowe 1988: 65).
Notation for Two-Colour Finite Designs

As explained above, finite design are either of type $cn$ (where $n$ is an integer, if no reflections are present, and where the smallest rotation is $360^\circ/n$), or of type $dn$ (where there are $n$ reflections). A $cn$ design (see Figure 3.17) can be coloured with two colours in only one way while still remaining consistent with all its isometries. Colour must be alternated around the design and $n$ must be an even number. This is denoted by $cn'$ (see Figure 3.24).

For finite designs $dn$, which admit reflections (see Figure 3.18), there are two possibilities. If $n$ is an odd number, there is only one way of colouring $dn$ with two colours and which is
consistent with a reflection. This is denoted $d'n$. Since all rotations preserve colours and all reflections reverse colours, if $n$ is an even number there are two different colourings of $dn$ that are possible. The first possibility is the same as that occurring when $n$ is odd: all rotations preserve colours and all reflections reverse colours. This is denoted $d'n$, just as for odd $n$. The second possibility when $n$ is even is different. Half of the reflections preserve colours and half reverse them; rotations of one $n$th of a $360^\circ$ turn reverse colours. This is denoted by $dn'$. Examples are shown in Figure 3.25 below (Washburn & Crowe 1988: 68).

![Figure 3.25. $d'n$, $dn'$](image)

**Notation for Two-Colour, One-Dimensional Patterns**

The notation for the seventeen two-colour, one-dimensional patterns is a modification of the $pxyz$ notation of the seven one-colour bands (see above). A prime (‘) is added to one of the four symbols if its corresponding motion reverses colours:

- the first symbol is $p$ if no translation reverses the two colours; it is $p'$ if some translation reverses colours;

---

14 The notation is that developed by Belov (1964).
• $x$, the second symbol, is $l$ if there is no vertical reflection consistent with colour; it is $m$ if there is at least one vertical reflection that preserves colour; and it is $m'$ if all vertical reflections reverse colours;

• $y$, the third symbol, is $l$ if there is no horizontal reflection or glide reflection consistent with colour; it is $m$ if there is a horizontal reflection that preserves colour; it is $m'$ if there is a horizontal reflection that reverses colours (except for the two instances in which the first symbol is $p'$ and where $y$ is $a$); it is $a'$ if there is no horizontal reflection, but the shortest glide reflection reverses colours; it is $a$ otherwise;

• $z$, the fourth symbol, is $l$ if there is no half-turn consistent with colour; it is $2$ if there are half-turns preserving colour; it is $2'$ if all half-turns reverse colours.

Figures 3.26a-q below give the seventeen two-colour bands as detailed by Woods (1935) and labelled with their Belov notation (Washburn & Crowe 1988: 69).
Figure 3.26c. $p'112$.

Figure 3.26d. $pm'1$.

Figure 3.26e. $p'1m1$.

Figure 3.26f. $p'1a1$.

Figure 3.26g. $pl'1$.

Figure 3.26h. $pm'11$.

Figure 3.26i. $p'm11$.

Figure 3.26j. $pm'm2$.

Figure 3.26k. $pm'm2'$.

Figure 3.26l. $pmm'2'$.
Notation for Two-Colour, Two-Dimensional Patterns

There is no universally accepted international notation for the forty-six two-colour, two-dimensional patterns, although the notation developed by Belov and Tarkhova (1964) is widely recognized. Other notations have been developed and correlated with that of Belov and Tarkhova by Grünbaum and Shephard (1987), Loeb (1971) and Lockwood and Macmillan (1978). The one-colour notation is based on the primitive cell of one of the five lattices underlying all two-dimensional patterns (see above). The two-colour notation is also based on the primitive cell, but in a more complicated fashion.
In general, a prime (') attached to a symbol indicates a colour change when the associated operation is performed. So, for example, if colour changes with a translation, the \( p \) of the notation changes to \( p' \) when the translation is along the edge of the primitive cell or to \( p'_e \) when the translation is along a diagonal of the primitive cell. When all mirror reflections in one direction reverse colours, the associated \( m \) becomes \( m' \). When all glide reflections in one direction reverse colours, the corresponding \( g \) becomes \( g' \) (Washburn & Crowe 1988: 70).

A \( pmg \) pattern is shown in Figure 3.27a below, accompanied by the five separate ways of colouring it with two colours that are consistent with all its motions (Figure 3.27b-f). Solid lines indicate typical mirror lines. Dashed lines indicate typical glide lines.

![Figure 3.27a. pmg.](image)

![Figure 3.27b. pm'g.](image)

![Figure 3.27c. pmg'.](image)
In Figure 3.27b, all mirror reflections reverse colours. No translation reverses colours and no glide reflection reverses colours. According to the rules above, the notation is established by putting a prime on the $m$, but not on the $p$ or $g$: $pm'g$. In Figure 3.27c, no translation or mirror reflection reverses colours, but all glide reflections reverse colours. The notation is thus $pmg'$. In Figure 3.27d, a translation along the edge of a primitive cell reverses colours, so that $p$ becomes $p'$. No mirror reflection reverses colours and not all of the glide reflections reverse colours. The notation is $p'mg$. In Figure 3.27e, no translation reverses colours. However, all mirror reflections and all glide reflections reverse colours. The notation is $pm'g$. In Figure 3.27f, the nomenclature rules do not work. There is a translation along the edge of a primitive cell that reverses colours, so that $p$ becomes $p'$. There are only glide reflections in a vertical direction, but no mirror reflections. And there are horizontal glide reflections. The name of the patterns is $p'_{\parallel}gg$ and the symbols do not indicate the underlying $pmg$ structure. This example indicates that the crystallographic rules determining notation and which are based on references to underlying primitive cells or lattices are perhaps too complicated to be useful for practical applications. For this reason I will use the flow
charts developed by Washburn and Crowe as a set of rules that determine the notation for patterns in terms of their rigid motion only (Washburn & Crowe 1988: 70-2).

**Introduction to the Flow Charts**

Washburn and Crowe developed flow charts for analysis of both one- and two-dimensional patterns. Both sets of flow charts ask questions about the presence and colouring of individual rigid motions.\(^{15}\) It is important to remember the concepts *preservation of colour*, *reversal of colour* and *consistency with colour* when using these flow charts. *Preserves colour* means that when any motion occurs, the same colouring is maintained; that is, all white units superpose on white units, and all black on black. *Reverses colour* means that colour changes everywhere when a motion occurs; that is, all white units superpose on black units, and all black on white. *Consistent with colour* means the presence of colour preserves or colour reversals from a point of rotation or a line of reflection in the pattern. Rotation or reflection of the entire pattern about that point or across that line must take place (Washburn & Crowe 1988: 81).

An example of a half-turn rotation \(180^\circ\) consistent with colour occurs in Figure 3.28, the notation for which is \(p’112\).\(^{16}\) Rotation of the pattern about point W ensures that

\(^{15}\)The order in which these queries are posed does not indicate a hierarchy of importance among the motions of translation, rotation, glide reflection and mirror reflection. Additionally, in some cases, not all symmetries present in a pattern are mentioned in the flow charts.

\(^{16}\)p’ because there is a translation that reverses colour; \(l\) because there is no vertical reflection consistent with colour; \(l\) because there is no horizontal reflection or glide reflection; and \(2\) because there are half-turns that preserve colour.
all white triangles will fall on black triangles, and *vice versa*. In other words, all colours are reversed in the half-turn about point W and the motion of twofold rotation about W is termed *consistent with colour*. Rotation of the pattern about point Y results in the superposition of white triangles on white, and black on black. All colours are preserved about point Y. This motion of twofold rotation is also termed consistent with colour (Washburn & Crowe 1988: 81-2).

![Diagram](image.png)

**Figure 3.29.** *p’112*.

Figure 3.29 below gives an example of motions not consistent with colour. This example has the same underlying structure as Figure 3.19f above; that is, *pma2* for the one-colour structural layout. However, in Figure 3.29, rotation about point W places white triangle C on black triangle B (a colour reversal), but white triangle D on white triangle C (a colour preservation). This rotation and all others are inconsistent with colour. Vertical reflections in lines like X are also inconsistent with colour. In this case there are only two motions consistent with colour: reflections in lines like Z, and translations like those that superpose triangle B on triangle F, and triangle A on triangle E. These motions preserve colour. This analysis of the motions particular to the pattern in Figure 3.29 gives us the notation *pm11* for the pattern: *p* because no translation reverses colour; *m* because there is one vertical reflection that preserves colour (along lines like Z); *l* because there is no
horizontal reflection or glide reflection; and \( I \) because there is no half-turn consistent with colour (Washburn & Crowe 1988: 82).

Flow Chart for the Twenty-Four One-Colour and Two-Colour One-Dimensional Patterns

The flow chart asks two types of questions. The first is whether there exists in the pattern any cases of the motion in question, which may be one of several in the pattern. The other type of question asks about the colour-preserving or colour-reversing properties of the motion(s) identified in the previous type of question. It will be helpful to use the chart to obtain the notations for several practice examples before applying it to the korai patterns. The practice patterns are taken from bands on historic pottery from San Ildefonso Pueblo in New Mexico, as redrawn by A. Pertschuk for Washburn and Crowe (1988) (Washburn & Crowe 1988:82-6).

Figure 3.30a below represents a ceramic design and Figure 3.30b represents its schematic representation, with centres of rotation and lines of reflection indicated. The first question on the flow chart (Appendix 1, Table 1.1) asks, “Is there a half-turn consistent with
colour?” A “yes” answer would mean that a) there is a twofold rotation that preserves all colours; or b) there is a twofold rotation that reverses all colours. In this example, a half-turn about centre R moves white sections A and C onto black sections D and B, and so on, so that black and white are interchanged throughout the whole pattern. The answer to the first question is “yes” - there is a half-turn consistent with colour because the twofold rotation about R reverses colour. A half-turn about centre S also reverses colour throughout the pattern; in fact, there are colour reversals about all such centres along line L (Washburn & Crowe 1988: 86).

![Figure 3.30a. pm'm2'. Ceramic design, San Ildefonso Pueblo, New Mexico.](image)

![Figure 3.30b. Schematic drawing of Figure 3.30a.](image)

The next question on the “yes” side of the flow chart asks, “Is there a horizontal reflection consistent with colour?” This is the same type of question as the first because it asks about the existence of a particular motion. But we must determine in this case whether there is consistency of colour across the horizontal reflection line, L in the diagramme. The
answer will be “yes” again, because white sections I, A and E reflect onto white sections K, C and G. Similarly black sections J, B and F reflect onto black sections M, D and H. The horizontal reflection preserves colour and thus it is consistent with colour (Washburn & Crowe 1988: 86).

The next question asks, “Does the horizontal reflection preserve colours?” We have already answered it in the paragraph above, so the answer on the flow chart is “yes.” The next question, “Is there a half-turn that preserves colours?”, has also been answered above, in that we discovered that all half-turns reverse the colours. The answer is “no.” At this point we reach the end of that particular branch of the flow chart. We find that the symmetry class of the pattern is revealed as $pm'm2'$ (Washburn & Crowe 1988: 86-7).

![Figure 3.31. $p'lm1$. Ceramic design, San Ildefonso Pueblo, New Mexico.](image)

Figure 3.31 above is our next example. Beginning at the top of the flow chart, we answer the first question with “no” because a half-turn about any point on the pattern’s horizontal axis will result in neither colour preservation nor colour reversal. For the next question on the existence of a vertical reflection consistent with colour, the answer is “no” again. However, there is a “yes” answer to the question, “Is there a horizontal reflection consistent with colour?” All sections above the line are the same colour as their
corresponding sections below the line, so colour is preserved. Question four asks, “Does the horizontal reflection preserve colours?” We have already discovered that it does, so the answer is again “yes.” This leads us to the last question, “Is there a translation that reverses colours?” The final answer is “yes” because the shortest translation moves the grey units to the black units, and \textit{vice versa}, through the whole design. The notation for this pattern is thus $p'1m1$ (Washburn & Crowe 1988: 92).

Below is a set of examples of the one- and two-colour classes of one-dimensional patterns. They are taken from real life objects, and illustrate the variety of cultures that have produced artifacts in which these symmetry classes can be found.

\textbf{Figure 3.32.} Tlingit twined basket, $p111$. Each diagonally arranged line of three attached triangles moves along the horizontal axis. No other symmetry is present along this axis, although the rectangular units above and below have a different symmetry, $pmm2$.

\textbf{Figure 3.33.} East African basket, $p1m'1$. The two horizontal band design fields are subdivided into rectangular panels. The pattern and the space remaining between the band lines alternate colour according to $p1m'1$. 
Figure 3.34. Enamelled brick pattern, Palace of Darius at Susa, 6th century BCE, *pm11*.

Figure 3.35. Wood cup, Kuba, Zaire, *p112*.

Figure 3.36. Section of a Sioux calumet pipe stem, *pmm2*.

Figure 3.37. Painted mat, Majuro, Marshall Islands, *pm'm2*.

Figure 3.38. Japanese travelling chopstick case, *pma2*.

Figure 3.39. Carved wood border, Hallingdal, Norway, *p1a1*. 
Flow Charts for the One-Colour and Two-Colour Two-Dimensional Patterns

Like the flow chart for one-dimensional patterns, both flow charts for two-dimensional patterns begin with a question about rotation (see Appendix 1, Tables 1.2-7). As we have seen, one-dimensional patterns admit either a half-turn (180°) or no rotation at all. Two-dimensional patterns admit five rotations: 60°, 90°, 120°, 180° and no rotation at all. Both flow charts thus have five branches, one for each rotation. A pattern that admits more than one type of rotation must be classified according to its smallest rotation. An example of this would be a \( p6m \) pattern (Figure 3.41 above), which admits rotations of 60°, 120° and 180°. It will appear only in the 60° branch of the flow chart for either one-colour or two-colour patterns, rather than the 120° or 180° branches.

There are two areas where some clarification of terms is necessary for classification
of two-dimensional patterns admitting $90^\circ$ rotations. In the $90^\circ$ branch (Table 1.5) there is a question about the existence of a twofold centre that preserves colours. If we refer back to Figure 3.21, we can see that squares in a checkerboard have two centres of rotation. One exists at the point where four squares meet, the other at the midpoint of the edge of a square. The former is a fourfold centre that admits rotations of $90^\circ$ and $180^\circ$. The latter admits only half-turns and no other rotations, and is thus a true twofold centre. The second area where clarity is essential lies in the same table, with the questions about closest fourfold centres, or fourfold centres and closest twofold centres. When using this branch of the flow chart it will be necessary to look at those centres which really are closest to each other. Otherwise there is a risk of getting a wrong answer (Washburn & Crowe 1988: 127).

Here is a simple example of a two-dimensional pattern analysis applied to the pattern on the main section of a loincloth from Peru, c1200-1500 (Figure 3.42). The pattern consists of light-coloured rodent shapes arranged in horizontal and vertical registers on a dark background.

![Figure 3.42. Chancay-style Peruvian loincloth, 1200-1500 CE, p1.](image)
The first question asks, “What is the smallest rotation consistent with colour?” The answer is “none,” and we are required to move to Table 1.3. The next two questions ask, “Is there a reflection consistent with colour?” and “Is there a glide reflection that preserves colours?” The answer to both is “no” because there are no mirror or glide reflections in the pattern. The fourth question in this sub-branch of the flow chart asks, “Is there a translation that reverses colours?” We answer “no” because all the shapes in the pattern are the same colour. We answer “no” to the last question, “Is there a glide reflection that reverses colours?” as well, because we have already seen that glide reflections are absent from the pattern. This gives us the symmetry class of $p1$ (Washburn & Crowe 1988: 129-30).

Figure 3.43 below gives us the pattern detail on the sleeve of an early twentieth century woman’s dress from the former Yugoslavia. Our analysis follows the same pathway as that of the previous example until we encounter the question, “Is there a translation that reverses colours?” In this case, the hooks alternate colours along both horizontal and vertical axes, so any translation that moves each horizontal row to the one above or below it will reverse all colours. The same phenomenon occurs when each vertical row is moved to either the right or left. We arrive at the classification $p'_{1}s1$ (Washburn & Crowe 1988: 132).

The flow charts, then, are the tools by means of which I will conduct a symmetry analysis of the one- and two-dimensional patterns that decorated the korai recovered from the Perserschutt rubble and fill near the Erechtheion on the Athenian Akropolis. I will examine these patterns for rigid motions in a plane, and for the colouring of these motions. I will look
at the information obtained for non-random statistical groupings that may indicate temporal and spatial clusters of significance. These may ultimately provide an understanding of what patterns predominated within the archaic Athenian city cultural context and of how they functioned within that context.

Figure 3.43. Detail of the sleeve of a woman’s dress, early 20th century, Kicevija, the former Yugoslavia, p’/l.
Chapter 4 - The Korai

In this section I will outline the facts and suppositions that relate to the korai whose painted designs are the subject of this study. The korai under consideration are, in date order as established by Karakasi: Athens, Acropolis Museum 593, 678, 679, 680, 682, 681, 670, 671, 673, 683, 675, 674, 594 and 685. I picked these particular korai because in 1907 Lermann published colour drawings of their ornamentation, taken from the excavators’ original diagrammes and notes as well as first-hand observation of the patterns still visible at that time. There are other korai with records of coloured patterns; however, there are no easily accessible records of these.

Because I am using symmetry analysis to find out what characteristics are associated with patterns and designs of the korai of Athens, I have also included Athens, National Museum 4889, the so-called “Phrasikleia” kore from Myrrhinous/Merenda, as well as its reconstruction, in order to determine whether the underlying patterns from the designs of a kore found outside Athens itself, but still within Attica, would be the same as, or different from, those emanating from the patterns and designs of the fifteen Acropolis korai.

____________________

1 abbreviated Acr. 593, etc.

2 abbreviated NM4889. The Phrasikleia and a kouros were found by Euthymios Mastrokostas in May 1972 in the necropolis of Myrrhinous, present-day Merenda, 30 km southeast of Athens (Karakasi 1997: 509). Karakasi reconstructed the colours and designs with the help of illustrator Herbert Meinhold (Karakasi 1997: 517). NM4889 is one of the oldest of the sequence of korai I am analysing.
Acr. 593 (The Pomegranate Kore)
c560-550 BCE; Pentelic marble; 0.995 m (lacks head and feet)
Payne & Young (1950), Plates 12.3; Richter (1968), Figure 150; Karakasi (2003), Plates 129 and 238

The height, 0.995 m as noted above, includes only the existing portions of the statue.\(^3\) The right arm holds a wreath-like object at the statue’s side, while the left arm is bent at the elbow. The left hand holds what is usually considered to be a pomegranate in front of the body.\(^4\) This characteristic - a statue holding an object in one of its hands - is frequently seen in a number of those korai thought to be of earlier date (Stieber 2004: 173). The kore wears a *chiton*,\(^5\) visible because of the buttons on the right forearm near the elbow, a *peplos* with *apotygma* (overfold) and tasselled belt, and an *epiblema* that hangs down the back and right side, as well as in folds over the left arm.\(^6\) The hair lies over the shoulders and down the back in a “quadrangular mass with a tress on either side”

\(^3\)I rely primarily on Richter (1968) for the descriptive information.

\(^4\)Stieber considers it possible that Acr. 593 holds an *aryballos* in her left hand (Stieber 2004: 160).

\(^5\)See Chapter 1.

\(^6\)Roccos proposes that Acr. 593 wears the long mantle associated iconographically with the *kanephoros* (Roccos 1995: 647). Referring to the place of Acr. 593 in “a pattern of visual retrospection on the Acropolis,” Stieber terms this kore a “votive statue” (Stieber 2004: 38). There has been - and still is - an energetic discussion about the purpose(s) of korai. Stieber’s chapter on the historiography of the korai (see her Chapter 1) covers the extensive literature. However, since this is not the focus of my study, I mention it in passing only.
The pendants on the necklace may also be aryballoi by analogy with similar features on two small terracotta Boeotian figurines (Schneider 1975: 63-64 and Stieber 2004: 160).

See Blümel (1969) for a discussion of the tools used by ancient Greek stone carvers.

There is a misprint on p. 40: the dates for Acr. 593 have been given as 480-470 BCE. There was no evidence of an errata slip in the volume I consulted.

(Richter 1968: 40). Three similar locks of hair lie over the front of each of the figure’s shoulders. The kore wears a necklace and, possibly, earrings. Richter noted that there is evidence for the sculptor’s use of the claw chisel on the back of the figure. Langlotz dated Acr. 593 somewhat earlier than other later analysts, to 580 BCE, although he suggested that the type still existed between 560 and 550 (Langlotz 1939: 44). Payne and Young situated Acr. 593 in the 550-530 BCE range on the basis of its attributes and stylistic features, in this case (1) the head and arm, which hold the pomegranate/aryballos against the body instead of out toward the viewer (Payne & Young 1950: 18); (2) the figure’s Doric peplos, which changed c550 BCE to the Ionic chiton; and (3) what Payne and Young term “the distinct lack of conviction about any but the frontal aspect,” where the body is “a single form tentatively modified” (Payne & Young 1950: 19). Richter placed this kore in her Group II stylistic category (c600-570 BCE), with a date of c580-570 BCE (Richter 1968: 40). Boardman also based his date on stylistic considerations, particularly the treatment of drapery and to a lesser extent the rendering of anatomical features (Boardman 1978: 73 and illus. 109). Martini agreed with Boardman’s date, suggesting that the buttons on the chiton sleeves and the folds of the mantle’s hem were indebted to earlier Naxian and Samian korai from the Acropolis (Martini 1990: 149-151 and illus. 45). Karakasi, who relied mainly on Langlotz’s dates for the Acropolis korai, in this case accepted Boardman’s date of 560-550 BCE (Karakasi 2003: 127).
Traces of painted ornamentation remain on Acr. 593 even today. Karakasi’s colour plate 238 clearly shows extant traces of red pigment on the pomegranate/aryballos and on the various garments. There is evidence of the degree of fading that has taken place in the almost seventy years between the publication of Payne and Young’s plate 12.3, Richter’s figure 150 and Karakasi’s plate 129a. Each is a black-and-white photograph of the frontal view of the statue. The 1936 photo reveals significant details of the rosettes that decorate the front panel of the peplos and the meanders running vertically along the length of the folds of the epiblema that hang over the left arm and horizontally around the hem of the peplos. Richter’s photographs were taken by Alison Frantz before 1968. In Richter’s Figure 150 it is possible to see that the remaining pigments in the rosettes and meanders have faded in the intervening fifty or so years. Frantz quite obviously used an artificial light source, indirectly visible because of the sharp shadows cast by the light’s oblique focus to the left and front of the statue’s left side. It may be possible that some of the differences noted between Payne and Young’s photograph and Frantz’s are due, at least in part, to this difference in sources of

---

10Nearly all of Payne and Young’s photographs were taken in daylight with a half-plate camera and an 8½ inch lens. They did not concern themselves with treatment of colour for technical reasons (Payne & Young 1950: ix-x). The original negatives were destroyed during World War II by a bomb that levelled the building in which they were stored. The photographic blocks survived, however, and were used in the second edition (Payne & Young 1950: viii).

11Richter reproduced Lermann’s colour plates in black-and-white because she had “found Lermann’s plates reasonably accurate, conforming for the most part to the descriptions by Dickens (1912) and Langlotz (1939). Since, however, the colours have in the course of time not only faded but changed (blue, for instance, becoming green), it seemed best to reproduce the decorations in black and white, thereby avoiding an erroneous impression of their original appearance” (Richter 1968: viii). See also below for Stieber’s comments.
light. Karakasi and her photographer Kostas Kontos produced her plate 129a using an artificial light source placed to the right of the statue, again deduced from the shadows cast by the left arm and the locks of hair on the left shoulder. Very little of each rosette and only small portions of the meanders remain.

Karakasi’s colour plates also include reproductions of Lermann’s 1907 large hand-coloured plates of the ornaments still visible on the Acropolis korai twenty years after their excavation. Stieber noted that “Lermann’s reconstructions of the korai’s polychromies are not foolproof and are occasionally questioned” but that “his observations and detailed verbal descriptions (Lermann 1907: 83-96) provide a useful supplement” (Stieber 2004: 73, n. 93). Since I am concerned not with the polychromies per se but with the patterns depicted on the garments of the korai by the use of polychromy, Lermann’s potential unreliability as a witness to the colours will not be an obstacle.

**Acr. 678**
c530 BCE; Parian marble; 0.97 m
Payne & Young (1950), Plates 34.1-3 and 35.3-4; Richter (1968), Figures 345-348; Karakasi (2003), Plates 137 and 241-243

This kore is complete from head to knees, although both forearms and hands are lacking. The back of the left calf was added at a later date. Folds in the drapery that meet at a point on the side of the upper right thigh indicate that the right arm was lowered and the right hand grasped the dress at that point. The missing left forearm was extended toward the

---

viewer, with the hand holding an object, as Richter suggests (Richter 1968: 71). This kore wears a chiton with a belt (just visible at the apex of the triangular shape formed by the front folds of the overmantle) and buttoned sleeves. Over the chiton she wears a short Ionic himation that is draped from both shoulders, descending in vertical pleated folds at both front and back. \textsuperscript{13} Richter writes regarding the hair that it “falls down at the back in a mass of angular, wavy tresses, with three similar tresses brought to the front on either side. On the crown of the head it is rendered by descending zigzag tresses, and above the forehead by three tiers of wavy ridges. At the back the hair is confined by a fillet ...” (Richter 1968: 72). \textsuperscript{14} Above and below the “beaded

\textsuperscript{13}Ridgway suggests that this type of himation was made in two pieces (Ridgway 1993:131).

\textsuperscript{14}While I have little disagreement with the adjectives and nouns used by various commentators to describe the hair of Archaic korai, I do wonder about their interpretations of what they see. When I look at the hair of the korai, I see that the sculptors have created distinctly different textural areas. For example, the hair over the forehead and the locks that frame the face are usually, although not always, sculpted very differently from the hair on top of the head and the locks that hang down the back. Acr. 678 has three distinct large rows of wavy hair crossing from ear to ear over the forehead. Each row also has three distinct and separate smaller rows carved within its length. The three large/nine small rows are tucked behind each ear and continue as the locks that fall over the front of both left and right shoulders. I believe that this is a representation of hair that is naturally wavy or that has been waved artificially with the aid of the Archaic equivalent of a crimping or curling iron (see also Stieber’s discussion (Stieber 2004: 64)). What Richter terms a “beaded chaplet”, a circlet of round objects joined together in a string, demarcates the boundary between the area of crimped hair and that of the “descending zigzag tresses”. I believe that the circlet marks the edge of a cap or hat that covers the crown of the head, perhaps similar in function to the polos that some korai wear. The zigzag tresses are not hair, but rather fabric, perhaps woven, felted or quilted into a highly textured cap, from which a long flap of the same fabric as the cap itself hangs down, held in place and anchored to the real hair by means of the “fillet.” It may have functioned in fashion similar to the 19th century snood as a means by which the masses of a woman’s hair could be confined in an orderly manner. Many other korai have these features as well, with variations. Sometimes the cap is a hat or polos; sometimes it is smooth or only slightly ridged. Stieber devotes several pages to a general discussion of these possibilities (Stieber 2004: 63-66). Since this is not the focus of the current study, I will not pursue the topic further at this point, except to note that there is some evidence on earlier vases to support this. See Rohner (1993) for a study of how hairstyles can be used as a dating tool to establish workshops, chronology and regional styles. See Acr. 682 for a discussion of the possible use of wigs.
chaplet” or taenia that encircles the crown are several holes for metal ornaments. The sculptor has carved both the lachrymal caruncle and the tragus of the ear, as well as differentiated the lips, which have vertical grooves at the corners. The earlobe is pierced for the addition of a metal earring, and a painted necklace was at one time evident on the front of the statue’s neck (Richter 1968: 72). Acr. 678 is generally considered to have been carved c530 BCE. Payne and Young wrote, “... the very shallow cutting of the folds contributes to the impression that the date of this statue must be before that of almost all the korai with diagonal himation; that is, at latest, not later than about 530 B.C.” (Payne & Young 1950: 22). Richter dates her to “about 535-530 B.C.” on the basis of where the figure stands with respect to its progression in style (naturalistic rendering of draperies and the human body) in her Group V,2 series (Richter 1968: 68). Boardman and Martini date her to 540-530 BCE (Boardman 1978: illus. 118 and Martini 1990: 153). Karakasi dates her to 530 BCE (Karakasi 2003: 161, table 10.1).

**Acr. 679 (The Peplos Kore)**
c535-530 BCE; Parian marble; 1.2 m (including a 2.8 cm plinth) Payne & Young (1950), Plates 29-33; Richter (1968), Figures 349-354; Karakasi (2003), Plates 138-139 and 244-247

---

15There are 24 drill holes above and 7 below the chaplet, probably for a metal wreath (Langlotz 1939: 53). Written testimony in confirmation of such ornaments exists in the poems of Sappho, who often mentions young girls wearing wreaths in their hair to please the gods (Schneider 1975: 12 and n. 61; Sappho, frag. 80D).

16The area of the eye where the ends of the eyelids meet near the nose contains a small, pinkish protrusion, the caruncle.

17The small lobe protruding from the side of the head at the upper base of the earlobe.

18Neither Richter’s Figure 348 nor Karakasi’s Plate 242 shows any trace of paint. Payne & Young’s Plate 34.2 clearly shows at least four spots of colour.
The right arm of this kore hangs by its side and the hand once held an (undetermined) object, as indicated by the hole that was drilled through its clenched fist. The left forearm and hand, which were formed separately, are missing. The left hand probably held an object extended toward the viewer. The mortice into which the forearm’s tenon was fitted, and the holes for the dowel fasteners, are still visible in the truncated end of the left upper arm. The folds of a chiton are visible over the right elbow and below the lower hem of the belted peplos with its apotyagma. The ends of the belt hang down over the front of the skirt. Folds of the peplos can be seen at the left elbow and at the hemline on each side. Remains of the painted designs are still clearly visible on Acr. 679 (see Karakasi’s plates). On each shoulder is a hole for the insertion of the ornamental brooches that fasten the peplos. The kore’s hair is very similar to that of Acr. 678; that is, we see again Richter’s “zigzag tresses” and “wavy ridges,” which I prefer to interpret as crimped hair across the forehead and long locks tucked behind the ears, covered by a fabric cap with a back flap, the hair and cap secured by a fillet or taenia (see n. 14 above). This kore’s cap does not have a “beaded chaplet”; nevertheless there are holes for the insertion of a circular object, again perhaps a

---

19Ridgway and Hurwit believe that if the Peplos Kore had held an arrow, she would have represented the goddess Artemis and that if she had held a spear, she would have represented Athena. See Ridgway (1990) 603-10 and Hurwit (1999) 126. Dickens makes a more general claim that objects carried in the hands of korai can be considered as votive offerings to the deity (Dickens 1912: 32).
wreath. The statue once had a meniskos, the remains of which are still to be seen.\(^{20}\) As with Acr. 678, the lachrymal caruncle is indicated and the eyeballs are exophthalmic (protruding). The tragus of the ear is present in the carving and the lips are differentiated. Both earlobes are pierced for the addition of earrings. Payne and Young date this kore to 540-530 BCE on the basis of a comparison with the head of the Moschophoros and the Rampin head. Richter dates it to 535-530 BCE (Richter 1968: 72) and Boardman agrees (Boardman 1978: illus. 115). Stieber believes that this kore is stylistically more like Late Archaic statuary such as the Kritios Boy (Stieber 2004: 25) and that it may be an “archaizing representation of a statue of a goddess” for funeral purposes, and is contemporary with other korai wearing the later Ionic chiton (Stieber 2004: 168). The Museum of Classical Archaeology at Cambridge University recreated the Peplos Kore (see Figure 4-4 above),\(^{21}\) although Ridgway is critical of the restoration.\(^{22}\)

\(^{20}\)Stieber’s discussion of meniskoi covers arguments ranging from the probability that they once supported attributes indicating divine status to the more practical suggestion that they protected the marble and paint from damage from bird droppings and weather (Stieber 2004: 26-28). Ridgway covers the literature in detail and concludes that the “idea of a meniskos as a bird repellent is an Aristophanic joke with no true counterpart in reality.” The metal attachments on the heads of some korai should be interpreted as “part of elaborate headdresses functioning as attributes and helping in the identification of the figures” (Ridgway 1990: 611-612). I am reminded of the method by which halos were held above some nineteenth-century statues of Christian saints, although the juxtaposition of halos and Archaic Greek statuary is problematic!

\(^{21}\)See [http://www.classics.cam.ac.uk/museum/peplostext.html](http://www.classics.cam.ac.uk/museum/peplostext.html) for a short history of the acquisition and painting of the plaster cast of the Peplos Kore.

\(^{22}\)Ridgway believes that attributes and paint have been erroneously restored on the Cambridge cast but does not go into detail (Ridgway 1993: 159, note 4.20).
Acr. 680

c. 530-520 BCE; Island marble; 1.155 m (lacks feet)
Payne & Young (1950), Plates 54-55; Richter (1968), Figures 389-393; Karakasi (2003), Plates 144-145 and 248-251

This kore’s right forearm is extended toward the viewer and she holds an apple or pomegranate in her right hand. The left arm hangs down at her side and the left hand originally grasped a fold of the skirt. A carved bracelet decorates the left forearm and a painted bracelet decorates the right. The kore wears a belted chiton. Over the chiton she wears a short Ionic himation, which has been draped from the top of the right shoulder to below the left armpit, with a small ruffled edge where the upper border has been folded over itself. The folds of the himation fall in vertical pleats from the upper border, displaying the painted borders and other ornamentation to the viewer. The ends of the pleats are missing on the bottom right side and two holes, wherein were found the remains of iron rivets, indicate where later repairs were effected. Four zigzag locks of hair fall over the front of each shoulder, each lock being subdivided into four smaller locks. This arrangement of locks within larger locks is repeated in the hair lying over the forehead, which zigzags on either side of a central part, Richter’s “two tiers of wavy ridges.” A section of overlapping semicircular folded material covers each temple in front of the ears, a part of the

23The marble is broken between the knuckles and the folded fabric.
Payne & Young term it a “thoroughly inferior work” on the basis of the “harsh” modelling of the face, the “singularly incompetent” right hand and its “very masculine build” (Payne & Young 1950: 33-34).

What Richter and others term a stephane with holes for ornaments curves around the perimeter of the head, encircling the “wavy ridges” of hair on top (Richter 1968: 79). I believe these ridges to be the sculptured equivalent of the woven fabric that forms the crown portion of a cap, and that the stephane is the brim, upturned at the front. The “mass of wavy tresses” at the back of the head is most likely a partial wig or hair extensions fastened to the edge of the cap. The lachrymal caruncle of each exophthalmic eye has been indicated, as has the tragus of each ear. The lips are deeply carved, do not meet at each end of the mouth and are bracketed by vertical grooves. Each earlobe is hidden by a large disk painted with a rosette decoration.

Payne and Young date this kore to the earlier part of the Ripe Archaic; i.e., c530 BCE (Payne & Young 1950: 33). Richter includes Acr. 680 in her Group V,2 middle category (c530-510 BCE) on the basis of its (relative) progression in style; i.e., rendering of features, elaboration of garments, carving of drapery folds, etc. (Richter 1968: 68). Boardman dates her to c520-510 BCE (Boardman 1978: illus 155). Karakasi dates her to 530-520 BCE (Karakasi 2003: 161, table 10.1).

Acr. 682

c525 BCE; Island marble; 1.825 m (including a 2.5 cm plinth)
Payne & Young (1950), Plates 40-42.1 and 43.2; Richter (1968), Figures 362-367; Karakasi (2003), Plates 146-147 and 252-253

The body of this kore was made in two pieces, the joint at the knees being secured

Payne & Young term it a “thoroughly inferior work” on the basis of the “harsh” modelling of the face, the “singularly incompetent” right hand and its “very masculine build” (Payne & Young 1950: 33-34).
with dowels and lead. The lower legs and feet of this kore were found separately and added in 1907. There are plaster restorations of missing pieces. The right arm, now missing, was extended and was joined to the body by means of a mortice and tenon. The left arm lay vertically along the left side of the body and the left hand, also missing, held a fold of the skirt. The neck is considered to be overly long (Richter 1968: 73). Acr. 682 wears a belted chiton over which is draped a short Ionic himation. The belt is visible beneath the himation, which crosses the torso from the top of the right shoulder to below the left armpit. The top of the himation has been folded over, creating a ruffled edge, and the front of the himation is draped so that its pleats create an inverted-V shape that reveals the decorative paryphe 25 swept to the left side by the grasp of the (missing) left hand. The feet are shod in sandals with carved straps and a hole in each foot indicates where a metal sandal ornament or fastener was inserted.26 There is a carved bracelet on the left arm, and a stephane and the remains of a meniskos on the head. Once again there is a row of small holes along the bottom of the stephane for the metal ornamentation that would have adorned the head. From ear to ear across the forehead runs a row of spiral curls, each formed of four locks of hair. The spirals run clockwise from

25The woven band that runs vertically along the front portion of the “skirt” of the chiton.

26Dickens provides an early description of the polychromy of the sandals (Dickens 1912: 234). Stieber notes the “precocious naturalism” of the exposed feet of Acr. 682, as compared to other aspects of the carving (Stieber 2004: 119).
the left ear to the centre of the forehead, and counterclockwise on the other side. Another tier of crimped or zigzag locks lies above the row of spiral curls, each of these also composed of four smaller locks. Above the stephane the skull is covered by Richter’s “radiating ridges” which, on closer inspection appear to be a cap of woven material sewn together in three or four segments, to judge from what look like seams in the areas where the ridges change their orientation. At the back of the head a “solid mass of zigzag tresses” falls from the stephane to below the shoulder blades - again, possibly a fabric flap or snood that covers or contains the natural hair, which appears at the bottom of the flap as twelve short crimped locks.27 Four long ringlets, or spiral tresses, fall from behind each ear over each breast. Holes remain on the chest for the bronze pins that attached the hanging ends of the ringlets.28 The lachrymal caruncle is indicated but the eyeballs, separately inserted, are missing. The lips are differentiated and do not meet at the corners of the mouth, where vertical creases have been carved. The tragus is carved on each ear and each lobe is covered by a disk-shaped earring. Payne and Young term it “by far the most startling, and perhaps also the least pleasing, illustration of the new style,” by which they mean the Ripe Archaic (Payne & Young 1950: 27). Richter calls this “one of the best preserved and most highly finished of the extant korai”

27 Stieber notes that knowledge of Egyptian portraits and statuary could have influenced Archaic Greek hairstyles and their representations in stone. For example, the so-called Louvre Princess wears a wig composed of several textures and lengths of hair (see Figure 4.7 below). The British Museum holds a composite wig of human hair from the New Kingdom period, found at Deir el-Medina (see Figure 4.8 below). Thus the representation of hair on the korai could be explained as an “Egyptianizing” feature (Stieber 2004: 65-66).

28 Some photographs, e.g., Payne & Young’s black-and-whites and three of Karakasi’s four black-and-white photographs, as well as her colour plates, show that portions of the ringlets between the ears and the shoulders are missing. All of Richter’s and one of Karakasi’s black-and-white photographs show that the missing portions have been restored.
Acr. 681 (The Antenor Kore)
c525 BCE; Island marble; 2.155 m (including a 4 cm plinth)
Payne & Young (1950), Plates 51-53 and 124.5; Richter (1968), Figures 336-340; Karakasi (2003), Plates 148-149 and 254-255

Acr. 681 was worked in one piece but reconstructed from numerous fragments and

---

29Boardman says that Acr. 682 “is generally regarded as one of the most strongly ionicizing [korai] ... Moreover, the complexity of the painted decoration on the dress is unrivalled on Acropolis korai” (Boardman 1978: 85).
plaster restorations. The feet and plinth were found before 1886, the greater part of the statue and the inscribed base in 1886 and the fragment between feet and torso after 1886.\(^3\) The left leg is slightly advanced and the left hand is lowered toward the left thigh in order to grasp a fold of the skirt. There is a carved bracelet on the left forearm. The missing right forearm probably extended an offering forward. The kore wears a chiton with no indication of a belt. A short Ionic himation falls in many vertical pleats from a folded-over band that passes from the top of the right shoulder to underneath the left arm. Like Acr. 680, the folded-over section forms a little ruffle along the band. Four extremely artificial-looking “locks” fall from beneath the edge of the stephane over the front of each shoulder. A rectangular mass, divided horizontally and vertically into squares, falls over the back from the edge of the stephane. Three rows of spiral curls cross from temple to temple over the forehead. The stephane itself and the crown of the head are smooth, again leading me to believe that the whole constitutes a cap to which may have been attached not only the back flap but also the front “locks.” A series of holes indicates that ornaments were attached to the stephane/cap at one time. The eye sockets are hollowed out and contained separately-fashioned eyeballs of glass set in a metal casing, one of which still

---

\(^3\)Payne and Young, following Dickens (1912), insist that the plinth and base have no connection to one another (Payne & Young 1950: 31, n.2). Later commentators do not share this view.
exists. The central portion of the face has been damaged, but enough remains to indicate that each end of the mouth, where the lips would normally meet, terminated in a vertical groove. The tragus of each ear has been sculpted, and the earlobes are pierced for earring attachments. The toes are missing from the feet. The inscription on the base reads:

\[\text{Νέαρχος ἀνέθεκε[ν ἴο κέραμε]}
\text{ὑς ἔργον ἁπαρχὲν τάθ[εναι]}
\text{Ἄντενορ ἐπ[οίεσεν ἦ]}
\text{ὁ Ἐὔμαρος τ[ὸ ἄγαλμα].}\]

This is only one of two Acropolis dedicatory inscriptions that can be linked with certainty to korai, the other being Acr. 686/609, the Euthydikos kore, not treated in this study (Karakasi 2003: 133). Payne and Young date Acr. 681 to 530 BCE (Payne & Young 1950: 33). Richter agrees with Payne & Young (Richter 1968: 70). Boardman dates her to 530-520 BCE (Boardman 1978: illus. 141). Martini dates her to 530-515 BCE (Martini 1990: 162). Karakasi dates her to 525 BCE, following Langlotz (Karakasi 2003: 161, table 10.1).

**Acr. 670**
c520 BCE; Island marble (except for the arms, which are Pentelic marble);\(^{34}\) 1.15 m (the feet are missing)
Payne & Young (1950), Plates 65-67; Richter (1968), Figures 377-380; Karakasi (2003),

\(^{31}\)Boardman says that they are rock crystals set in lead (Boardman 1978: illus. 141). See also Dickens 1912: 229.

\(^{32}\)IG I\(^1\). 628. “Nearkhos [the potter] dedicated it from the first fruits to Athena. Antenor, son of Eumaros, made the statue.”

\(^{33}\)For a full discussion of the inscriptions see Raubitschek (1949), and Jeffery (1990) for Archaic inscriptions more generally. See Holloway (1992) for a discussion of the Acropolis korai as dedications celebrating financial prosperity and success by the nonaristocratic commercial class of Athens, including artisans, that arose after Solon’s early sixth century reforms. See Richter (1968) and Schneider (1975) for interpretations that assume that korai were aristocratic dedications.

\(^{34}\)Karakasi (2003) 125, n. 141.
Plates 152-154 and 257-258

The right forearm of Acr. 670, made separately, is extended forward (the hand is missing) and is held in place by a dowel. The left forearm crosses in front of the body from hip to groin and the left hand grasps the paryphe. She wears a chiton that has been pulled over its (hidden) belt to form a *kolpos*, or pouch.\(^{35}\) The sleeves of the chiton are fastened with buttons. The kore has a carved bracelet on her left arm.\(^{36}\) A stéphane on which the painted decorative band still exists encircles the head and has a series of holes around its upper edge for the insertion of ornaments.

Richter says that the hair above the stéphane “is rendered in concentric, broad rings” (Richter 1968: 76) but again, I believe it to be a cap that covers the natural hair.\(^{37}\) The “mass of zigzag tresses” falls from the bottom of the stéphane to mid-back. The points of the zigzags that lie to the right of the centre line in this “mass” face to the right and those lying to the left face left, leading me again to conclude that this is an artificial construction, such as a flap of material that is intended to cover the hair. Four locks

\(^{35}\)It may also be a *chitoniskos*, a short blouse- or sweater-like garment worn over a skirt (Stieber 2004: 70). Ridgway (1993) 132-133 and n. 24 notes that there is no word in ancient Greek sources that can be associated with the idea of a skirt.

\(^{36}\)Karakasi, who was permitted to examine the korai closely, notes that this bracelet is carved in the form of a snake (Karakasi 2003: 119).

\(^{37}\)This cap is similar to the *sakkos*, a cap or snood worn by married and mature women over their bound-up hair. Ridgway believes that it is evidence of a helmet in Acr. 681 who must therefore be identified as Athena (Ridgway 1990: 602-603). See Jenkins (1985) for a discussion of sprang hairnets.
fall from behind each ear over each shoulder. Across the middle of the forehead and just in
front of each ear lie sections of short, crimped locks, in between which are larger sections of
“horizontal row[s] of waves.”38 These have the appearance of a decorative band of fabric
attached to the lower border of the front portion of the stephane. It covers the natural
crimped hair except in the areas indicated above. The eyeballs have been included in the
carving of the eyes, along with the lachrymal caruncle and the canthus. The tragus of the ear
has been indicated and the earlobe supports a decorated disk-shaped earring. The remains
of a meniskos can be seen on top of the head. Payne and Young date Acr. 670 to c520 BCE
(Payne & Young 1950: 35). Richter dates her to the last quarter of the sixth century BCE
(Richter 1968: 77) and Boardman to c520-510 BCE (Boardman 1978: illus153). Karakasi
dates her to 520 BCE (Karakasi 2003: 161, table 10.1).

Acr. 671
520 BCE; Pentelic marble; 1.67 m (without feet)
Payne & Young (1950), Plates 42.2-3-43.1; Richter (1968), Figures 341-344; Karakasi(2003), Plates 159-161 and 258c-259

The left leg of Acr. 671 is advanced. The right forearm extended forward toward the
viewer and the left forearm was at rest vertically along the left thigh. Both forearms are
missing today but were originally carved as separate pieces fastened on with dowels. There
is no evidence that the left hand grasped a fold of the skirt or paryphe. Acr. 671 wears a
chiton that is pulled over its belt to form a kolpos. An epiblema is draped over both shoulders
and arms, and hangs in heavy folds over the back and sides of the chiton. The paryphe falls

38Payne and Young’s Plates 67.1-4 indicate the detail of this section most clearly.
vertically from beneath the kolpos to what remains of the hem of the chiton’s skirt. A curved stephane, similar in shape to that of Acr. 670, sits on the head. Above the stephane there is a cap, similar to the cap on the head of Acr. 670, except that its undulating ridges pass over the skull from one side to the other in parallel lines. The “mass of hair” that falls down the back of the neck from the lower border of the stephane is covered by the wraps of the epiblema that are draped around the shoulders. Because there was no clear back view of this kore at my disposal, I was unable to examine closely the arrangement of hair/fabric carved by the sculptor.\textsuperscript{39} It may be, however, that the epiblema serves the same social purpose as the flap or snood mentioned in connection with the korai discussed previously; i.e., it covers and contains the hair in a modest fashion suitable to a young and unmarried Athenian girl from a family of more than adequate means. Three crimped locks fall from behind the ears over the shoulders and breasts. A section of at least ten locks of crimped, wavy hair emanates from a centre part above the forehead, ending at mid-temple on either side. Between the temples and the ears are two concentric semicircles of crimped hair or fabric, very similar to those found on Acr. 680. The eyeballs protrude and both lachrymal caruncle and canthus\textsuperscript{40} have been carved. The lips are deeply carved, meeting in a groove at either end of the mouth. The tragus is indicated in both ears, the lobes of which are pierced for earrings. The remains of a meniskos is found

\textsuperscript{39}Richter’s Figure 341 is blurry and badly developed.

\textsuperscript{40}Either corner of the eye where upper and lower eyelids meet.
on the head. Payne and Young do not discuss Acr. 671. Richter dates her to c530-525 BCE (Richter 1968: 71); Boardman to c530 BCE (Boardman 1978: illus. 111). Karakasi dates her to 520 BCE (Karakasi 2003: 161, table 10.1).

**Acr. 673**

520-510 BCE; Pentelic marble;\(^{41}\) 0.93 m (the legs from below the knee and feet are missing)\(^{42}\) Payne & Young (1950), Plates 62-64; Richter (1968), Figures 368-372; Karakasi (2003), Plates 164-165 and 260-261

The left leg is advanced and the right arm (now missing) was extended, perhaps with its hand holding a votive offering. The right arm was carved separately and was joined to the body by means of a mortice and tenon. The left arm (also missing) hung down along the left side and the left hand grasped a fold of the skirt. Acr. 673 wears a chiton (no belt is visible), over which is draped a short Ionic himation. The himation lies over both shoulders, instead of over only one as in previous examples, and is pulled up over its top band, creating a series of rounded, oblique folds emanating from the centre front of the band. The upper edge of the chiton is visible over this band. The himation hangs down in vertical pleats on both front and back of the statue. The coloured paryphe emanates from beneath the centre front of the himation and is swept to the left by the pull of the left hand on

---

\(^{41}\)Langlotz says it is Pentelic marble, while Dickens says it is Parian marble. Richter mentions both (Richter 1968: 75).

\(^{42}\)Richter says the height is 0.91 m
the fabric. On top of the head, and surrounded by an ornamented stephane, is a cap consisting of concentric ridges of fabric (Richter’s “concentric waves”), similar to that of Acr. 670. From ear to ear and over the forehead there are what Richter terms “vertical zigzag ridges, ending in spirals,” which may be the sculptor’s rendering of hair. The mass that hangs down the back, from under the stephane to below the shoulder blades, consists of ten vertical sections of zigzag locks, five on either side of a central divide (see also Acr. 670). Four crimped locks fall from below and behind each ear over the shoulders and breasts. The three inner locks on either side had separately carved ends, and for which the holes for attaching them remain. A 13 cm long meniskos, bent to the right, protrudes from the top of the head. The lachrymal caruncle has been indicated, as has the curve of the upper eyelid, and the eyeballs were carved as part of the face. The lips are differentiated, with a groove at each end of the mouth. The tragus of the ear has been carved and the earlobes are covered by disk-shaped earrings. Acr. 673 is one of five korai that showed traces of charring.\footnote{Karakasi (2003) 130 and n. 213. Lindenlauf examined the korai for damage and determined that many had been deliberately destroyed or mutilated. See Lindenlauf (1997), esp. p. 46 ff., 87, 88, 91.}

Payne and Young date her to c520 BCE (Payne & Young 1950: 35); Richter to the last quarter of the sixth century (Richter 1968: 76). Boardman dates her to 520-510 BCE (Boardman 1978: illus 152), as does Karakasi (Karakasi 2003: 161, table 10.1), following Langlotz.

\textbf{Acr. 683}
510 BCE; Pentelic marble, 0.805 m (above its plinth)\footnote{This kore has sometimes been considered as a representation of a dwarf as a result of her short stature and proportions. She may be another example of Egyptianizing in Archaic Greek art. See Stieber (2004) 80-1 and Brouskari (1971) 81.}
Payne & Young (1950), Plate 59.1-3; Richter (1968), Figures 381-384; Karakasi (2003),
Plates 167 and 264

Acr. 683, unlike most of the korai discussed above, has her right foot advanced. The left forearm is extended toward the viewer with the elbow at the figure’s side. The left hand holds a bird, the upper part of which, fashioned separately, is missing although the hole for its attachment mechanism is still visible. The right arm is lowered and the right hand grasps a section of skirt. She wears a chiton pulled over its belt to form a kolpos. A paryphe runs down the centre front of the skirt, from beneath the kolpos to the top of the feet. This kore is unusual in that she wears shoes, the red pigment of which remains on the marble. Acr. 683 has a stephane on her head, which holds in place a mass of “zigzag ridges”, both across the top of the head and falling to the middle of the back. From ear to ear and across the forehead there is a thick, puffy roll that looks somewhat like the brim of a knitted hat. At the front, this is covered with short, vertical, crimped “locks” that curve in a fan-shaped pattern as they approach the ears. The lachrymal caruncle has been indicated, as has the tragus of the ear. The earlobes are covered by spiral earrings and the lips are differentiated. There is no meniskos. Payne and Young do not assign a precise date to Acr. 683, other than to include her in their Ripe Archaic category, 530-500 BCE (Payne & Young 1950: 34). Richter dates

---

*Pollux (7.93 = PCG III, 2, 761; cf. Arist. Lys. 64) noted that Aristotle used the term akatia (ἀκάτια / ‘little boats’) in reference to a type of shoe worn by women. See Stieber’s discussion of this aspect of Acr. 683 in the context of borrowings from Egyptian art (Stieber 2004: 176-7). Harrison noted that she was called Khoriatopoula (Χωριατοπούλα), the Country Girl, by Greeks of the 1950s (Harrison 1955: 170).*
her to the last quarter of the sixth century (Richter 1968: 78) and Boardman to c510 BCE (Boardman 1978: illus 184). Karakasi dates her to 510 BCE (Karakasi 2003: 161, table 10.1). Acr. 683 may have stood originally on a pillar inscribed with a dedication to Athena by Lysias and Euarkhis:

\[ \text{Λυσίας ἀνέθεκεν Ἁθηναίαι}
\]

\[ \text{ἀπαρχέν. Εὐάρχης ἀνέθεκεν}
\]

\[ \text{δεκάτεν Ἀθηναίαι}\]

**Acr. 675**

510-500 BCE; Parian marble; 0.55 m (the legs from below the knees and the feet are missing) Payne & Young (1950), Plates 49.3-5-50.1-3; Richter (1968), Figures 394-397; Karakasi (2003), Plates 174-175 and 266-268

The left leg of this kore is advanced and the left arm and hand (now missing) were lowered in order to pull the paryphe of the chiton to the left side. The right forearm (also missing) was worked separately and attached via mortice and tenon. Acr. 675 wears a short Ionic himation over a chiton. The himation is draped over the right shoulder and under the left armpit. It forms a series of folds where it is pulled up over its top band. The himation hangs down in pleats, in such a way that its decorated lower border is exposed to best advantage. The back of Acr. 675 is smooth, no detail having been carved into it except for the back edge of the himation, although the shapes of the body (legs, buttocks, shoulders, etc.) are clearly evident. Encircling the head is a stephane with a series of holes for the addition of ornaments along the front of its upper rim. There is no meniskos. The crown of the head and the mass hanging down the back are smooth and undifferentiated. At each side

---

of the mass are two vertical, slightly curved sections divided horizontally into “chunks”, Richter’s “abbreviated tresses.” Three locks divided horizontally into similar chunks fall from behind and below the ear over the shoulders to below the breasts. The forehead and temples are covered with two different sections of what may or may not be hair. The lower section consists of three smaller strands that curve across the forehead from ear to ear in a series of S-shaped waves. The upper section consists of short, crimped locks that originate under the stephane. Acr. 675 has a painted necklace around her neck. Holes somewhat lower down on her chest suggest that there was also a second metallic necklace at one time. The lachrymal caruncle is indicated, the lips are differentiated and the tragus of the ear has been carved. The earlobes are covered by large, disk-shaped earrings, each of which retains traces of its painted rosette. Payne and Young place Acr. 675 in the earliest of their three groupings of Ripe Archaic korai (Payne & Young 1950: 31). Richter dates her to the last quarter of the sixth century BCE (Richter 1968: 80). Boardman dates her to c520-510 BCE (Boardman 1978: illus. 177) and Karakasi dates her to 510-500 BCE (Karakasi 2003: 161, table 10.1).

**Acr. 674**
500 BCE; Parian marble; 0.92 m (the legs below the knees and the feet are missing)
Payne & Young (1950), Plates 75-78; Richter (1968), Figures 411-416 and 434; Karakasi (2003), Plates 178-179 and 269-272

The head and neck of Acr. 674 were formed separately and attached with a tenon.
There are rectangular holes on the shoulders that when filled with molten lead may have helped to hold the head in place. The missing right arm and the drapery in front of the right leg were also carved separately. The right forearm was extended toward the viewer; the left forearm (also missing) was lowered along the body, while the left hand would have pulled the paryphe to the left side. Acr. 674 wears a short Ionic himation over a chiton. The himation is draped over the body from right shoulder to left armpit. It is pulled over its top band to form a series of small ruffles over the chest, while across the back it forms a series of five parallel ridges. The folds of the himation hang in vertical pleats in such a way that the ornamental border is displayed on both the front and the back of the statue. Acr. 674 wears a stephane, which crosses the crown of her head from behind one ear to behind the other but does not continue around the back of the head. The top of the head is covered in Richter’s “delicate wavy ridges” that look very similar to the ridged areas that emanate from the buttons of the chiton along the upper arms and those that descend from the neck band of the chiton to beneath the band of the himation. This would be another indication that part of the headgear could be made of cloth. The “mass of wavy tresses” that descends from beneath the edge of the cap to the middle of the back consists of twelve vertical sections, six on each side of a central dividing line. Each vertical section is divided horizontally into “chunks”, the vertical edges of each “chunk” forming a continuous zigzag from cap brim to mid-back. Six locks, three on each side, fall from behind and below the ears over the shoulders and breasts. Each large lock
is crimped and contains three, four or five smaller crimped strands. The temples and forehead are covered with concentric, overlapping, crimped strands that may or may not represent hair. There is no part visible, on the one hand, yet each overlapping crimped strand is made up of two such smaller strands. The remains of a meniskos sit on top of the head. The sculptor of Acr. 674 has modelled clavicles, lachrymal caruncle and the curve of the upper eyelid over the eyeball. The lips meet at the corners and the transition between lips and cheeks is denoted by a slight, rather than deep, groove. The tragus of the ear is evident and the earlobes are covered by a disk-shaped earring decorated with a rosette. Payne and Young include Acr. 674 in their third group of Ripe Archaic korai, placing her just “before the year 500” (Payne & Young 1950: 34). Richter dates her to c500 BCE (Richter 1968: 82) and Boardman to c500 BCE (Boardman 1978: illus. 158). Karakasi also dates her to 500 BCE (Karakasi 2003: 161, table 10.1).

**Acr. 594**
500 BCE; Island marble; 1.23 m (the head and feet are missing)

---

47 Karakasi notes that many of the korai with meniskoi and which date down to 510 BCE were discovered in the vicinity of the Erechtheion. Those few korai with meniskoi and which date between 510 and 490 all came from the vicinity of the Parthenon (Karakasi 2003: 118). Acr. 685 is another such.

48 The clavicle is the collarbone, the long bone that makes up part of the shoulder girdle.

49 Payne and Young base the date of Acr. 674 on the sculptor’s interest in “what is essentially feminine not merely in the surface-forms, but also in the structure of the female body. Hence the long and slender neck, the sloping shoulders, their narrowness in proportion to the width of head and hips. ... The frame of 674 is ... the creation of a mind sensitive to something more subtle than the inexhaustible vitality which burns in the figures of an earlier period.” (Payne & Young 1950: 34). The analysis relies on perceived developments in such details as “the effect of harmony obtained by the uniform close-set folds [of the himation] which cover both shoulders and breasts.” It is such subjective interpretations that I am attempting to avoid with the methodological approach of symmetry analysis.
The left leg of Acr. 594 is advanced and the missing right forearm was extended toward the viewer. The left forearm and hand (also missing) were lowered in order to pull the paryphe to the side of the left thigh. Acr. 594 wears a short Ionic himation over a chiton. The himation is draped over the right shoulder to below the left armpit and a small portion has been pulled over its top band to form a ruffled edge between the breasts. An epiblema hangs in folds from both shoulders down the back and along the sides. The remains of ten crimped locks can be seen on the back, on top of the epiblema. Eight crimped locks, four on each side of the neck, fall down across the shoulders and breasts. The ends of these locks were carved separately and attached via the extant holes on the chest. Richter makes note of the modelling of the body through the drapery, particularly of the left knee. Payne and Young include Acr. 594 in the earliest of their three groups of Ripe Archaic korai, dating to 520-510 BCE50 (Payne & Young 1950: 29-30). Richter dates her to c510-500 BCE (Richter 1968: 80), while Boardman (1978) does not discuss this kore. Karakasi dates her to 500 BCE (Karakasi 2003: 161, table 10.1).

Acr. 685
500-490 BCE; Parian marble; 1.225 m (the feet are missing)
Payne & Young (1950), Plates 72-74; Richter (1968), Figures 573-577; Karakasi (2003), Plates 189-191 and 274-275

---

50Payne and Young assign this date because of Acr. 594’s “exceptional elaboration of surface, and clear connections with Ionic (Cycladic) sculpture, and which are certainly to be placed well before the end of the sixth century...” See also note 49 above.
The left leg of Acr. 685 is advanced and both forearms were extended forward, although the right forearm is now missing, as is the left hand. The forearms were carved separately and attached with dowels. The tail of a bird is carved into the left forearm near the wrist, from which we can deduce that she must have held a bird in her missing left hand. A bracelet has also been carved onto the left forearm. Acr. 685 wears a short Ionic himation over her chiton. The himation is draped over the right shoulder and under the left armpit. It has been pulled over its top band, forming pleats that can be seen curving around the left side from front to back. She wears a stephane on her head, above which is a concentrically ridged cap, from the centre point of which ridges emanate from a centre point at the back of the head. There is a hole for a meniskos on the top of the head. A crimped mass falls from beneath the stephane to the middle of the back. The zigzags of the crimps face in opposite directions from a vertical dividing line but, unlike those of earlier korai, the dividing line is not clearly marked and it does not lie along the central vertical axis of the mass. Eight tresses fall over the shoulders and breasts, four from behind each ear. Each lock is curled into running-S shapes along its length, rather than being crimped, and each consists of two smaller locks. A series of crimped ridges, some twice the width of others, emanates from a centre part to cover the forehead and temples. There are holes in this hair mass on each temple for the

---

51Stieber notes that the skirt portion of the chiton appears to be made of a heavier fabric, “more drapable than linen,” in contrast to the fine, crinkled bodice. She believes that this may signal different fabrics or weaves used in the garments (Stieber 2004: 70-71).
attachment of a decorative element, perhaps a wreath. The lachrymal caruncle of each eye is indicated, as is the tragus of each ear. Like Acr. 674, the lips meet at the corners, bracketed only by shallow impressions. A large disk-shaped earring decorated with a rosette covers each earlobe. Payne and Young include Acr. 685 in their third (and latest) grouping of Ripe Archaic korai (Payne & Young 1950: 35). Richter dates her to the early fifth century BCE and includes her in the Group V Euthydikos Kore Group (Richter 1968: 101). Boardman does not discuss this kore. Karakasi dates her to 500-490 BCE (Karakasi 2003: 161, table 10.1).

**NM 4889 (Phrasikleia)**
550-540 BCE; Parian marble; 1.76 m
Karakasi (2003), Plates 90, 114-115 and 235-237

NM 4889 stands with her right leg very slightly advanced. Her right arm lies vertically along her right side and her right hand grasps a handful of her skirt fabric at thigh height. Her left arm is bent at the elbow and the forearm crosses her chest. The left hand holds the bud of a lotus flower. Each wrist is encircled by a carved bracelet. This kore wears a belted peplos decorated with a patterned panel that runs from neck to hem. The pattern on the panel is an incised and painted meander between borders. A similar patterned panel runs around the neck, down the sleeves and around the sleeve cuffs. What Stieber terms a “tongue-patterned border” (Stieber 2004: 145) runs around the garment and is draped over the arches and insteps of the feet in such a way as to reveal the detailing of the toes and

---

52 Stieber devotes an entire chapter to this kore, in order to “test the theory of the semiotics of appearance and a symptom of realism in Archaic Greek art.” See Stieber (2004) 141-178.
sandals. The belt of the peplos is incised with a pattern of running spirals between dog-toothed borders. The belt buckle, complete with tongue and clasp, is also indicated. Several kinds of swastikas and rosettes are incised into the remainder of the peplos. NM 4889 wears a necklace decorated with what may be fruit and lotus buds, or lotus buds and aryballoi (see Acr. 593 above). Her earrings also take the shape of lotus buds, each of which hangs from a ring that pierces the earlobe. She wears a stephane of alternating lotus buds and flowers. The hair at the back of the head is visible as a series of narrow, rounded ridges that are visible between the brim of the stephane and a meander-decorated ribbon tied from ear to ear around the hair at the back of the head. From the bottom of the ribbon twenty “locks” hang down the back to below the shoulders, each lock consisting of a sequence of not-quite-spherical globules and ending in an upside down cone. Four similar globular “locks” hang down from behind each ear to shoulder height. At the shoulder, three of the locks continue down to fall over the breast, while one lock falls along the shoulder to the middle of the upper arm. The globules are smaller in this portion of each lock, as are the conical tips. The hair over the forehead emanates from a central part (visible below the crown) toward and behind each ear in a series of S-curves that connect with the back hair, visible between the crown and the ribbon. The lips are deeply carved and do

---

53 This lotus bud stephane (although it is more like a crown) is paralleled closely only by the painted version on the Berlin kore. See Karakasi (2003), Plate 234.
not meet at the corners of the mouth. The eyeballs and irises are prominent and incised. The lachrymal caruncle is indicated, as is the curvature of the upper eyelid. The tragus of the ear is evident. NM 4889 is one of a very few korai to have retained her nose. She is also associated with an inscription that points to her function as a funerary monument. The inscribed base, known since 1729, was removed from a wall of the Church of the Panaghia in Merenda in 1968. The main face of the base contains the following inscription:

\[
\text{σέμα Φρασικλείας. / κόρε κεκλέσομαι / αἰεί,}
\]
\[
\text{ἀντὶ γάμο / παρὰ θεο ῃ ν τούτο / λαχο ἕ σύ ὑ νομά.}
\]

The left lateral side of the base was inscribed by the sculptor:

\[\text{'Αριστίων Ηάρ[ός μ'] ἐπ[ίς]σε}\]

Boardman tentatively dates her to 550 BCE (Boardman 1978: 73 and illus. 108a). Karakasi dates her to 550-540 BCE (Karakasi 2003: 161, table 10.1).

**A Note About Chronology**

It is customary to date Greek statues in terms of progression toward the natural in the

---

54Only two extant and substantially preserved Attic korai can be connected with tombs: the Berlin kore and Phrasileia (Stieber 2004: 142).

55IG I³. 1261.

56“Marker of Phrasileia. I shall always be called maiden, the gods allotting me this title in place of marriage.”

57“Aristion of Paros made me.”

58Definitive publication of NM 4889 had not appeared by the time Boardman’s book was published. For a sampling of the proposed dates for this kore, see Stieber (2004), 142, n.7, and Stieber (2004), 142, 147 and 168 for a discussion of the factors taken into account when various dates were proposed. Stieber herself dates the Phrasileia to c520 BCE, “roughly contemporary with the kouros, Kroisos” and in line with those theories that posit the Alkmeonid family’s exile from Athens to as late as 514 BCE (Stieber 2004: 142).
rendering of drapery, body parts, and so on. As Stieber noted, this is a sensible premise, in view of the fact that the chronology established by Gisela Richter for the korai has remained more or less stable since she first introduced it in 1968 (Stieber 2004:3). Quibbles about dating usually result from differences of opinion regarding a sculptor’s ability to “render volume and three-dimensionality and to break through the limitations imposed by the shape and dimensions of the block [of stone]” (Stieber 2004: 2-3). I have chosen to accept Karakasi’s dates for the korai as a place from which to begin a new methodology for analysing the korai. For this study I believe it is enough to begin with the assumption that Karakasi’s dates are correct, or at least acceptable. If I were to continue the investigation in more detail and in other directions, I would certainly take into account variations in the dates for individual korai, producing variations in the statistical analysis with each variation in date in order to discover whether the differences in assigning dates resulted in significant changes in the overall interpretation.
Chapter 5 - The Patterns

Acr. 593

Pattern 1: a battlement with inset open squares between two straight lines, along the edges of the epiblema, in red on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn (180°) consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection along line B consistent with colour; (iv) there is no half-turn that reverses colours; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \( pma2 \).

---

59I have used the colour plates from Lermann (1907) as the basis for my analysis. The figures in the text have been scanned, resized and adjusted using Adobe Photoshop and Microsoft Paint.

60In Lermann’s colour plates, the buff background represents the marble on which the design or pattern was incised and/or painted.
**Pattern 2:** a complex meander with squares, at the bottom of the skirt, in red on a buff background

![Pattern 2](image)

**Figure 5.2.** *p112*

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is *p112*.

**Design 1:** a four-petal rosette, from a non-border area of the peplos, in red on a buff background. This design has four-fold rotational symmetry about point A, as well as four distinct mirror reflection lines. This is a *d4* finite design.

![Design 1](image)

**Figure 5.3.** *d4*
**Design 2:** an incised five-pointed star with an inset five-petal rosette, from a non-border area of the peplos. The rosette is painted in red on a buff background.

This design has five-fold rotational symmetry about point A, as well as five distinct mirror image reflection lines. This is a $d5$ finite design.

**Acr. 678**

**Pattern 1:** a border of nested diamonds between two lines, forming the paryphe and running vertically down the middle front of the skirt of the chiton, in blue on a buff background.
- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is a horizontal reflection consistent with colour along line B; (iii) the horizontal reflection along line B preserves colours; (iv) the half-turn about point A preserves colour; (v) there is no vertical reflection that reverses colour: the underlying pattern of symmetry is *pmm2*.

**Acru. 679**

**Pattern 1:** a band of backward S-shapes forming counterclockwise running spirals, interspersed with single petals; forming the upper part of the border of the apotygma, in red and green on a buff background.

![Pattern 1](image)

**Figure 5.6. p112**

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn about point A that preserves colours; (v) there is no translation that reverses colours: the underlying pattern of symmetry is *p112*.
**Pattern 2:** a band of stylized acanthus leaf and lotus blossom motifs, forming the lower part of the border of the apotygma, in red and green on a buff background.

![Pattern 2](image)

**Figure 5.7. pm11**

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is *pm11*.

**Acr. 680**

**Pattern 1:** a band of S-shapes forming red clockwise running spirals, interspersed with single blue petals, set between a blue band on the upper edge and a blue band and a red band on the lower edge; forming the lower section of the multi-banded border of the himation, in blue and red on a buff background.
If the lower red band were absent, there would be a half-turn consistent with colour.\footnote{If the lower red band were absent, there would be a half-turn consistent with colour.} (i) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \( p\bar{1}1 \).

**Pattern 2:** a band consisting of intertwined meanders interspersed with squares nested within larger squares; forming the paryphe and running vertically along the middle front of the skirt of the chiton, in blue and red on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A;
(ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p112$.

**Pattern 3:** a battlement with inset squares bordered by a straight band, running around the neck of the chiton, in blue and red on a buff background.

![Pattern 3](image)

**Acr. 680. Pattern 3.**

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserve colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pm11$.

**Pattern 4:** a border of dots between two sets of coloured bands, running horizontally along the folded-over edge of the himation, blue and red on a buff background.
It is necessary to visualize that this pattern is laid out flat, as if the fabric had been placed on a smooth flat surface like a tabletop.

- using Appendix 1, Table 1.1,\(^{62}\) (i) there is a half-turn consistent with colour about point A; (ii) there is a horizontal reflection consistent with colour along line B; (iii) the horizontal reflection preserves colours; (iv) there is a half-turn that preserves colours about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \(pmm2\).

**Pattern 5:** a double battlement with pendant inset squares forming a border along the edges of the chiton and over the left shoulder and arm to form the left sleeve; in red and blue on a buff background.

\(^{62}\)It is necessary to visualize that this pattern is laid out flat, as if the fabric had been placed on a smooth flat surface like a tabletop.
- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p112$.

**Pattern 6:** a series of separated right-angled zigzags painted between two incised lines, with a row of dots above, all running horizontally above the left lower front border of the himation, green and red on a buff background.

![Pattern 6](image)

**Figure 5.13.** $p111$

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p111$.

**Pattern 7:** a blue battlement infilled with blue squares, with one band of blue above, from the neck edge of the himation, blue on a red background.
- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pm11$.

**Pattern 8:** a green broken meander between a red band and a blue band on one side and a red band on the other, with a row of blue dots and another red band below that; on the right lower front border of the himation, in red, green and blue on a buff background.
Assume that the blue dots are equally spaced with respect to the angles of the meanders.

Not visible in Karakasi’s photographs but evident on Lermann’s drawing.

- using Appendix 1, Table 1.1, there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \( pm11 \).

**Pattern 9:** a battlement set in a band that forms the lower border of the skirt of the chiton, red on a blue background.

Pattern 10: a series of separated right-angled zigzags below a solid band, above an incised line and forming the border of that part of the himation that is draped over the extended right arm; green and blue on a buff background.

---

63 Assume that the blue dots are equally spaced with respect to the angles of the meanders.

64 Not visible in Karakasi’s photographs but evident on Lermann’s drawing.
- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is p111.

**Design 1**: a four-petal rosette from a non-border area of the chiton or the himation, blue on a buff background. This design has only four-fold rotational symmetry about point A. The petals are set at a slant with respect to the central blue dot, so mirror reflection lines are not possible and thus there is no reflection symmetry. The design is therefore a c4 finite design.

**Acr. 682**

**Pattern 1**: a series of squares with infill of alternating designs inserted into a broad band bounded on both sides by a narrow band, and further bounded on one edge by a narrow band.
with spirals extended at right angles to the border and on the other edge by a straight narrow band; from the front border of the himation; white, blue, green and red on a buff background.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p111$.\(^{65}\)

**Pattern 2:** a central stripe containing a series of four-petal rosettes alternating with six-petal rosettes, flanked on either side by a plain band and a band with a battlement; one edge is bounded by two narrow stripes, the other by only one; this band forms the edge of the chiton where it is buttoned together over the right shoulder and arm to form the right sleeve;\(^{66}\) blue, green, yellow and red on a red or orange background.

---

\(^{65}\) If the top blue band with the spirals were not included, the pattern would have a horizontal reflection that is consistent with colour and that preserves colours, as well as no vertical reflection that reverses colours; thus a $pmm2$ underlying pattern of symmetry.

\(^{66}\) Karakasi does not have a photograph of this detail, but Payne & Young’s Plate 40 gives an excellent view of the incised and painted elements of this border.
green, red and white on a buff background.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A;\(^67\) (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \(pm11\).

**Pattern 3:**\(^68\) there is a similar arrangement of edge-patterned borders of the chiton meeting over the left arm and shoulder to form the left sleeve; the design consisting of a set of nested boxes with crenellated edges, and dot and rosette infill; the set is repeated along the border

\(^67\)Assuming that the battlements on both sides of the central band are mirror images of each other and that the central motifs are placed equidistant from each other.

\(^68\)Karakasi did not include all of Lermann’s colour plates relating to Acr. 682.
band of the chiton which extends from beneath the long ringlets hanging over the kore’s right shoulder to the border of the left sleeve; red and blue on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is a horizontal reflection consistent with colour along line B; (iii) the horizontal reflection preserves colours along line B; (iv) there is a half-turn that preserves colours about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pmm2}.

\textbf{Pattern 4:} a wide central stripe bordered on each side by two intertwined bands, and bounded on one side by a straight band; this pattern appears on the belt of the chiton; red, blue and green on a buff background.
- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colour along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pm11$.

**Pattern 5:** a series of squares with right-angled arms extending from three of the four corners and infilled with rosettes or four-armed crosses inside squares; the spaces between the three-armed squares are filled with alternating designs of rosettes or stars formed by dots; the whole bounded on either side by a thin band; this is the pattern on the paryphe; red, green and white on a blue background.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p111$.

---

$^{69}$If the outside green band were absent, or if there were two outside green bands, there would be a half-turn consistent with colour.
Design 1: this design consists of eight blue dots around a central incised centre point A, and it is found inside the border of the himation. The smallest rotation is $360^\circ / 8$, or $45^\circ$ about point A. There are eight distinct mirror reflection lines. This is a $d8$ finite design.

Acr 681

Pattern 1: a wide band formed of crenellated squares, nested inside of which are plain squares, bounded on either side by a plain straight band, a band of large dots,$^{70}$ then another

---

$^{70}$These dots appear to be incised, then filled with colour. See Karakasi (2003), Plate 256 for a clear photograph of the incisions.
plain straight band; this runs along the middle of the left sleeve where the edges of the chiton
meet and at the front neckline edge of the chiton; red, blue and green on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A;
(ii) there is no horizontal reflection consistent with colour;\(^{71}\) (iii) there is no vertical reflection
consistent with colour;\(^{72}\) (iv) there is no half-turn that reverses colour; (v) there is no vertical
reflection that reverses colours: the underlying pattern of symmetry is \(p112\).

**Pattern 2:** a series of battlements interspersed with squares infilled with five dots, between
two plain bands; visible as a band of ornamentation at the back of the kore between the fall
of the hair and the hem of the himation;\(^{73}\) blue and red on a buff background.

\(^{71}\)Because the crenellations are not symmetrical in position with respect to each other.

\(^{72}\)If the dots above and below the middle band were consistently placed over the crenellated squares, so that
there was a vertical reflection consistent with colour, the underlying pattern of symmetry would be \(pma2\).

\(^{73}\)See Karakasi (2003), Plate 256 again.
- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colour along line A; (iv) there is no vertical reflection that reverses colour: the underlying pattern of symmetry is \textit{pm11}.

\textbf{Pattern 3}: two rows of squares with right-angled arms extending from three of the four corners, and bordered by two plain bands, the upper row and the lower row reversed and “mirror-imaged” with respect to each other; each square contains a smaller square infilled with a square, dot or rosette; this is the paryphe, visible below the front pleats of the himation to the point where the skirt is pulled sideways; red, green, blue and grey on a blue background.
If there were no rosette in the middle of the central square, if one of the petals of the five-petal rosette were situated on a vertical reflection axis, or if the rosette consisted of an even number of petals, a vertical reflection would be possible. Since the rosette has five petals offset from the vertical, reflection is not possible.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection that preserves colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colour: the underlying pattern of symmetry is \( p111 \).

**Pattern 4:** a meander pattern with a square infilled with a rosette inset between its hooked arms; from the brim of the cap/stephane; blue and red on a buff background.

![Acr. 681. Pattern 4.](image)

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with color; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \( p111 \).

**Design 1:** an eight-petal rosette of alternating blue and red petals on a buff background, from the himation above its decorative band. This rosette has eight-fold rotational symmetry about

---

\(^{74}\)If there were no rosette in the middle of the central square, if one of the petals of the five-petal rosette were situated on a vertical reflection axis, or if the rosette consisted of an even number of petals, a vertical reflection would be possible. Since the rosette has five petals offset from the vertical, reflection is not possible.
point A, as well as eight distinct mirror reflection lines. Reflections along lines like B preserve colours while reflections along lines like C reverse colours. Rotations by 1/8th of a full turn about point A reverse colours. This is a $d8'$ finite design.

Figure 5.29. $d8'$

**Ac. 670**  
**Pattern 1:** two rows of squares with right-angled arms extending from three of the four corners, the upper row and the lower row reversed and “mirror-imaged” with respected to each other; each square contains an X-shape formed from a central square linked to the corners of four other squares at each of its corners; this is the decorative band that forms the paryphe; red on a green background.

Figure 5.30. $p112$
- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \(p112\).

**Pattern 2:** an alternating band of stylized lotus blossoms and acanthus leaves forming a decorative band along the front border/brim of the stephane/cap; red and white on a green background.

![Acr. 670. Pattern 2.](image)

Figure 5.31. \(pm11\)

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \(pm11\).

**Pattern 3:** an eight-petal rosette emanating from a centre dot, each rosette repeated in a horizontal-vertical grid on the chiton; green petals and red central dot on a buff background.
- using Appendix 1, Table 1.2, because this is a two-dimensional pattern, the smallest rotation of the pattern consistent with colour is $90^\circ$; moving to Appendix 1, Table 1.5, (I) there is a reflection consistent with colour along lines like C, D, and F; (iii) there are reflections consistent with colour in four directions; e.g., about point E and along dashed lines 1-4; (iv) there is a two-fold centre that preserves colours about point A; (v) there is a $90^\circ$ turn that preserves colours about point B; (vi) there is no reflection that reverses colours: the underlying pattern of symmetry is $p4m$.

**Design 1:** This green eight-petal rosette emanating from a central red dot forms the basic unit of Pattern 3 above. There is eight-fold rotation about point A, as well as mirror reflection along lines such as B. This is a $d8$ finite design.
**Acr. 671**

**Pattern 1**: a band of alternating lotus buds and acanthus leaves, forming a decorative band on the upright brim of the cap; red on a blue background.

![Pattern 1](image1)

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \(pm11\).

**Pattern 2**: a band of interwoven meanders inset with squares infilled with four-petal rosettes between two straight bands, forming the border of the epiblema; blue and red on a buff background.

![Pattern 2](image2)
- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p112$.

**Pattern 3:** two wide-band battlements and one narrow-band battlement running parallel to each other, infilled with checkerboard squares and bordered on each side by two entwined looped bands, forming the paryphe; red and blue on a buff background.

![Figure 5.36. pma2](image-url)
is no vertical reflection that reverses colours: the underlying pattern of symmetry is \( pma2 \).

**Pattern 4:** rows and columns of curled-hook swastikas alternating with four-petal rosettes in a horizontal-vertical grid pattern inside the border of the epiblema; red swastikas and blue rosettes on a buff background.

![Pattern 4](image)

**Figure 5.37. \( p_c'4 \)**

- using Figure A.2, Appendix A, because this is a two-dimensional pattern,\(^75\) the smallest rotation of the pattern consistent with colour is \( 90^\circ \); moving to Figure A.5, Appendix A, (I) the smallest rotation consistent with colour is \( 90^\circ \) about points like A, B or C; (ii) there is no reflection consistent with colour; (iii) there is a \( 90^\circ \) turn that preserves colours about points like B or C; (iv) there is a \( 90^\circ \) turn that reverses colours about points like A: the underlying pattern of symmetry is \( p_c'4 \).

**Design 1:** This design is a red swastika with curved arms turning clockwise that appears in

\(^{75}\)The swastika and the rosette are the basic elements of the grid.
Pattern 4 (above) on the epiblema. It has four-fold rotational symmetry about point A but no mirror reflection. It is a $c_4$ finite design.

**Design 2:** This is a blue four-petal rosette appearing in Pattern 4 (above) on the epiblema. It has four-fold rotational symmetry about point A and four distinct mirror reflection lines B, C, D and E. It is a $d_4$ finite design.
Acr. 673

**Pattern 1:** a series of interwoven meanders inset with squares, each square infilled with a smaller square, the whole bordered by a straight band on one side only, and found on the vertical brim of the cap/stephane; red and blue on a buff background.

![Acr. 673. Pattern 1.](image)

**Figure 5.40. p111**

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour;\(^76\) (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is *p111*.

**Pattern 2:** a series of battlements forming squares, each infilled with a four-petal rosette, and edged on one side by a straight line; this band lies along the left shoulder and arm and forms the boundary where two edges of the chiton are buttoned together to form the left sleeve; blue on a red background.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour;\(^77\) (ii) there is

\(^76\)Because of the single blue band along only one edge.

\(^77\)Because of the blue band along only one edge.
no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no translation that reverses colours: the underlying pattern of symmetry is \( p111 \).

**Pattern 3:** a series of boxes infilled with crosses alternately depending from and rising above the straight narrow bands that form each edge of the border along the bottom edge of the himation; red and blue on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no half-turn that reverses colours; (v) there

\(^{78}\)It is not possible to determine whether the battlements are symmetrical with respect to each other.

127
is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pma_2$.

**Pattern 4:** a straight line of blue dots running above Pattern 3 along the bottom edge of the himation; blue on a buff background.

![Pattern 4](image1.png)

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is a horizontal reflection consistent with colour along line B; (iii) there is a horizontal reflection that preserves colours along line B; (iv) there is a half-turn that preserves colours about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pmm_2$.

**Pattern 5:** a series of parallel nested battlements in different colours, one having interior dots, with infilled squares containing four-petal rosettes with right-angled or diagonal configurations, forming the paryphe; green, white, red and blue on a buff background.

![Pattern 5](image2.png)

[Figure 5.43. $pmm_2$]

[Figure 5.44. $pmm_2$]
using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is a horizontal reflection consistent with colour along line B; (iii) there is a horizontal reflection that preserves colours along line B; (iv) there is a half-turn that preserves colours about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \( pmm2 \).

**Acr. 683**

**Pattern 1:** two bands of stylized acanthus leaves separated by single petals, each reversed in orientation with respect to the other; a double line of triangles with apices pointing to the centre of the line separates the acanthus leaves; the whole forms a band running over both left and right shoulders and down both arms and marking the line where the two edges of the chiton meet to form the sleeves; blue on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A;
Because of the alternating positions and orientation of the central triangles. If we knew the arrangement of the motifs on the chiton, it would be possible to assign an underlying pattern of symmetry category.

(ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no half-turn that reverses colours; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pma2}.

\textbf{Pattern 2}: a row of stylized acanthus leaves alternating with single petals forming a decorative band on the neck edge of the chiton; blue on a buff background.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{Acr.683.Pattern2.png}
\caption{pm11}
\end{figure}

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pm11}.

\textbf{Design 1}: This motif scattered over the chiton consists of two blue stylized acanthus leaves set end to end and separated on either side by a three-petal cluster. The design has two-fold rotation about point A and mirror reflection along line B. It is a \textit{d2} finite design.\textsuperscript{80}

\footnote{Because of the alternating positions and orientation of the central triangles.}

\footnote{If we knew the arrangement of the motifs on the chiton, it would be possible to assign an underlying pattern of symmetry category.}
Acr. 675

**Pattern 1:** a row of stylized acanthus leaves and lotus blossoms forming the decorative band on the stephane; red on a blue background.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \( pm11 \).

**Pattern 2:** a crenellated battlement paralleled on each side by a battlement with internal decorative motifs consisting of alternating four dots in a square and one dot, the meanders
The crenellations of the central battlement do not have the same pattern of right-angled turns at each larger turn.

infilled with a motif of four squares jointed to a central square at its corners, the whole band edged on either side by a straight line and forming the paryphe; white on a red background with blue edges.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with color; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p111$.

**Pattern 3:** a horizontal sequence of squares with crenellated edges infilled with alternating motifs of nested right-angled crosses and four squares jointed to a central square at its corners, the sequence bordered on either side by a straight line, the whole forming the border at the lower edge of the himation; white on a red background bordered with blue.

---

81 The crenellations of the central battlement do not have the same pattern of right-angled turns at each larger turn.
I assume that the crenellated edges of the squares are exactly reversed on opposite sides.

Acr. 675, Pattern 4 appears to be similar to Acr, Pattern 3. However, the crenellations of Pattern 4 do not appear to be symmetrical with respect to each other, in contrast to those of Pattern 3.

Figure 5.50. \textit{pmm}\textsubscript{2}

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is a horizontal reflection consistent with colour along line B;\textsuperscript{82} (iii) there is a horizontal reflection that preserves colours along line B; (iv) there is a half-turn that preserves colours about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pmm}\textsubscript{2}.

**Pattern 4:** a sequence of squares with crenellated edges infilled with nested right-angled crosses, bordered by a straight band on one side and a line of dots on the other, forming the decorated border of the chiton at the neck and, where the edges of the chiton meet over the left shoulder and arm, the left sleeve; white on a red background with a blue border on one side and a border of red dots on the other.

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour;\textsuperscript{83} (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is no translation

\textsuperscript{82}I assume that the crenellated edges of the squares are exactly reversed on opposite sides.

\textsuperscript{83}Acr. 675, Pattern 4 appears to be similar to Acr, Pattern 3. However, the crenellations of Pattern 4 do not appear to be symmetrical with respect to each other, in contrast to those of Pattern 3.
that reverses colours: the underlying pattern of symmetry is \( p111 \).

Pattern 5: a series of interwoven meanders inset with squares, each square infilled with a smaller square which is in turn infilled with a four-petal rosette; forming the decorative border on the portions of the chiton that fall over the right shoulder and arm and are buttoned together to form the right sleeve; white on a red background, red on a blue background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection
consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \( p112 \).

**Pattern 6:** a horizontal and vertical grid of alternating motifs as follows: a swastika with arms that spiral clockwise with a dot between each spiral arm and with a diamond shaped centre, and a diamond shape formed by a small triangle at each apex with bases facing the centre, these motifs found on both the himation and the chiton inside their decorative borders; blue and red on a buff background.

![Pattern 6](image)

*Figure 5.53. pg*

- using Appendix 1, Table 1.2, because this is a two-dimensional pattern,\(^{84}\) there is no rotation of the pattern consistent with colour;\(^{85}\) moving to Appendix 1, Table 1.3, (I) there is no

---

\(^{84}\)The swastika and the rosette are the basic elements of the grid.

\(^{85}\)Rotating the swastikas and rosettes about a point would result in reversing the direction of the arms of the swastikas.
reflection consistent with colour; (iii) there is a glide reflection that preserves colour along trajectories like A-A’; (iv) there is no glide reflection that reverses colours: the underlying pattern of symmetry is $pg$.

**Design 1:** This motif consists of four blue clockwise-turning running spirals joined together in a diamond shape with a dot between each spiral arm. It is one of two motifs found inside the decorative borders of the chiton and himation. The smallest rotation is $360°/8$, or $45°$ about point A. While a dot on one side of the diamond will be reflected on the other side, the spiral arms when reflected will face in the wrong direction. Hence no reflection is possible and this is a $c8'$ two-colour finite design.

![Design 1](image)

**Design 2:** This design consists of four red triangles aligned around a centre point with bases facing in, the second of the two motifs found inside the decorative borders of the chiton and himation. The smallest rotation is $360°/4$, or $90°$ about point A. Reflections are possible along four distinct mirror reflection lines, such as B or C. This is a $d4$ one-colour finite design.
Acr. 674

**Pattern 1:** a horizontal series of squares, crenellated internally into four squares joined by one corner to a fifth central square, and each of these five internal squares having a centrally positioned dot; the larger external square has its horizontal sides extended in opposite directions to form hooked arms that connect with the arms of the next squares in line; a series of dots infills the space between the hooked arms and along the outer horizontal edges of the larger squares; there is a straight band marking each edge of this decorative band which forms the front vertical surface of the stephane; blue, red and green on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection
consistent with colour; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \( p112 \).

**Pattern 2:** the same as above, but lacking the dots, and the arms of the squares do not touch; forming the border of the himation; blue and red, bordered by a blue stripe above and a green stripe below, on a buff background.

![Figure 5.57. \( p'111 \)](image)

- using Appendix 1, Table 1.1, (i) there is no half-turn consistent with colour; (ii) there is no vertical reflection consistent with colour; (iii) there is no horizontal reflection consistent with colour; (iv) there is no glide reflection consistent with colour; (v) there is a translation that reverses colours along line B: the underlying pattern of symmetry is \( p'111 \).

**Pattern 3:** two rows of squares with right-angled arms extending from three of the four corners, the upper row and the lower row reversed and “mirror-imaged” with respect to each other; each square contains a smaller square infilled with a square-within-a-square, forming the paryphe; red, green and blue on a buff background.
- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is no half-turn that preserves colours: the underlying pattern of symmetry is \( p112' \).

**Pattern 4:** this pattern is composed of six-petal rosettes set in lines and columns but offset so as to form a diagonal lattice pattern permitting six-fold rotation about the centre of each rosette; it is found inside the decorative border of the himation and on the chiton to either side of the paryphe; in blue, green and red on a buff background.
- using Appendix 1, Table 1.2, because this is a two dimensional pattern, the smallest rotation consistent with colour is $60^\circ$; moving to Appendix 1, Table 1.7 (I) there is a reflection consistent with colour along line A; (ii) there is no half-turn that preserves colours; (iii) reflection through two closest six-fold centres along line B does not preserve colours: the underlying pattern of symmetry is $p6\text{'}mm\text{'}$.

**Design 1**: This consists of a six-petal rosette. The red, blue or green rosettes are placed in a hexagonal lattice on the himation and the chiton. This design has six-fold rotational symmetry about point A and six distinct mirror reflection lines, for example along lines B and C. It is a $d6$ finite design.

---

**Acr. 594**

**Pattern 1**: two bands of interwoven meanders inset with squares containing four-petal rosettes and separated by a straight line; this panel runs over the left shoulder and arm, forming the left sleeve of the chiton;\textsuperscript{86} white on a red background and red on a green background.

---

\textsuperscript{86}There is no indication that it is composed of two bands joined together by buttons, so I will treat it as one band.
- using Appendix 1, Table 1.1, (i) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is $p112$.

**Pattern 2:** a narrow band consisting of alternating crosses and dots, bordered by two straight bands; this band runs at right angles to Pattern 1 around the hem edge of the left sleeve; white and red on a green background with two red and two green border bands.
- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A;
(ii) there is a horizontal reflection consistent with colour along line B; (iii) there is a horizontal
reflection that preserves colours along line B; (iv) there is a half-turn that preserves colours
about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern
of symmetry is $pmm_2$.

Pattern 3: a series of squares infilled alternately with a cross or a five-squares-joined-at-the-
corners arrangement, bounded on each side by a straight green band and a line of dots, with
an outer border of green on one side; this forms the decorative edge of the himation; grey on
a green background, green on a red background, green on a grey background.

Figure 5.63. pm11

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour;\(^{87}\) (ii) there is

\(^{87}\)If the outer green band were not present, there would be a half-turn consistent with colour.
a vertical reflection consistent with colour along line A;\textsuperscript{88} (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pm11}.

\textbf{Pattern 4:} a band of interwoven meanders with crenellated edges and infilled with squares containing a five-squares-joined-at-the-corners arrangement; this forms the paryphe; grey on a red background, grey on a blue background, red on a blue background.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure5.64.png}
\caption{\textit{pm11}}
\end{figure}

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A or A';\textsuperscript{89} (ii) there is no horizontal reflection consistent with colour; (iii) there is no vertical reflection consistent with colour; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \textit{p112}.

\textsuperscript{88}I assume that the rows of dots and the centres of the filled squares are symmetrically aligned with respect to each other.

\textsuperscript{89}Assuming that the crenellations are symmetrical with respect to each other.
**Pattern 5**: two interlocked sequences of squares having an infill of a five-squares-joined-at-the-corners arrangement, bounded by a straight band on two sides and on one side by a line of dots; this forms the lower border of the epiblema; blue, red and green on a buff background.

![Pattern 5](image)

*Figure 5.65. pm11*

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour;° (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is pm11.

**Design 1**: This motif consists of a four-petal red rosette in a blue circle. It has $360^\circ/4$, or four-fold, rotational symmetry about point A, as well as four distinct mirror reflection lines, like those along B and C. It is a $d4$ finite design.

°Because of the line of dots that exists on only one side of this pattern.
**Design 2:** This is a set of four back-to-back green semicircular lines with spiral hooked arms. It has $360^\circ/4$, or four-fold, rotational symmetry about point A, and four distinct mirror reflection lines, like those along B and C. This is a $d4$ finite design.

**Acr. 685**

**Pattern 1:** two interlocked sequences of squares, the lower set infilled with a four-petal rosette within a square and the upper infilled with a four-pointed star motif infilled with a cross; edged on both sides by a straight band; this forms the decorative band on the vertical brim of the stephane/cap; red on a blue background.
146

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line A; (iii) there is a vertical reflection that preserves colours along line A; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pm11}.

\textbf{Pattern 2}: a simple battlement infilled with blue dots; this narrow border is one of two at the lower edge of the himation; red and blue on a buff background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no half-turn that reverses colours; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pma2}.
**Pattern 3:** a battlement infilled with four-petal rosettes between two straight bands; this is the second of the two decorative bands at the lower edge of the himation; red and blue on a buff background.

![Figure 5.70. pma2](image)

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no half-turn that reverses colours; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pma_2$.

**Pattern 4:** a wide straight band bounded on either side by a battlement and a narrow straight band; this pattern is found on the belt of the chiton; green and red on a buff background.

![Figure 5.71. pmm2](image)

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A;
(ii) there is a horizontal reflection consistent with colour along line B; (iii) there is a horizontal reflection that preserves colours along line B; (iv) there is a half-turn that preserves colours about point A; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is $pmm_2$.

**Pattern 5:** a series of boxes infilled with four-petal rosettes, surrounded by larger boxes with crenellated edges, the whole bounded by a straight band on either side; this is the paryphe; blue, red, white and green on a buff background.

![Pattern 5](image)

**Design 1:** this is a blue cross with arms of equal length set at right angles to each other, from
the chiton. It has $360^\circ/4$, or four-fold rotational symmetry about point A, as well as four distinct mirror reflection lines along lines like B and C. It is a $d4$ finite design.

\textbf{NM4889}

**Pattern 1:** a battlement with a line at right angles to the battlement line in each indentation; this pattern is found on the fillet/taenia that holds in place the hair at the back of the head and the twenty locks; black on a yellow background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A;
(ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \( pma2 \).

**Pattern 2**: two rows of “T”-shapes with their crossbars alternately facing or turned away from the centre of the band, and bounded by two straight bands; this pattern forms the neck edge of the chiton and runs over both shoulders and arms to form the sleeves; black on a yellow background.

- Using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is a half-turn that preserves colours about point A; (v) there is no translation that reverses colours: the underlying pattern of symmetry is \( p112 \).

**Pattern 3**: tangential circles on a central band, flanked on either side by a dog-toothed band;
this pattern is found on the belt of the peplos; black on a yellow background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no half-turn that reverses colours; (v) there is no vertical reflection that reverses colours: the underlying pattern of symmetry is \textit{pma2}.

\textbf{Pattern 4}: an interwoven series of battlements; this forms the paryphe of the peplos; black on a yellow background.

- using Appendix 1, Table 1.1, (I) there is a half-turn consistent with colour about point A; (ii) there is no horizontal reflection consistent with colour; (iii) there is a vertical reflection consistent with colour along line B; (iv) there is no half-turn that reverses colours: the underlying pattern of symmetry is \textit{pma2}.
Pattern 5: a nested “tongue”-patterned border bounded on one side by two straight lines and on the other by one straight line; this forms the hem edge of the skirt; black, red and yellow on a red background.

![Pattern 5](figure5.78)

- using Appendix 1, Table 1.1, (I) there is no half-turn consistent with colour; (ii) there is a vertical reflection consistent with colour along line B; (iii) there is a vertical reflection that preserves colours along line B; (iv) there is a vertical reflection that reverses colours along line C: the underlying pattern of symmetry is $p'm11$.

Design 1: This three-pointed yellow star on a red background is one of the designs on the peplos. It has three-fold rotational symmetry about point A and three distinct mirror reflection lines, like line B. It is a $d3$ finite design.

![Design 1](figure5.79)
**Design 2:** This is a four-pointed yellow star on a red background, also one of the designs on the peplos. It has four-fold rotational symmetry about point A and four distinct mirror reflections lines, like B and C. It is a $d_4$ finite design.

![Design 2](image)

**Design 3:** This is a black swastika with hooked arms facing clockwise on a red background, from the peplos. It has four-fold rotational symmetry about point A but no mirror reflections because of the hooked arms. It is a $c_4$ finite design.

![Design 3](image)
**Design 4:** The same as Design 3, with hooked arms facing counterclockwise. It is also a $c_4$ finite design.

![Design 4](image1.png)

*Figure 5.82. c₄*

**Design 5:** This is a six-pointed yellow star set into a black circle, on a red background, from the peplos. It has six-fold rotational symmetry about point A and six distinct mirror reflection lines, like B and C. It is a $d_6$ finite design.

![Design 5](image2.png)

*Figure 5.83. d₆*

**Design 6:** This is an eight-pointed yellow star on a red background from the peplos. It has eight-fold rotational symmetry about point A and eight distinct mirror reflection lines, like B and C. It is a $d_8$ finite design.

![Design 6](image3.png)
**Design 7:** This twelve-pointed yellow star set into a black circle on a red background is found on the peplos. It has twelve-fold rotational symmetry about point A and twelve distinct mirror reflection lines like B and C. It is a $d_{12}$ finite design.

**Design 8:** Again from the peplos, a rosette with six yellow and six black petals on a red background. It has twelve-fold rotational symmetry and twelve distinct mirror reflection lines, like B and C. Half of the reflections reverse colours and half preserve colours. Rotations by 1/12th of a full turn reverse colours. This is a $d_{12}'$ finite design.
**Design 9:** A rosette with eight yellow and eight black petals on a red background found on the peplos. It has sixteen-fold rotational symmetry about point A and sixteen distinct mirror reflection lines, like B and C. Rotations by $1/16$th of a full turn reverse colours. Half of the reflections reverse colours and half preserve colours. This is a $d16'$ finite design.
Chapter 6 - Results

Data Analysis

This section of my thesis attempts to uncover in a systematic and empirical manner changes in the occurrence of the patterns described in Chapter 5. I use the methodology of symmetry analysis to provide a framework within which to explore the possibilities that pattern change is connected to other changes in Archaic Athenian society. The amount of data provided by symmetry analysis of the patterns found among the painted decorations on the sixteen Akropolis korai is statistically small, and the dates established for some of the korai are still in dispute (based on stylistic considerations), so that I am able to provide only tentative, rather than more secure, conclusions. However, I believe that the approach to analysis of these particular data points to other areas for study that may reveal aspects of Archaic Greek culture hitherto neglected or unnoticed.

The Tabulated Results

In order to manipulate the data obtained from my analysis of the Acropolis korai’s underlying designs and patterns of symmetry, I transferred the findings to an Excel spreadsheet (see Appendix 2, Table 2.1). Once the data had been entered, I was able to perform various operations on them. I first performed a sort on three of the columns: I asked the programme to sort the ‘pattern/design’ column in ascending order; the ‘date range’ column in descending order;¹ and the number of pattern ‘occurrences’ column in ascending order.

¹So that the dates BCE assigned to each kore would arrange themselves in the customary manner.
order, and in that sequence. The results are listed in Appendix 2, Table 2.2.

Table 6.1, derived from Table 2.2 in Appendix 2, shows that \textit{pma2} appears on korai for the longest period of time. It appears on the earliest kore in the list and continues to appear down to the latest kore; i.e., from 560 BCE to 490 BCE, a range of seventy years. Similarly, \textit{p112} appears for sixty years, between 560 BCE and 500 BCE. Each of these patterns appears as a one-colour pattern throughout that time period. There are three other patterns that appear for significant lengths of time: \textit{pm11} for forty-five years, between 535 BCE and 490 BCE; \textit{pmm2} for forty years, between 530 BCE and 490 BCE; and \textit{p111} for thirty years, between 530 BCE and 500 BCE. Each of these is also a one-colour pattern.

It is reasonable to suggest that \textit{pma2} and \textit{p112} are patterns of symmetry that, because of the consistency of their use throughout the period during which sculptors and painters created and decorated korai for their Athenian patrons, indicate a fundamental continuity within the Archaic Athenian design tradition for this time period. In other words, \textit{pma2} and \textit{p112} were most likely to have been “favourite” Archaic Athenian patterns that underlay the work of both the artists who created the korai and, if we admit that their work was based on real life models,\footnote{A premise developed by Stieber (2004) and upon which her later arguments are based. See Barber (1991) and her remarks on replication of some of the patterns on her own loom, cited earlier. See also Becetti’s introduction to Cecchetti’s catalogue: “... la distribuzione dell’ornato, le partizioni, tutto il repertoria dei motivi trovano con la decorazione dipinta sui costumi delle korai, mi sembra che confermino la fondamentale aderenza a stoffe reali ...” (Cecchetti (1972): 6.} the weavers who designed and wove the cloth on which the garments carved in stone were modelled.
Another observation to be noted is that c 535 BCE, three additional patterns were added to the canon of the Archaic Athenian design tradition: \( pm11, pmm2 \) and \( p111 \). They continued to be used for another thirty to forty-five years. We may thus consider that these patterns of symmetry were accepted as decorative elements from that time on. It is also reasonable to ask why this should be so; that is, what factors, be they social, cultural, historical, political, etc., might have influenced the adoption of the patterns into the canon at this time.

Table 6.1. Akropolis korai: frequency of patterns by date range

<table>
<thead>
<tr>
<th>Pattern</th>
<th>Date Range</th>
<th>Time Span</th>
<th>No. of Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>pm12</td>
<td>560-490</td>
<td>70 years</td>
<td>10</td>
</tr>
<tr>
<td>p112</td>
<td>560-500</td>
<td>60 years</td>
<td>12</td>
</tr>
<tr>
<td>p’m11</td>
<td>550-540</td>
<td>10 years</td>
<td>1</td>
</tr>
<tr>
<td>pm11</td>
<td>535-490</td>
<td>45 years</td>
<td>14</td>
</tr>
<tr>
<td>pmm2</td>
<td>530-490</td>
<td>40 years</td>
<td>9</td>
</tr>
<tr>
<td>p111</td>
<td>530-500</td>
<td>30 years</td>
<td>11</td>
</tr>
<tr>
<td>p112'</td>
<td>525-500</td>
<td>25 years</td>
<td>1</td>
</tr>
<tr>
<td>pg</td>
<td>510-500</td>
<td>10 years</td>
<td>1</td>
</tr>
<tr>
<td>p4m</td>
<td>520</td>
<td>1 year</td>
<td>1</td>
</tr>
<tr>
<td>p,'4</td>
<td>520</td>
<td>1 year</td>
<td>1</td>
</tr>
<tr>
<td>p6'mm'</td>
<td>500</td>
<td>1 year</td>
<td>1</td>
</tr>
<tr>
<td>p'111</td>
<td>500</td>
<td>1 year</td>
<td>1</td>
</tr>
</tbody>
</table>

A third observation is that there is only one instance of colour reversal in these two early groupings of patterns: \( p’m11 \), a colour-reversal variant of \( pm11 \), which occurred once between c550 BCE and 540 BCE. This particular pattern of symmetry is found on NM4889, the “Phrasikleia” kore, discovered at Myrrhinous/Merenda in the 1970s. This is an instance of colour reversal that occurs outside of Athens proper. It is reasonable to suggest that colour reversal in underlying patterns of symmetry was not acceptable within the Archaic
Athenian design milieu during this early period, but was acceptable in the Myrrhinous area of Attika. Since $pma_2$ and $p112$ appeared on NM4889 as well, we can also say that these patterns of symmetry were used in design contexts both in and outside Archaic Athens from at least 550 BCE.

Colour reversal becomes more common, relatively speaking, after c525 BCE. We find two occurrences of $p112'$, one of the colour-reversal variants of $p112$, in Acr. 681 (525 BCE) and Acr. 674 (500 BCE). There is one occurrence of $p'111$, a colour-reversal variant of $p111$, in Acr. 674 (500 BCE) as well. There are two other instances of colour reversal at this time: one occurrence of $p_c'4$ in 520 BCE and one occurrence of $p6'mm'$ in 500 BCE. We must ask what took place in Athens between 525 and 500 BCE that may have influenced this development, and whether it may be related to, or part of, the addition of $pm11$, $pmm2$ and $p111$ to the canon in c535 BCE.

From 520 BCE we begin to see occurrences of one- and two-colour two-dimensional underlying patterns of symmetry; that is, that in addition to one-dimensional patterns on bands and borders, we now find patterns in two-dimensional arrays on the flat planes of a garment’s skirt, sleeves, bodice or other drapery. There is one occurrence c510-500 BCE of $pg$, a two-dimensional pattern with smallest rotation consistent with colour of $0^\circ$ but with no colour reversal, from Acr. 675. There is one occurrence c520 BCE of $p4m$, with smallest rotation consistent with colour of $90^\circ$ and with no colour reversal, from Acr. 670. There is one occurrence c520 BCE of $p_c'4$, a two-dimensional pattern with smallest rotation consistent
with colour of 90° and with colour reversal, from Acr. 671. And there is one occurrence c500 BCE of \( p6' \text{mm}' \), with smallest rotation consistent with colour of 60° and with colour reversal, from Acr. 674. Thus, two-dimensional patterns of symmetry, with or without colour reversal, appear from c520 BCE on. We may ask whether changes in Athenian society are reflected in this development but, given the paucity of data for this type of pattern, it may be wiser to note only that in vase painting from earlier periods we find that the painter has depicted peploi both with and without two-dimensional patterns on their plane surfaces.

Figure 6.1 below illustrates goddesses on the way to the wedding of Peleus and Thetis, as discussed earlier. The goddess on the right of the central cluster of three wears a peplos with one-dimensional patterning on bands and borders interspersed with non-patterned figurative mythological scenes on the skirt, sleeves and bodice. The goddess on the left wears a peplos with a two-dimensional chequerboard pattern into the alternating squares of which rosettes are set. The third wears a peplos with one-dimensional border patterns only. Figure 6.2 below, a scene of women spinning wool and weaving from a lekythos attributed to the Amasis Painter c550-530 BCE, portrays several women wearing peploi decorated with two-dimensional patterns on the plane surfaces, as well as patterned borders and bands. Figure 6.3 below, from an amphora by Lydos, c550 BCE, shows two women, one of whom wears a peplos with band ornamentation only, the other wearing a peplos with a two-dimensional pattern based on placement of a specific design within a grid on bodice, sleeves and skirt. So, while two-dimensional patterns do not appear on the earliest sculpted korai from the Acropolis, there are precedents from vase painting to suggest that this was not always the
case.³ In general then, c525 BCE we begin to see a change in the type of underlying patterns of symmetry that appear on the korai. Colour reversal is the dominant characteristic but we also find several patterns not seen in the earlier periods.

Figure 6.1. Detail of the procession of the gods and goddesses to the wedding of Peleus and Thetis; the François Vase (volute krater), Kleitias, c570 BCE.

³See Cecchetti 1972 for a comprehensive catalogue of decorative motifs on Attic black-figure vases.
Figure 6.2. Lekythos, attributed to the Amasis painter, c550-530 BCE.

Figure 6.3. Amphora by Lydos, depicting the fallen of Troy; Menelaos and Helen; and the murders of Astyanax and Priam, Attika, c550 BCE.
An examination of the designs from the korai reveals similar features. In Table 6.2, also derived from Table 2.2 in Appendix 2, the most common design is $d_4$, of which there are seven instances. It has fourfold rotational symmetry about its centre point as well as reflection symmetry along its four distinct mirror reflection lines. This design appears on five of the Acropolis korai and on NM4889 from Myrrhinous in Attika. In my data it appears first in 560 BCE and continues to 490 BCE, a period of seventy years. Its earliest appearance is on Acr. 593 dated 560-550 BCE, then on NM4889 from Myrrhinous 550-540 BCE. There is a gap of twenty years before it appears again in Athens on Acr. 671 (520 BCE), on Acr. 675 (510-500 BCE), Acr. 674 (500 BCE) and Acr. 685 (500-490 BCE). We may speculate that, like $pma_2$ and $p112$, $d_4$ is a design element common to the Archaic Athenian cultural context, as well as a specific context outside Athens, for that seventy-year period, even though we have no examples for the period 540-520 BCE.

Table 6.2. Akropolis korai: frequency of designs by date range

<table>
<thead>
<tr>
<th>Design</th>
<th>Date Range</th>
<th>No. of Years</th>
<th>No. of Occurrences</th>
<th>Object Designator</th>
</tr>
</thead>
<tbody>
<tr>
<td>d4</td>
<td>560-490</td>
<td>70 years</td>
<td>7</td>
<td>NM4889 + 5 others</td>
</tr>
<tr>
<td>d5</td>
<td>560-550</td>
<td>10 years</td>
<td>1</td>
<td>Acr593</td>
</tr>
<tr>
<td>d3</td>
<td>550-540</td>
<td>10 years</td>
<td>1</td>
<td>NM4889</td>
</tr>
<tr>
<td>d6</td>
<td>550-500</td>
<td>50 years</td>
<td>2</td>
<td>NM4889 + 1 other</td>
</tr>
<tr>
<td>d12</td>
<td>550-540</td>
<td>10 years</td>
<td>1</td>
<td>NM4889</td>
</tr>
<tr>
<td>d12'</td>
<td>550-540</td>
<td>10 years</td>
<td>1</td>
<td>NM4889</td>
</tr>
<tr>
<td>d16'</td>
<td>550-540</td>
<td>10 years</td>
<td>1</td>
<td>NM4889</td>
</tr>
<tr>
<td>c4</td>
<td>550-520</td>
<td>30 years</td>
<td>4</td>
<td>NM4889 + 2 others</td>
</tr>
<tr>
<td>d8</td>
<td>550-520</td>
<td>30 years</td>
<td>3</td>
<td>NM4889 + 2 others</td>
</tr>
<tr>
<td>d8'</td>
<td>525</td>
<td>1 year</td>
<td>1</td>
<td>Acr681</td>
</tr>
<tr>
<td>d2</td>
<td>510</td>
<td>1 year</td>
<td>1</td>
<td>Acr683</td>
</tr>
<tr>
<td>c8'</td>
<td>510-500</td>
<td>10 years</td>
<td>1</td>
<td>Acr675</td>
</tr>
</tbody>
</table>
There are several other designs that appear more than once in the thirty-year period between 550 and 520 BCE. \(c4\), having fourfold rotational symmetry about its centre but no reflection symmetry, is found c550-540 BCE twice on NM4889 from Myrrhinous. It is not found again until ten to twenty years later, once on Acr. 680 (530-520 BCE) and once on Acr. 671 (520 BCE). Like \(c4\), another common design is \(d8\), which has eightfold rotational symmetry about its centre as well as reflection symmetry along its eight distinct mirror reflection lines. It appears once on NM4889 (c550-540 BCE) but not at Athens until fifteen years have elapsed, when it is found once on Acr. 682 (525 BCE) and then once on Acr. 670 (c520). The occurrences of \(c4\) and \(d8\) on NM4889, in addition to appearing outside Athens, are also the earliest instances of these two designs (550-540 BCE). The later Athenian occurrences of \(c4\) and \(d8\) date to 530-520 BCE, which corresponds to the time period during which we saw the addition of \(pm11, pmm2\) and \(p111\) to the body of underlying patterns of symmetry. We may wonder whether the same factors or influences are at work in this case as well.

\(d2\), having twofold rotational symmetry about its centre and reflection symmetry along two distinct mirror reflection lines, is not found on NM4889, and is found only once, on Acr. 683 from 510 BCE. \(d6\), which has sixfold rotational symmetry about its centre and reflection symmetry along six distinct mirror reflection lines, is found twice between 550 and 500 BCE. It appears c550-540 BCE on NM4889 from Myrrhinous, then not for another forty to fifty years until 500 BCE, when it is found once on Acr. 674. One of these designs does not show up at Myrrhinous in the earlier period, and one does. Both designs are not used at Athens.
until c520-500 BCE, when two-dimensional patterns begin to be seen on the korai. We also begin to see colour reversal among the designs at roughly the same time as it appears among the patterns. NM4889 from Myrrhinous has the earliest examples of colour reversal in its \( d_{12} \) and \( d_{16} \). It is not found on the Acropolis korai until we see \( d_{8} \) on Acr. 681 (c525 BCE) and \( c_{8} \) on Acr. 675 (510-500 BCE). Again we see that 525 BCE is pivotal for change in both design and pattern on the korai.

Another observation is that there are fewer occurrences of designs on the korai than of patterns: 26 design occurrences in total versus 62 pattern occurrences. There are somewhat fewer varieties of design on the korai than of patterns: 12 distinct designs (including colour reversals) versus 13 distinct patterns (including colour reversals and two-dimensional patterns). NM4889 from Myrrhinous has the greatest variety of designs (8) and patterns (3), for a total of 11. The Acropolis kore that approaches these statistics most closely is Acr. 675 (510-500 BCE) with 2 distinct designs, 4 distinct one-dimensional patterns and 1 two-dimensional pattern, for a total of 7. Acr. 678 (530 BCE) has only one distinct one-dimensional pattern; Acr. 679 (535-530 BCE) has only two distinct one-dimensional patterns. Neither of these korai has designs of any description. Acr. 673 (520-510 BCE) has three distinct one-dimensional patterns; Acr. 683 (510 BCE) has two distinct one-dimensional patterns and one distinct design. It could be argued that the designs were not as common as patterns on the peploi and chitones because they may have been more difficult for the sculptor to incise and/or more difficult for the painter to paint. It could also be argued that there may have been an associated higher cost involved in adding extra decorative features to the korai.
and that some patrons would not have wanted, or been able, to pay for the “deluxe model”, as it were.

**Correlation of the Results With Historical Information**

In her study of Ica-Inca interactions in the Ica Valley culture of Peru c1350-1570 CE, Dorothy Washburn compared the results obtained from her symmetry analysis of the design motifs on the distinctive Ica polychrome pottery with an earlier analysis\(^d\) of the “features and themes” of these same designs, a standard method used to analyse finds from graves in Ica cemeteries.\(^5\) She undertook the analysis to determine how “features and themes analysis and the symmetry analysis reflect the presence of the conquering Inca on the Ica Valley culture,”\(^6\) and in particular whether one type of analysis or the other more accurately reflects the cultural situation both pre- and post-conquest of the indigenous Ica by the Inca. In other words, she explored whether both methods of analysis would give the same interpretation to the same set of data.

Ceramic evidence indicates that administrative centres closer to the Inca capital of Cuzco reflect Cuzco-style forms and polychromies in standardized stylistic canons, while smaller and more distant centres show very little evidence of the Inca hegemony. Additionally, ceramics produced locally for the Inca administrative elites display stylistic

---

\(^d\)Menzel (1976).

\(^5\)See Washburn (2004b).

features of the Cuzco style mixed with features of the local style. In the Ica Valley, pottery evidence of the Inca conquest include Cuzco-style Inca ceramics as well as locally made copies of the Cuzco style, termed “Ica-Inca.” Washburn expected that the Ica-Inca style would be standardized in the Inca fashion and different from the locally produced pottery. But because it was produced locally for the local administrative elites, it should reflect a mixture of Inca and Ica styles (Washburn 2004b: 217-8).

Menzel, who based her study on consistency in the appearance of vessel shapes, design motifs and their location in standard layout areas, found consistent, gradual and long-term stylistic changes that correlated with the time framework for the Inca conquest of the region in which the Ica Valley was included. By contrast, Washburn analysed six motifs found on the grave lot ceramics for continuity and change, and based the analysis on the illustrated designs published by the earlier researcher. Her results indicated a “remarkable continuity” in the symmetries underlying the six motifs throughout the 220 year-period covered by the earlier study, even during the Inca occupation. Each analytical method emphasizes a different aspect of the interaction between the conquerors and the conquered (Washburn 2004b: 220-5). But only Washburn postulated that the results are indicative of the local group’s attempt to maintain its cultural identity in the face of conquest and control by a foreign power (Washburn 2004b: 226). The outside stylistic elements, imposed by the Inca, were reorganized and reused by the local Ica Valley population.

---

7See Menzel (1976), Chapter V, 221-45 for her conclusions.
Washburn then looked at a correlation of the results of both kinds of ceramic analysis with other archaeological evidence from the time. She noted that archival documents indicate that the Inca added their own power structures to existing local political/administrative organizations, keeping the local elites and maintaining local systems of land tenure and forms of government. The features and forms analysis of the ceramic patterns produced an interpretation that postulated the existence of a centralized Ica government prior to the Inca conquest, with Inca presence limited to administrative buildings in the Ica capital after the Inca influx. In outlying areas, Ica pottery motifs persisted and Inca pottery motifs appeared only centrally. Washburn argued that this type of analysis does not address the nature of the Inca presence, nor how it is manifested in the archaeological record. Symmetry analysis, on the other hand, reveals that the continuity of Ica structures during the period of Inca rule points to a political control that was not absolute, because local traditions were maintained and local communities remained economically self-sufficient (Washburn 2004b: 227-8). Washburn concluded that symmetry analysis can describe accurately and in an empirical fashion how continuities or changes in symmetry can reflect different kinds of cultural change.

I postulated that my symmetry analysis of the patterns on the Akropolis korai would reveal changes that would correlate with changes in the Athenian cultural context during the sixth century BCE. I found continuity in the use of some underlying patterns of symmetry throughout the seventy-year period between 560 and 490 BCE, as well as evidence of change, in the form of colour reversal and the addition, or cessation in usage, of other underlying patterns of symmetry. I looked at such historical documentation as is available about the time
period in question, which consists primarily of references to and fragments of the texts of Archaic writers that are found in later ancient authors.

I noted above that some patterns and designs show evidence of continuity during the seventy years between 560 BCE and 490 BCE. Beginning in the early sixth century, three to four decades before the first of the korai from the Erechtheion find was created, both Athens and Attica experienced political and social unrest of sufficient magnitude that the elite of the city appointed Solon archon in 594/3,\(^8\) with absolute authority for one year to resolve problems related to the widening economic gap between those who were wealthy and those who were much less so, as well as to resolve the concomitant problems of unrest and discontent. The existing fragments of his laws, expressed as poetry, have been interpreted customarily to mean that he redistributed land by moving the \textit{horoi} (boundary markers), cancelled debts or debt-bondage, instituted a new council, introduced a new class census, established law courts with juries and provided a comprehensive code of laws to ensure that all citizens were treated justly (Parker 2007: 24-8). But we know of his policies only because the fragments appeared outside their earlier sixth century context in such later texts as the \textit{Athenaion Politeia},\(^9\) compiled by an anonymous fourth-century author who was probably a student of Aristotle.

\(^8\)Or possibly as much as twenty years later (Parker 2007: 24).

\(^9\)The \textit{Athenian Constitution}. The fragments are available to us outside their contemporary social, political and literary context, with their meanings obscured by the commentaries of later authors (Hall 2007: 191-6).
Whether Solon initiated these economic and social changes, and if he did, whether they were truly democratic in nature and/or effective, is less interesting than the fact that such remedies would be considered as solutions to popular unrest at such an early time (Hall 2007: 195). In terms of the cultural context in which the korai later began to appear, we begin to have an idea of the areas of conflict between different socio-economic groups of Athenians - Solon’s kakoi (the “bad” or “ugly” ones) and agathoi (the “good” ones).

The author of the Athenaion Politeia (hereafter abbreviated as AP) reports that Solon’s reforms did not succeed in quelling the economic and social unrest (AP 7.1; Herodotos 1.29 - hereafter referred to as Hdt.; see also Ehrenberg 1968: 74-6). Some thirty years later (or ten years later, if we accept Sancisi-Weerdenburg’s arguments) c560 BCE when the first of the Erechtheion korai is supposed to have been created, Peisistratos made his initial bid to be sole ruler of Athens during a period of regional factionalism. He was driven into exile shortly thereafter and again a second time after an abortive attempt to regain power c557 BCE. He returned c547 BCE with military support from the Argives and financial support from Thebes to consolidate his position as tyrant. His active supporters and opponents throughout these years were members of powerful Athenian families, backed by factions from the populace as a whole (Parker 2007: 28-29). Peisistratos’ family itself had a land base and influence in the mesogaia (the interior plain, particularly around Brauron and

---

10Sancisi-Weerdenburg argues that flaws in the historiographical analysis of this period are based on fifth century bias and consequent distortions in traditions concerning the Athenian tyranny, lack of sixth century documentary evidence, a reliance on the chronology as established by Herodotos in particular, and assumptions concerning the identification of tyrants as promoters of religious and cultural activities, to the exclusion of anyone else. See Sancisi-Weerdenburg 2000b for the full argument.
Marathon), whence he derived much of his support (Hall 2007: 225).

We see that this ten to fifteen-year period was marked by political unrest, ending with Peisistratos’ installation of himself as tyrant on his third attempt to seize power. But there are continuities in the socio-political situation that lasted until the expulsion of Hippias, the last Peisistratid tyrant, in c510/509 BCE. For example, the author of the *Athenaion Politeia* notes that Peisistratos’ administration was more *politikós* (constitutional) than tyrannical (*AP* 16.2), and Thucydides (hereafter referred to as *Thuc.*) writes that “in other respects, the city itself continued to employ the laws that had previously been laid down, except that [the Peisistratids] always took care that one of their own held the chief magistracies” (*Thuc.* 6.54.6).\(^1\) We cannot assume that the period during which the Peisistratids ruled Athens was qualitatively different to any great degree from what came before or after\(^2\) and it is against this social, economic and political background that we must evaluate the early patterns of symmetry. Both *pma2* and *p112* can be found on the Akropolis korai beginning c560, as can designs *c4, d4, d6* and *d8. pma2, p112* and *d4* continue to be used on the korai through to 490 BCE. Here we see that societal continuity is reflected by the continuity of the patterns and design.

The *Athenaion Politeia* says that Peisistratos died c528/527 and was succeeded by his sons Hippias and Hipparkhos (*AP* 17.1-3), who have often been credited with building

\(^{1}\)Translation by Jonathan M. Hall (Hall 2007: 230).

\(^{2}\)Hall 2007: 230.
projects and other acts of patronage as a form of self-publicity (Hall 2007: 141). Hipparkhos is supposed to have welcomed the lyric poet Anakreon of Teos (Plato, *Hippias* 228b; *AP* 18.1) and Simonides of Keos (*AP* 18.1). A number of non-Athenian sculptors, such as Aristion of Paros, were active in Attika during the Peisistratid tyranny as well (Hall 2007: 142). Several Attic sanctuaries and temples are considered to have been built during this period, although the dates continue to be in dispute. The sanctuary of Artemis at Brauron and the first temple of Dionysos Eleuthereos on the southern slope of the Akropolis are two examples of later sixth century building construction first attributed to Peisistratos himself and then to Hippias and Hipparkhos. In addition to large public monuments and patronage of the arts, they undertook other public works, such as a better water supply (the *Enneakrounos* well), additions to the agora built by Solon and the institution of new customs regulations, as well as more stringent application of existing regulations, in order to derive more revenue from Athens’ growing foreign trade. These are some of the Peisistratid changes that took place c530-520 BCE, when three other patterns of symmetry first appear (*pm11, pmm, ...

---

13Of late, the dates of many of these have been reassigned to the Kleisthenic period during the final decade of the sixth century. An example is the *Archaio Neos*, the Old Temple of Athena Polias, built on the Akropolis just south of where the Erechtheion is located. It was originally ascribed to Hippias and Hipparkhos but there are now arguments that suggest it should be dated to c510-500 on the basis of its remaining sculptural fragments. See Hurwit 1999 for example. There are several objections to this “down-dating.” First, we must ask whether such a large amount of building activity could be compressed into such a small period of time, given the size of the structures, the materials from which they were constructed, the tools available and the necessary financial resources. Secondly, the dates attributed to these buildings are based almost exclusively on style. A chronological scheme like this assumes that stylistic evolution is chronologically linear and uniform, which it patently isn’t, and is often based on “fixed points,” like the destruction levels of Near Eastern cities such as Hama in Syria or Ashkelon in Palestine, which have been securely dated by references in Assyrian or Babylonian records, or the dates of the Greek colonial foundations in Magna Graecia as established by Thucydides and supported by pottery evidence. In the case of the sanctuary structures in Attica and Athens itself, we should allow some leeway in our acceptance of later dates because no more than four to five years separates the expulsion of Hippias and Kleisthenes’ reforms. Additionally, such rigidity of interpretation fails to take into account the time required for planning and execution of such large projects. See Hall 2007: 227-9 for a full discussion.
By Harmodios and Aristogeiton, who were later commemorated in commissioned bronze statues created by the sculptor Antenor sometime before 480 BCE.

Hipparkhos was assassinated in 514 BCE\(^4\) and Hippias ruled for four more years by himself, instituting increasingly harsh and repressive measures in order to retain his authority and control (*Hdt*. 5.55; *Thuc*. 6.56; *AP* 18 ff.), including taking hostages from the wealthy families, and introducing taxes on births and deaths. He was eventually expelled in 510 BCE by the Spartans, who were persuaded to depose him by the Alkmaionid enemies of the Peisistratids (*Hdt*. 5.64-65). Two more years of factional infighting occurred, one faction led by Isagoras, son of Teisandros, an aristocrat who was supported by other elite Athenian families, since he had been appointed archon for 508/507 BCE. The other faction was led by the Alkmaionid Kleisthenes, son of Megakles, whose maternal grandfather was Kleisthenes of Sikyon, and who was probably the eponymous archon for 525/524 BCE on the Athenian archon list (Hall 2007: 211). Isagoras, aided by the Spartans, succeeded in ousting Kleisthenes, exiling him from Athens along with seven hundred Athenian families who were Alkmaionid supporters. But the *dēmos* intervened to annul the exile, executing the Isagorid supporters and recalling Kleisthenes.

---

\(^4\)By Harmodios and Aristogeiton, who were later commemorated in commissioned bronze statues created by the sculptor Antenor sometime before 480 BCE.
When Kleisthenes returned, he began the process of reforming the social and political structure of Athens. He created ten new *phylai*, often called “tribes”, to replace the original four phylai, whose political power was thus neutralized and replaced with ceremonial functions relating to religion. The phylai served as the main subdivisions of the citizen body for purposes of military, social and political organization. Each *phylê* was commanded by a *phylarkhos*, or tribal leader and was divided into three *trittyeis*, or associated geographic units, one in the city, one in the coastal regions and one inland (see Map 6.1 below). Each *trittys* was assigned a variable number of the Attic *demoî*, (demes, or villages; see Map 6.2 below), with the number of demes assigned to a trittys dependent on the population size of each deme, so that the number of citizens assigned to each of the ten new phylai would be equal (Hall 2007: 213).

A citizen would register with his own deme at the age of eighteen. The army was made up of regiments from the phylai, with ten *stratêgoi*, or generals, elected annually, one for each phylê. A *boulê* (council) of five hundred was set up, to which each phylê contributed a *prytany* (fifty members) annually. Each prytany served as the executive for the boulê for one month of the ten-month year. The boulê itself drafted the agenda for motions to be debated by the assembly and oversaw administrative matters (Ehrenberg 1968: 87-94; Hall 2007: 213).

Other changes were instituted as well, with the net result being a “reconfiguration of the relationships between the components that constituted the *polis*” (Hall 2007: 216).
Map 6.2. Settlements in Attika.
Kleisthenes’ exact goal is unclear. According to the *Athenaion Politeia* (21.2) he wanted to redistribute the phylai so that more people would be eligible for citizenship, including those who had been disenfranchised during the Peisistratid tyranny (*AP* 13.5). A perhaps more politically astute (and less altruistic) view is that he wanted to break the influence of the powerful Athenian elite families on the ways in which matters of city government had been conducted to that point in time. Regardless of his intent, the net result was that the reshuffling of the tribal system created a new sense of unity among the citizens (Hall 2007: 217). In addition, the decision of the dèmos to rid itself of Isagoras, his supporters and the Spartans, and to recall Kleisthenes, was important in the development of democracy at Athens because it constituted one of the citizen body’s first acts of political self-expression (Hall 2007: 218).15

I expected to find a record in the patterns of symmetry that the redistribution and reformation of the four tribes into ten had the effect in socio-cultural terms of breaking the long-standing ties between and among extended families within the demes. The political redistribution should have forced individuals and groups into forming new affiliations because they were now compelled to associate with people from other regions of Attika in their military units and prytaneis and when they served on the boulê. In other words, I expected to find that Kleisthenes’ political reorganization would have had a noticeable effect on the underlying patterns and designs c510 BCE and after, much as the Inca hegemony over the Ica

---

15See Osborne (1996a): 292-304 for a more complete discussion of the events and Kleisthenes’ possible motivations.
resulted in a detectable change in Ica patterns (see above). This does not appear to have taken place.

Colour reversal first appeared before then, c530-520 BCE during the period of Peisistratid rule, as did the first instances of two-dimensional patterns. To me this indicates that the most important factors for change in Archaic Athens were not related directly to the final steps of the polis toward its first manifestation of democracy but rather to earlier sociopolitical, economic and cultural activities under the Peisistratids. To a certain extent, this is supported by Raubitschek’s surmises regarding the evidence for the existence of the demes before Kleisthenes. He noted that there is no real evidence in Solon to assume that the local Attic communities were called demes; each was more likely to have been known at that time as a ‘polis’ (πόλις). The change may have begun under the new Solonian laws and by the time of Peisistratos (c560-527 BCE), there is more evidence for the existence of demes. The account of Peisistratos’ establishment of the ‘dikastai kata demous’ (δικασταὶ κατὰ δήμοις / judges for the communities; AP 16.5) probably means no more than that these arbitrators were appointed for the rural communities. But it also may indicate that these local communities had existed well before the time of Kleisthenes and that they began to be treated as distinct political units only after his reforms.¹⁶ So the Kleisthenic reforms, instead of disrupting the existing social order, and thus the underlying patterns of symmetry, had little noticeable impact on what had already occurred sixty to thirty years earlier, or on the pattern categories. Like the Ica mentioned above, the Athenians appear to have accepted additional

¹⁶See Raubitschek 1949: 467-78 for the complete discussion.
patterns and designs during this time period, and incorporated them into their non-representational art forms alongside those patterns and designs that were already part of their cultural heritage.

Next Steps and Possibilities

One of the main drawbacks to this analysis has been the lack of data. As mentioned earlier, I restricted my study to those korai found in the 1880s near the Erechtheion and whose patterns Lermann had published in 1907 because it was relatively simple to extract the patterns and designs from his colour plates. There are other Akropolis korai with the remains of patterns still visible, but there are no printed usable colour copies of these patterns. If this study were to be extended, I would examine a wider range of Athenian and Attic korai, relying on such black-and-white reproductions as now exist, and produce a larger sample on which to carry out statistical analyses and from which to either reinforce or disprove my earlier observations and conclusions. Of course, the best way to examine them would be to visit them in situ in Greece.

There are other directions in which this study could be extended. Since the korai were produced in a relatively short time period, it would be interesting to find out whether their underlying patterns of symmetry appeared both earlier than c560 BCE and later than 490 BCE in other media. We have a very large extant selection of Athenian and Attic pottery that is decorated with non-representational patterns as well as human and animal figures. I have selected patterns from several vases that range in age from c900-850 BCE to c490 BCE (see
Figures 6.4-6.11 below) and analysed these. The results are listed in Table 6.3 below.

Table 6.4 below compares the patterns found on the vases with the patterns found on the korai. Since this is at best a very rough exercise to demonstrate the potential of pattern analysis, it will not be possible to make any but the most superficial observations. There are, however, some interesting observations to be made. Several of the most commonly occurring patterns from the korai also occur frequently on the pots, for example \textit{p112}, \textit{pm11} and \textit{pmm2}, and they appear consistently over a period of approximately four hundred years, from c900 to c490 BCE. Another pattern used consistently on the korai, \textit{pma2}, appears only once on an early Attic pot, while it appears eleven times on the korai over a range of seventy years. This could be explained by the fact that the size of pot samples is very small. If I had included a much larger number of Attic vases, I would expect to find more occurrences of this particular pattern. Some patterns occur only on the korai, such as \textit{p111}. If the sample size of vases were larger, I would expect to find a wider range of patterns. Some patterns occur only on the vases, for example, \textit{pl1a1} and \textit{pl1m1}. This may be because these patterns were considered unacceptable for any decorative object other than vases, because we have not yet found korai on which these patterns were used, or because in the case of \textit{pl1m1} at least, some event occurred c735-700 BCE that rendered its use on any object unacceptable. With two exceptions, \textit{pma2} and \textit{pl1m1}, all patterns appeared on objects from both Attika and Athens. There were no vases with examples of either colour reversal or two-dimensional patterns. Again, further study in this area may provide some interesting results.
**Table 6.3.** Attic and Athenian vases: type and frequency of patterns by date range

<table>
<thead>
<tr>
<th>Vase</th>
<th>Date (BCE)</th>
<th>Find Spot</th>
<th>Pattern(s)</th>
<th>No. of Occurrences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 6.4</td>
<td>900-850</td>
<td>Attika</td>
<td>p112, pm11, pma2</td>
<td>1, 1, 1</td>
</tr>
<tr>
<td>Fig. 6.5</td>
<td>750-735</td>
<td>Attika</td>
<td>p1a1, pm11, pma2</td>
<td>1, 1, 1</td>
</tr>
<tr>
<td>Fig. 6.6</td>
<td>735-700</td>
<td>Athens</td>
<td>p1a1, p1m1, pmm2</td>
<td>3, 1, 4</td>
</tr>
<tr>
<td>Fig. 6.7</td>
<td>700-680</td>
<td>Attika</td>
<td>p112, p1a1, pmm2</td>
<td>1, 3, 1</td>
</tr>
<tr>
<td>Fig. 6.8</td>
<td>530</td>
<td>Attika</td>
<td>p112, pm11, pmm2</td>
<td>1, 2, 1</td>
</tr>
<tr>
<td>Fig. 6.9</td>
<td>530-520</td>
<td>Attika</td>
<td>p112, pm11, pmm2</td>
<td>1, 1, 1</td>
</tr>
<tr>
<td>Fig. 6.10</td>
<td>520-510</td>
<td>Athens</td>
<td>p112, pm11, pmm2</td>
<td>1, 2, 1</td>
</tr>
<tr>
<td>Fig. 6.11</td>
<td>500-490</td>
<td>Attika</td>
<td>p1a1, pm11</td>
<td>1, 2</td>
</tr>
</tbody>
</table>

182
Table 6.4. Comparison of vases vs korai with respect to pattern

<table>
<thead>
<tr>
<th>Vases</th>
<th>Akropolis Korai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pattern</td>
<td>Find Spot(s)</td>
</tr>
<tr>
<td>----------</td>
<td>--------------</td>
</tr>
<tr>
<td>pma2</td>
<td>Attika only</td>
</tr>
<tr>
<td>p112</td>
<td>Athens &amp; Attika</td>
</tr>
<tr>
<td>pm11</td>
<td>Athens &amp; Attika</td>
</tr>
<tr>
<td>pmn2</td>
<td>Athens &amp; Attika</td>
</tr>
<tr>
<td>p1a1</td>
<td>Athens &amp; Attika</td>
</tr>
<tr>
<td>p1m1</td>
<td>Athens only</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Figure 6.4. Neck-handed amphora, first half of 9th century BCE, terracotta, Attika.

Figure 6.5. Jug, c750-735 BCE, Attika.
Figure 6.6. Jug, c735-700 BCE, Athens, 16.1 cm.

Figure 6.7. Neck-handled amphora, c700-680 BCE, Analatos painter, Attika.
Figure 6.8. Black-figure neck-handled amphora, c530 BCE, Akhilles killing Penthesilea, Attika (found at Vulci).

Figure 6.9. Neck-handled amphora, c530-520 BCE, mask of Dionysos, Attika.
Figure 6.10. Black-figure amphora, c520-510 BCE, Athens.

Figure 6.11. Atalanta lekythos, c510-490 BCE, Attika, 31.8 cm.
A geographical sample of vases (see Figures 6.12 to 6.15 below) produced the results in Table 6.5.

**Table 6.5. Geographical sample of Corinthian and other vases**

<table>
<thead>
<tr>
<th>Object</th>
<th>Description</th>
<th>Date</th>
<th>Pattern 1</th>
<th>Pattern 2</th>
<th>Pattern 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fig. 6.12</td>
<td>ProtoCorinthian aryballos</td>
<td>650-640</td>
<td>pm11</td>
<td>p’m11</td>
<td></td>
</tr>
<tr>
<td>Fig. 6.13</td>
<td>Corinthian oinochoe</td>
<td>640-630</td>
<td>pm11</td>
<td>p’m11</td>
<td>pmm2</td>
</tr>
<tr>
<td>Fig. 6.14</td>
<td>Laconian kylix</td>
<td>565-560</td>
<td>pm11 (x 2)</td>
<td></td>
<td>pmm2</td>
</tr>
<tr>
<td>Fig. 6.15</td>
<td>Boeotian low kylix</td>
<td>6(^{th}) cent.</td>
<td>pm11</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This very small sample size produces five occurrences of *pm11*, which seems to be common to Athens/Attika as well as to Corinth, Boeotia and Laconia; two occurrences of colour reversal from Corinth (*p’m11*); and two instances of *pmm2* from Corinth and Laconia. There are two aspects to note: first, the apparently widespread use of *pm11* across four geographical areas and second, the appearance of colour reversal in the mid-sixth century in Corinth. Both would be worth further study. Other possibilities include extending the analysis to patterns from geographical locations which the Greeks were known to have inhabited or in which they traded, for example, Phrygia, Lydia, Cyprus, Egypt, Magna Graecia and the Black Sea coast.
Figure 6.12. ProtoCorinthian aryballos, c650-640 BCE, 13.7 cm.

Figure 6.13. Corinthian oinochoe, c640-630 BCE, 23.5 cm.
Figure 6.14. Kylix by the Arkhesilaos painter, Lakonia, c565-560 BCE.

Figure 6.15. Boeotian low kylix by the Protome painter, 6th century BCE, 6.7 cm.
Conclusions

My research has focused on the use of a mathematically based classification system for nonrepresentational patterns in the plane to analyse the patterns found on fifteen Archaic Greek korai, fourteen of them found on the Akropolis and one from Myrrhinous/Merenda. Non-representational patterns, usually termed “abstract” or “geometric”, are commonly found on textiles, tiles, ceramics, basketry, carved wood or worked stone as borders or overall areas of decoration. I have applied this system, as developed by Washburn and Crowe, to the korai patterns in order to uncover what could be termed structural consistencies in the Archaic Greek stylistic system, and in order to reveal continuities or discontinuities with other historical events in the history of Archaic Athens and Attika. To my knowledge, this is the first time that Washburn and Crowe’s methodology has been applied to artefacts from Archaic Greece. My expectation was that the political reorganization of the Athenian/Attic tribal system under Kleisthenes c508 BCE would have upset the existing social order and would have resulted in changes in the patterns. Instead, I found that the changes may have occurred earlier in the history of Athens, c530-520 BCE during the rule of the Peisistratid tyrants. At that time, possibly due to the stability of government under Peisistratos, which may also have included an influx of foreign influences in the form of the opening of the borders of Attika to non-Attic artisans and traders, the repertoire of Athenian one-colour, one-dimensional patterns increased to include patterns with colour reversal and two-dimensional patterns. I compared the patterns from the korai with patterns from both Athenian/Attic vases and vases from several other Greek city states at both earlier and the same time periods. The sample was too small in statistical terms to reveal definitive trends; however, the results were
interesting enough to indicate that further in-depth investigation could provide valuable insights. I also suggested other areas which might prove fruitful, such as an extension of the analysis to patterns from cultures outside Greece (Magna Graecia, Egypt, Lydia, Phrygia, Crete, Cyprus, the Levant, etc.) in order to look at the possibility of other cultures having influenced Greek patterns, and vice versa.

These structural consistencies must have had some communicative function for the inhabitants of Archaic Athens, although it is unlikely that we may know definitively what that function was. For the archaeologist, underlying patterns of symmetry once revealed permit reliable, non-subjective categorizations of styles and comparisons among styles. Knowledge of these consistencies provides one framework within which to understand the context not only of the creation of the korai themselves but also of larger movements within Archaic Greek society and in this case within Archaic Athenian society. The features of the Archaic style can be described using this analytical tool in order to provide a broader understanding of the style and of the way it functions within its cultural context. Symmetry analysis allows us to describe objectively how different cultures depict their world. It is a tool for the definition of cultural relationships by classification of invariant features. And although it is not by any means the only tool for such studies, it provides one means by which we can gain further insights into ancient Greek culture in particular and into culture itself as a system.
Bibliography

Ancient Sources


Press.

Belles Lettres.


+Mem.+3.10.1. English text based on Xenophon. Xenophon in Seven Volumes. Vol. 4.
Cambridge, MA: Harvard University Press. Greek text based on Xenophon.


Secondary Sources

London: British School of Archaeology at Athens; Thames & Hudson.

265-79.


Pattern Design” in Innovations in Applied Artificial Intelligence : 17th International
Conference on Industrial and Engineering Applications of Artificial Intelligence and


Millennium B.C. as a Source for Greek Vase Painting of the Orientalizing Style.


Cecchetti, P.C. 1972. *Decorazione dei Costumi nei Vasi Attici a Figure Nere.* Roma: De Luca Editore.


University Press.


University Press.


Ehrenberg, V. 1968. *From Solon to Socrates: Greek History and Civilization During the Sixth and Fifth Centuries B.C.* London: Methuen.


Chicago Press.


Cambridge: Cambridge University Press.


Anthropology.


Kurke, L. 1999. “Pindar and the Prostitutes, or Reading Ancient Pornography” in *Constructions of the Classical Body*, J.I. Porter, ed., Ann Arbor, University of


University Press, 91-126.


Couprie et al., Albany, State University of New York Press, [7]-69.


Arbor, University of Michigan Press, 1-18.


---------- 1990. “Birds, “Meniskoi” and Head Attributes in Archaic Greece.” *AJA* 94: 583-


Smith, J.M. 1882. *Ancient Greek Female Costume*. London: Sampson Low, Marston,
Searle & Rivington.


Table 1.1. Flow Chart for One-Colour and Two-Colour One-Dimensional Patterns
Table 1.2. Preliminary Flow Chart for One-Colour and Two-Colour Two-Dimensional Patterns
Table 1.3. Flow Chart for Two-Dimensional Patterns Admitting No Rotations Consistent with Colour
Table 1.4. Flow Chart for Two-Dimensional Patterns with Smallest Rotation Consistent with Colour of 180°
Table 1.5. Flow Chart for Two-Dimensional Patterns with Smallest Rotation Consistent with Colour of 90°
Table 1.6. Flow Chart for Two-Dimensional Patterns with Smallest Rotation Consistent with Colour of 120°
Table 1.7. Flow Chart for Two-Dimensional Patterns with Smallest Rotation Consistent with Colour of $60^\circ$
Table 2.1. Akropolis korai: list of patterns with frequency and year

<table>
<thead>
<tr>
<th>object designator</th>
<th>year</th>
<th>pattern</th>
<th>frequency of pattern occurrence on object</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acr593</td>
<td>560-550</td>
<td>pma2</td>
<td>1 epiblema, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p112</td>
<td>1 chiton, bottom edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d4</td>
<td>1 peplos</td>
<td></td>
</tr>
<tr>
<td>Acr678</td>
<td>530</td>
<td>pmm2</td>
<td>1 paryphe</td>
<td></td>
</tr>
<tr>
<td>Acr679</td>
<td>535-530</td>
<td>p112</td>
<td>1 apotygma, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pm11</td>
<td>1 apotygma, edge border</td>
<td></td>
</tr>
<tr>
<td>Acr680</td>
<td>530-520</td>
<td>p111</td>
<td>3 himation, edge border (3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p112</td>
<td>2 paryphe; sleeve, left</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pm11</td>
<td>3 chiton, neck border; himation, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pmm2</td>
<td>1 himation, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pma2</td>
<td>1 himation, edge border; chiton, skirt border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c4</td>
<td>1 chiton; himation</td>
<td></td>
</tr>
<tr>
<td>Acr682</td>
<td>525</td>
<td>p111</td>
<td>2 himation, edge border; paryphe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pm11</td>
<td>2 sleeve, right; belt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pmm2</td>
<td>1 sleeve, left</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d8</td>
<td>1 himation</td>
<td></td>
</tr>
<tr>
<td>Acr681</td>
<td>525</td>
<td>p112</td>
<td>1 chiton, neck border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pm11</td>
<td>1 himation, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p111</td>
<td>2 stephane</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d8'</td>
<td>1 himation</td>
<td></td>
</tr>
<tr>
<td>Acr670</td>
<td>520</td>
<td>p112</td>
<td>1 paryphe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pm11</td>
<td>1 stephane</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p4m</td>
<td>1 chiton; 2 dimensional</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d8</td>
<td>1 chiton</td>
<td></td>
</tr>
<tr>
<td>Acr671</td>
<td>520</td>
<td>pm11</td>
<td>1 stephane</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p112</td>
<td>1 epiblema, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pma2</td>
<td>1 paryphe</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p4'4</td>
<td>1 epiblema; 2 dimensional</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>c4</td>
<td>1 epiblema</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>d4</td>
<td>1 epiblema</td>
<td></td>
</tr>
<tr>
<td>Acr673</td>
<td>520-510</td>
<td>p111</td>
<td>2 stephane; sleeve, left</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pma2</td>
<td>1 himation, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pmm2</td>
<td>2 himation, edge border; paryphe</td>
<td></td>
</tr>
<tr>
<td>Acr683</td>
<td>510</td>
<td>pma2</td>
<td>1 sleeve, left &amp; right</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pm11</td>
<td>1 chiton, neck border</td>
<td></td>
</tr>
<tr>
<td>Acr675</td>
<td>510-500</td>
<td>pm11</td>
<td>1 stephane</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p111</td>
<td>2 paryphe; sleeve, left</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pmm2</td>
<td>1 himation, edge border</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>p112</td>
<td>1 sleeve, right</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>pg</td>
<td>1 chiton &amp; himation; 2 dimensional</td>
<td></td>
</tr>
</tbody>
</table>
### Akropolis Korai: List of Patterns with Frequency and Year

<table>
<thead>
<tr>
<th>object designator</th>
<th>year</th>
<th>pattern</th>
<th>frequency of pattern occurrence on object</th>
<th>note</th>
</tr>
</thead>
<tbody>
<tr>
<td>c8'</td>
<td>1</td>
<td>chiton &amp; himation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d4</td>
<td>1</td>
<td>chiton &amp; himation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acr674 500</td>
<td>p112</td>
<td>1 stephane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p'111</td>
<td>1</td>
<td>himation, edge border</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p112'</td>
<td>1</td>
<td>paryphe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p6'mm'</td>
<td>1</td>
<td>chiton &amp; himation; 2 dimensional</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d6</td>
<td>1</td>
<td>chiton &amp; himation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acr594 500</td>
<td>p112</td>
<td>2 paryphe; sleeve, left</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pmm2</td>
<td>1</td>
<td>sleeve, left edge border</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pm11</td>
<td>2</td>
<td>himation, border; epiblema, border</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d4</td>
<td>2</td>
<td>epiblema; himation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acr685 500-490</td>
<td>pm11</td>
<td>1 stephane</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pma2</td>
<td>2</td>
<td>himation, border (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>pmm2</td>
<td>2</td>
<td>belt; paryphe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d4</td>
<td>1</td>
<td>chiton</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NM4889 550-540</td>
<td>pma2</td>
<td>3 taenia; belt; paryphe</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p112</td>
<td>1</td>
<td>chiton, neck edge &amp; sleeves, left &amp; right</td>
<td></td>
<td></td>
</tr>
<tr>
<td>p'n11</td>
<td>1</td>
<td>peplos, bottom border</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d3</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c4</td>
<td>2</td>
<td>peplos (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d4</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d6</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d8</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d12</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d12'</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d16'</td>
<td>1</td>
<td>peplos</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 2.2. Akropolis korai: frequency of designs and patterns by date range

<table>
<thead>
<tr>
<th>Design</th>
<th>Date Range</th>
<th>Occurrence</th>
<th>Pattern</th>
<th>Date Range</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>c4</td>
<td>550-540</td>
<td>2</td>
<td>p111</td>
<td>530-520</td>
<td>3</td>
</tr>
<tr>
<td>c4</td>
<td>530-520</td>
<td>1</td>
<td>p111</td>
<td>525</td>
<td>2</td>
</tr>
<tr>
<td>c4</td>
<td>520</td>
<td>1</td>
<td>p111</td>
<td>525</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>c8'</td>
<td>510-500</td>
<td>1</td>
<td>p111</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>d2</td>
<td>510</td>
<td>1</td>
<td>p111</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d3</td>
<td>550-540</td>
<td>1</td>
<td>p112</td>
<td>560-550</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d4</td>
<td>560-550</td>
<td>1</td>
<td>p112</td>
<td>525</td>
<td>1</td>
</tr>
<tr>
<td>d4</td>
<td>550-540</td>
<td>1</td>
<td>p112</td>
<td>520</td>
<td>1</td>
</tr>
<tr>
<td>d4</td>
<td>520</td>
<td>1</td>
<td>p112</td>
<td>520</td>
<td>1</td>
</tr>
<tr>
<td>d4</td>
<td>510-500</td>
<td>1</td>
<td>p112</td>
<td>510-500</td>
<td>1</td>
</tr>
<tr>
<td>d4</td>
<td>500-490</td>
<td>1</td>
<td>p112</td>
<td>500</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>d5</td>
<td>560-550</td>
<td>1</td>
<td>p112'</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d6</td>
<td>550-540</td>
<td>1</td>
<td>p4m</td>
<td>520</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d8</td>
<td>550-540</td>
<td>1</td>
<td>p6'mm'</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>d8</td>
<td>525</td>
<td>1</td>
<td>p4m</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d8'</td>
<td>525</td>
<td>1</td>
<td>p4'</td>
<td>520</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d12</td>
<td>550-540</td>
<td>1</td>
<td>pm11</td>
<td>535-530</td>
<td>1</td>
</tr>
<tr>
<td>d12</td>
<td>530-520</td>
<td>1</td>
<td>pm11</td>
<td>530-520</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>d12'</td>
<td>550-540</td>
<td>1</td>
<td>pm11</td>
<td>525</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>d16'</td>
<td>550-540</td>
<td>1</td>
<td>pm11</td>
<td>510-500</td>
<td>1</td>
</tr>
<tr>
<td>Design</td>
<td>Date Range</td>
<td>Occurrence</td>
<td>Pattern</td>
<td>Date Range</td>
<td>Occurrence</td>
</tr>
<tr>
<td>--------</td>
<td>------------</td>
<td>------------</td>
<td>---------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1</td>
<td>pm11</td>
<td>510</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pm11</td>
<td>500-490</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pm11</td>
<td>500</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>pm'm11</td>
<td>550-540</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>560-550</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>550-540</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>530-520</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>520-510</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>520</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>510</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'ma2</td>
<td>500-490</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>530-520</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>530</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>525</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>520-510</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>510-500</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>500-490</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p'mm2</td>
<td>500</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
<td>9</td>
</tr>
</tbody>
</table>