
CHAPTER 7: RADIATION

TWO DIMENSIONAL DESIGN

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Definition

Radiation may be described as a special case of repetition. Repeated unit forms or structural subdivisions which revolve regularly around a common center produce a pattern of radiation.

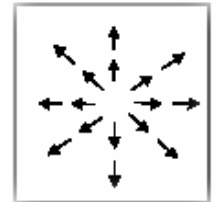
Look at the flowers in bloom and you can always discover radiation patterns in the arrangements of their petals.

Radiation can have the effect of optical vibration that we find in gradation. The repetition of unit forms or structural subdivisions around a common center has to go through a gradation of directions. Therefore, radiation may also be called a special case of gradation.

Characteristics of a Radiation Pattern

Radiation pattern has the following characteristics, which help to distinguish it from a repetition or gradation pattern:

a. It is generally multi-symmetrical.



b. It has a very strong focal point, which is usually located at the center of the design.



c. It can generate optical energy and movement from or towards the center.



The Radiation Structure

Center of radiation

- ❑ This marks the focal point around which unit forms are positioned.
- ❑ It should be noted that the center of radiation is not always the physical center of the design.



Directions of radiation.

This refers to the directions of structural lines as well as the directions of the unit forms.



The Radiation Structure

Three kinds of radiation structure

The Centrifugal Structure

The Concentric Structure

The Centripetal Structure

The Centrifugal Structure

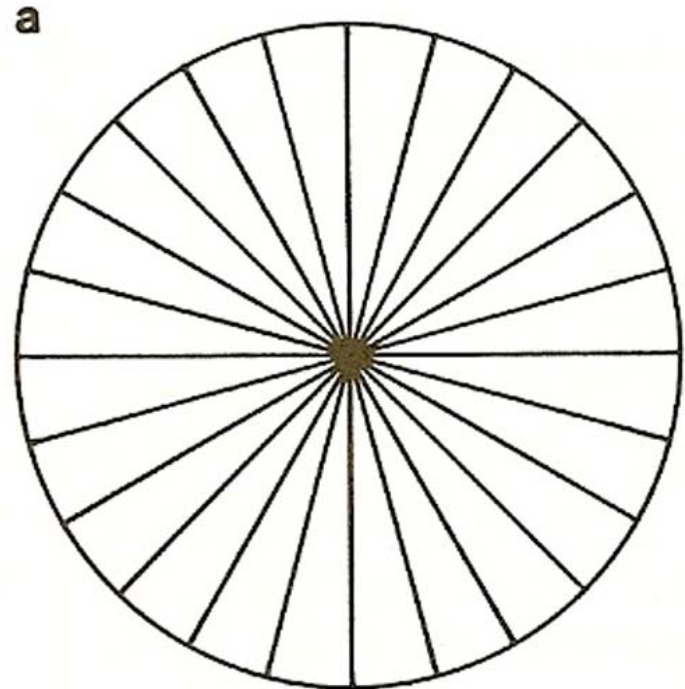
This is the commonest kind of radiation structure. In it, structural lines radiate regularly from the center to all directions.

- a.** The basic centrifugal structure.
 - b.** Curving or bending of structural lines.
 - c.** Center of radiation in off-center position.
 - d.** Opening up of the center of radiation.
 - e.** Multiple centers, by opening up of the center of radiation.
 - f.** Multiple centers, by splitting and sliding the center of radiation.
 - g.** Multiple centers or hidden multiple centers.
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a. The basic centrifugal structure

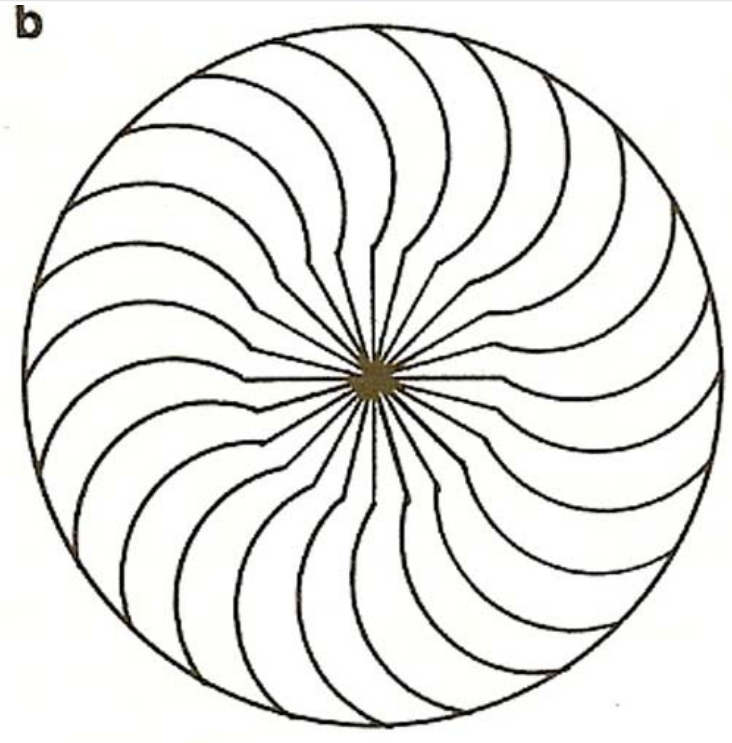
□ This consists of straight structural lines radiating from the center of the pattern.

□ All the angles formed by the structural lines at the center should be equal.



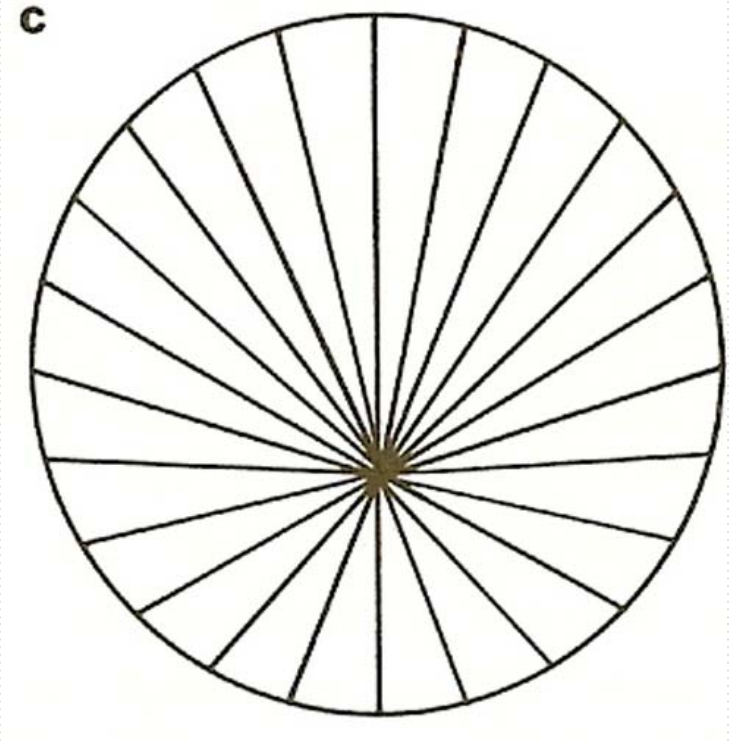
b. Curving or bending of structural lines

□ The pervious straight structural lines can be curved or bent regularly as desired.



c. Center of radiation in off-center position

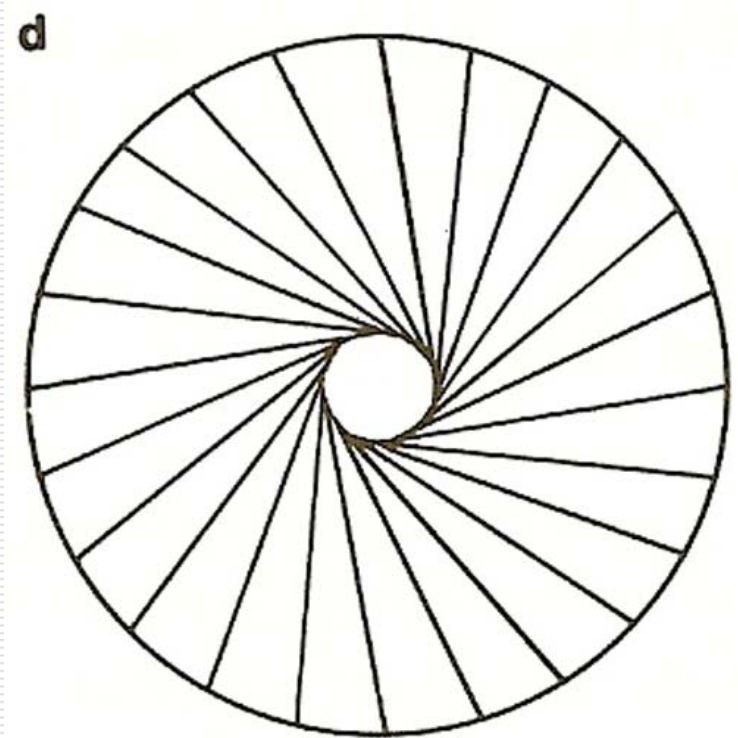
The center of radiation is often also the physical center of the design, but it can be placed in an off-center position, as far as the edge or even beyond it.



d. Opening up of the center of radiation

□ The center of radiation can be opened up to form a round, oval, triangular, square, or polygonal hole.

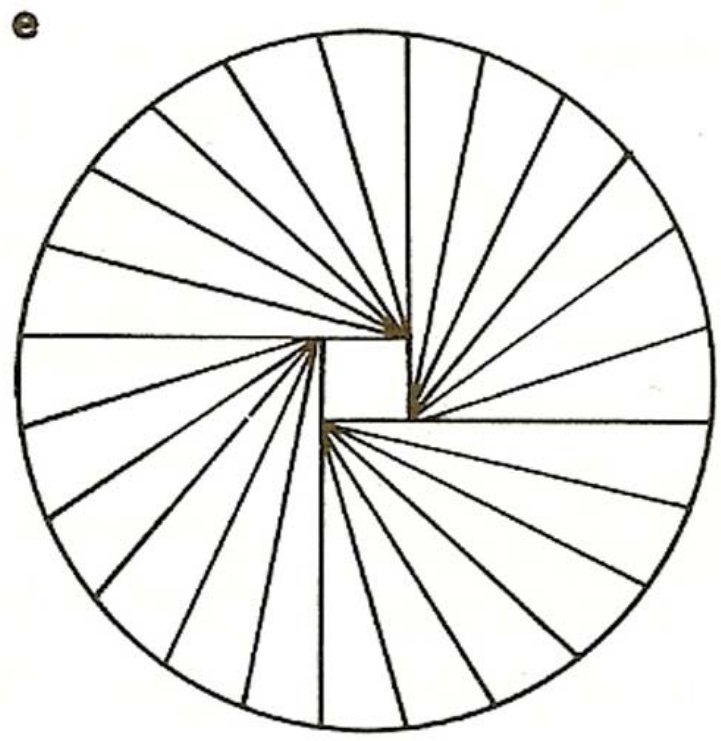
□ In this case, the structural lines do not radiate from the center of the hole but run as tangents to the circular hole or as extensions of the sides of the central triangle, square, or polygon.



e. Multiple centers, by opening up of the center of radiation

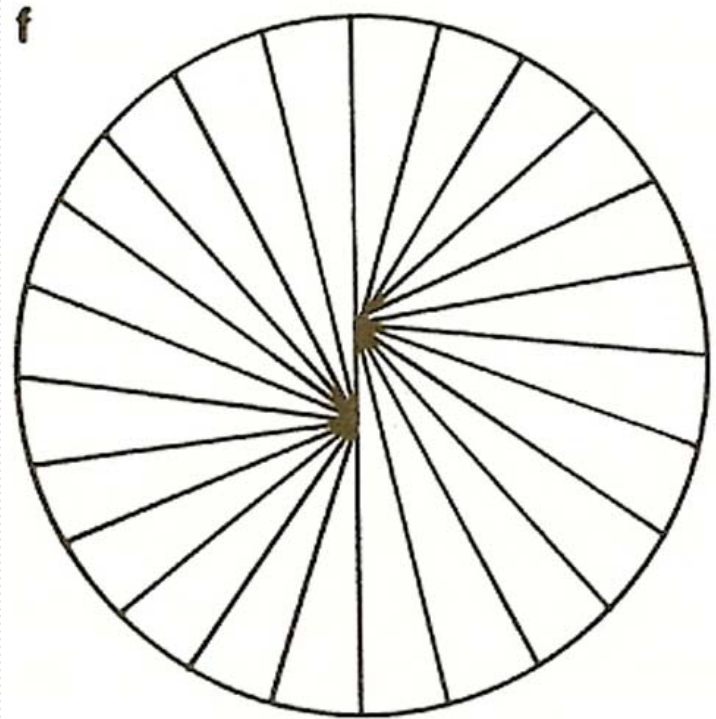
□ After the center of radiation has been opened up and a regular triangle, square, or polygon appears, each vertex of the triangle, square, or polygon can become a center of radiation.

□ This means that if the polygon is a hexagon, there will be six centers of radiation.



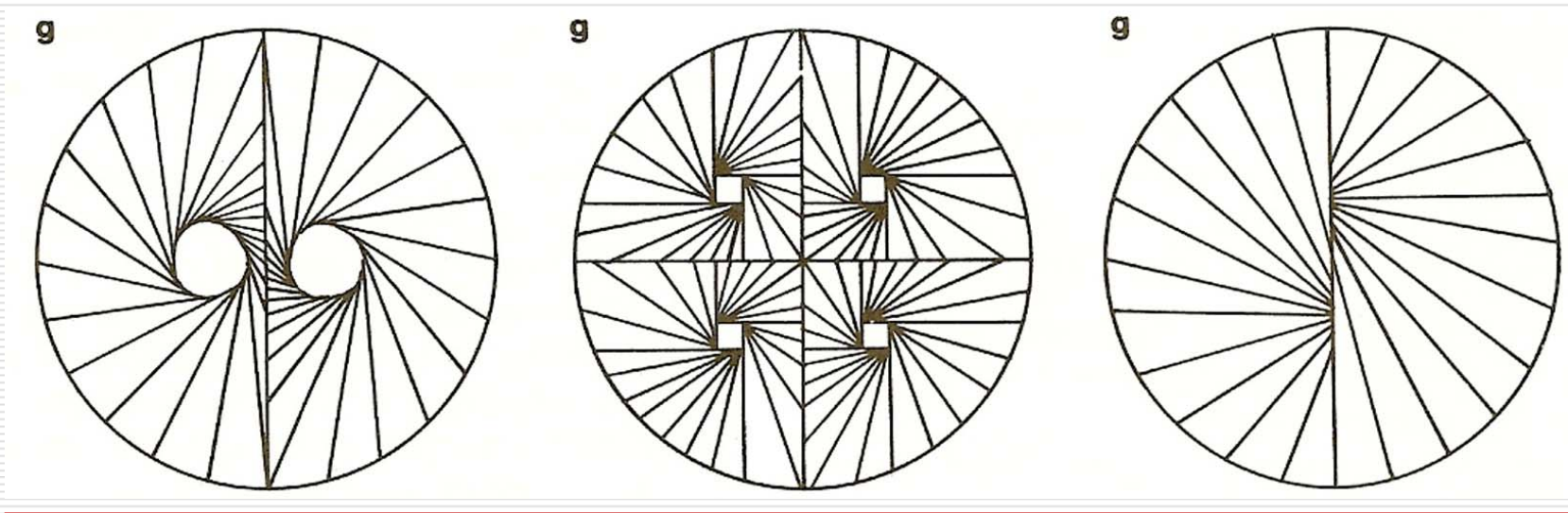
f. Multiple centers, by splitting and sliding the center of radiation

A center of radiation can be split into two by having half of the design radiate from one off-center position, and the remaining half from another off-center position, with the two centers on one straight line which passes through the physical center of the design.



g. Multiple centers or hidden multiple centers

Multiple centers or hidden multiple centers, by combining sections of off-center radiation structures - Two or more sections of off-center radiation structures can be organized and combined to form a new radiation structure.



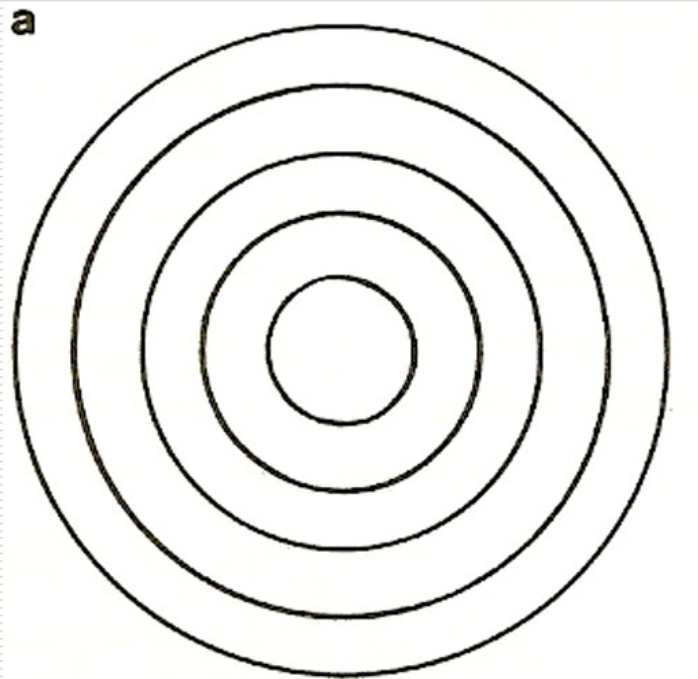
The Concentric Structure

In a concentric structure, instead of radiating from the center as in a centrifugal structure, structural lines surround the center in regular layers.

- a. The basic concentric structure.
 - b. Straightening, curving, or bending of structural lines
 - c. Shifting of centers.
 - d. The spiral.
 - e. Multiple centers.
 - f. Distorted and/or hidden centers.
 - g. Gradual rotation of concentric layers.
 - h. Concentric layers with centrifugal radiations.
 - i. Re-organized concentric layers.
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a. The basic concentric structure

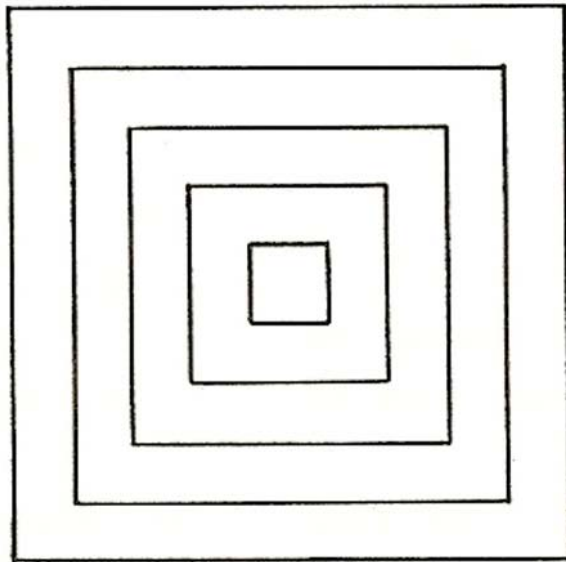
This consists of layers of equally spaced circles enclosing the center of the design which is also the common center of all the circles.



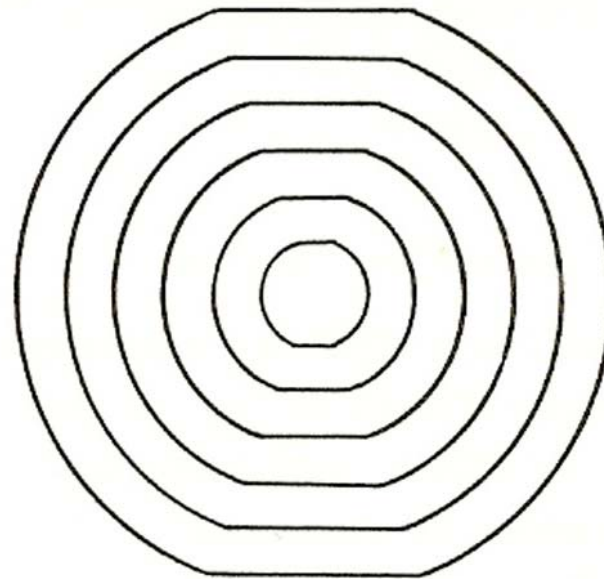
b. Straightening, curving, or bending of structural lines

- The concentric structural lines (as in pervious) can be straightened, curved, or bent regularly, as desired.
- In fact, any single shape can be made into concentric layers.

b

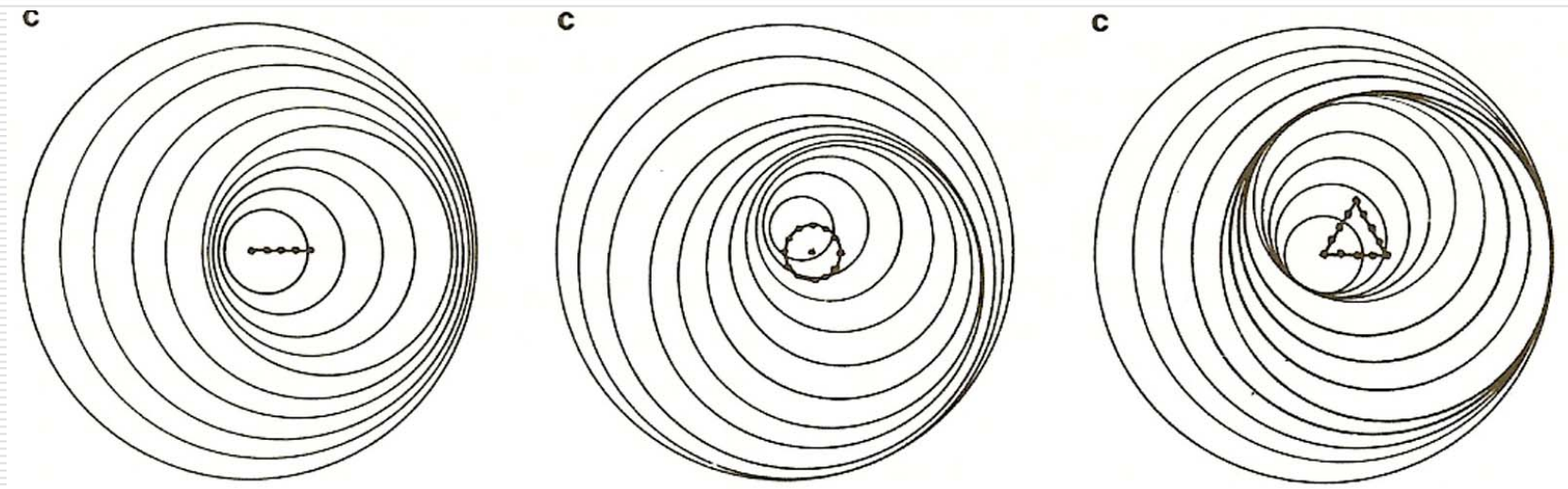


d



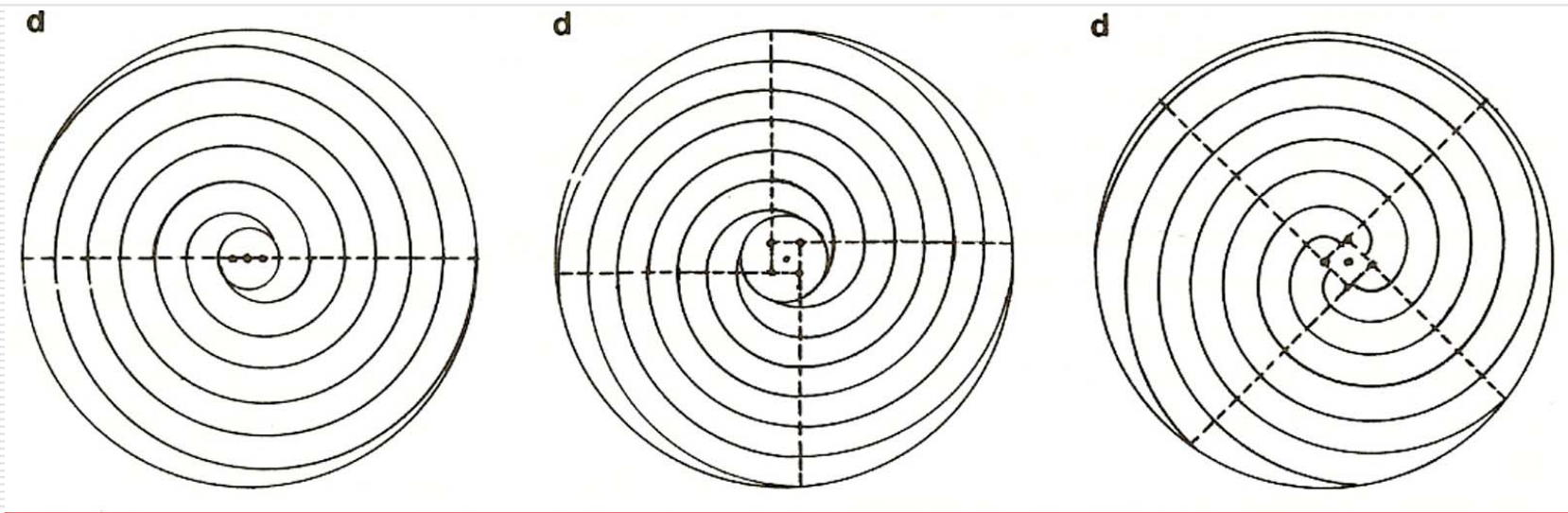
c. Shifting of centers

Instead of having a common center, the circles can shift their centers along the track of a line, which may be straight, curved, bent, and possibly forming a circle, triangle, square, or any desired shape.



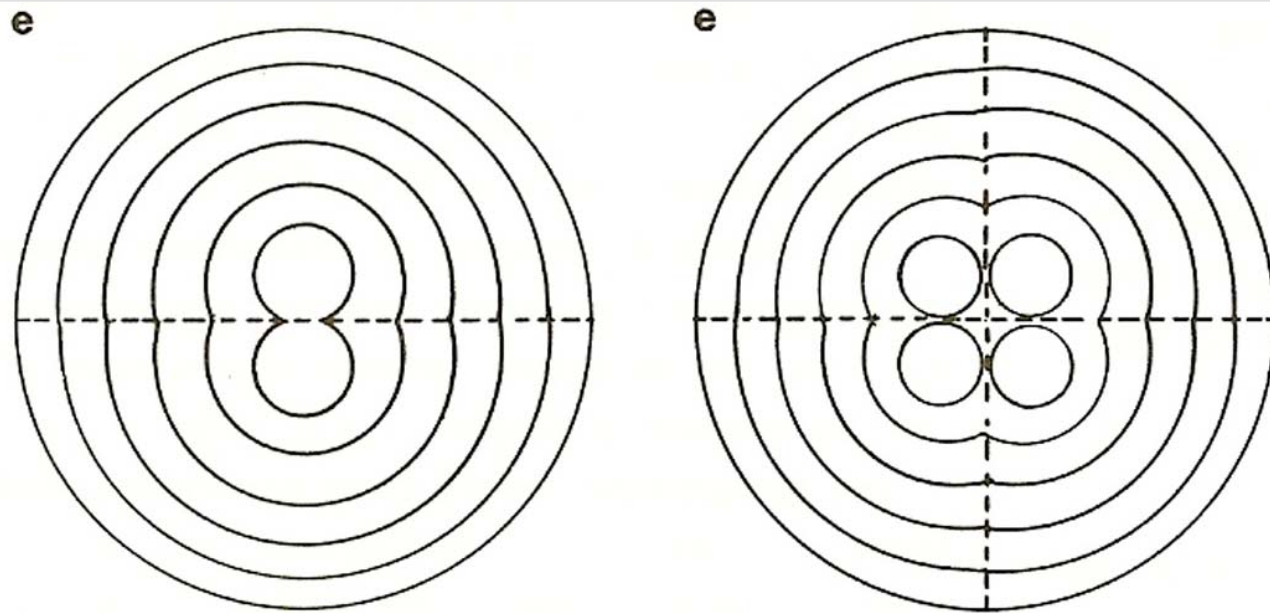
d. The spiral

A geometrically perfect spiral is very difficult to construct. However, a less perfect but still regular spiral can be obtained by dissecting the basic concentric structure and putting the sectors back again. Shifting of centers and adjusting of the radius of the circles can also produce a spiral.



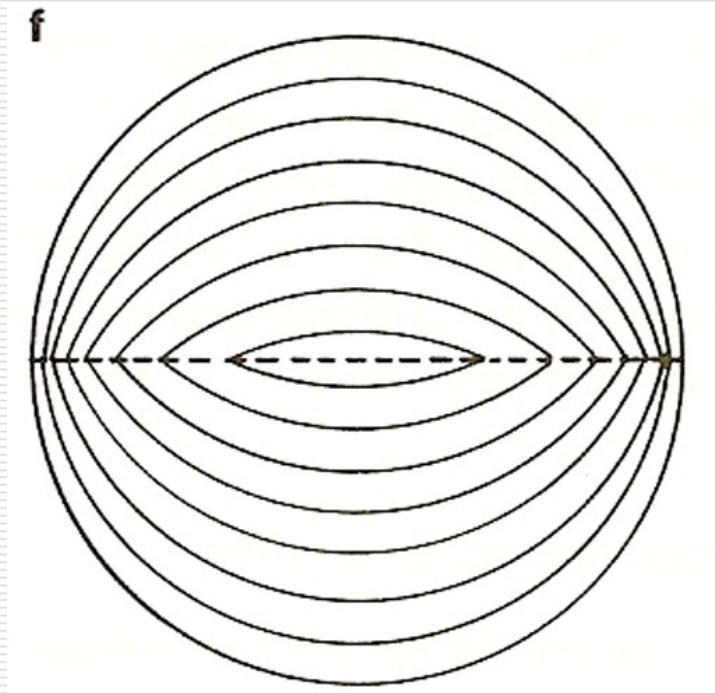
e. Multiple centers

By taking a section or a sector of a concentric structure and repeating it, sometimes with necessary adjustments, a concentric structure with multiple centers can be constructed.



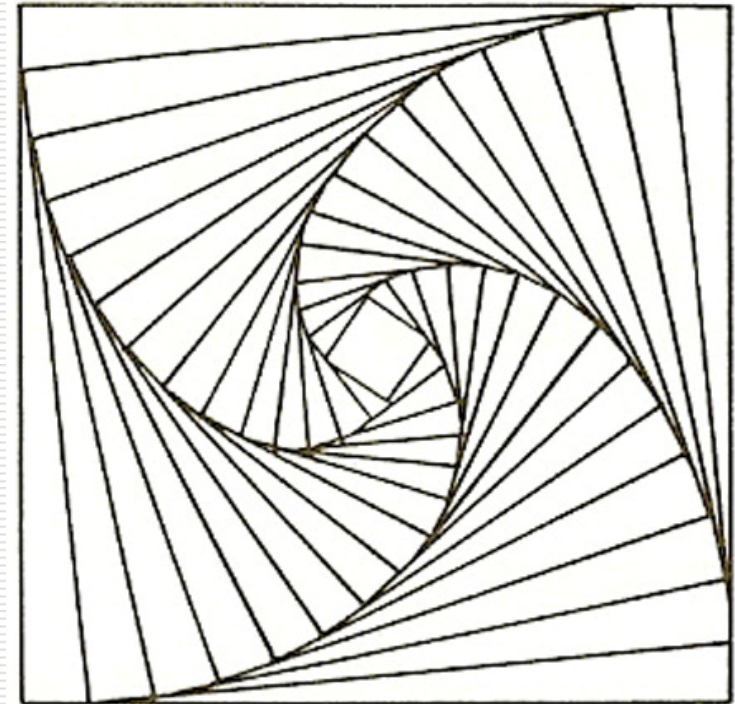
f. Distorted and/or hidden centers

The design may contain a distorted center, or several hidden centers.



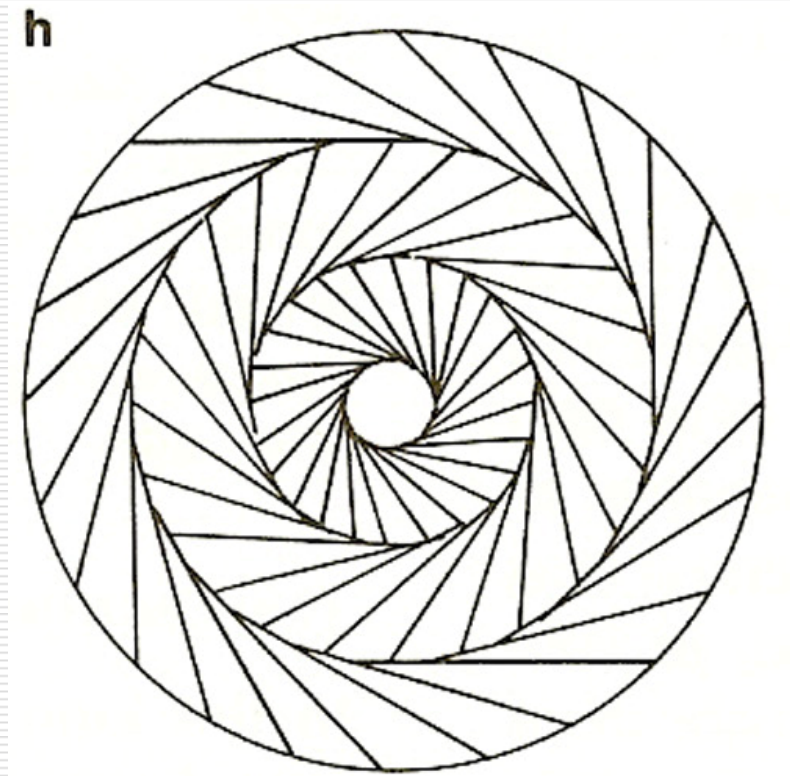
g. Gradual rotation of concentric layers

If the concentric layers are not perfect circles but squares, polygons, or irregular shapes, they can be gradually rotated.



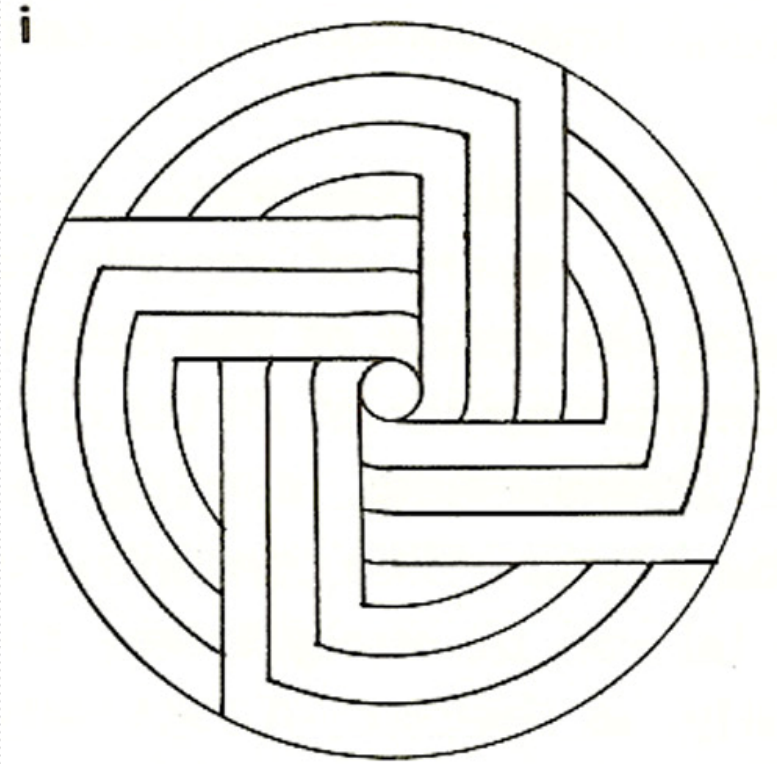
h. Concentric layers with centrifugal radiations

Centrifugal radiations can be constructed within each concentric layer.



i. Re-organized concentric layers

The concentric layers can be reorganized so that some of the structural lines can be bent and linked with other structural lines, resulting patterns with one or more centers.

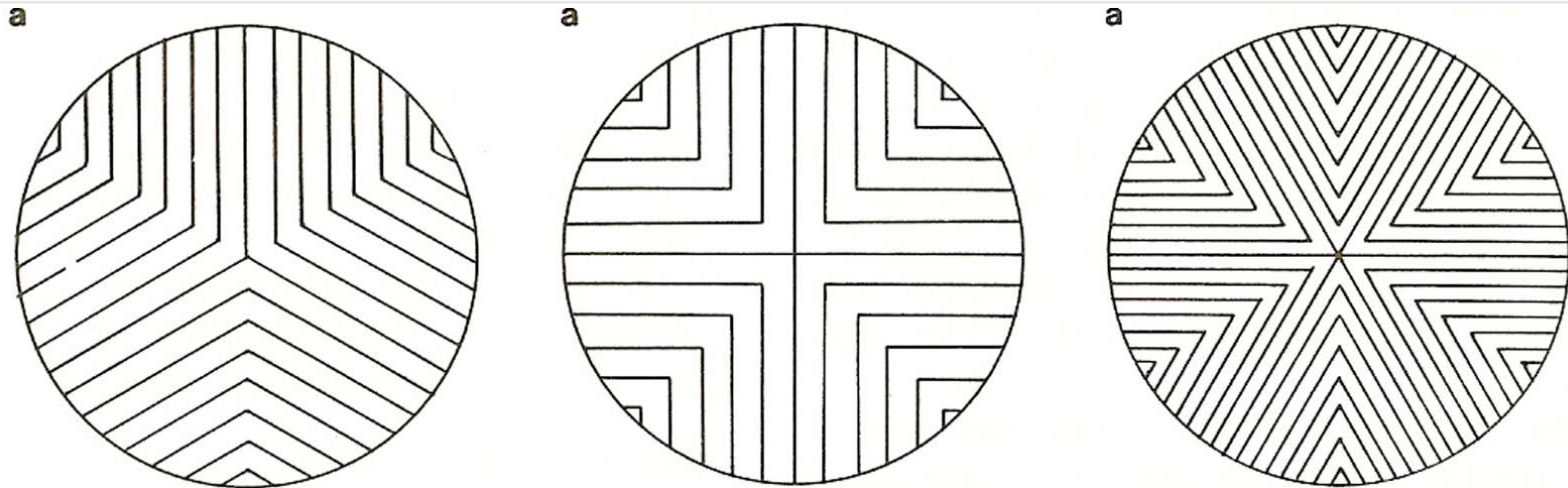


The Centripetal Structure

- ❑ In this kind of structure, sequences of bent or curved structural lines press towards the center.
 - ❑ The center is not where all the structural lines will converge but where all angles or curves formed by the structural lines point towards.
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- a. The basic centripetal structure
 - b. Directional change of structural lines
 - c. Curving and bending of structural lines
 - d. Opening up of the center of radiation
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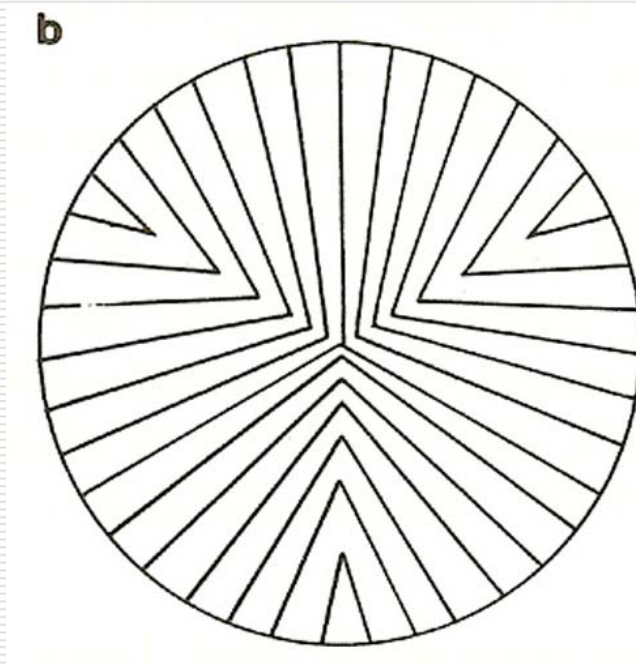
a. The basic centripetal structure

This consists of equal sectors within each of which are constructed equidistant lines parallel to the two straight sides of the sector, forming a series of angles progressing towards the center.



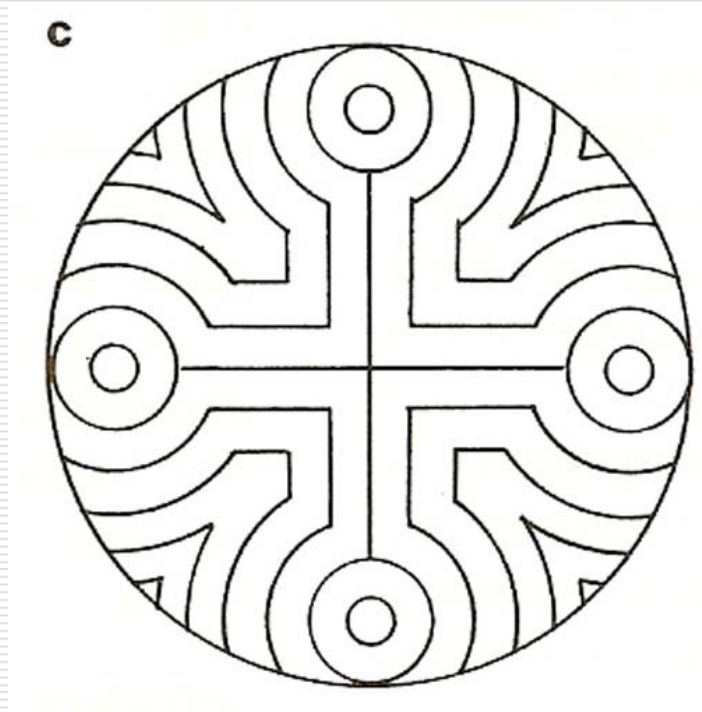
b. Directional change of structural lines

The parallel lines in the basic centripetal structure can change in direction, so that increasingly acute or obtuse angles are formed at the joining points of the structural lines.



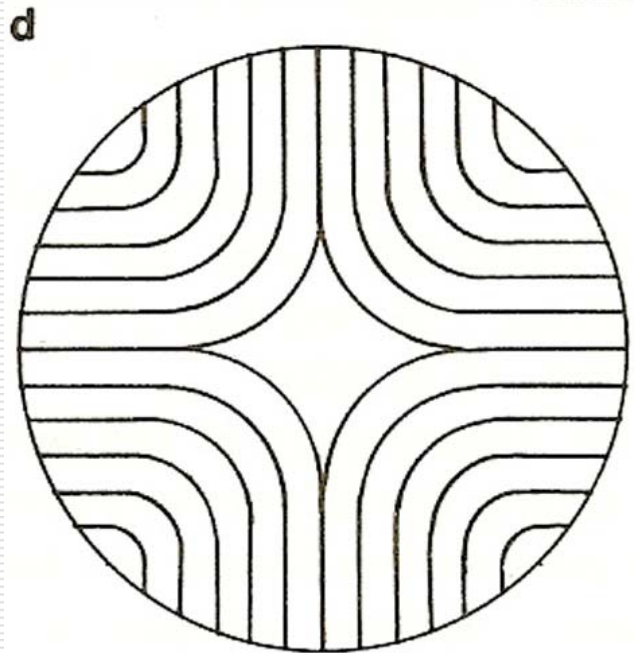
c. Curving and bending of structural lines

The structural lines can be curved or bent regularly, creating complex changes within the pattern.



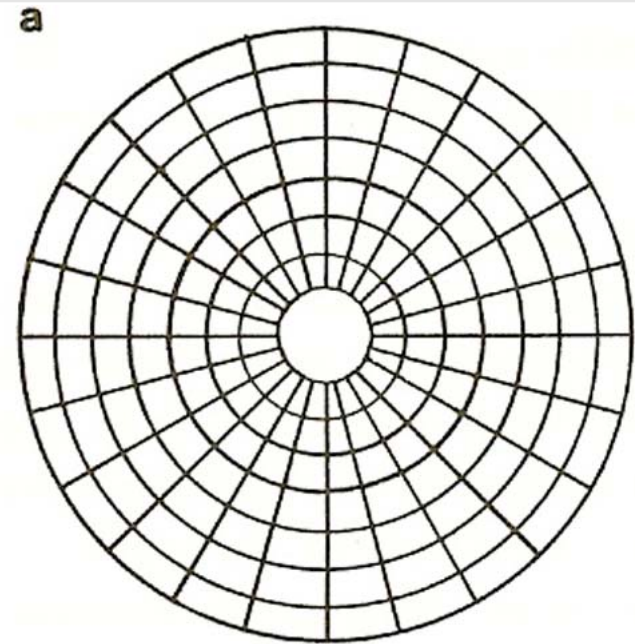
d. Opening up of the center of radiation

By sliding the sectors of a centripetal structure, the center of radiation can be opened up and a triangle, square, polygon, or starshape can be formed.



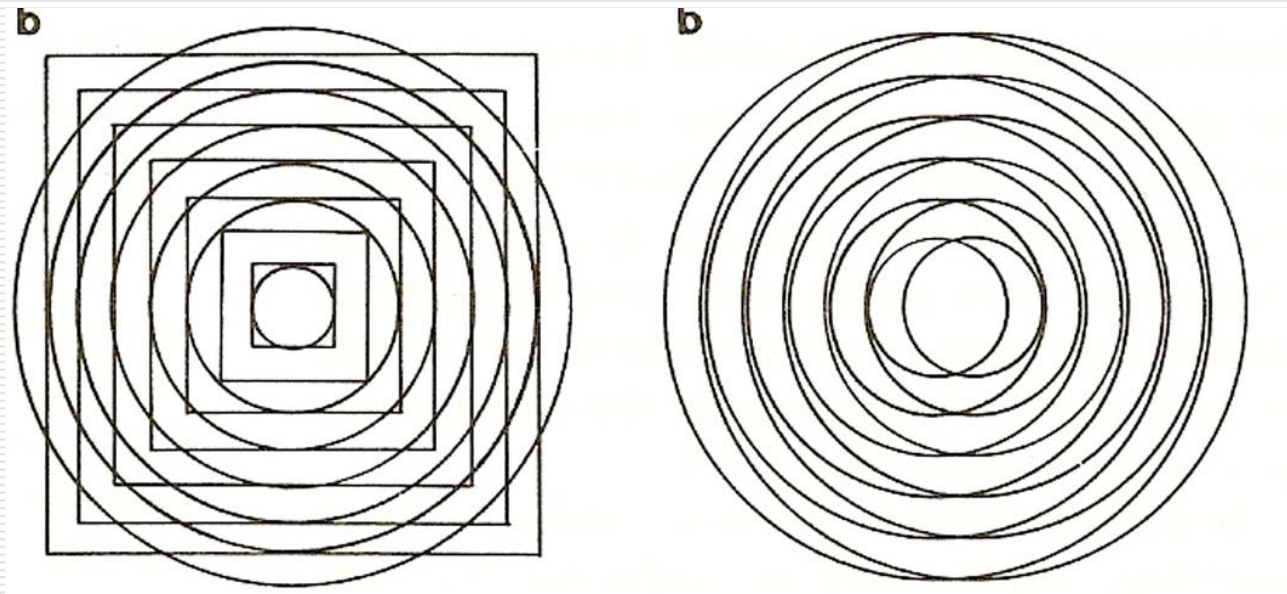
Superimposition of Radiation Structures

As pointed out earlier, the three kinds of radiation structure are interdependent. Unless the unit forms are just the structural lines themselves made visible, each kind of radiation structure generally requires another to produce fine structural subdivisions for the accommodation of unit forms.



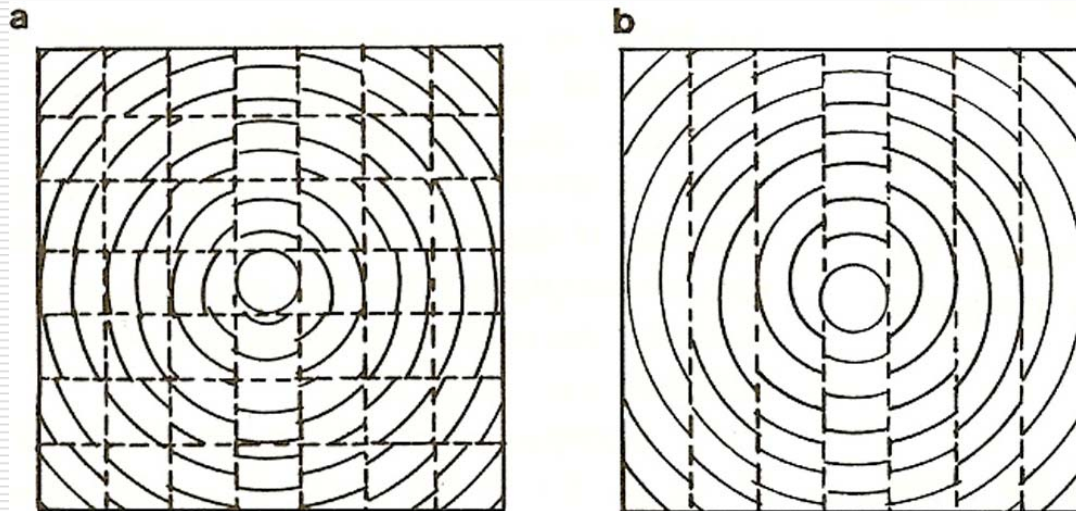
Superimposition of Radiation Structures

Sometimes one radiation structure is superimposed upon another of the same type or a different type with a different purpose. The result is a complex composition, often producing interesting patterns.



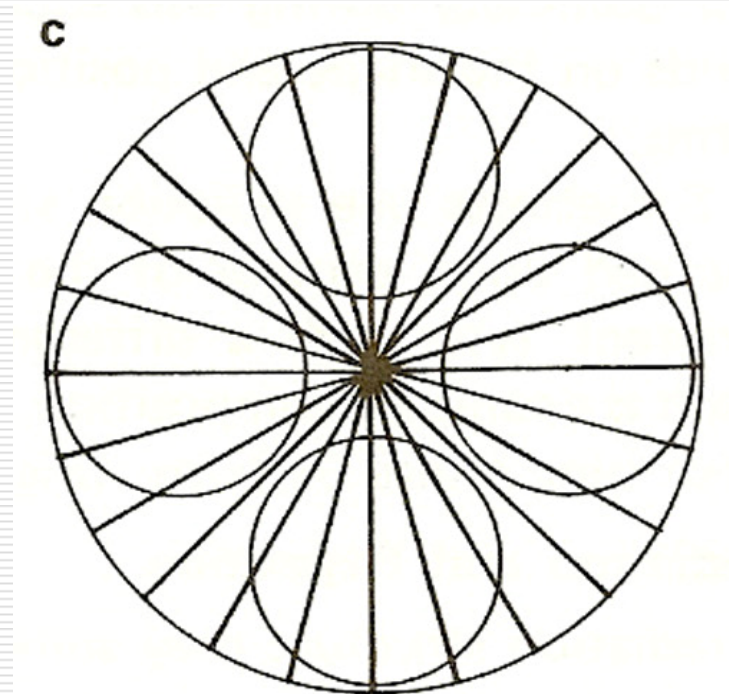
Radiation and Repetition

A radiation structure may sometimes be superimposed upon a repetition structure. With the repetition structure remaining unchanged, the radiative structural Lines may be shifted slightly so that the continuity of the radiative lines from one repetitive structural subdivision to the next is interrupted to provoke a sense of movement.



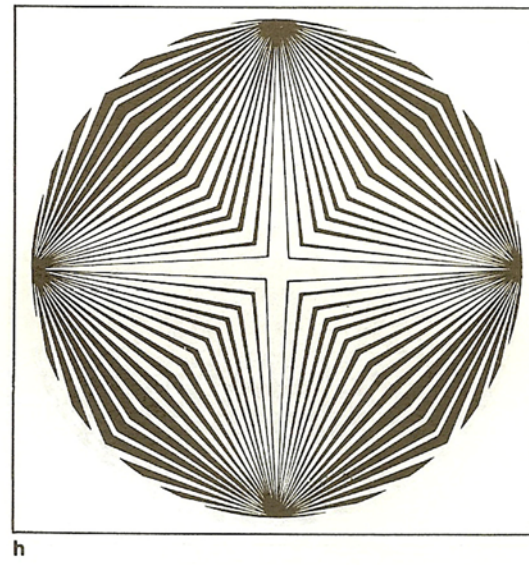
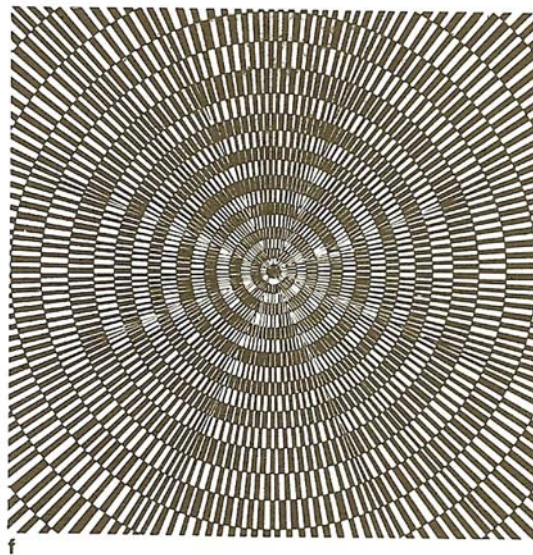
Radiation and Repetition

A radiation structure may also be superimposed upon simple repetitive forms guided by an inactive repetition structure.



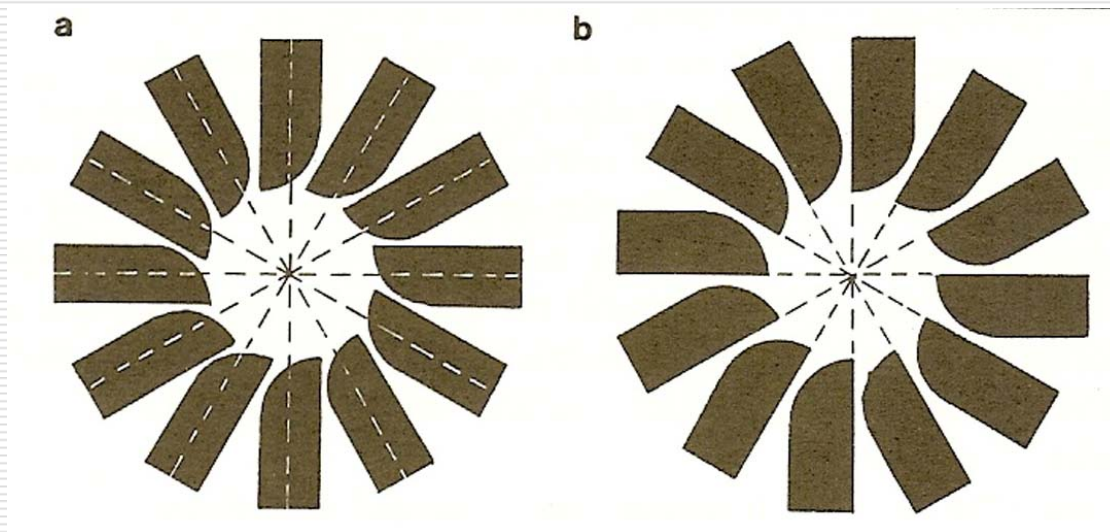
Radiation and Repetition

Gradational angles and/or spacing may be used in a great many of the cases. A radiation structure may be superimposed on a gradation structure or a group of gradational unit forms in the same way as it is superimposed on a repetition structure or a group of repetitive forms.



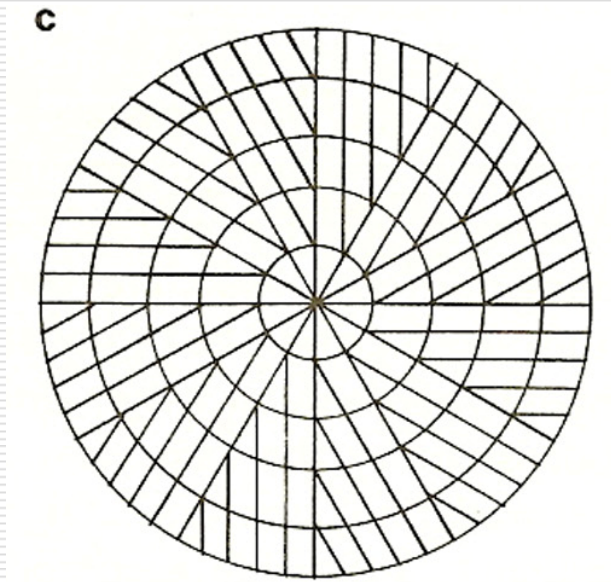
Structural Subdivisions and Unit Forms

In a centrifugal structure, the subdivisions are generally repetitive in both shape and size. Unit forms fit these subdivisions in the same way that they fit those in a repetition structure, except that the subdivisions normally carry the unit forms in their directional rotation.



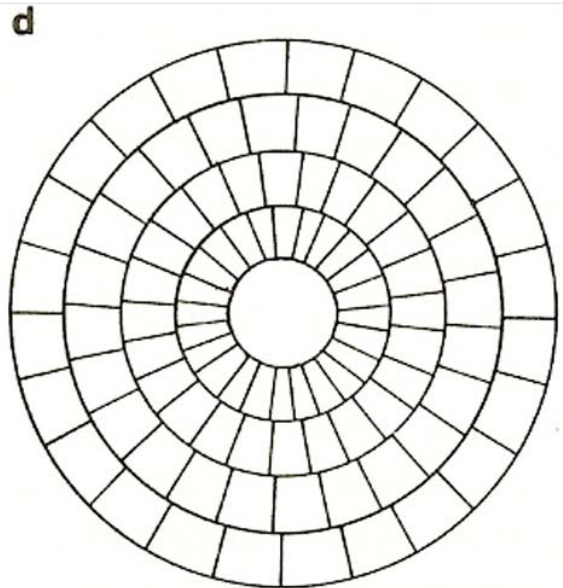
Structural Subdivisions and Unit Forms

Within each of the subdivisions in a centrifugal structure, finer subdivisions can be constructed if desired. A sequence of parallel lines can be employed for the purpose, but there is virtually no limit to the ways of making further subdivisions.



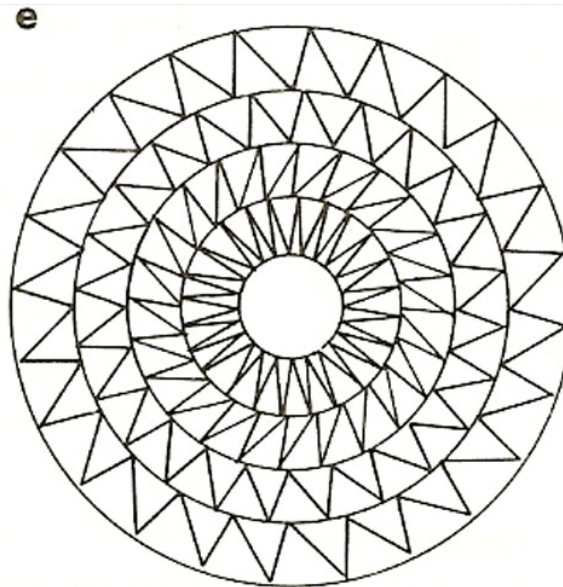
Structural Subdivisions and Unit Forms

A centrifugal structure is usually required for making fine subdivisions, and each ring can be rotated variably, if necessary, so that the subdivisions in one ring do not have to align with those in the next ring.



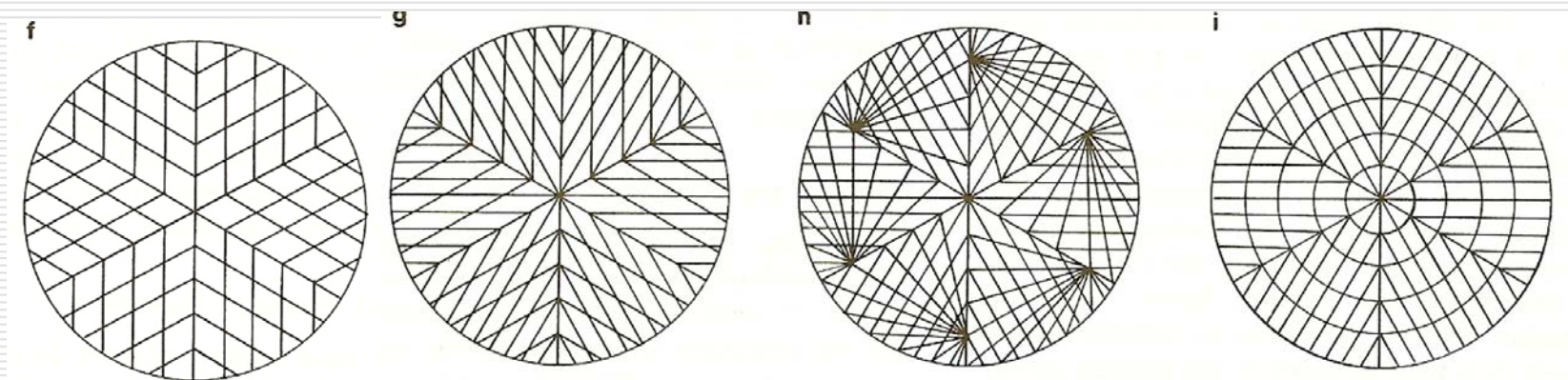
Structural Subdivisions and Unit Forms

Subdivisions obtained in this way are generally repetitive within each ring, but gradational from the center towards outer rings. Unit forms fit these subdivisions in the same way as they fit those in a gradation structure.



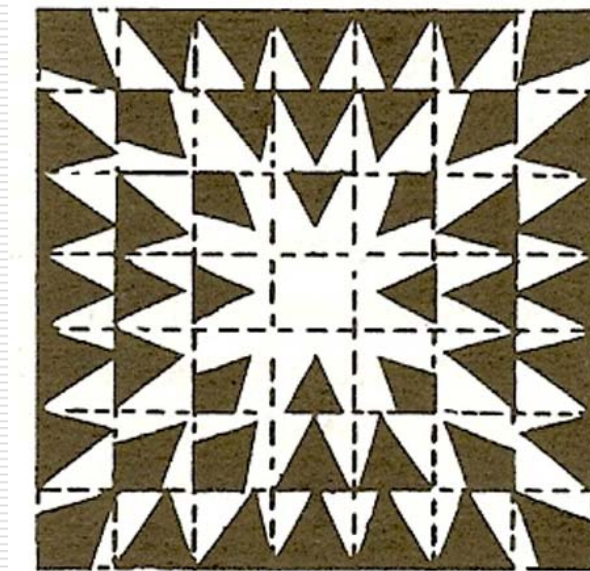
Structural Subdivisions and Unit Forms

In a regular centripetal structure, the subdivisions are defined by sets of parallel lines which curl or bend towards the center. These can be further divided by superimposing sets of parallel lines, another centripetal structure, or a concentric structure.



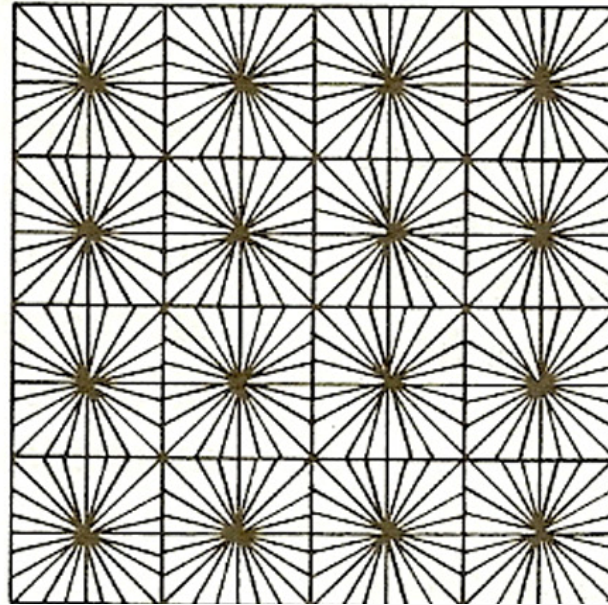
Unit Forms in Radiation

In planar rotation, the unit forms can be rotated in such a way that they all point to the physical center of the design. In planar progression, they can gradually move towards or away from the center from one concentric ring to the next.



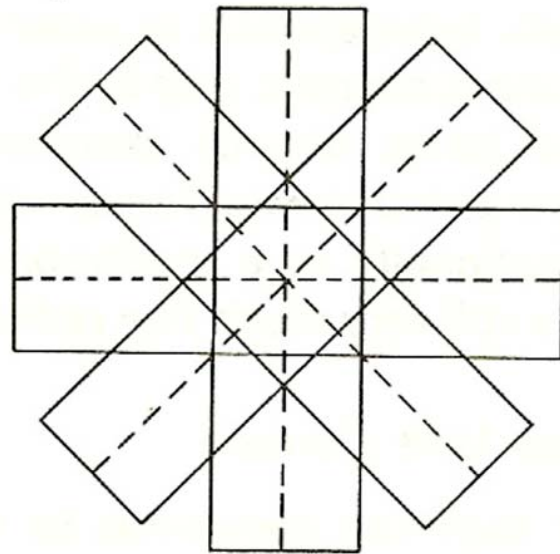
Unit Forms in Radiation

Unit forms can be designed as miniature radiation patterns which are arranged repetitively or gradationally in a repetition structure. The effect is still very much like radiation.

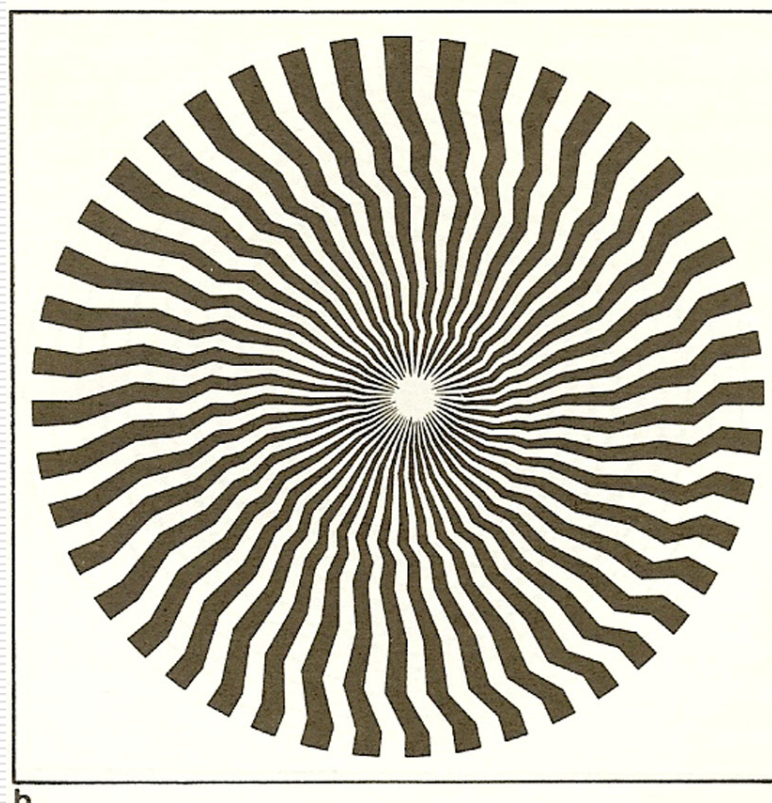
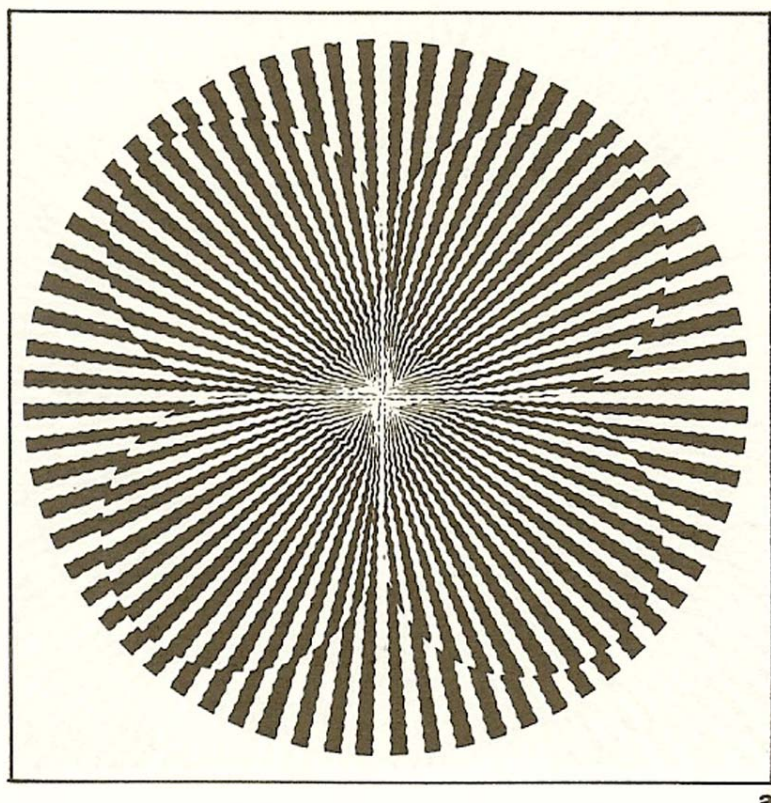


Oversize Unit Forms

A unit form can sometimes be almost as big as the entire radiation pattern itself, or its length or breadth can be comparable to the diameter of radiation. Such oversize unit forms can be rotated along a centrifugal structure, maintaining a fixed relationship to each of the structural lines.

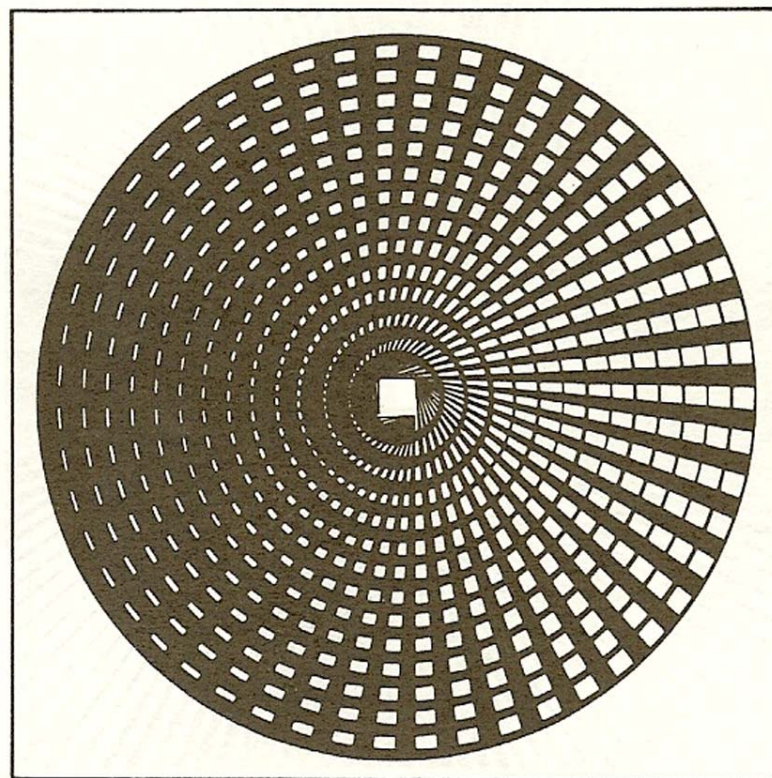
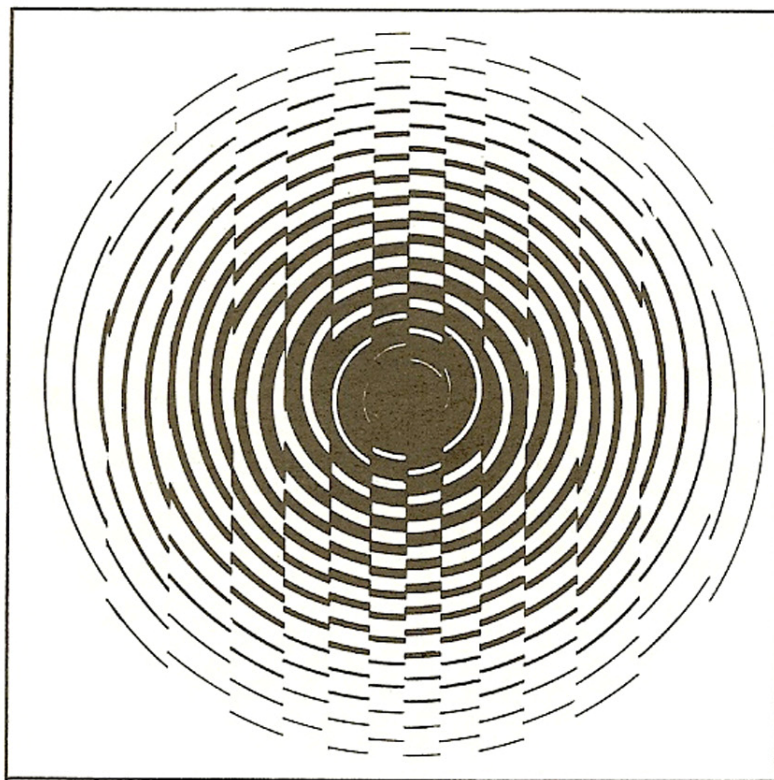


Exercises

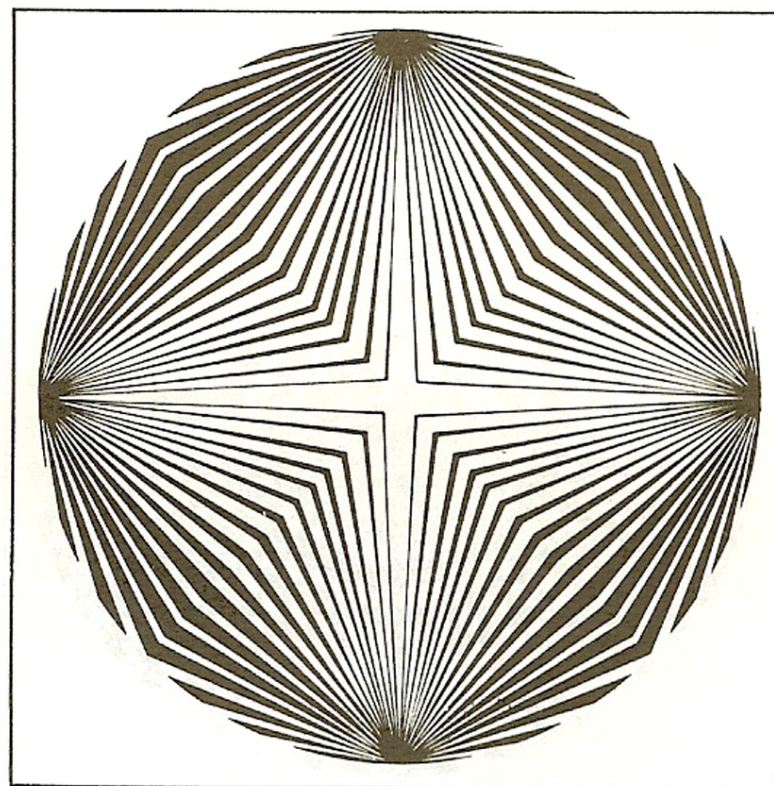
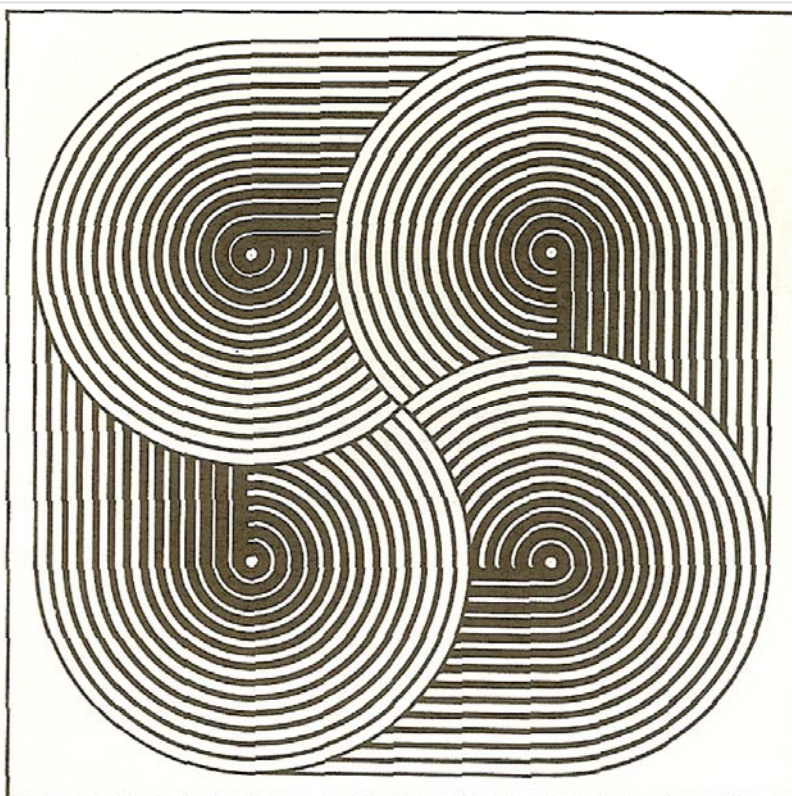


Exercises

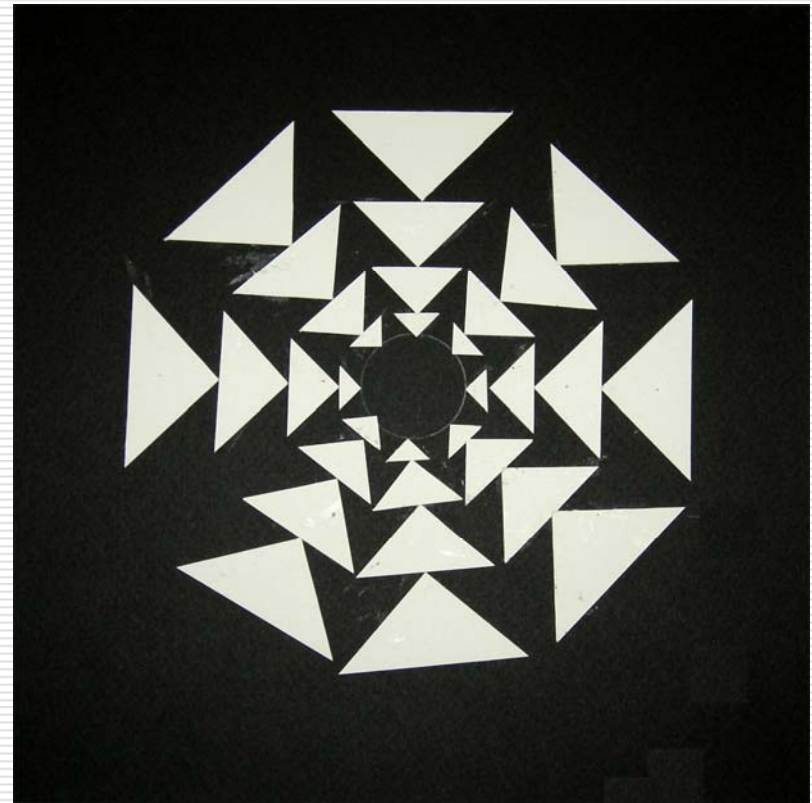
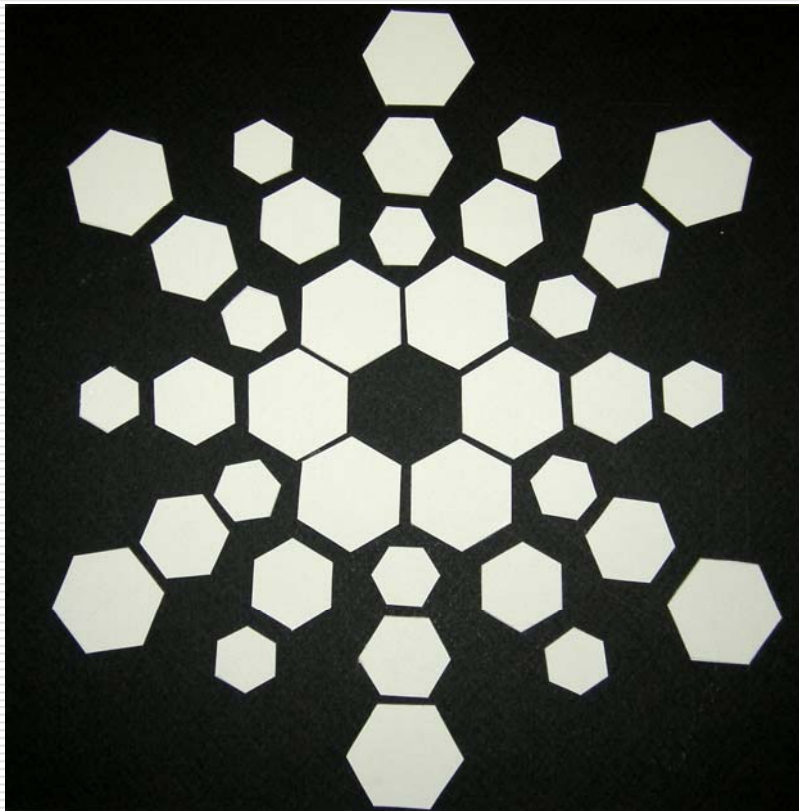
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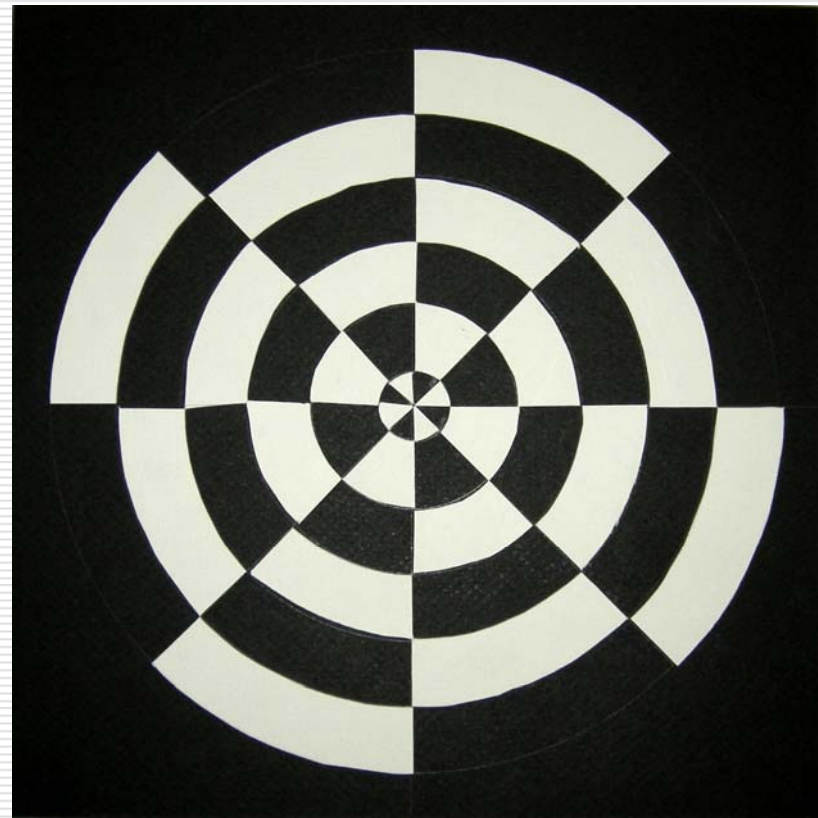
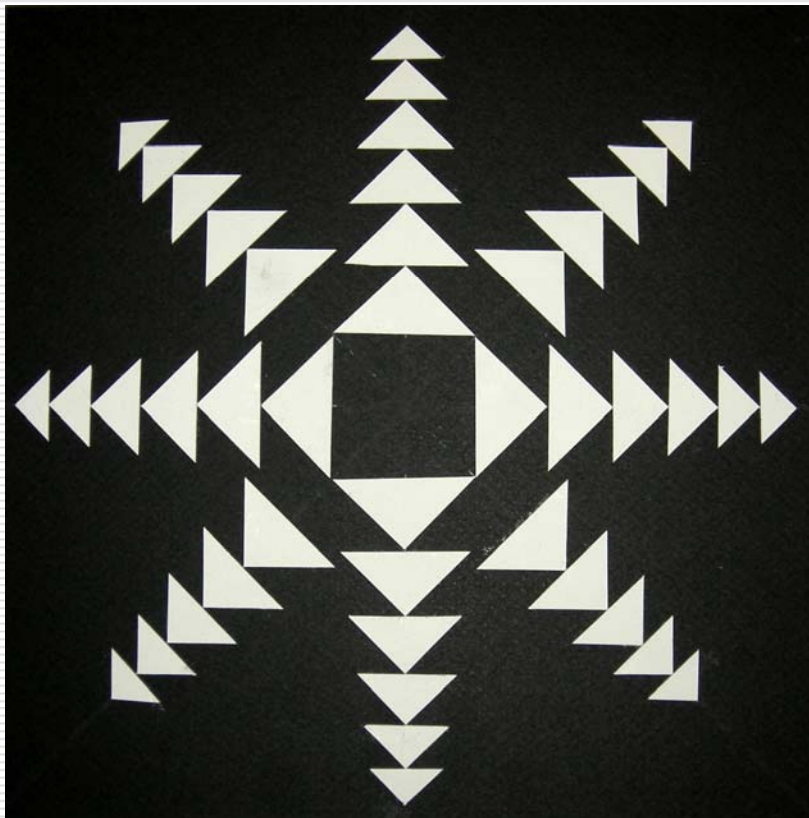
Exercises



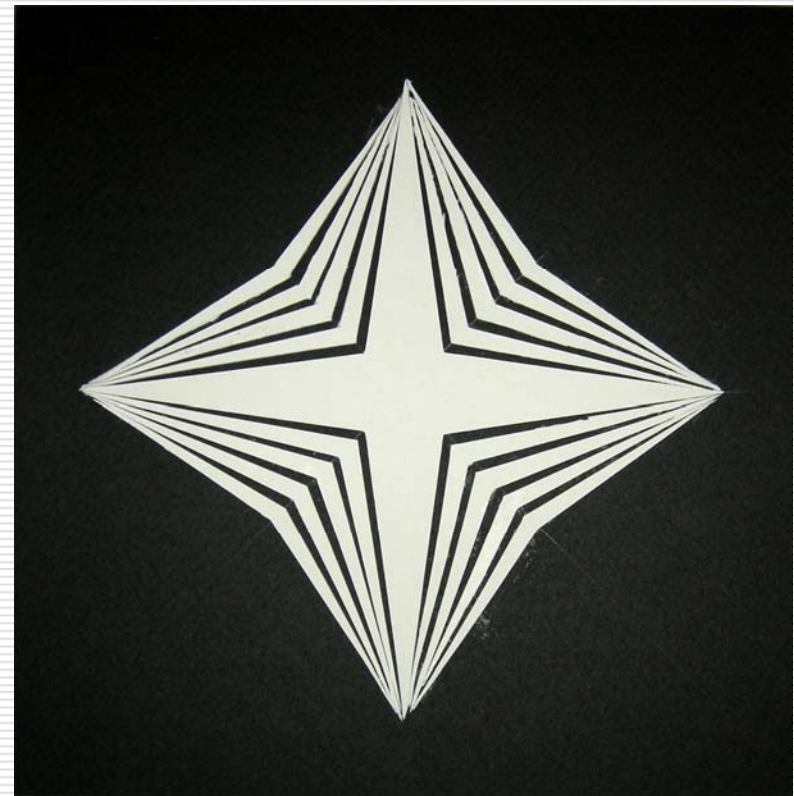
Examples



Examples



Examples



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