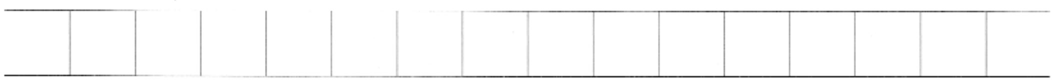
Structure and movement

Four equal sides
four right angles:
one square.

a1:

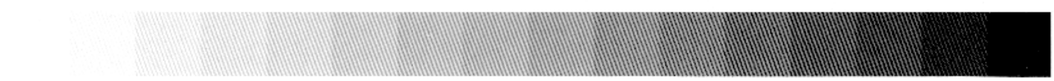
Displaced horizontally by the length of one side.
To infinity on the left.
To infinity on the right.

a2:



The equal areas are distinguished by different shades.
A finite group of elements,
with terminal limits in black and white,

a3:



The number of elements
is determined by the gradations between the extremes.
If the gradations are large,
the number of elements is small;
at least two: black and white.
If the gradations are small,
the number will be large; perhaps a thousand,
perhaps the eye can distinguish even more;
probably less.
There are no theoretical limitations:
one shade is darker
than the last even if the gradations are fine,
and vice versa.
Ideally the gradations between successive
shades are equal.
Then the series forms a natural order.

In this case:
a series of 16 equal elements
with 15 equal gradations.
Again, the number of elements is unimportant.
Only the order, the system of reference, is important.

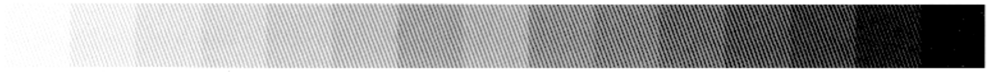
If it forms a whole, self-contained in principle,
we define it as a structure.

Movement: disturbing the natural order.
Upsetting the equilibrium of the series;
or giving it a new equilibrium
(which can only be more complex
than the original structure).
Introducing movement: starting activity;
creating tensions.
Changing the positions of the elements
means giving their relationships new weight,
giving the whole a new appearance.

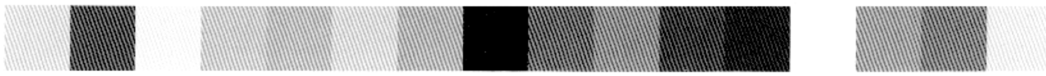
This implies: using the same elements
To create as many different effects as possible.
From a single structure,
deriving many different constellations.

Put simply: giving form to the material.
Using visual elements
as the composer uses the scale.

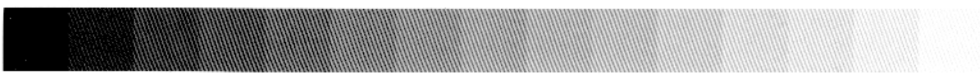
For example:



a 4: Interchange two of the 16 elements.
Namely 8 and 9. The sequence is broken.
But order is maintained, and symmetry preserved
It has only become more complex,
let us say more differentiated.



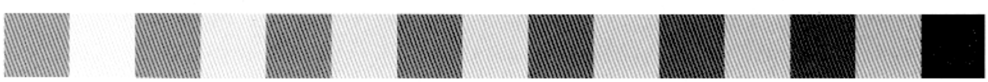
a 5: The one-dimensional series
contains many possible constellations (factorial 16)
but few principles of order.
One of these is Arp's "Law of Chance."
Random rearrangement
without detectable equilibrium
causes all of the elements to change their position.



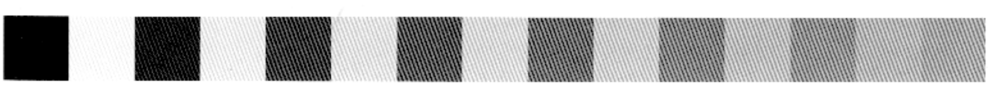
a 6: Like a 5: each element changes its position,
but not its order.
The sequence is preserved, but reversed:
a left-right problem
as meaningless geometrically as it is optically.
(But it may be significant psychologically.)

a 7: A cyclic permutation of the series.
I.e. the right taken away and added to the left:
in this case exactly half.
The extremes of black and white meet;
they provide maximum contrast.
The ends are the two intermediate greys.

a 8: The series arranged to sort of leap back and forth.
White placed in the middle,
And each of the next darkest shades
placed alternately to its left and right:
giving a dark end on each side.
In figures:...6–4–2–1–3–5–7...



a 9: The series with the elements interspersed.
I.e. the lighter and darker halves
Are regularly interposed.
The intervals between successive shades are greater,
But increase evenly;
In numbers: 1–9–2–10–3–11–4...



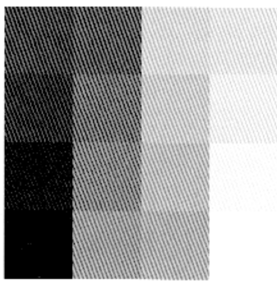
a 10: The next example is like a 9.
The darker half has been rotated 90 degrees.
Thus two operations are used for a single grouping:
interposition and rotation.
The shade gradations contain
Both the greatest and the least contrasts;
The former left, the latter right,
In numbers: 1–16–2–15–3–14–4–13...

One step further
removed
from the original arrangement of the material:
(see above) increasing the scope for conscious design.

Instead of retaining the elements
in their original one-dimensional row,
group them in a two-dimensional field.
There is no longer a self-contained order.
But more surprises:

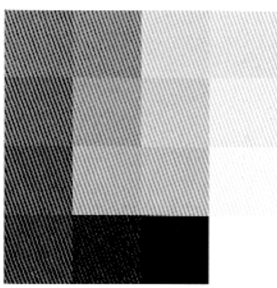
The relationships between the elements
are multiplied.
As well as a one-dimensional left-to-right proximity
we now have top-to-bottom and diagonal proximities
producing two-dimensional interrelationships.
While each element in the line series has two neighbours
(and each end element only one),
on the field it will have
eight if it is in the centre,
five if it is on the edge and three if it is in the corner.

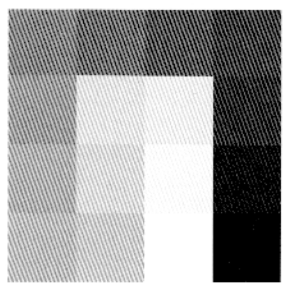
b 1: The line series folded upon itself like a hinge
becomes a two-dimensional grouping
but with its one-dimensional origin still discernible.

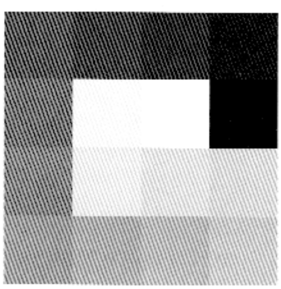


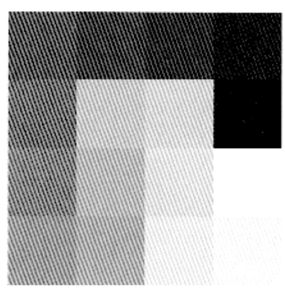
The hinge
can be defined under general aspects:
as a line coiled down
on a field of 4x4 units.
Following the rule:
the line must pass through each of the 16 positions;
may not be broken,
or intersect itself.

This principle can be utilised
to produce a finite number of variations.
b 2 to b 5: a selection:

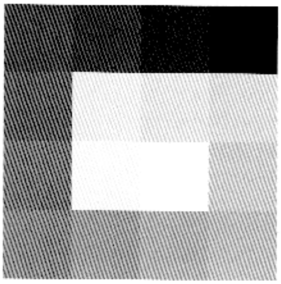




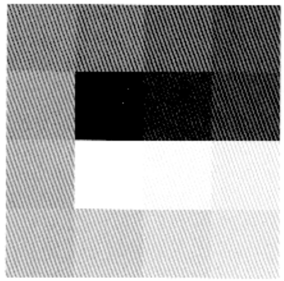




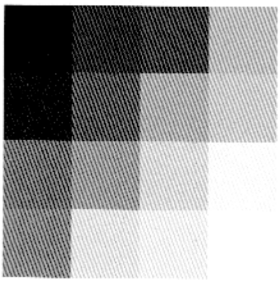
b 6: Special case of the coil:
a right-angled spiral.



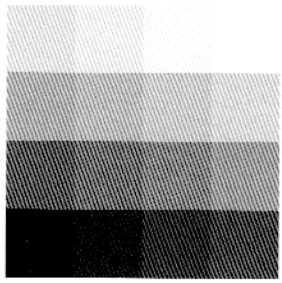
b 7: A double spiral.



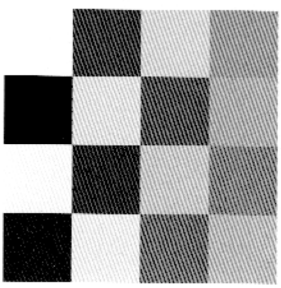
b 8: The hinge folded diagonally.



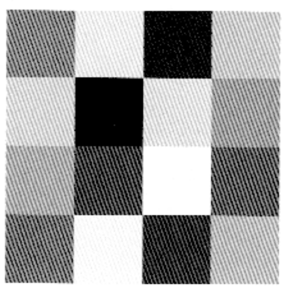
b 9: The series divided into four equal sections,
the sections placed side by side.
The sequence is interrupted.



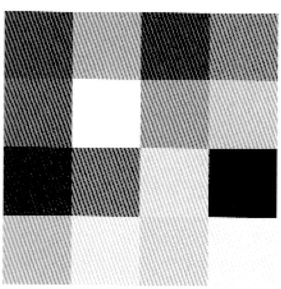
b 10: The arrangement takes on
a more characteristic appearance
once the order of the line series
is abandoned.
The elements interspersed
in two dimensions.



b 11: A "magic square".
(A puzzle familiar from the schoolroom:
each horizontal, vertical and diagonal
column of four elements always adds up to 34.
If the four shades in each column are "added together"
their sum is always the same shade of grey.)



b 12: A random arrangement.
Here: a grouping obtained by shuffling numbers.



Sixteen different elements grouped in a field.
The field for this defined
(4x4, though others would be possible):
Strangely, therer are no more possiblities
than there are possibities
of grouping the elements in a line series.
The formula is constant: factorial 16,
(nevertheless, 20,922,400,000,000 variants).
Programming a problem
means planning in stages (with feedback, of course).
The first stage is the material
in its original sequence.
(With colours, for example, it is the colour solid.)
From stage to stage experience is accumulated,
and each stage provides material for the next.

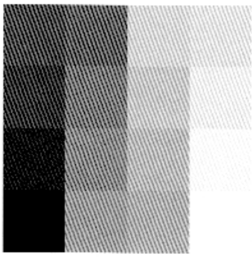
Four identical groups added together:
one group composed of groups.
Or: a structure composed of structures,

In the first place groups are formed from groups
by symmetrical replication.

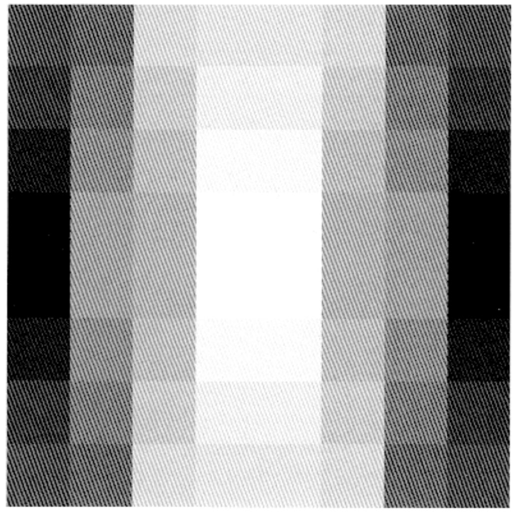
The prerequisite remains:
to stay within the two dimensions of the surface.

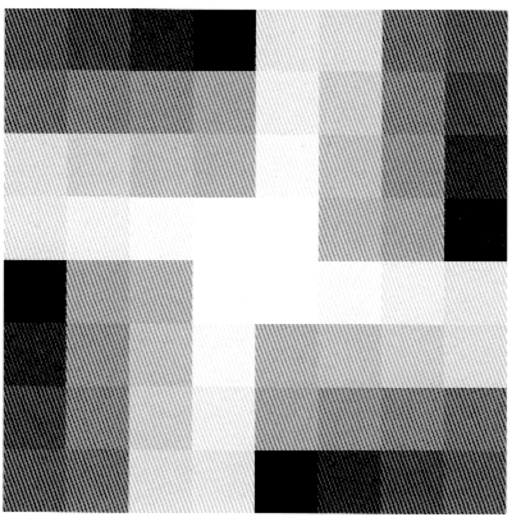
The space dimension is not taken into account.
But even if it is not intentionally included
it is incorporated automatically;
its presence is virtual, not actual,
but perceived nevertheless:
it is not possible to visualise all the shades
as lying in the same plane.
But it is left to the beholder to choose
which are in the "foreground", which in the "background".

Group b1 is

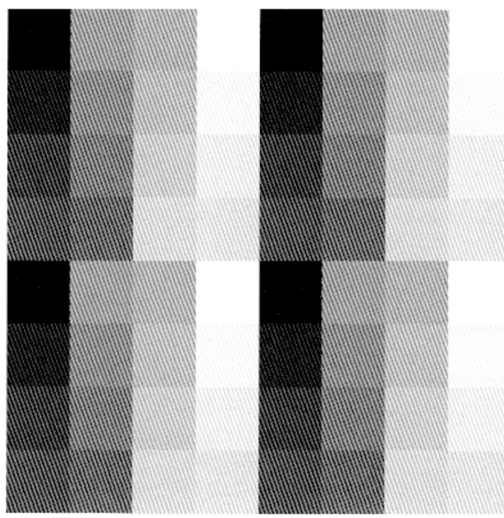


c1: reflected





c2: rotated



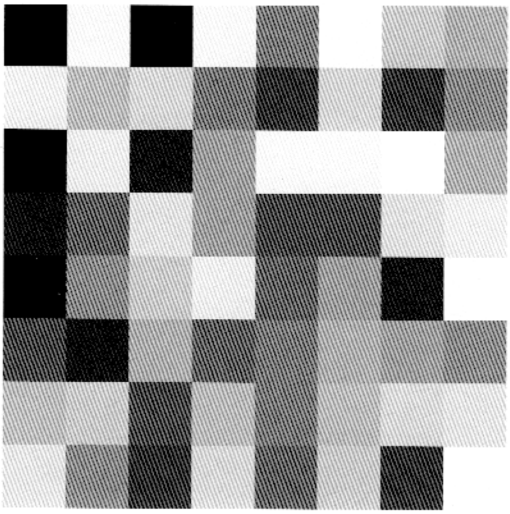
c3: displaced.

Limiting the number of replications to four
is of little importance when the group is displaced.
In the cases of rotation and reflection
new, complex units are generated:
Beyond mere additiion, a whole is formed,
which is greater than the sum of its parts.

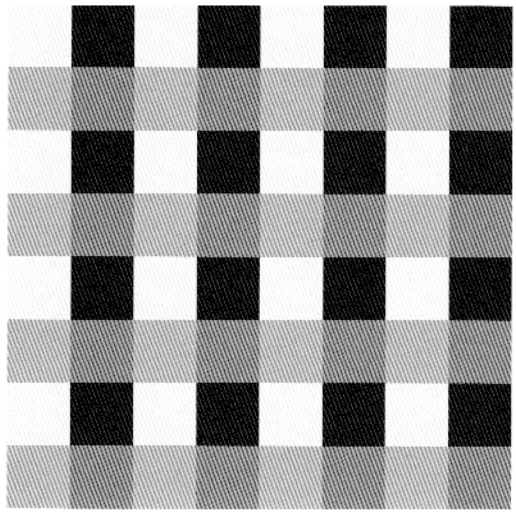
In the second place groups are formed from groups through integration on the larger field.
That means: in examples c 1- 3
the 16-element group b 1 is replicated
as a whole 4 times;
and by an operation of symmetry
the 4 are combined to form a new whole.
The new field measures 8x8 units.

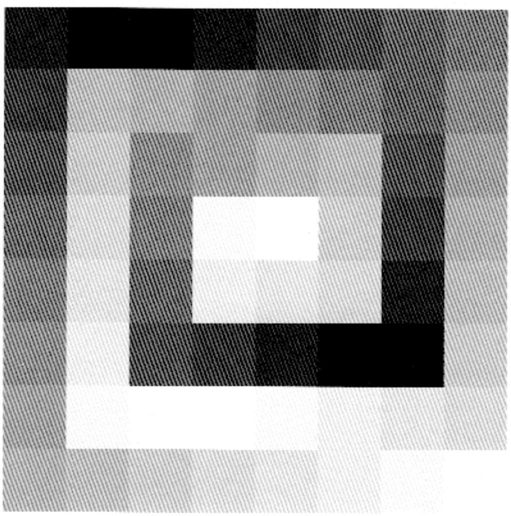
Instead of taking this field as a result
it may be used as a starting point.
Instead of placing 4 groups of 16 elements
next to each other in intact groups,
the groups may be broken up and the 64 elements
distributed over the entire field at will.

c 4 : following the law of chance.

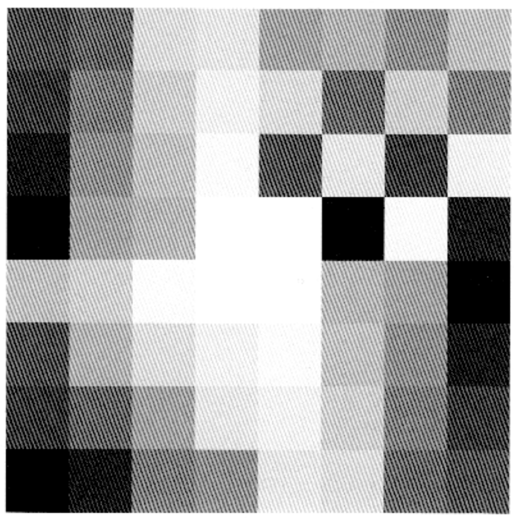


c 5: Arranged in groups with the same elements
and interposed.





c 6: as alternately reversed series,
i.e. from white to black to white again in turn
and arranged as a spiral on the larger field.



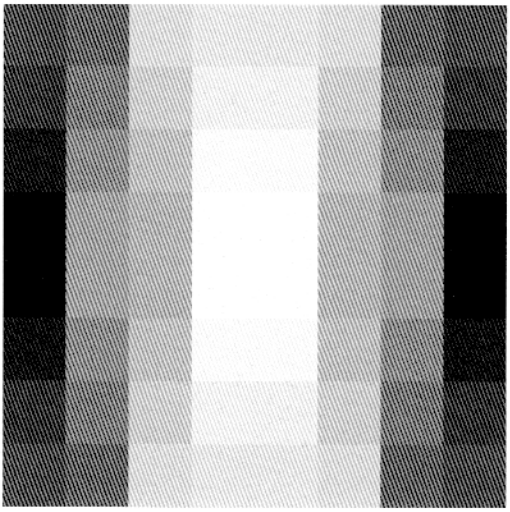
c 7: Grouped by an arbitrary act,
that is, neither following a definite rule
nor by means of deliberate randomness.
Composed, that is to say, "by feeling".

Examples c 1 to c 7
are not self-contained,
This even less the case for the replicated groupings
than for the simple, two-dimensional ones.
They demonstrate possibilities in principle.
The possibilities are as uncountable
as their number is finite.
But here, too, general views can be obtained.

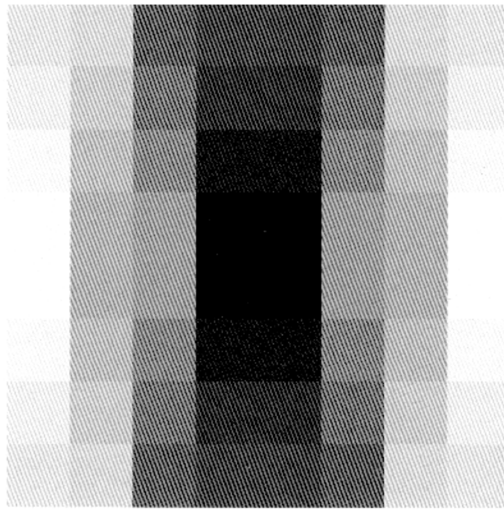
Following the practice of the surveyor,
the network of data points may be refined.
The lower orders of possible groupings
may be systematically placed between the higher orders.

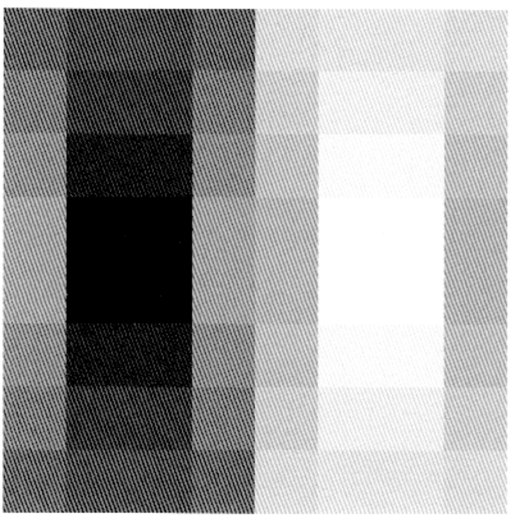
Each grouping
may be changed by a permutation
that may be more or less regular.

The reflected grouping c 1 is seen as a "negative" if in

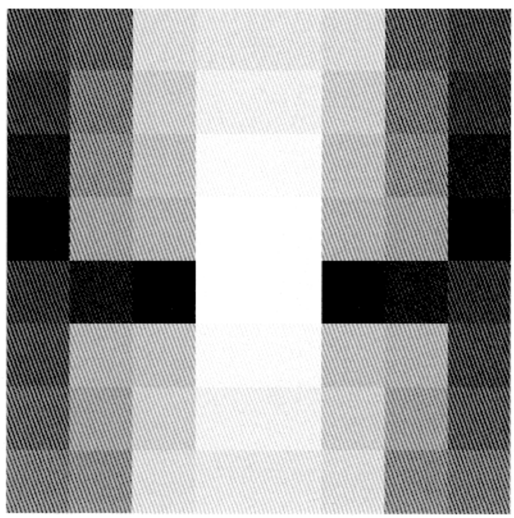


c 8: the order of the elements is reversed.





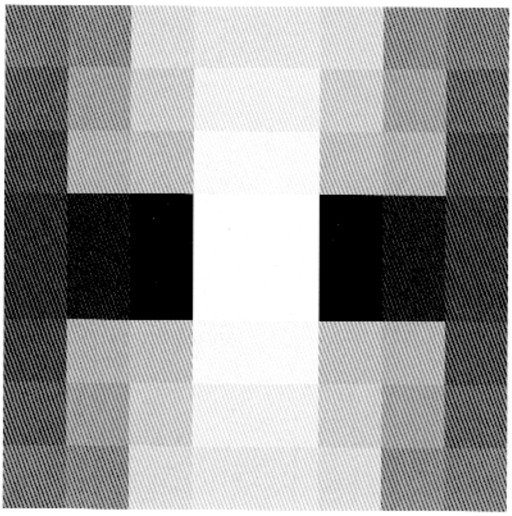
c 9: two vertical rows of c 1 taken from the right
and added to the left.



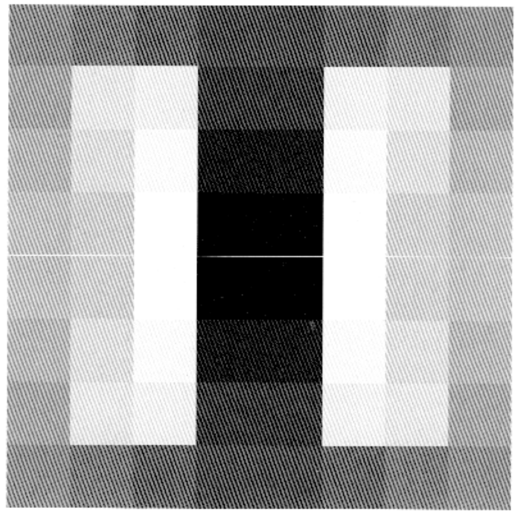
c 10: again, the basis is c 1:
the white centre has been displaced
one element downwards.
Corresponding to this spark
All of the other elements change position.
The original symmetrical arrangement
has lost its horizontal axis;
the vertical axis is preserved.

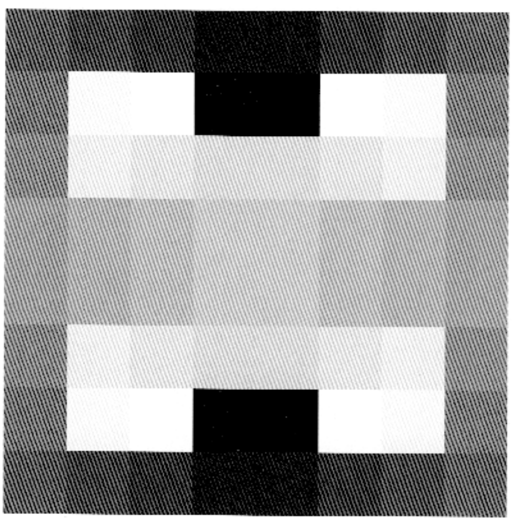
It is also interesting
to examine the results of the same operation
carried out with other groups.
The line series of elements randomly coiled
in the 16-element groups
are reflected twice
and thus provided with an optimum degree of order,
i.e. the maximum degree
of symmetrical relationships.

c 11: b 2 reflected.

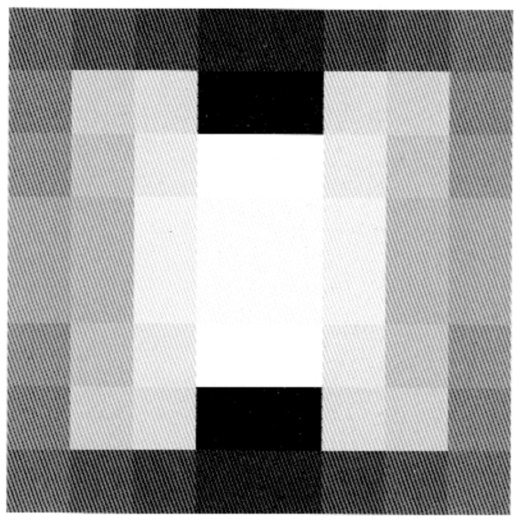


c 12: b 3 reflected.





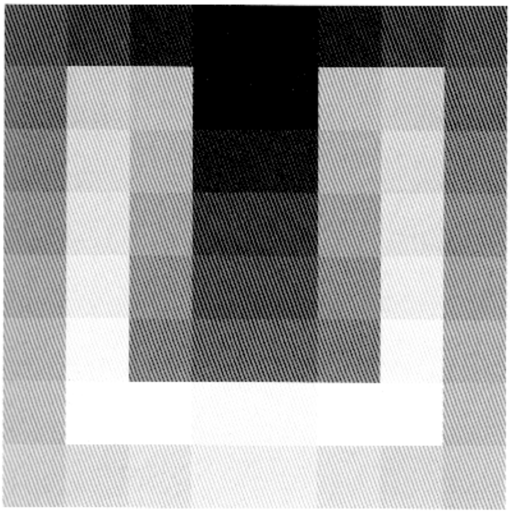
c 13: b 4 reflected.



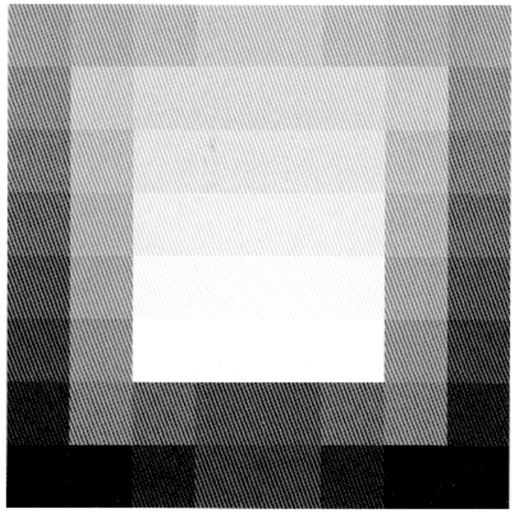
c 14: b 5 reflected.

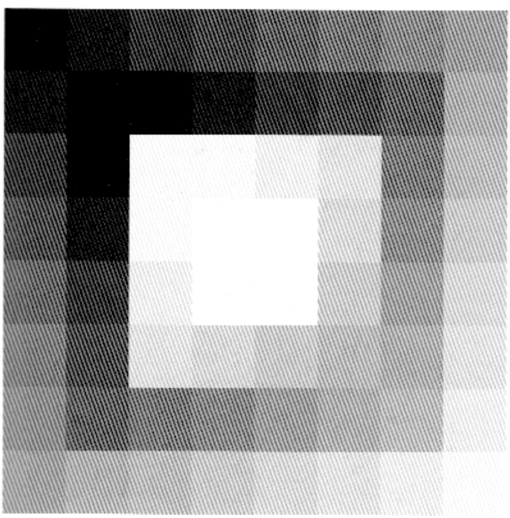
Example c 10 is a single-axis reflection obtained from the permutation of c 1.
From the outset, a different method can be used to produce reflections of this kind.

c15: all elements are divided into two halves; coiled at will in one (vertical) half and reflected in the other.

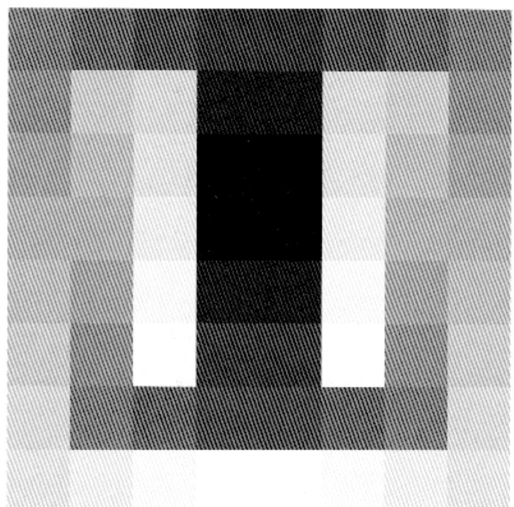


c16: c15 permutated.





c17: reflection along a diagonal.

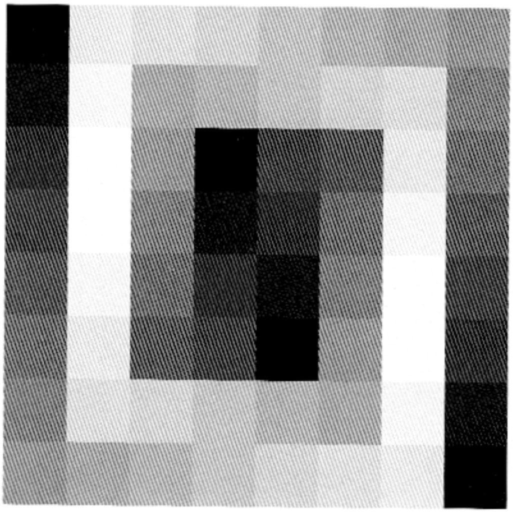


c18: reflected spirals.

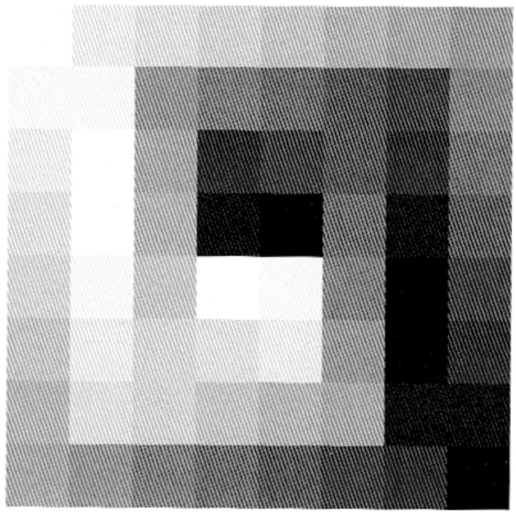
Examples c 15 to c 18
are combinations of two different operations:
coiling and reflecting.

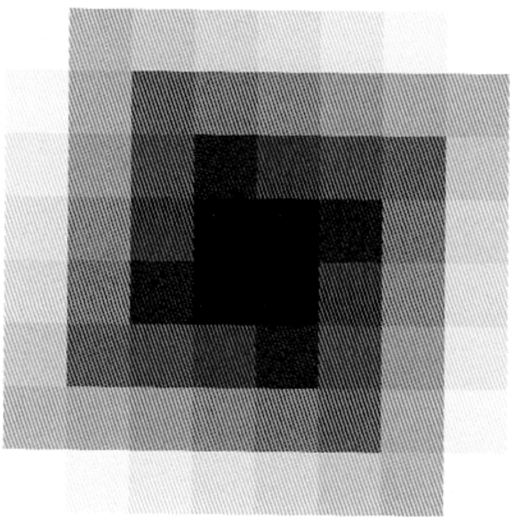
The following examples are of coiling,
or more precisely: of spiralling combined with rotation,
with the spirals ending up within each other
rather than adjacent to each other:
thus we have a third operation, interpenetration
plaing a role.

c 19: two spirals mutually inverted at 180 degrees.

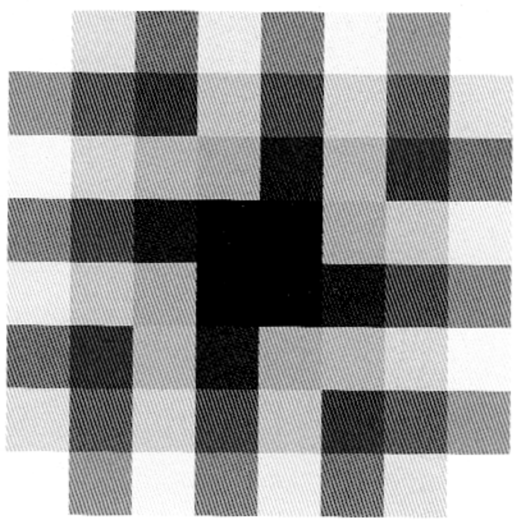


c 20: as c 19, with the sequence of the elements
in the second spiral reversed.





c 21: four spirals interpenetrating at 90 degrees.



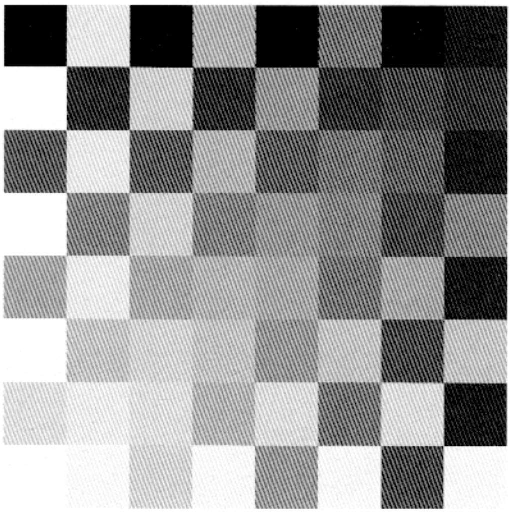
c 22: as c 21, but using the line series a 10.
The figure appears transparent in the middle.
The interpenetration of a 10 is potentiated.

Characteristic for groups of repeated elements:
to the relationships
between the different elements
are added relationships between like elements.

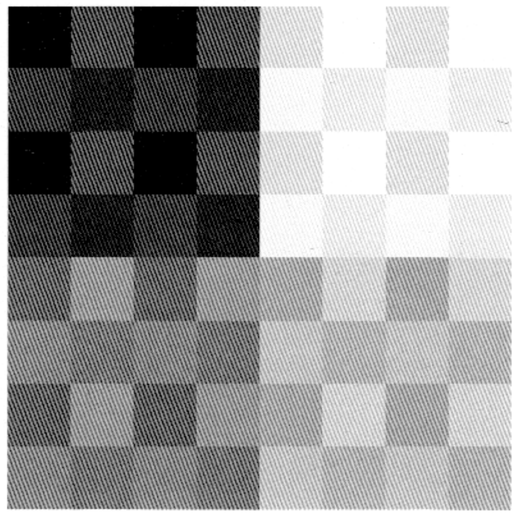
These relationships may
not only be taken as automatic results,
but used as the basis
of new groupings.

The total of 64 elements is composed of 16 groups
of 4 identical elements each.
The operations consist in
interposing them.

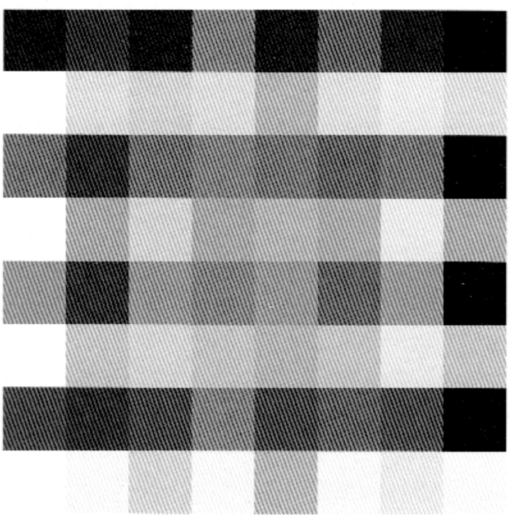
Because of their arrangement
and the impression they give of spatial transparency
let us call this type of grouping:
interpenetration. (see c 22)



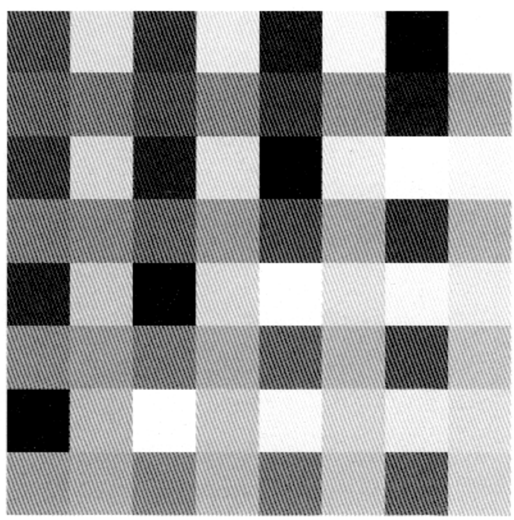
c 23: interpenetration and rotation in two halves.



c 24: interpenetration and rotation
proceeding from a grey center.



c 25: as c 24, in a permutated order,
i.e. proceeding from a black-white centre.



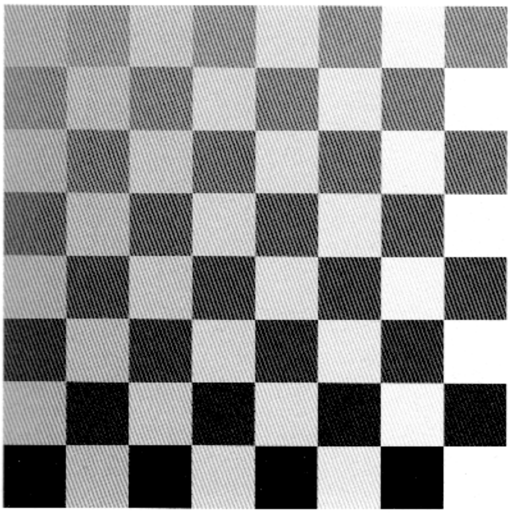
c 26: interpenetration of groups in graded zones.

Each constellation is a combination
of free choice
and predestined result;
of chance and order.

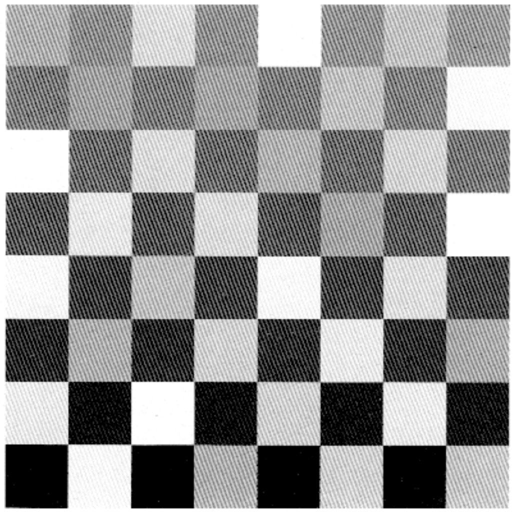
Each order is a special case
among all the possible groupings,
determined by the coincidence
of criteria, as numerous and as self-contained as possible.
The more complex its principle,

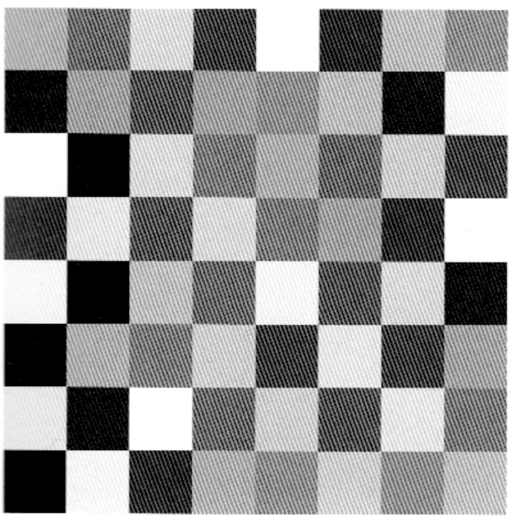
Chance is a different matter.
It may be harnessed in any number of ways:
with dice, lots, a roulette wheel;
by using the telephone directory, the 100-year calendar;
or with the help of a blind person,
or the whims of a monkey –
the results will always be different,
but they will nonetheless be scarcely distinguishable.
We may perceive 1000 different kinds of order,
but the differences between ten chance arrangements
can be identified only with difficulty.

c 27: chessboard interpenetration.

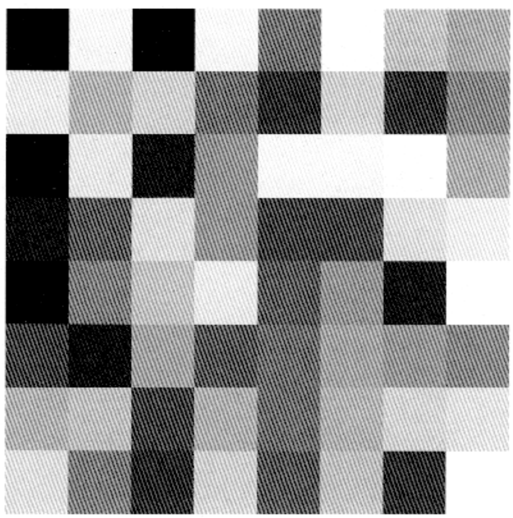


c 28: the lighter half has been deprived of order, and distributed according to chance.





c 29: as c 28, with the darker half
also in a chance distribution.
No element is in its original position any longer;
but the two halves are.
This is the criterion of order,
and its effect is preserved.



c 4: This final criterion has also been abandoned;
all the elements are mixed at random.

The interpenetration c 27
contains a particularly high degree of order.
This order is now reduced successively,
i.e. in the proportion in which
the chance component becomes more important.