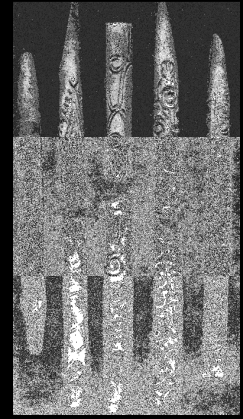


History: Paleolithic

- Often representations, even literalistic
- Captures the anatomy and movement of animals
- Artists did not create their own media, but accepted what nature gave them



Circa 17,000 BC

History: Neolithic

- New modes of life
- Artificial objects
- Artistic production encompasses the entire object
- Separation of the object and its ornament: separate artifacts



Circa 5,700 BC

History: Neolithic

- Ornament is now extraneous to the object
- Often stereotypical



Circa 5,700 BC

History: Neolithic

- Often stereotypical
- Almost infinite scope for variations
- Laid the foundation for contemporary ornament



Circa 2,600 BC

History: The last 5000 years

- A creative explosion
- Not everything is new



West African mud house, circa 1888

History: The last 5000 years



Chinese,
circa 300 BC

- New modes: ornamental writing
- Balance between stylization and literalism



Book of Kells, VIII century

History: The last 5000 years

- Bilateral Symmetry



Byzantine, VI century

History: The last 5000 years

- Bilateral Symmetry
- Animal Ornament



Bactrian, I century

History: The last 5000 years

- Bilateral Symmetry
- Animal Ornament



Chinese, IV century BC

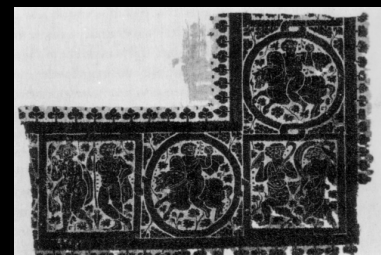
A Paradigm of Cultural Exchange

- Paisley Pattern
- Multiple factors: material and technique, fashion, international trade and artistic invention



A Paradigm of Cultural Exchange

- The Medallion style



Late Roman Empire, V century

A Paradigm of Cultural Exchange

- The Vine-scroll



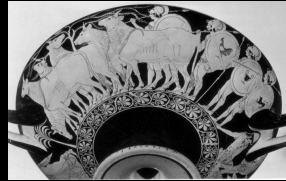
Egyptian, XIV century BC



Greek, IV century BC

A Paradigm of Cultural Exchange

- The Vine-scroll



Greek, VI century BC



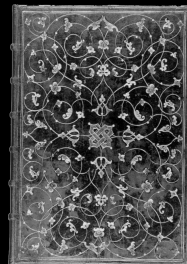
China, V century

A Paradigm of Cultural Exchange

- The Vine-scroll



Italy, VIII century



Italy, XVI century

Ogival Patterns



Roman North, II century



Samarkand
VII century

Ogival Patterns

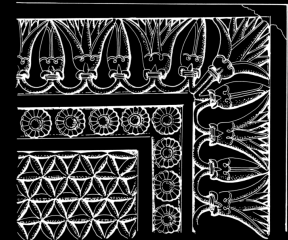
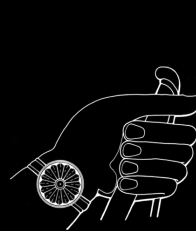


Italy, XV century



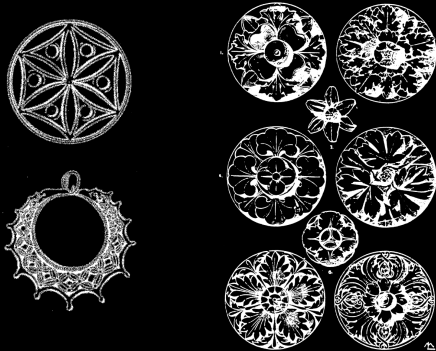
Owen Jones, XIX century

The rosette and star motif

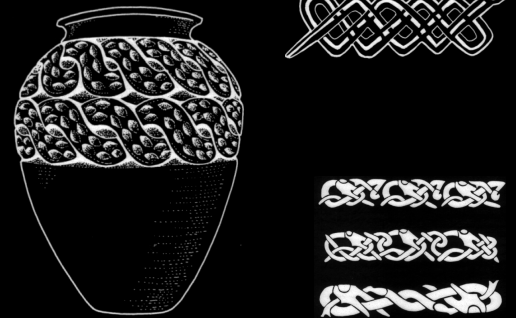


Assyria, IX century BC

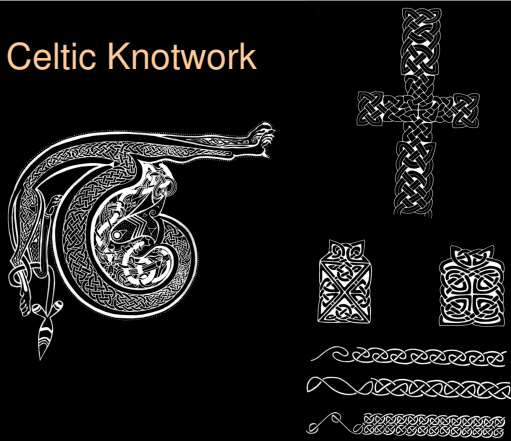
The rosette and star motif



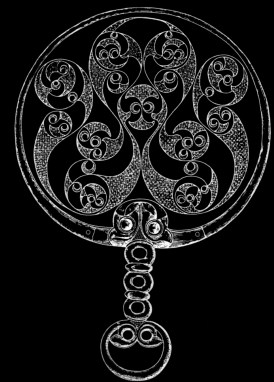
Celtic Knotwork



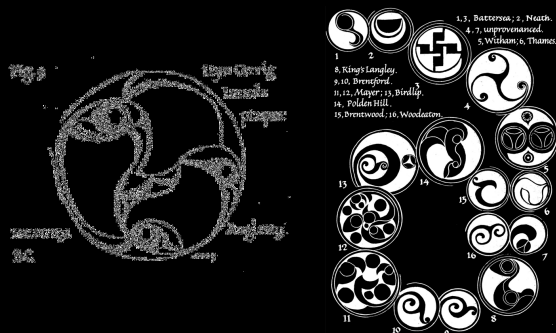
Celtic Knotwork



Celtic Scrolls



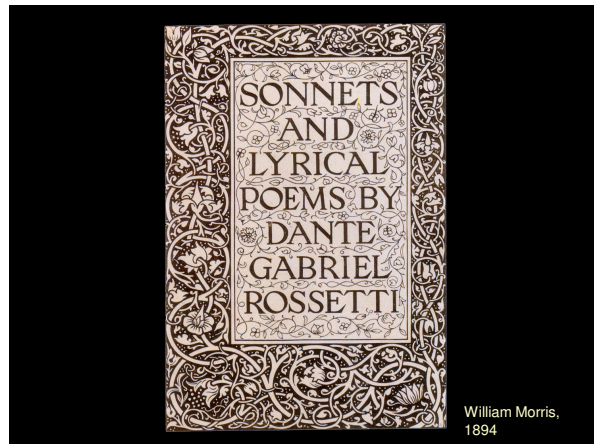
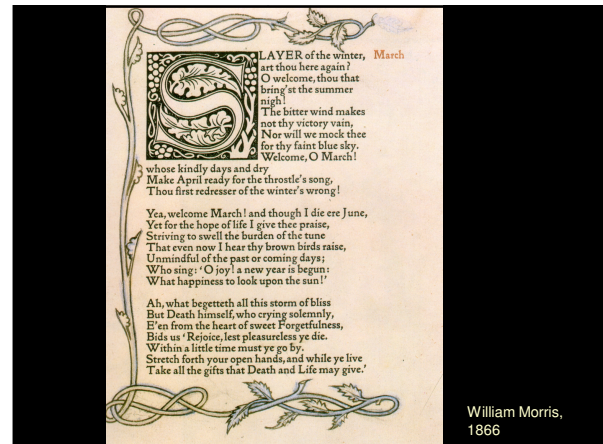
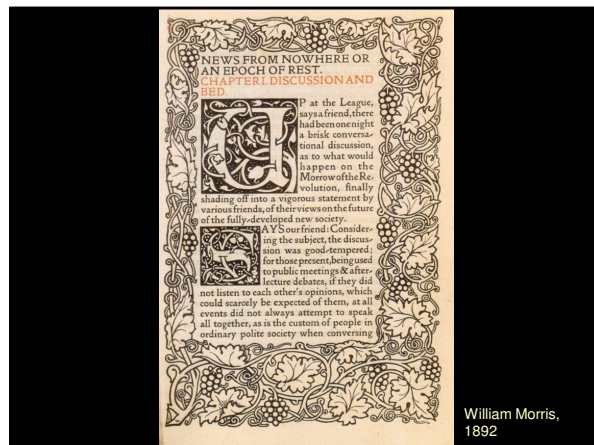
Early Celtic Spirals



Islamic patterns

- Three Components:
 - Calligraphy
 - Stylized plant motif
 - Pure geometric motif



William Morris,
1894William Morris,
1866William Morris,
1892

Rhythmized Foliation

- A repetitive or recycling linear pattern
- The periodic formation of a scroll shape
- The periodic emergence of a radiation or dilating figure emerging from the scroll that is usually, but not always, conventionalized from plant forms (foliation)



Computer-Generated Floral Ornament

Problem statement

The problem space of all possible ornamental design is simply enormous. In order to approach the problem at all, we need to limit our domain. We therefore make the following taxonomy (adapted from Meyer [21]).

First, the *elements* of ornamental design can be broken down into three broad categories:

1. *geometrical elements*, such as lines, polygons, ovals, and the like (Figure 1a);
2. *natural forms*, which can be further classified as:
 1. plants (Figure 1b);
 2. animal/human forms (Figure 1c);
 3. physiographic features (Figure 1d); and
3. *artificial objects*, such as shields, ribbons, or torches (Figure 1e).

Second, for our purposes we will similarly divide the *applications* of ornament into four main contexts:

- A. to *bands*, which have finite thickness in one dimension and are infinitely repeating in the other (Figure 2a);
- B. to *half-open borders*, which are tightly constrained along one or more edges, but open in other directions (Figure 2b);
- C. to *panels*, which are arbitrary bounded regions of the plane (Figure 2c); and
- D. to the *open plane*, in which the ornament typically becomes a repeating pattern (Figure 2d).

Computer-Generated Floral Ornament

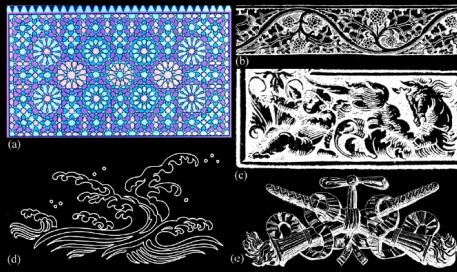


Figure 1 Design element categories. (a) Geometric forms (after Alhambra tile) [29, plate 29]. (b) Natural forms (plants (Gothic vine) [10, fig. 82]). (c) animal/human forms (border detail, Germany 1518) [4, plate 30]. (d) physiographic forms (17th century Japanese wave motif) [9]. (e) artificial objects (Renaissance torches) [21, plate 80].

Computer-Generated Floral Ornament

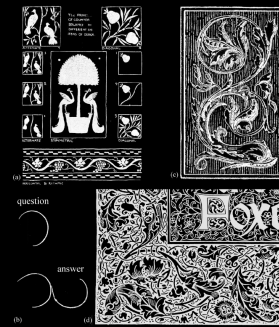


Figure 4 Balance. (a) in composition [8]. (b) question and answer within lines [8]. (c) question and answer within lines [8].

Computer-Generated Floral Ornament

- Conformation to geometric constraints

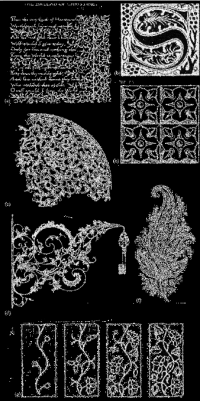


Figure 5 Conformation to geometric constraints. (a) A square tile with a complex floral pattern. (b) A circular tile with a complex floral pattern. (c) A rectangular tile with a complex floral pattern. (d) A triangular tile with a complex floral pattern. (e) A hexagonal tile with a complex floral pattern. (f) A complex floral pattern within a square frame.

Computer-Generated Floral Ornament



Figure 6 Growth transporting a design [10, plate 77].

Figure 7 Natural vs. conventional representation [8].

Computer-Generated Floral Ornament

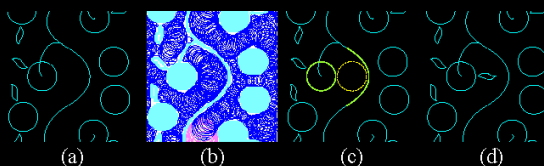


Figure 8 One iteration of the main loop. (a) Elements already in place at the start of the iteration. (b) The render buffer, with points covered by elements and/or the region boundary (in red). Eligible empty-region circles are superimposed in yellow, ineligible circles (on the exclude list) in green. (c) The selected empty circle C (dashed blue lines) and the nearby elements that are candidates for growth (thick purple lines). (d) The ornament after a rule has placed a new leaf.

Computer-Generated Floral Ornament

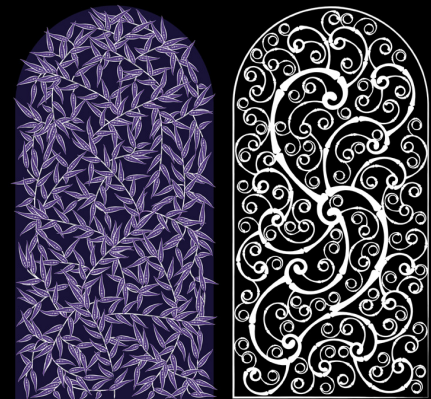


Figure 9 Yellow leaf pattern.

Figure 10 Reddish green pattern.

Computer-Generated Floral Ornament

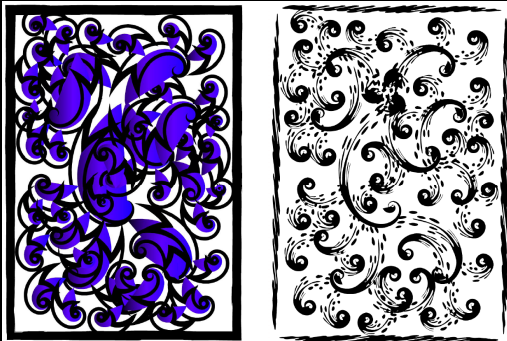


Figure 17. Results of combining different digital synthesis models.