

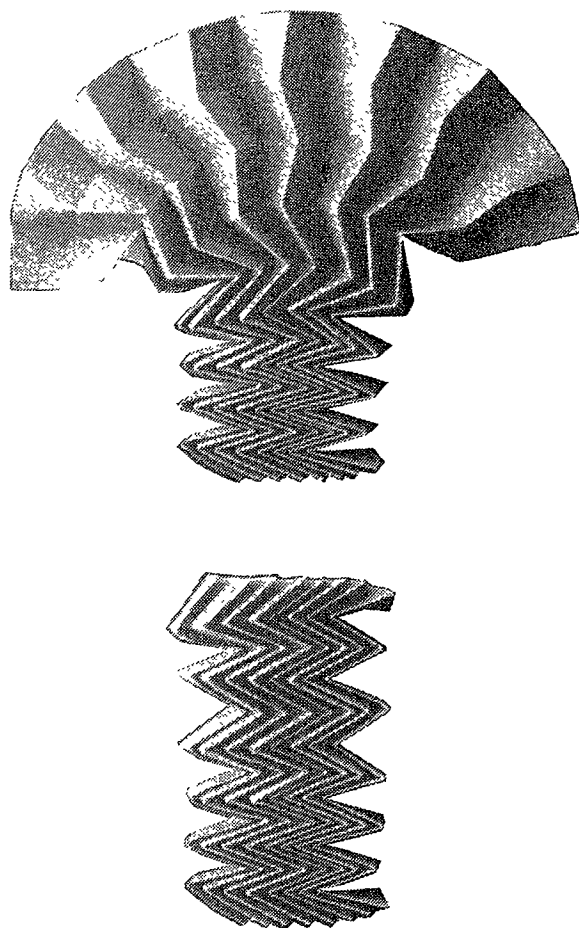
Symmetry: Culture and Science

Origami, 2

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György Darvas and Dénes Nagy

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The *Miura-ori*
opened out like a fan

PAPER SCULPTURE

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Origami, or paper folding, is always practised with both hands. This reflects the symmetry implicated in paper folding. This symmetry is accompanied by a further aspect; that of the way the folding is performed: the folds made on the paper introduce successively different points of reference; points around which the symmetry turns, and folded lines which act as the axes of symmetry.

The marks into the space are also dualistic operations: left - right, above - under, up - down, right-side - wrong-side, and so on... Symmetry is ever present though its form is dependent on which model do you wish to construct. For instance, in origami, animals generally have an axis of symmetry along a single axis; plants and flowers, on the other hand, have their symmetry organised around a central point.

All the traditional bases and techniques are also objects of analysis from the point of view of symmetry: the water-bomb base, the preliminary base, the windmill base, the bird base, the fish base; the reverse fold, the squash fold, the rabbit's ear.

The paper shape used is often the square, which has many axes of symmetry, like polygons for example.

Symmetry is the foundation of any equilibrium. It puts the mind ease. It is the origin of aesthetic. It allows the glance not to be lost. The symmetry is a glance on a human being, who is symmetrical too. In the sense of origami, a human being is symmetrical and is, moreover, represented in a closed surface. We start from a piece of square paper, and, through successive symmetrical folds, reduce it while we get a closed, completed origami model. The most important feature of origami is not the final object created, but the operations that are performed to obtain that final product. That final product may become elegant and simple, for it to be seen as interesting and aesthetically pleasing. If not the best techniques are applied or too much paper is used in the construction of a model, it will be seen as inelegant and not very artistic. The application of paper in successive layers is considered unaesthetic and spoiling its artistic and symmetrical charm. Ideally, origami should involve delicate folds, each of which should be reflected upon, like the moving of chesspieces on a chessboard.

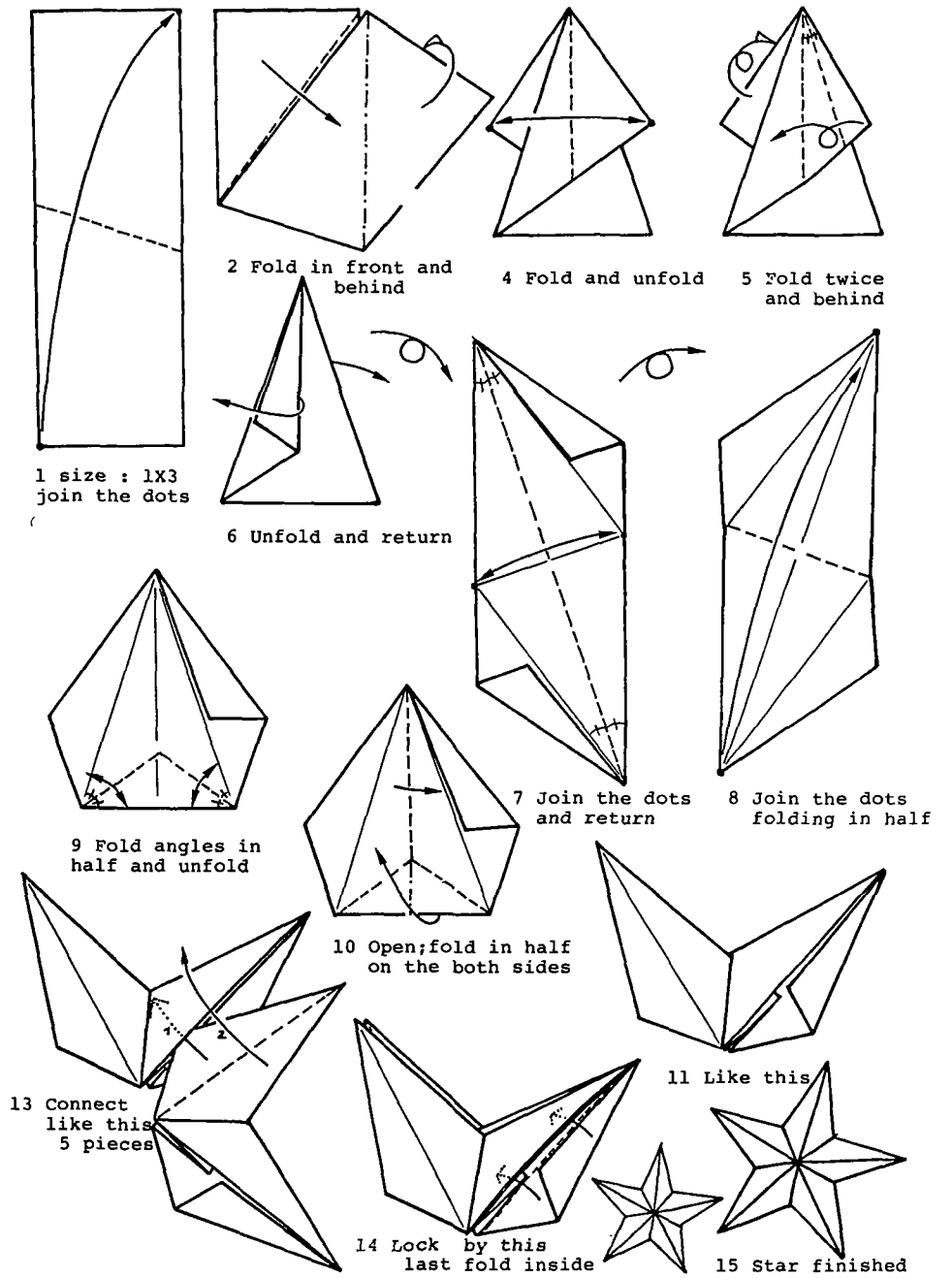
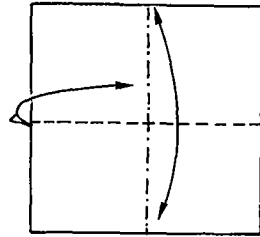
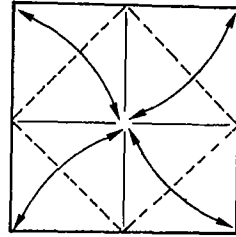


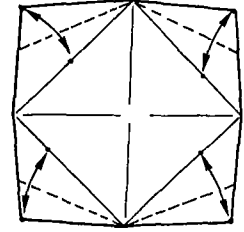
Figure 1: Star by D. Boursin (1992).



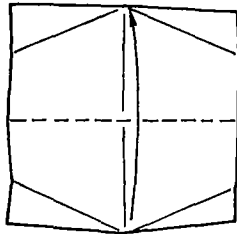
1 Fold and unfold



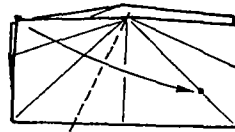
2 Fold to the center and unfold



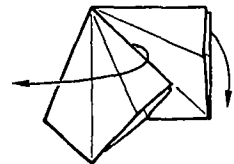
3 Make the creases



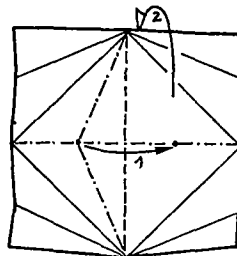
4 Fold in half



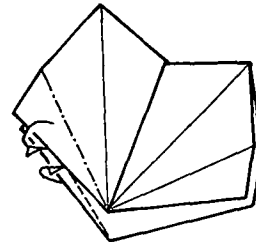
5 Fold dot to dot



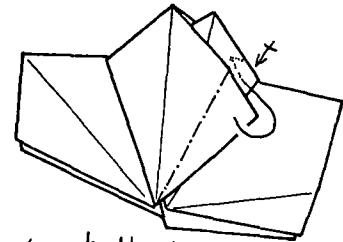
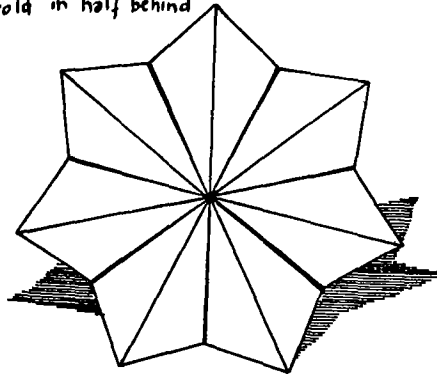
6 Unfold completely



7 Join the dots then fold in half behind

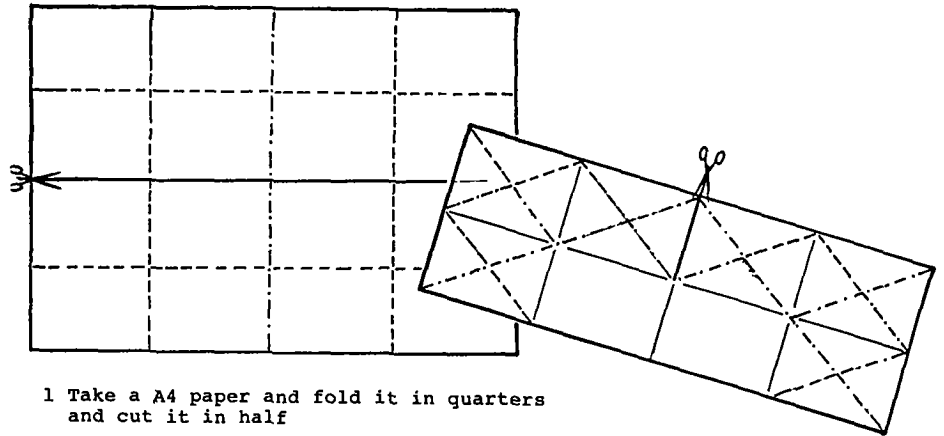


8 on both sides fold behind



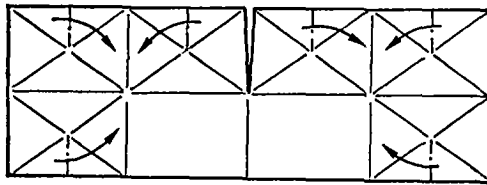
9 Connect the 7 pieces to lock, put the tongues inside the pockets

Figure 2: Star in 3 dimensions by D. Boursin (1992).

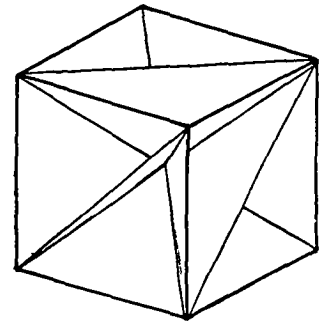


1 Take a A4 paper and fold it in quarters and cut it in half

2 Fold all the quarters except two parts and cut until the middle



3 Fold each triangle then fold it in 3 Dimensions



5 The cube where appears v^3 and v^2

4 Fold the both pieces of A4 and connect together her.

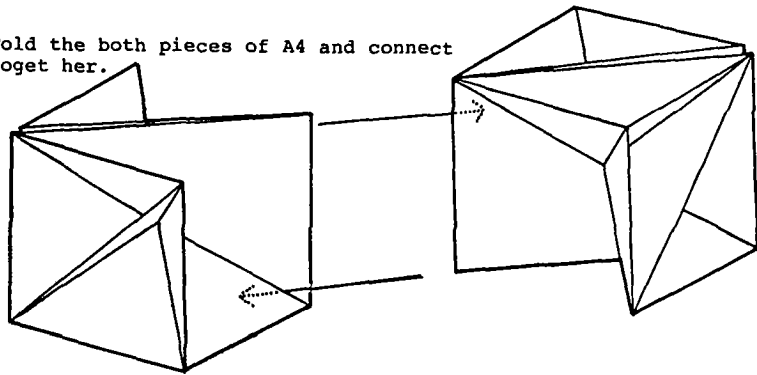
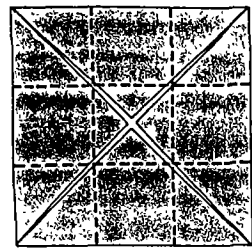
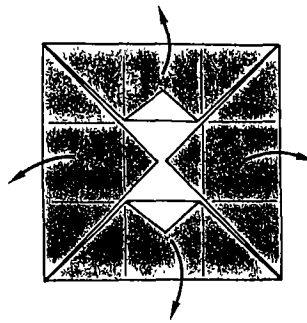


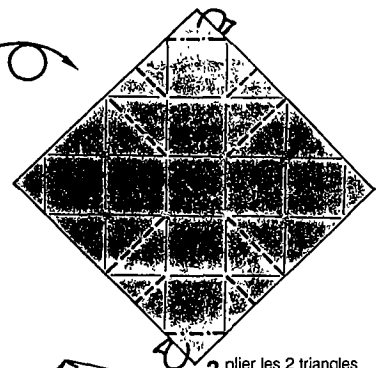
Figure 3: Cube structure by D. Boursin (1990).



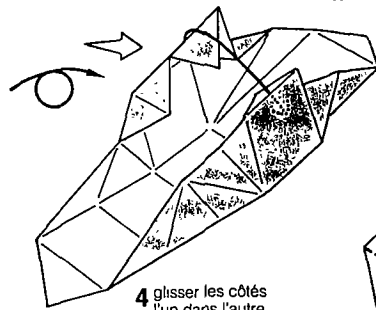
1 plier les 4 pointes d'un carré jusqu'au centre puis marquer les plis au tiers dans les 2 sens



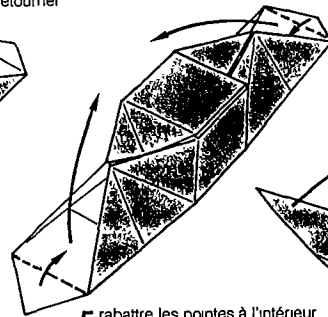
2 ouvrir complètement et retourner



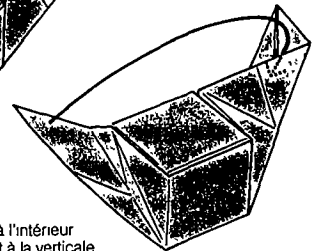
3 plier les 2 triangles derrière et marquer les derniers plis comme indiqués puis retourner



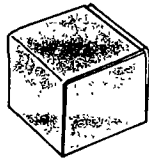
4 glisser les côtés l'un dans l'autre



5 rabattre les pointes à l'intérieur puis remonter le tout à la verticale



6 emboîter l'un dans l'autre



7 le cube terminé

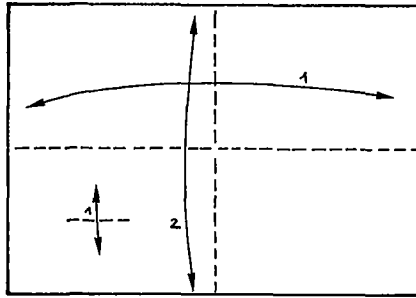
Figure 4: Cube by D. Boursin (1990).

The model's symmetry should explain the essence itself of the paper and symmetry: minimum of matter for a maximum of expression should be one of the fundamental rules to follow in creating a new aesthetic of symmetry and generally origami.

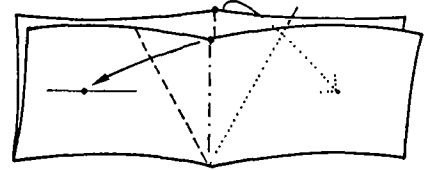
To practice the folding, it's to sculpt the matter trying to explain the best expression. Personally, I prefer simple origami; I try to be simple in my origami works, however it's very difficult.

For me, origami is most of the time, a wink of life, generally very ephemeral. Now the task is to fold different irregular sizes, or polygon shapes of paper from the usual square-shaped paper. A4 size paper owns interesting proportions: $21 \times \sqrt{2} = 29.7$ ($\sqrt{2}$ is the diagonal of a square, $\sqrt{3}$ is the diagonal of an A4 size paper and also the diagonal of the cube). The relation between 2 and 3 dimensions is also interesting to explore and can be used for folding different sorts of cubes and polyhedrons with this paper size.

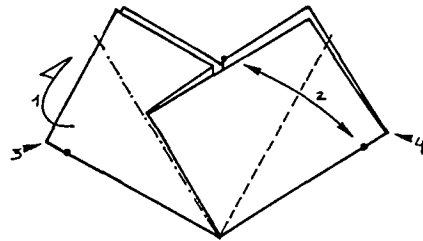
Summing up, symmetry cannot be dissociated from a sense of equilibrium, proportion, elegance and aesthetic beauty.



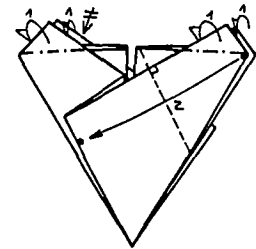
1 A4 paper : fold and unfold as indicates



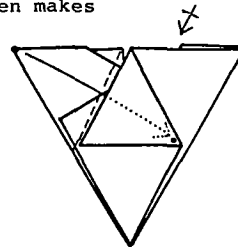
2 Hold the paper with both hands and fold dot to dot



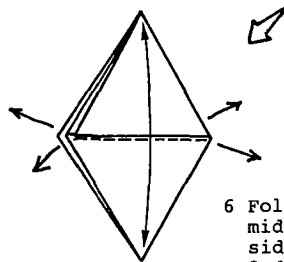
3 Make the creases then makes reverse folds



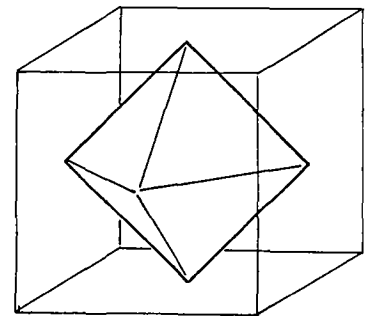
4 Fold inside the little triangles (4) then fold the right side down to the dot. Repeat on the other side.



5 Put the left triangle inside the central one



6 Fold and unfold the middle on the both sides. For making in 3 dimensions, pull out the opposite corners.



7 The octahedron finished

Figure 5: Octahedron by D. Boursin (1992)

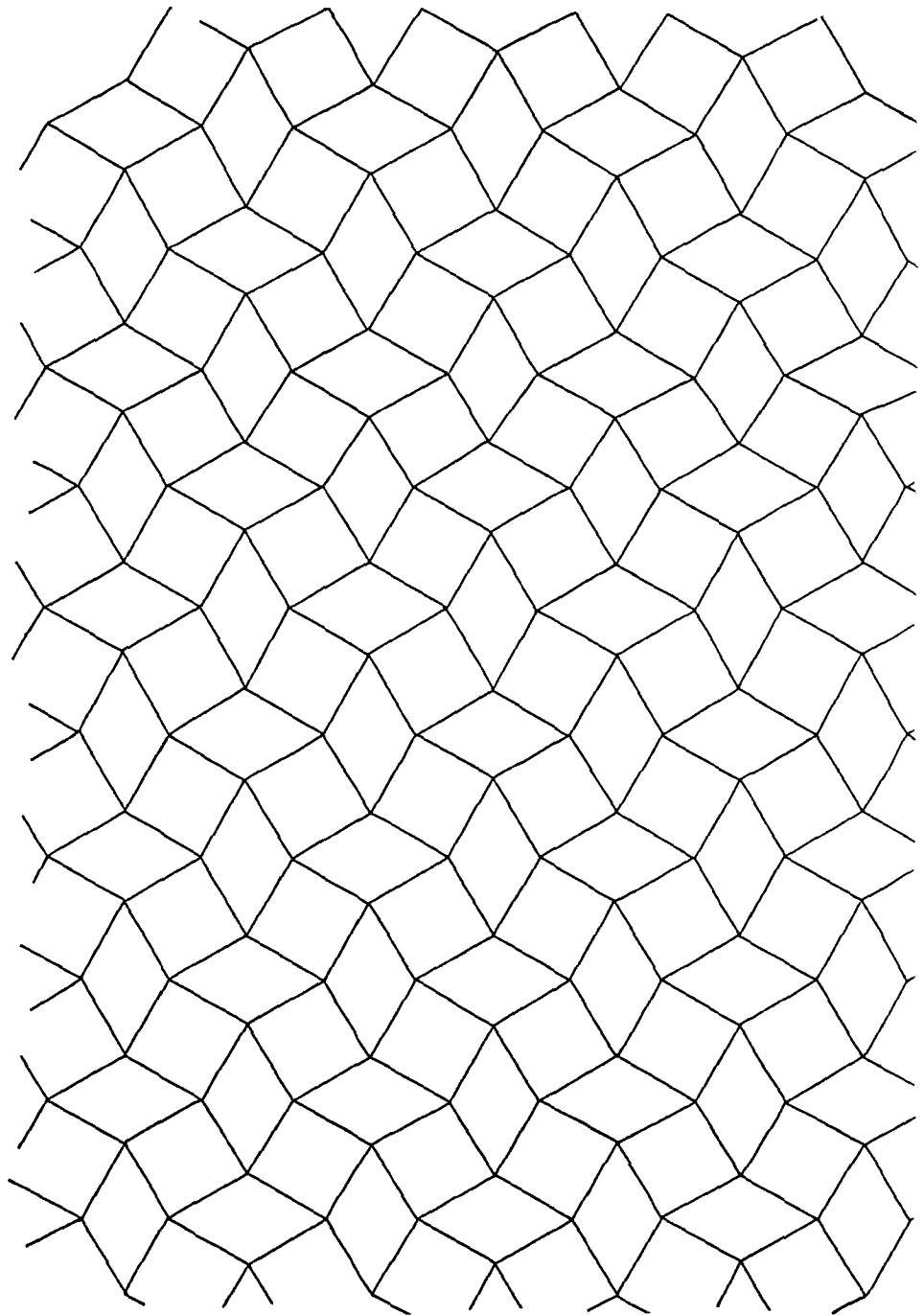


Figure 6: Folding frame: The structure (D. Boursin).

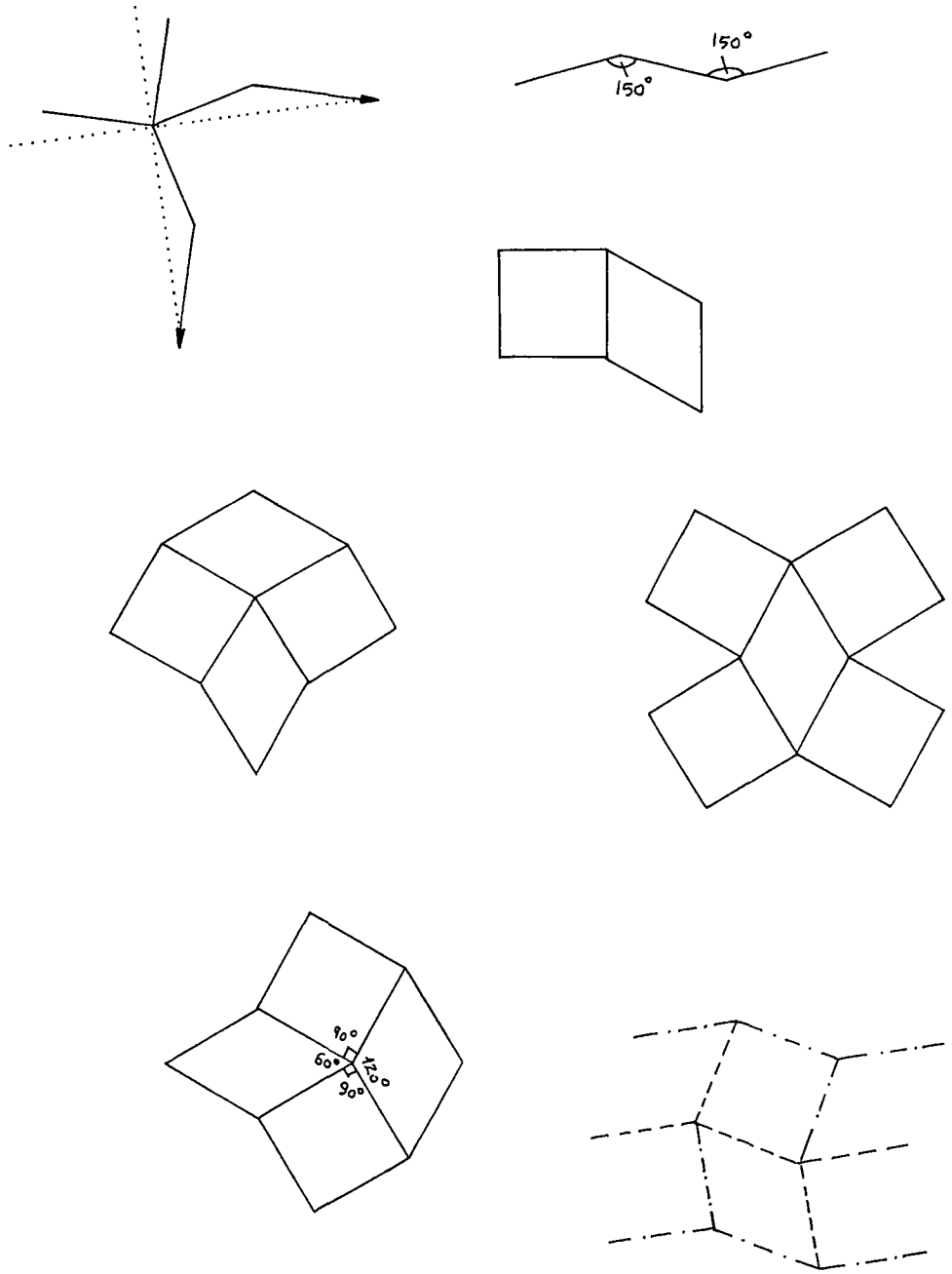


Figure 7: Folding Frame: Details (D. Boursin).

THE AUTHOR'S PUBLICATIONS ON ORIGAMI:

Boursin, D. (1983) *Le ticket plié*.

Boursin, D. (1988) *Manuel pratique d'origami*, ed. Celiv.

Boursin, D. (1989) *Papiers pliés, des idées plein les mains*, ed. J'ai lu.

Boursin, D. (1990) *Pliages en mouvement*, ed. Dessain et Tolra.

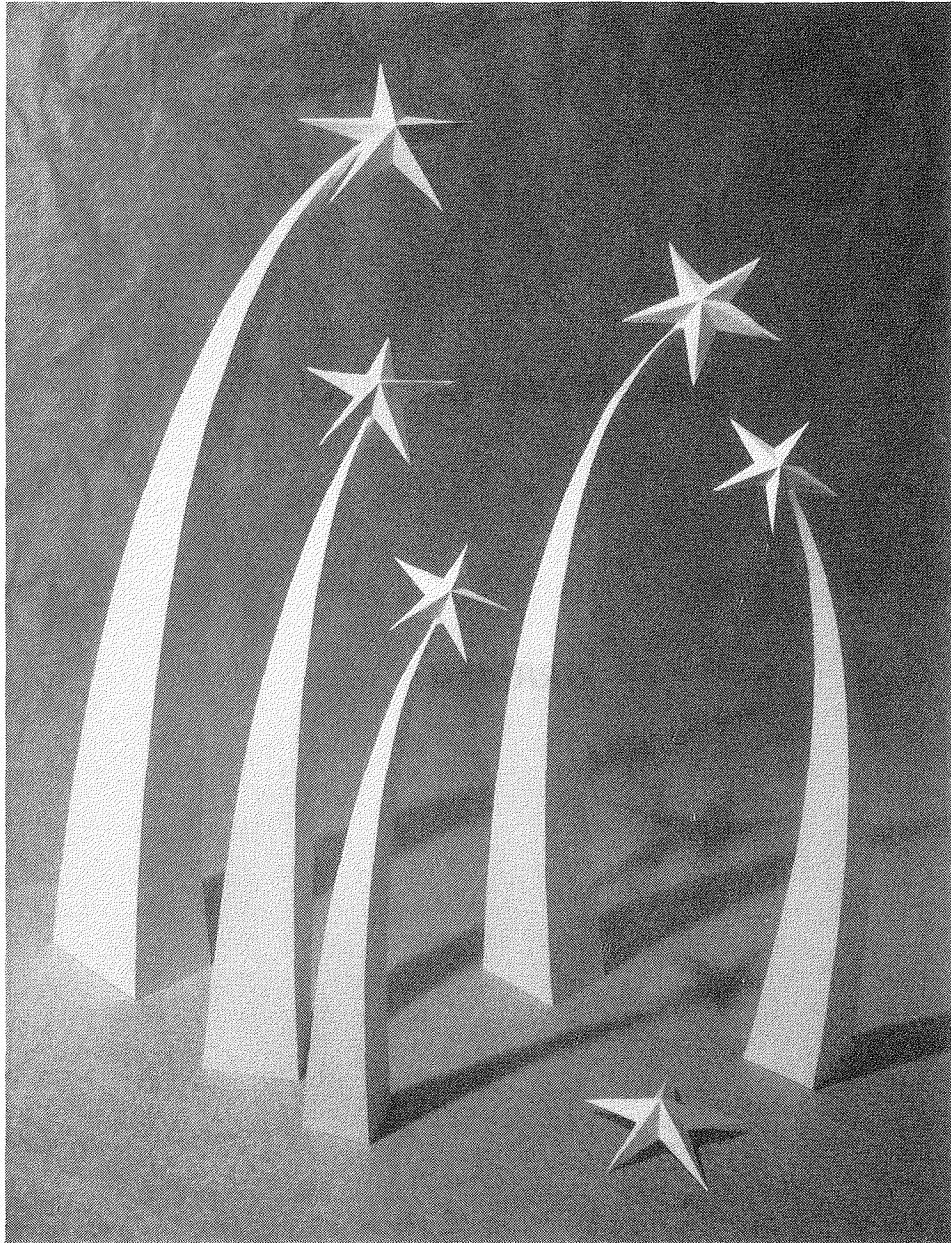
Boursin, D. (1991) *Pliage des serviettes*, ed. Dessain et Tolra.

Boursin, D. (1992) *Pliages en liberté*, ed. Dessain et Tolra.

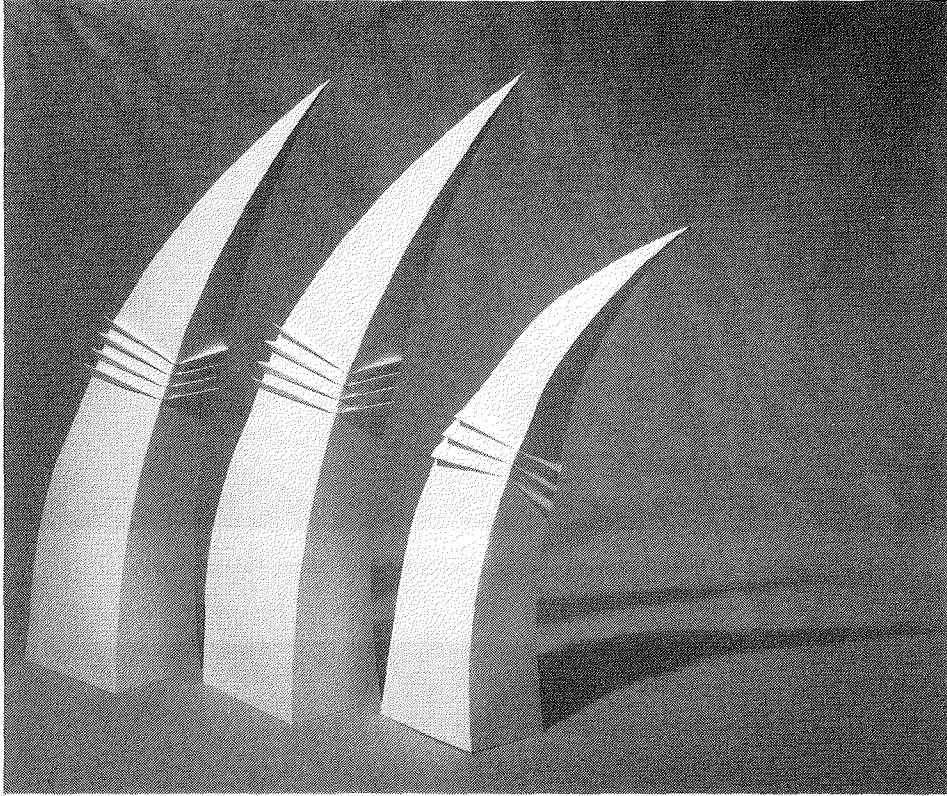
Boursin, D. (1994) *Pliages premiers pas*, ed. Dessain et Tolra.

SYMMETRIC GALLERY

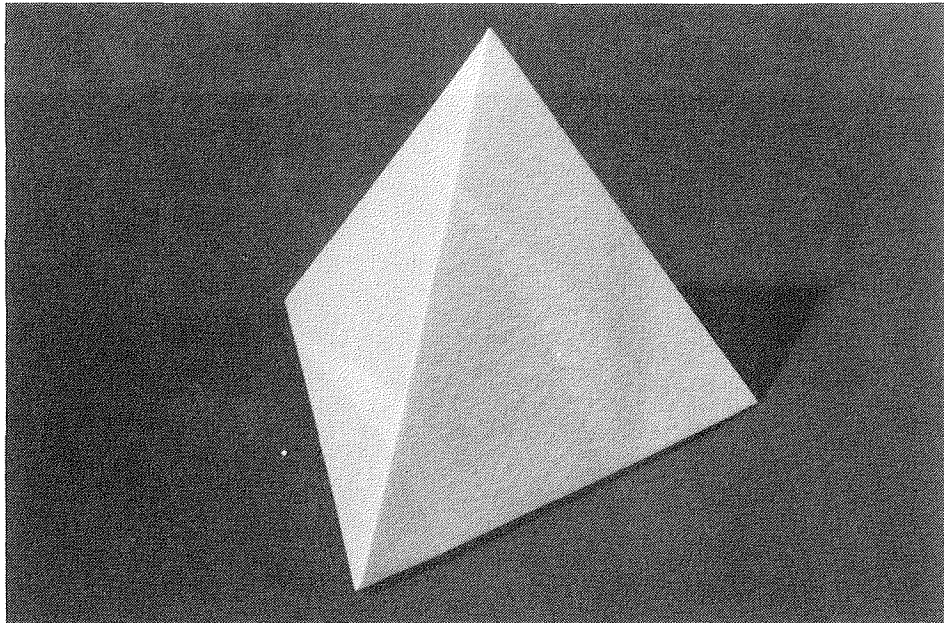
ORIGAMI



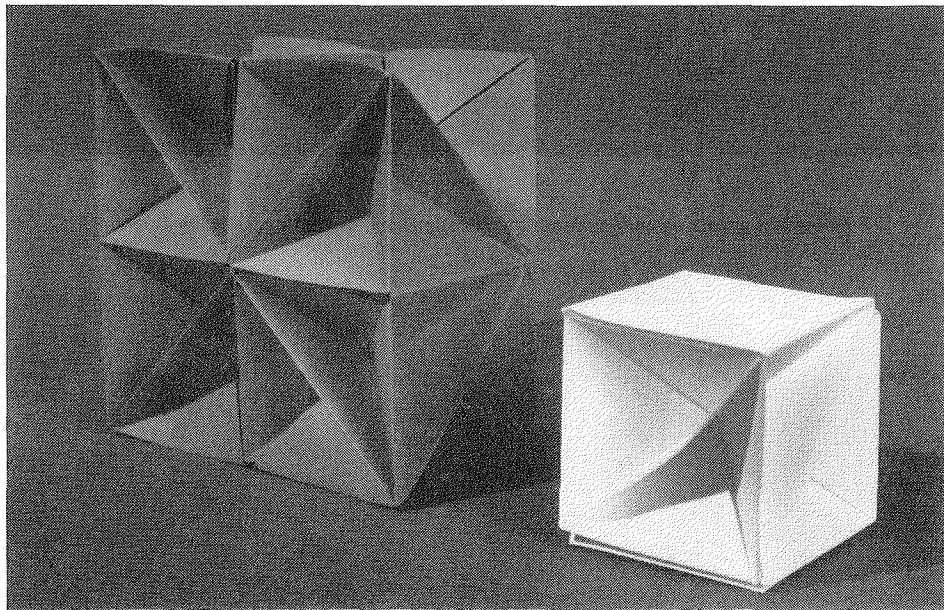
Shooting Stars, one piece paper with curve, (Didier Boursin).



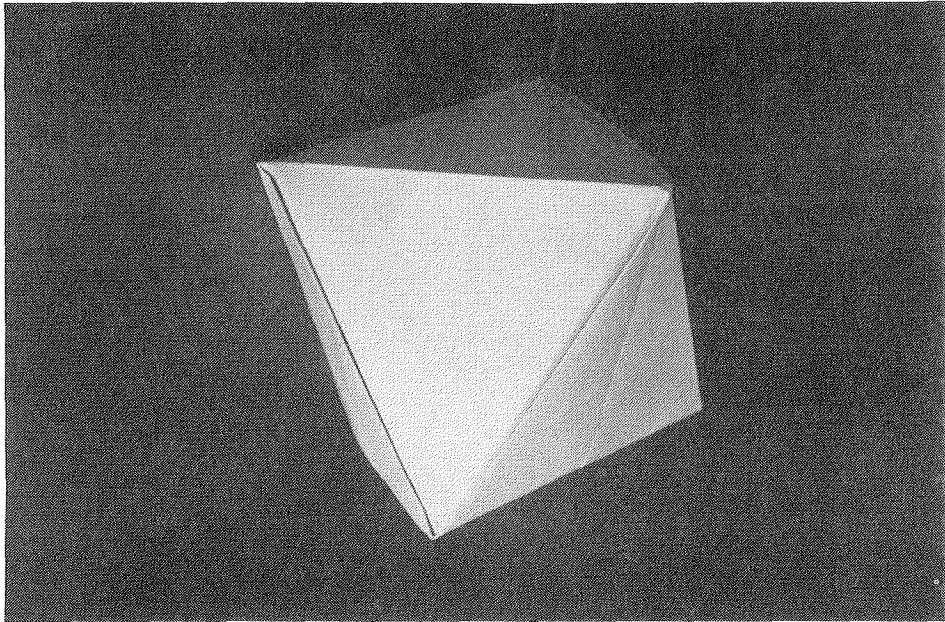
3 Horns, it is a work on curving paper then continue and discontinue, (Didier Boursin).



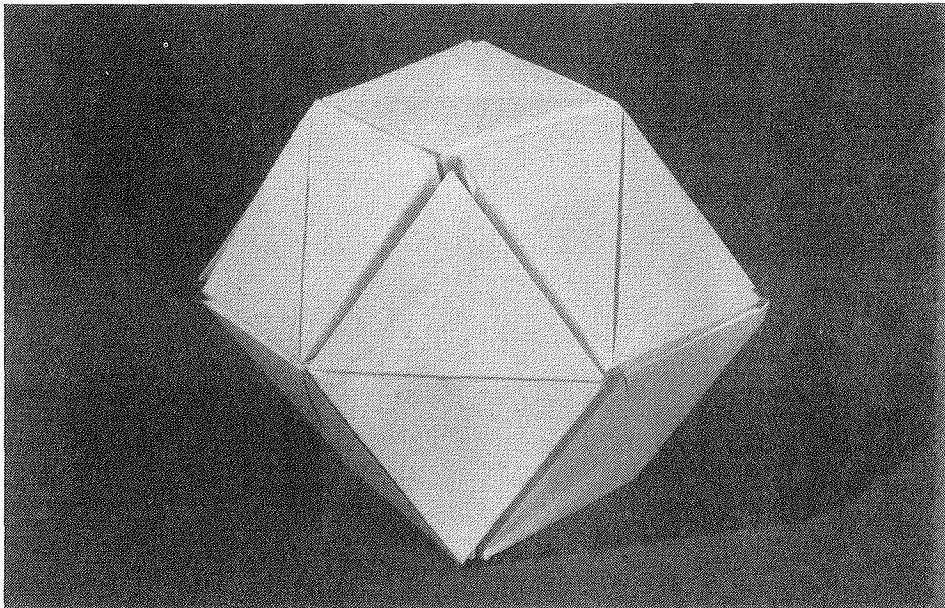
Tetrahedron, from A4 sheet of paper, (Didier Boursin, photo: Fabrice Besse).



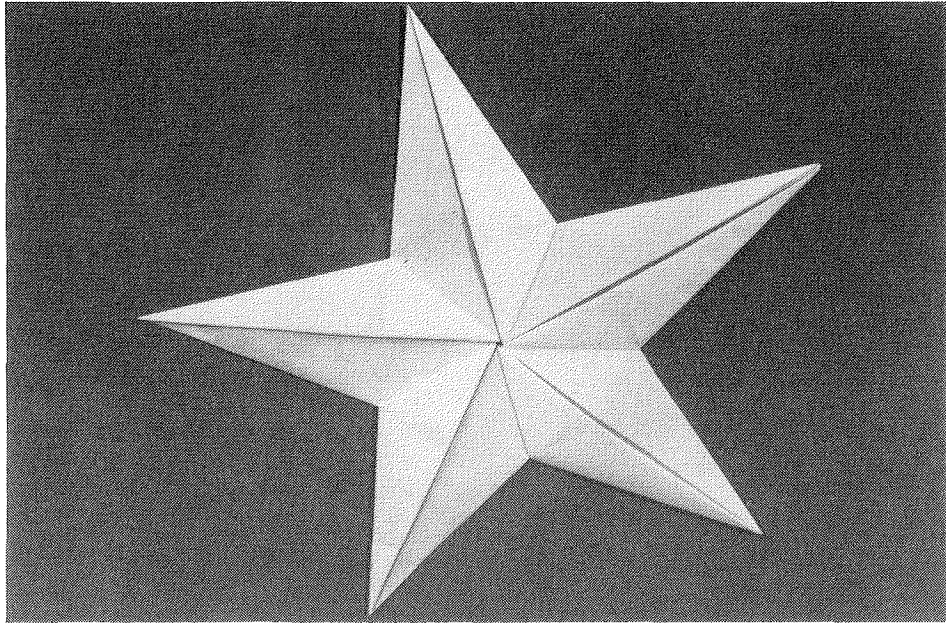
Cubes, from A5 sheet of paper, (Didier Boursin, photo: Fabrice Besse).



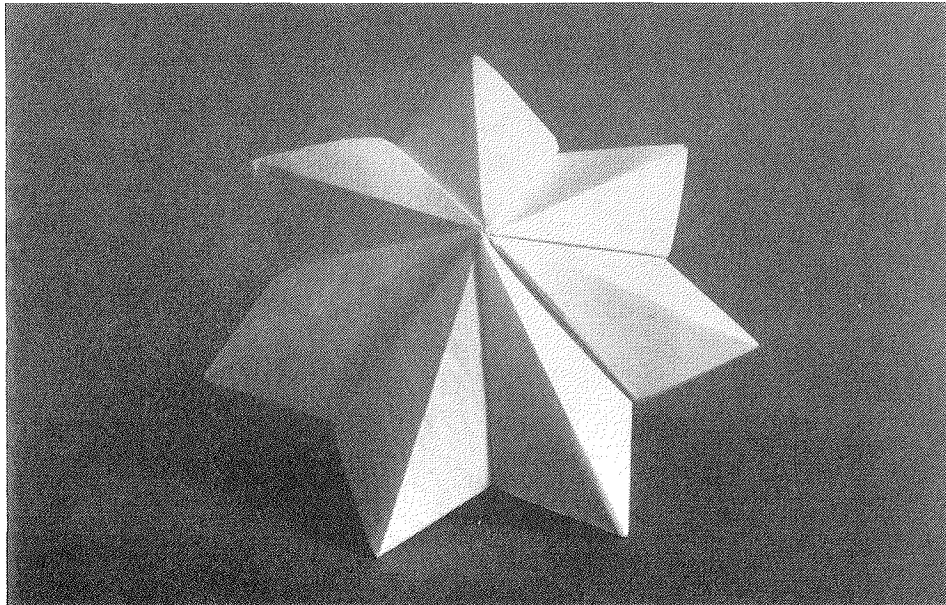
Octahedron, (Didier Boursin, Photo: Fabrice Besse).



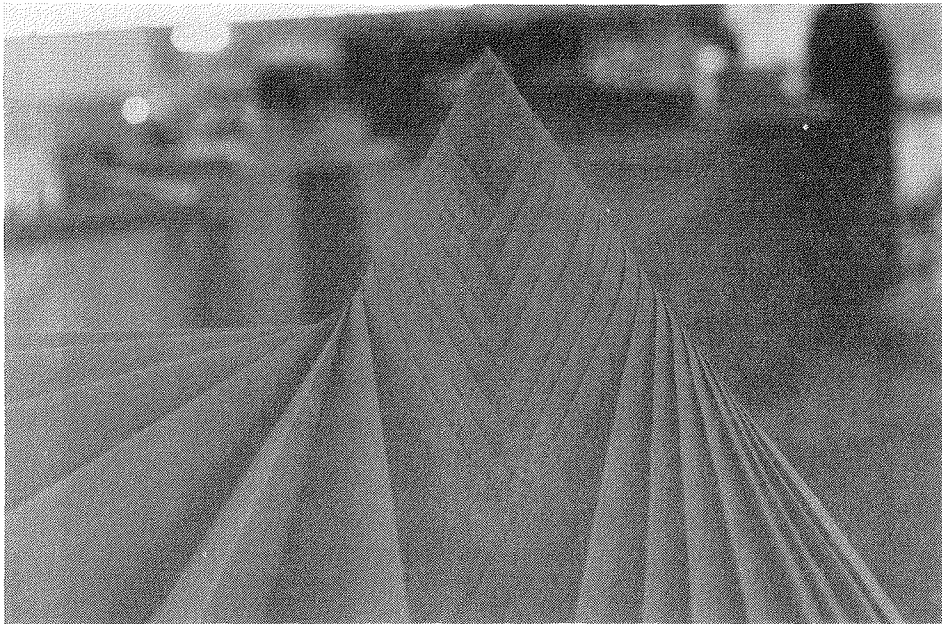
Polyhedra, (Didier Boursin, photo: Fabrice Besse).



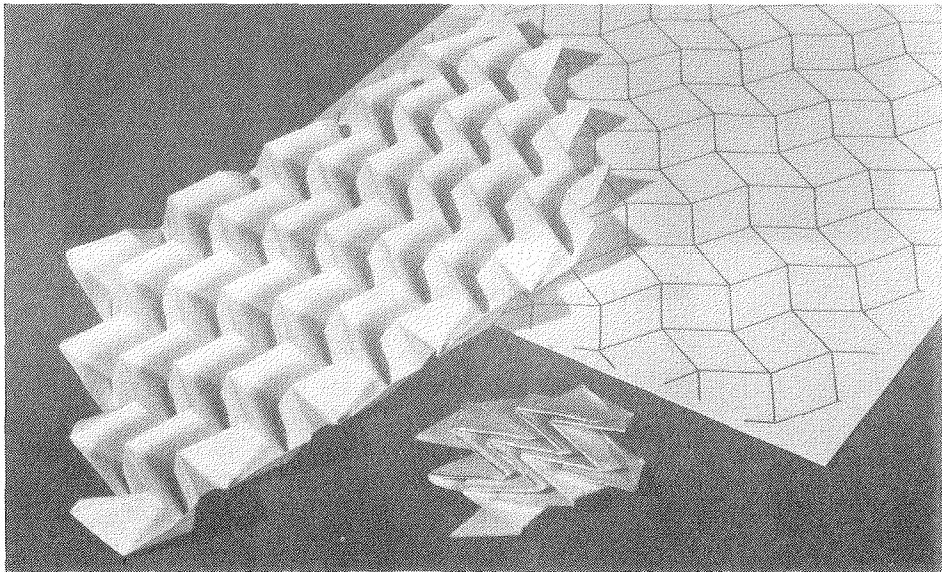
5 Points Star, (Didier Boursin, photo: Fabrice Besse).



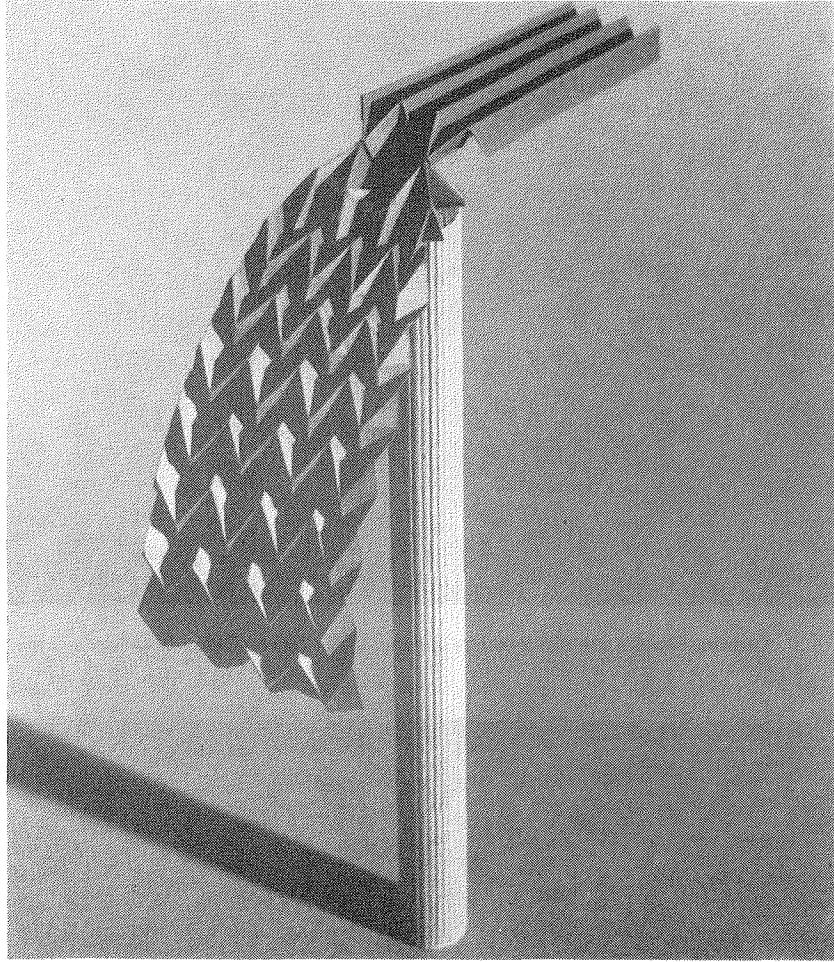
Star in 3 Dimensions, (Didier Boursin, photo: Fabrice Besse).



Growing Plant, it contains 9 meters of paper in one piece, (Didier Boursin).



Folding Frame. It is impossible to fold directly by hands. The artist has different frames like this with a minimum of foldings; this is one of the best solutions, (Didier Boursin, photo: Fabrice Besse).



Mobile, (Didier Boursin, photo: Fabrice Besse).