Geometry of Pre-Columbian Andean Textiles

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Pre-Columbian Andean

- **Pre-Columbian**: Time in history of American continents before significant European influence
- **Andean**: Related to the Andes Mountains
  - Parts of modern-day Colombia, Chile, Argentina, Peru, Bolivia, and Ecuador
  - Refers to civilizations that used to thrive there
Cultures

- Textiles first appear in Paracas culture
- Other cultures such as Nasca, Wari, Chimu, Chancay, and Inca gained power over parts of the Andes
- Textiles were often the most valuable commodity they possessed

Source: Dransart
From Paracas to Inca

- First and last Pre-Columbian Andean cultures to produce textiles
- Paracas
  - ~ 800 BC - 100 BC
- Inca
  - ~ 1438 - 1533 AD
- Hard to tell which culture had more advanced textiles
Paracas Culture

- Most textiles found at a necropolis in Peru by an archeologist in the 1920s
  - 420 bodies
  - Paracas wrapped their dead in tapestries
- Paracas were fishermen and farmers
- Not much is known in regards to how they were organized, but it is evident that they had some kind of social stratification
  - Differences in grave goods left in tombs
    - Some individuals are wrapped in bundles with a rich array of offerings, pointing to their position as chiefs, high officials, or elite members of society

Source: Paracas, An Introduction
More Paracas Culture

- Combining the cotton growth in the coastal valleys with camelid fiber yarn that they obtained through trade with mountain peoples, the weavers produced celebrated textiles that were found in the tombs.
- Textiles played an important role in visual communication:
  - Especially in transmitting religious ideas and beliefs.
- Some motifs form complex visual metaphors that allude to the natural environment, society, and rituals:
  - Cosmic powers and attributes
  - Severed Heads
‘Reading’ the Images

● Masked figures with animal-like features
  ○ Supernatural creatures from a mythical pantheon?
  ○ Representations of ancestors with abnormal powers?

● Figures transformed into
  ○ Felines (tail, claws, and fangs)
  ○ Birds (wings spread out, beaks, and claws)
  ○ Orcas (fins, tails, and teeth)

● Appendages in the shape of serpents or plants radiate from mouths or bodies
  ○ Many brandish weapons and severed human heads (trophies won in battle? Heads of the ancestors symbolizing the supernatural forces invoked to ensure the continuation of the world of the living?)
    ■ Ex: the “Mythical Anthropomorphic Being”
    ■ Ex: the “Big-Eyed Being”
      ● Represented in frontal view
      ● Enormous round eyes
      ● Wavy appendages ending in snake heads or human heads

● Shamans commonly represented

Source: Mantos Funerarios
THREE STYLES OF EMBROIDERY
Linear Style Embroidery

~ features geometric designs in linear array (vertical, horizontal, or diagonal)

~ all elements in the design are made of a series of parallel, evenly spaced embroidered lines

Source: Mantos Funerarios
Broad Line Style Embroidery

~ the embroidery stitches run parallel and are thicker and slightly more flexible than those of the Linear style

~ the background color blends in with the primary motif to produce a sort of “transparent” look

~ the result is a visually elusive image in which it is difficult to distinguish between human and animal figures

Source: Mantos Funerarios
Block Color Style Embroidery

~ emerged somewhat later in the Paracas cultural timeline

~ complex figures are much less linear and more detailed (body shape, posture, attire, and features)

~ marked difference between the background color and the image

~ the range of colors employed is infinitely richer than in the Linear and Broad Line styles

Source: Mantos Funerarios
What style of Embroidery is this?

Linear, Broad Line or Block Color?
Symmetry

- A plane figure is said to be symmetrical if it admits one or more of the four plane isometries.
- A design is a plane figure that admits an isometry.
- A pattern is a design with translational symmetry.
Symmetry

- The first type of symmetry is reflectional symmetry.
- A mirror line is placed in the middle of the pattern to show a reflection over it.
Symmetry

- The second type of symmetry is translation symmetry.
- A translation of the plane is just a displacement or shift by a certain distance along a certain line.
Symmetry

- The third type of symmetry is rotational symmetry.
- A rotation has exactly one fixed point and is completely specified when we know its center, the angle of rotation, and its sense, clockwise or counterclockwise.

This design has a 180 degree rotation.
Symmetry

• In two-dimensional patterns, the presence of two intersecting mirror lines implies the presence of a rotation, which is twice the angle of the intersection of the two lines.

Since this pattern has mirror lines that intersect with a 90 degree angle, the pattern has a 180 degree rotation.
Symmetry

- The final type of symmetry is glide reflectional symmetry.
- A glide reflection can be simply described as a translation (glide) followed by a reflection in a line parallel to the direction of translation.
Birds, with outstretched wings and hexagonal eyes, are embroidered in stem stitch against a solid red ground on a yellow plain-weave fabric. Inside the border is a row of birds with large, heart-shaped heads. In this block colour style, the embroiderer first outlined the motif and then filled in the background with diagonally oriented lines of stitches.
What symmetries does this textile have?
From this view, we can see that this one-dimensional multicolored pattern does in fact have vertical reflectional symmetry. Although colors are not preserved when performing this motion, the pattern can still be called consistent with color.
From this view we can see that this pattern has translational symmetry. In fact, a figure cannot be called a pattern if it does not admit translational symmetry.
Here we can see that this pattern has glide reflection. The pattern is translated to the right, then reflected over the axis of translation. Up for debate.
Ignoring the top row of faces and the bottom row of threads in this pattern allows it to have rotational symmetry. Calling the faces and the bottom row “background” allows us to do this.
What symmetries does this textile have?
The textile has glide reflection symmetry, translational symmetry, and possibly vertical symmetry.
“The Paracas Textile”
Mantle: Hunchbacked shamans

This mantle consists of a hunchbacked figure, perhaps an old man. His outfit ends in severed human heads. The figure’s hair is unbound, he appears to be wearing a diadem and circular ear ornaments. A triangular shaped knife is above its head and a severed head is in one hand as well. The other hand holds a fan which appears to cover half of its face, and a staff with rattles. This figure may represent a shaman transfigured into an animal, due to the fact that it has claws instead of feet.
What symmetries does this textile have?
Mantle: Mythical Agricultural Being
“mantle of the staircase”

This textile features stepped geometric motifs. A unique textile technique is employed. This technique consists of weaving warp and weft threads of different colors interconnecting them at the edges of the designs. The side borders are embroidered in the Block Color style with a 16 times repeating figure. This figure is shown standing, in side view, facing front and looking up. It is wearing a loincloth, a tunic, anklets, and has a painted face. It is holding a mace and a staff. Four serrated appendages emerge from its face and chin. These end in severed human heads. The body is shaped like a lima bean, and so for this reason it likely represents a mythical being associated with an agricultural fertility cult.

Source: Mantos Funerarios
Symmetries?
Inca Culture

- The capital was Cuzco, in the central Peruvian Andes
- They created a huge empire reaching over 2,400 miles along the length of the Andes
- They called their empire *Tahuantinsuyu*, or Land of the Four Quarters
- The king was the supreme head of state and was considered a living god ruling by divine right
- The royal family controlled important areas of government, including the army
Inca

- Textiles still symbolize wealth and status
- Vicuna and Guanaco wool used to make clothes for important people
  - Llama and alpaca wool used for common people
- Most colors were used, but rarely blue
  - Colors had meanings behind them
- While still depicting spirits and animals, Inca textiles focused more on abstract geometric designs, especially checkerboard motifs.

Source: Cartwright
Colors

Red: conquest, rulership and blood

Green: rainforests, the peoples who inhabited them, ancestors, rain and its consequent agricultural growth, coca, and tobacco

Black: creation and death

Yellow: maize and gold

Purple: the first colour and associated with Mama Oclla, the founding mother of the Inca race

Source: Cartwright
Unku (shirt)

- Abstract Geometry
- Tocapus
  - Squares containing several combinations of figures

Source: Macedo
Unku 2

- Tocapus
- Checkerboard
- Symmetry
  - Top
    - 180 degree rotational
    - Translational
  - Bottom
    - Vertical Reflection

Source: Macedo
BIBLIOGRAPHY


