Fig. 1

In 1963 Joost Baljeu, editor of the art magazine 'Structure'[1], invited me to write something about my work. At that time I was interested in the origins and production of form.

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The realization that just two directional forces could apparently suffice to describe and also give rise to form in nature, art and technology, fascinated me and I set out ambitiously to describe how a straight line shift (translation) and rotation could theoretically account for a vast repertoire of form.

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[1] *Structure* sixth series 2-1964. 'Thoughts on Construction' Peter Lowe

A lathe is an example of a forming machine that combines rotary and straight-line movements of a cutter to produce cylindrical, conical, spherical and helical forms. In dance, straight line and rotary movement of human limbs give rise to a range of expressive gesture. Similarly, many plants generate form as they position their foliage to gain optimum energy from the sun. This too can involve rotational and translationary movement.

A rotary force combined with a straight-line shift produces a spiral or helix. Trying to illustrate this, I discovered an unexpected combination in the form of a rectilinear spiral (fig.1.).

I began with a square and by adding a double square and an 'L' shape comprising three squares I formed a rectangle with a ratio of 3:2. At this point I began to wonder if it were possible to continue the process until I arrived at another complete rectangle or square. This seemed to me to be aesthetically desirable and mathematically intriguing. At the same time it hadn't then occurred to me that $1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 = 36$ and that obviously the whole could predictably fit a 6 x 6 unit square. Instead, I continued by trial and error, unsure if it would work out.

To the 3: 2 rectangle I added a straight segment of four squares followed by another 'L' shape segment of five squares. I continued adding 'L' shapes incremented by one square until I finally arrived at the number 8. At this stage the combined segments formed a complete 6 x 6 square of spiral segments [2]

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[2] The question then arose as to what would be the next series of consecutive integers that add up to the next square and triangular number. In the early seventies I enlisted help from Chris Frith and later Edward Grabczewski. Frith calculated the next complete square using a mainframe computer at the Maudsley Hospital, London and
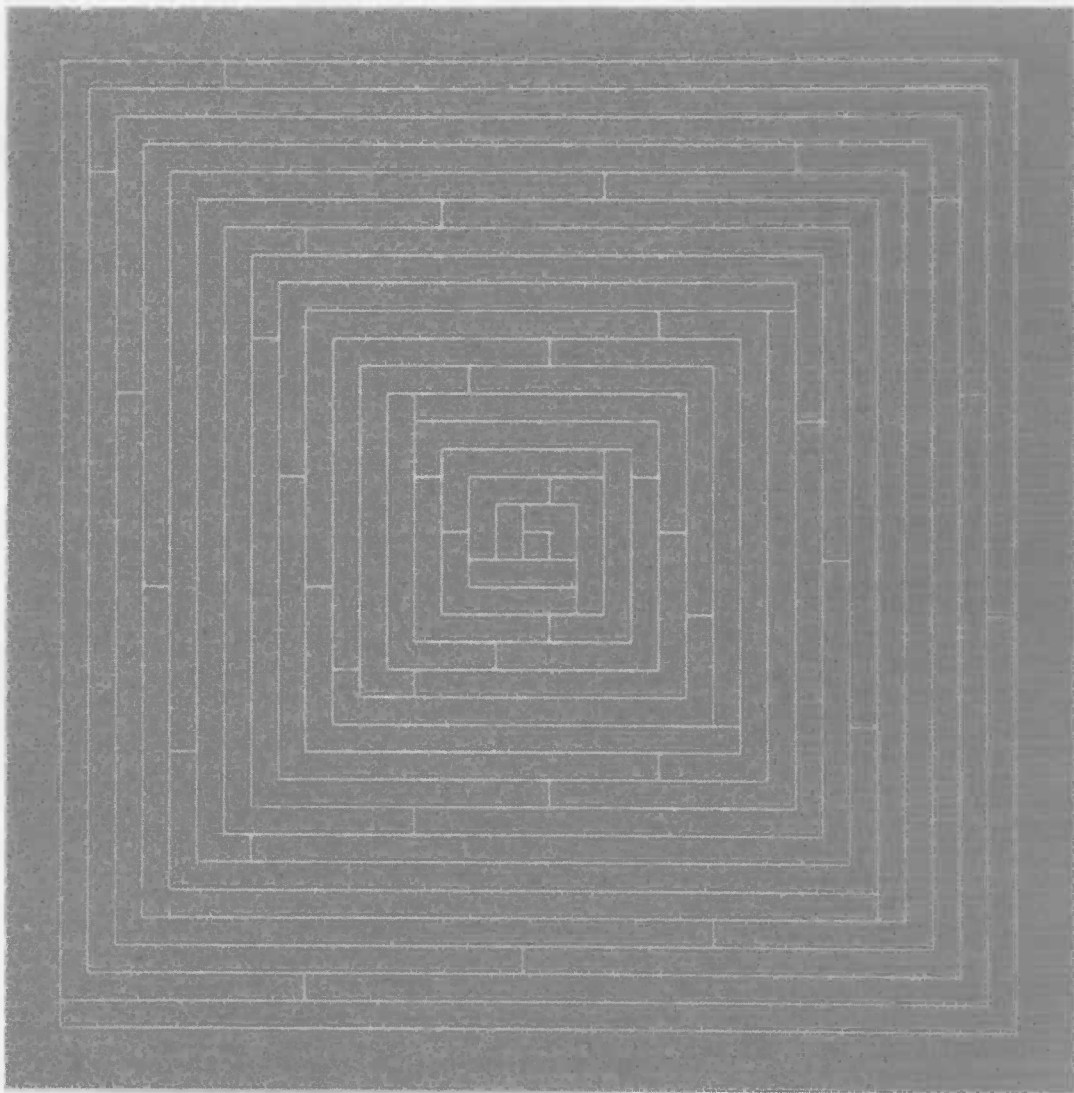
Fig. 2

The aesthetic appeal of the original 6 x 6 spiral lay in its simplicity, its transparency and the suggestion of an intelligible beginning and end. What started out as a square went through a consistent process of change and culminated in a logical and inevitable recurrence of the square. What would the next spiral based upon the sum of consecutive integers look like?. The answer (Fig 2) was worked out independently by Edward Grabczewski and Chris Frith

output the spiral image onto microfilm. Grabczewski arrived at a solution using a handheld programmable Texas Instruments TI57 calculator

Making and interpreting art are two different acts. For example, although the next larger spiral drawings were accurately predicted using deductive methods, interpreting them relies on induction, typically by comparing one thing with another and looking for patterns.
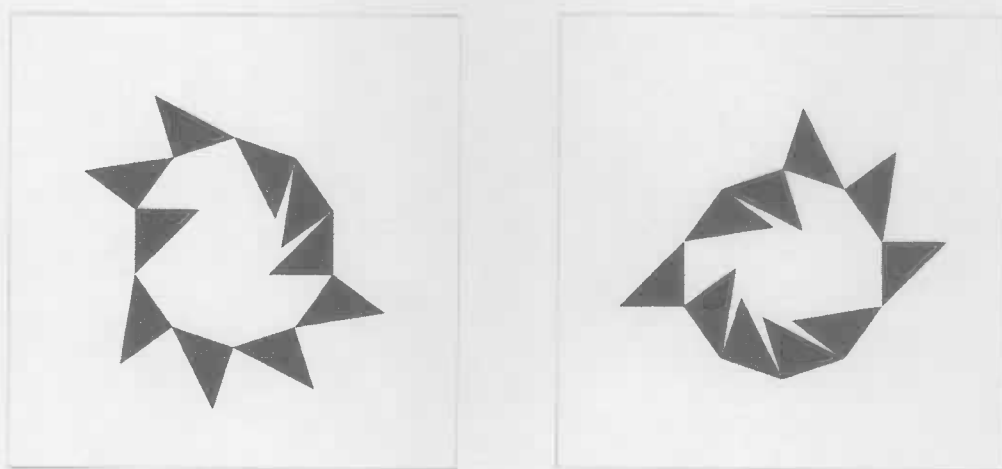

Fig 3

Feelings and ideas meld together. For example, the pair of designs above (fig.3) exemplify, for me at least, feelings and thoughts about being on the inside or being on the outside. This human reaction to being included or excluded is potentially a strongly emotional one. I decided to develop the idea in terms of pattern and form. One of many ways that seemed appropriate was to to express this in terms of triangles placed inside or outside a polygon. Without digressing into personal pathology, I can hazard a guess why I might have unconsciously preferred those particular shapes and it has little to do with beauty.

The question inevitably arose about how many variants there are for a given number of triangles and polygons. Thus seven isosceles triangles could face clockwise or anti-clockwise to produce 18 possible arrangements. (fig 4) excluding the two entirely symmetrical ones.
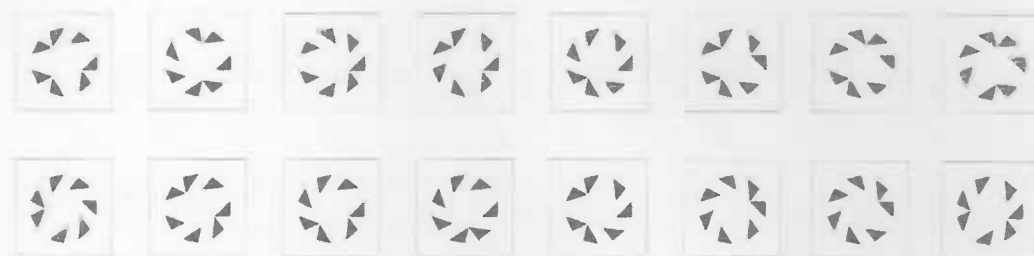

Fig 4

Here are the possibilities for nine triangles that were worked out for me independently by Chris Frith and Ernest Edmonds. (fig 6)
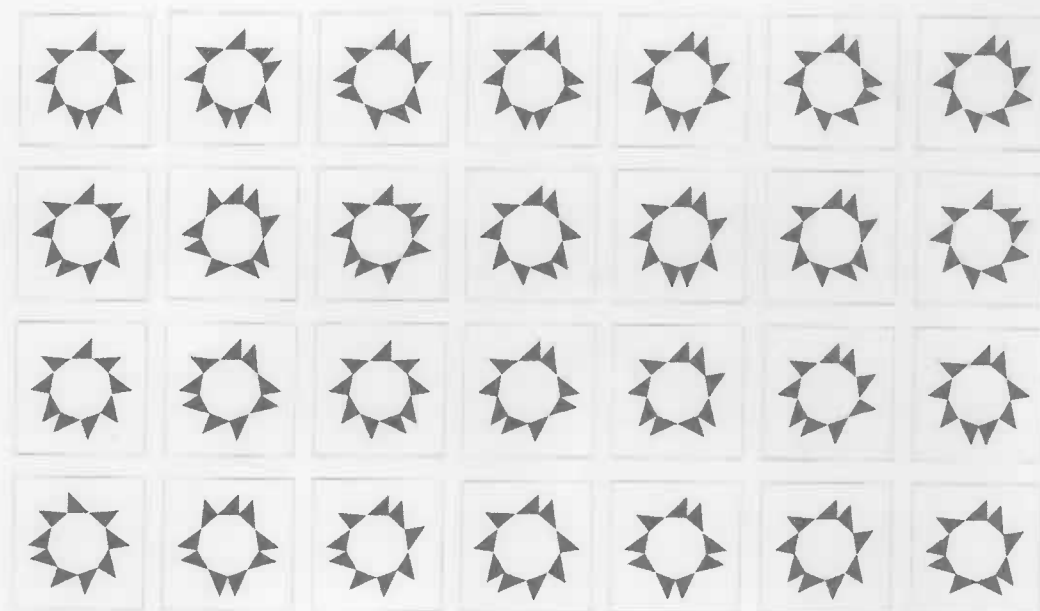
Fig 5

By flipping all the triangles (Fig 6), I suddenly saw the space between them open up so the eye could flow through the figure instead of being directed along the outside or trapped in the centre. The flipped and unflipped versions fitted into one another to form a ring of squares.

I repeated the process but the result pleased me less because it seemed chaotic, arbitrary and unintelligible. But, after repeated flips, the original configuration returned to identity and I accepted it.
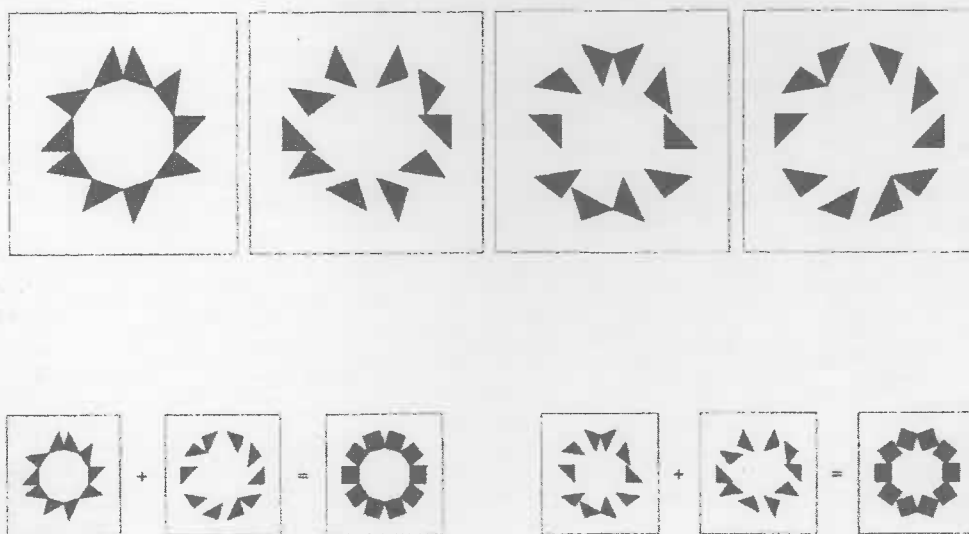

Fig 6

I strive for imagery that is transparently conclusive.. By 'conclusive' I mean that nothing can be added or taken away without destroying the integrity of the structure. This

does not mean there cannot be variants of the system or other ways of presenting it.

I work by trial and error. Very rarely have I ever woken from sleep with a complete idea that was realisable. The closest was to imagine what it might be like to place equilateral triangles within a regular polygon in such a way that they increase in size as they progressively span the vertices until the largest triangle touches the perimeter of the dodecagon at three points.
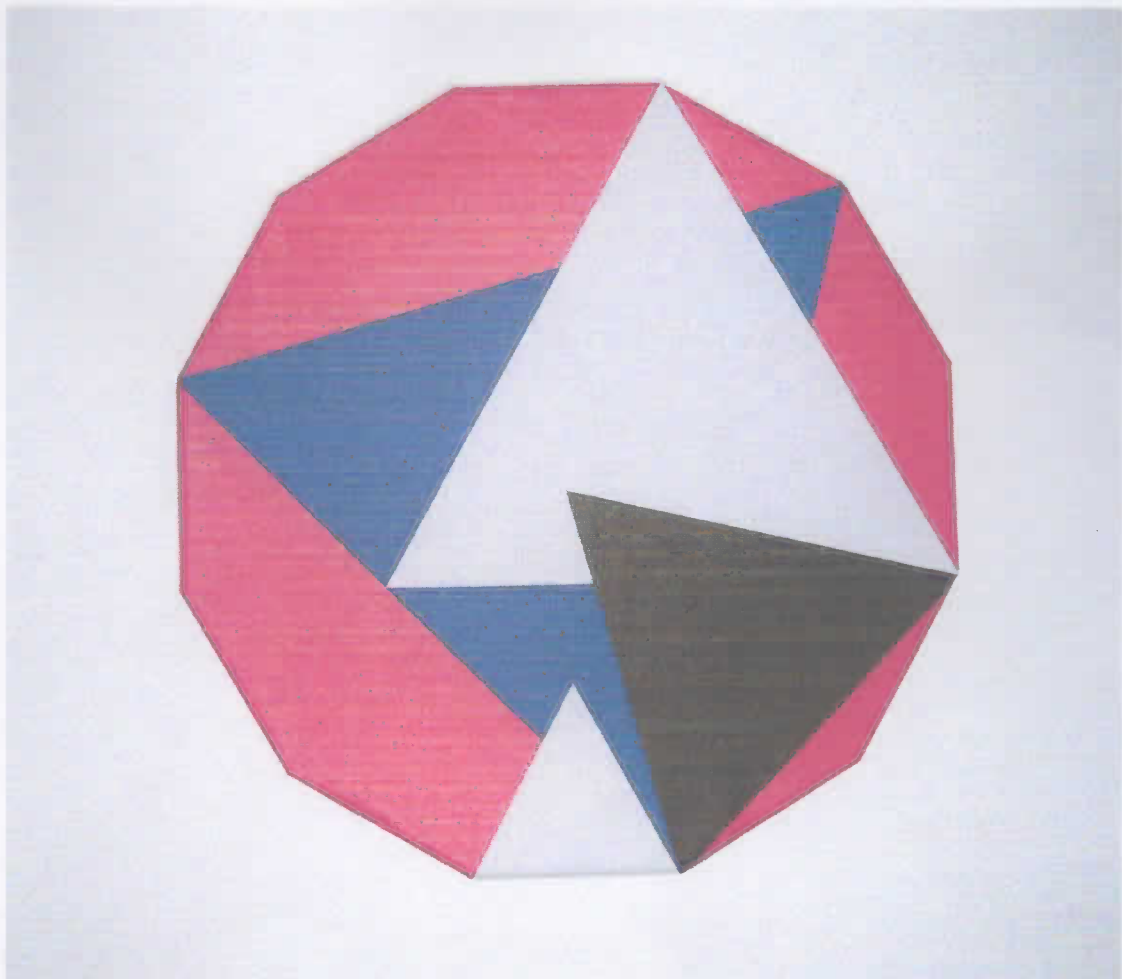

Fig 7

In figure 7, the black and white triangles are regarded as separate from the chromatic ones. The blue triangle is in

the same ratio as these but it doesn't behave in the same way as the achromatic triangles. Its separateness is emphasized by breaking the law of consistency that implies that its corners should meet the apex of the larger of the two white triangles.

This raises questions concerning the integrity of the system. Should absolute conformity govern or should non-conformity be allowed? Only by introducing conformity can non-conformity be expressed. This suggests that maybe by consistently disallowing the points of all triangle to touch another, a different feeling will be evoked, one which has a different logic but which is no more or less valid than the previous idea. (Fig. 9) Thus, from one way of thinking comes another.

Fig.
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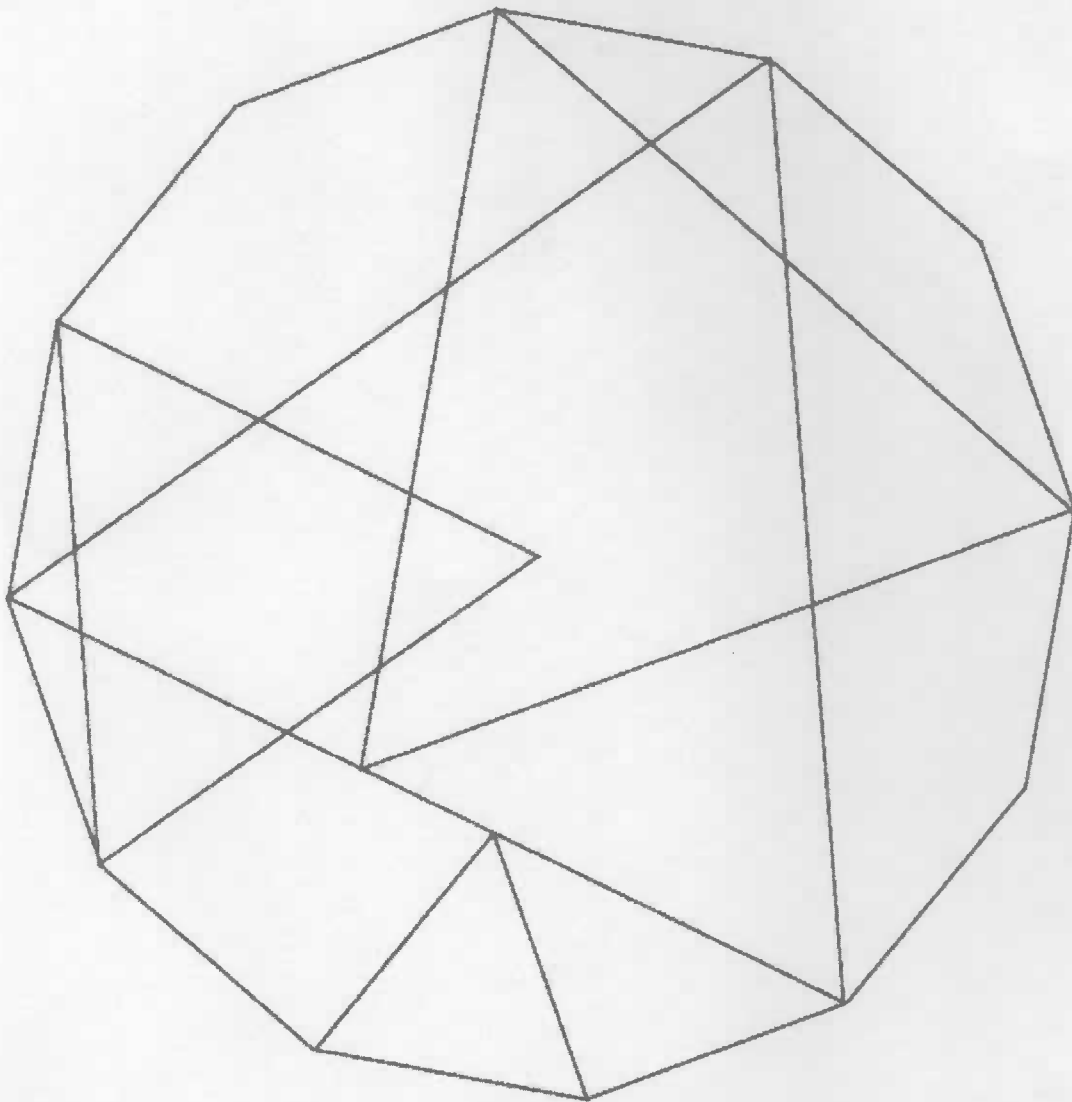
System of Six Elements on Grey (1969), shown below as fig. 10, is also the result of rotations and straight-line shifts. Rotating the second element from the left 90 degrees gives the fifth element for example. The rows and columns of black and white crosses are arranged according to a predetermined pattern. All the white crosses and all the black crosses are placed on a diagonal. Elements in the top row change places sequentially until they are reversed in the bottom row. Similar inter-relationships appear throughout. (See fig. 10)

1	2	3	4	5	6
4	1	5	2	6	3
5	3	1	6	4	2
2	4	6	1	3	5
3	6	2	5	1	4
6	5	4	3	2	1

Fig. 10

To look at it another way, the element in the first row and column moves one place, the second element moves two places, the third moves three places and so on. There is an imaginary zero column on the left which is counted as a space.
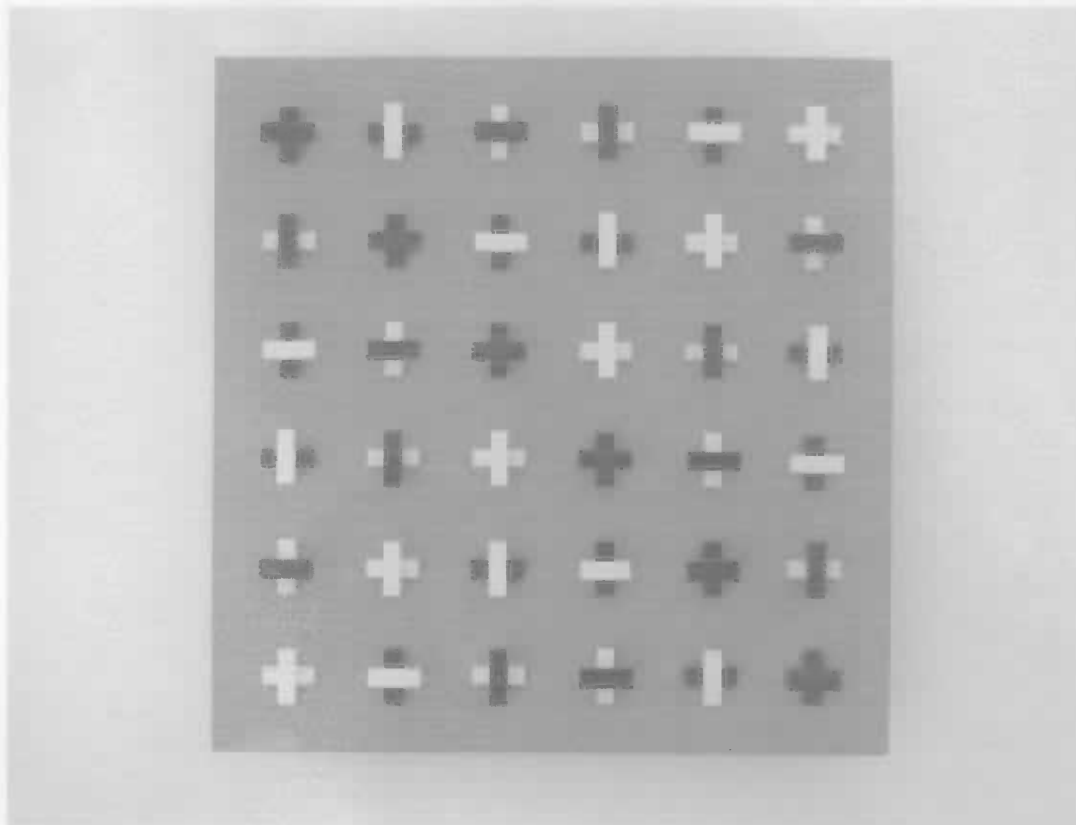
Fig. 11 System of six elements on grey 1969

All the above examples are attempts to communicate visually without intentionally putting emphasis on mimetic or symbolic means. Reason plays an ambivalent role as it does in most activities because there is inevitably randomness and subjectivity at work too. It seems to me that for subjective reasons I have decided not to celebrate these aspects. Ultimately, I cannot explain this decision.