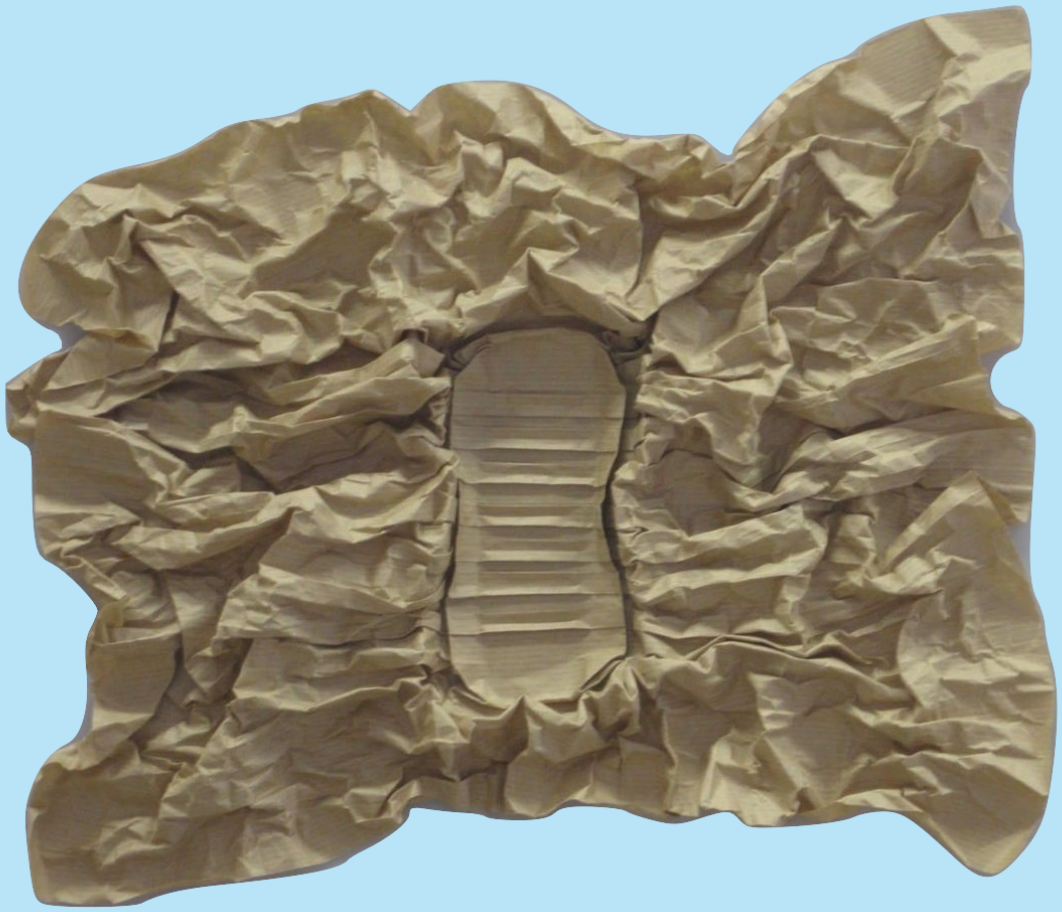
The Art of folding paper in your hands

An invitation to the practice of folding paper

Michel Lucas

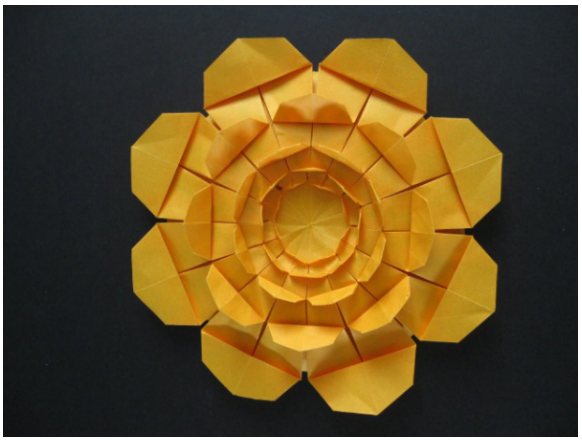


Walk in the land of folding

Red-Throated Colibri
design Michael G. LaFosse

Roses
design Robert J. Lang

Hedgehog
design Kouji Nakagawa



Perpetual Flower
design Dasa Severovà

lady's-slipper orchid
design Kalei Anne Lundberg

Centipede
design Manuel Sirgo Alvarez

Design and layout: Michel LUCAS
Models, diagrams, foldings and photos of Michel LUCAS, unless otherwise stated.
This book is offered to you. You can broadcast it as much as you want.
Thanks to Nicolas Terry for making this available on his site.

Who is this book for?

Origami has known and is experiencing a tremendous development since the 1950s. We have gone from traditional Japanese folds, almost immutable, to folds invented by designers from all countries, using increasingly advanced and mastered techniques. New sources of inspiration have made it possible to diversify the branches of this growing art. This book aims to make you want to explore some spaces in this forest.

Which audience is targeted?

- people who have heard of origami, do not know what it is, and would like to know what it is without daring to ask;
- people who only know the folds of their childhood (the flapping bird, the fortune teller, the crane, the paper casserole) and would like to know if other folds exist;
- folders eager to discover new facets of their art and wishing to go further in the knowledge of origami today;
- probably not the experienced folder, who think they know everything about this book, but who could, however, advise it to those who want to know everything about this art!

How to use this book?

Three routes are available:

- **the route in pictures**
  Simple visual exploration of the world of paper folding, the walks offer you a collection of photos of models created by master folders of all countries and folded by the author. Their variety and possible complexity will surprise you. We are far from the paper casserole!
- **the discovery course**
  Numerous texts dot the book. They make it possible to understand the relevance of each chapter or each model. They allow you to familiarize yourself with the specific vocabulary of origami.
- **practical work**
  Each chapter is accompanied by diagrams, a series of diagrams describing the procedure for folding a model. Easy to do, they are accessible to everyone, including beginners. A little perseverance and passion, and you will have a small collection that will amaze those around you!

These three routes can be done sequentially or randomly, entirely or not, at your choice. But they must be accompanied by a systematic search for additional information on the internet. The technical terms used, the names of the creators, the names of the models are all potential entries for your favorite search engines. This is the hidden part of this work.

If this book allows you to get the keys to enter the wonderful world of paper folding, then perhaps I would have achieved my goal: to have made you want to make it your hobby!

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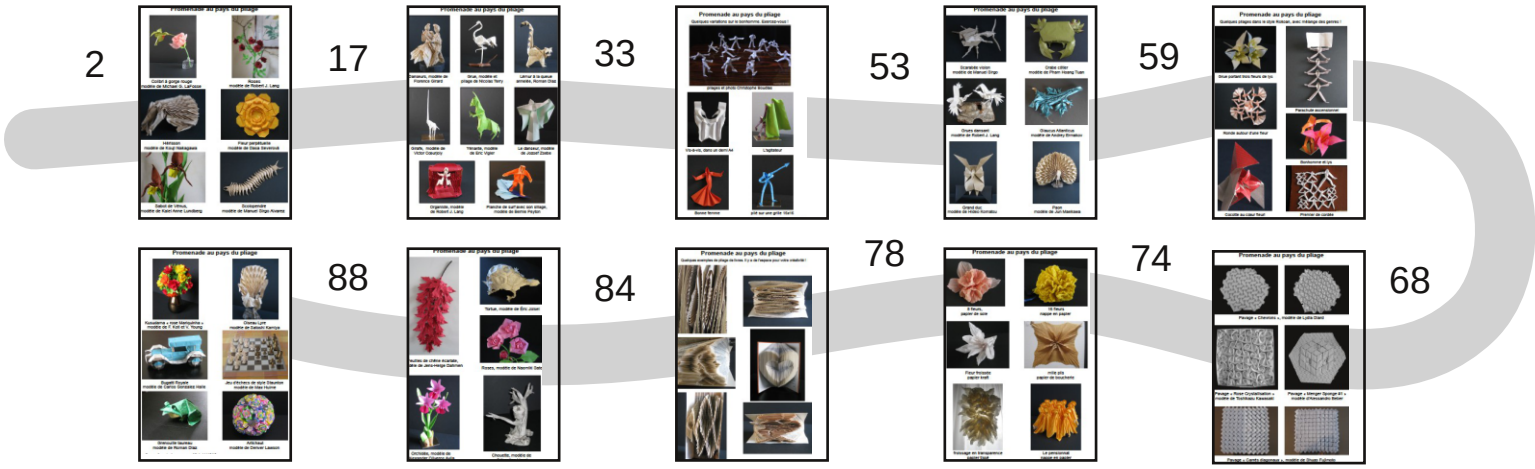
The route in pictures

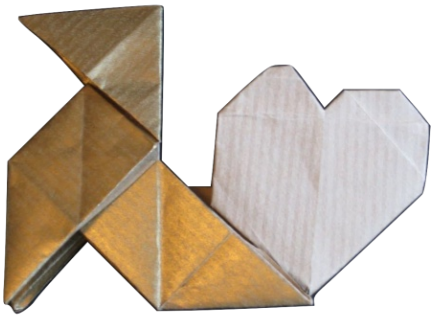


Discovery course

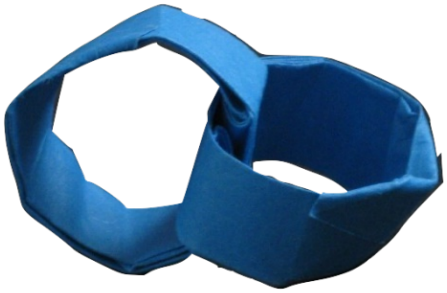
Practical work

Over the pages, you will find the description of the folding of about twenty models. Their level of difficulty ranges from one to three stars on a scale of 5.

Some representative models are illustrated on this page. You will also find three traditional models: the lily on page 14, the crane on page 15, the traditional casserole on page 16. Other folds are available. Find them!



p. 12 Pajarita and Heart
Francis Ow



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Jeremy Shafer

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Maria Sisnayskaya

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Sonobe module

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Michel Lucas

Introduction

The evolution of origami through the ages can be compared, all things considered, to that of computers: from a very simple material, many technical inventions and dazzling intuitions have made it possible to go from one hobby with activities limited to the possibility of plunging into a moving but wonderful world, full of discoveries and magnificent results.

Stuck for a long time in traditional Japanese folds, origami was transformed in depth during the creation of diagrams. The creations of the Master Folders could then be transmitted around the world, awakening many vocations with very diverse aspirations and inspirations.

From then on, origami quickly transformed into an "art of folding paper", with its currents, its fashions, its technical inventions, its gurus. Many branches have developed: modular origami, tesselations, left shapes... The production of numerous books and booklets of conventions as well as the appearance of the internet and its means of sharing have led to a beneficial popularization of this art.

Many people then wanted to get into the practice of folding paper. They often encountered the wall of "which end to start ? ".

The forest of books "for beginners" or the flowering of tutorials on the internet makes it difficult to access the diversity of the art of paper folding. Many people give up quickly due to a lack of understanding of the diagrams or a lack of interest in the models offered.

The objective of this book is to make you discover the variety of paper folding, to give you some keys to start entering this universe and, above all, to encourage you to discover everything, to try everything, to doubt, to persevere . It is by folding paper that one becomes an origamist.

One certainty: if you have fingers and paper, you can do it!

For further

You will find this section almost everywhere in the book. It is intended to encourage you to leave these pages, to find other sources of information both on the internet and in books that deal with folding paper.

So, first reflex: a search on the internet using the terms, names or proper names that are given to you!

Which paper to use?

To start, let's eliminate a preconceived idea_: no, it is not compulsory to have special origami paper (naturally Japanese ...) to be able to fold! Any paper can be folded, and there are all kinds.

The most difficult is not to find paper, but to choose the one that will be best suited to the folding to be carried out. Some elements of choice:

- the grammage of the paper (mass per square meter), which can be compared to its thickness. Ordinary printing papers have a grammage of 80 g / m2 We also use more "heavy" papers (from 90 g / m2 to 160 g / m2), but also more "light" papers (from 20 g / m2 to 60 g / m2). The grammage determines a certain hold of the paper. The thicker and denser it is, the more difficult it is to fold!
- the colour. This is certainly one of the elements of the complexity of the choice. You will find plain papers in one color (same color on both sides) or two colors (the two sides of the sheet have a different color). Note that one of the two colors is often white. You will also find papers with patterns, the variety of which may leave you perplexed.
- the grain, or the texture: smooth, granulated, fluffy ...
- format: square, rectangular (for example in A4 or A3 format), in rolls like kraft (often 70x100 cm), gift wrap or tablecloths. But you can also use discs or tea bag ...
- dimension: you will find pre-cut papers of all sizes: 5x5 cm, 7,5x7,5 cm, 15x15 cm, 30x30 cm, 65x85 cm ... But you can cut them to the size that suits you best!

Some examples of papers commonly used by origamists and which you can find in specialized stores: so many, kraft, washi, kami, biotope, origamido, lokta, shindanshi, but also toilet, butchery, silk, mulberry, metallic paper, textured, glassine, elephant skin ... and so on and better.

If you cannot find what you are looking for on this list, there is nothing to stop you from making your own paper. You can laminate two sheets in the colors of your choice (for example using methyl cellulose-based glue such as wallpaper glue), or even make sandwich paper using aluminum foil as a support for two sheets of tissue paper.

You can even start a collection of folding papers. Take a close look at any piece of paper that falls into your hands: wrapping paper, gift paper, letter paper, kraft paper, florist paper, single-colored, patterned, small or large, etc. This is not what is missing!

Then try to fold something with the paper you selected. Depending on the result, you will keep or discard the sheet during the test. You will quickly have a large supply of base material!

In summary, fold, take the trouble, it's the paper that misses the least!

Know how to read and use a diagram

Diagrams are to folding paper what partitions are to music: a universal tool allowing to understand what are the different stages allowing to realize a complete folding.

Created in the 1950s by Akira Yoshizawa and Samuel L. Randlett, they consist of the description of the folding process using a succession of thumbnails, each with conventional signs allowing to imagine, from a situation given, the fold (s) to be made to go to the next step. They helped move from traditional Japanese origami to universal paper folding.

For more details, consult on the internet
https://fr.wikipedia.org/wiki/ System_Yoshizawa-Randlett/

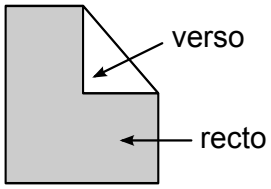
The basic folds and gestures are brought together in the "*solfège du plieur*", collection of more or less standardized symbols. If a certain de facto normalization exists, debates still stir the community of paper folders and folders today: content of music theory, shape and size of arrows, arrangement of thumbnails, (un) controlled designation of actions, type of dashes for the folds... The main thing is to understand the functions represented, and not to be stopped by minor differences.

Some advice:

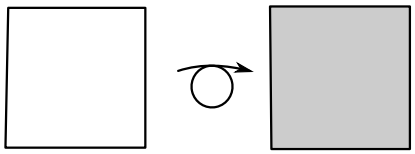
- have on hand a music theory of the folder, in order to fully understand the meaning of each symbol.
- first of all fold, look at the whole diagram, to locate the crucial stages.
- know how to differentiate the preparation folds (return arrow), the folds to be made (single arrow) and the marking lines (often traces of folds made previously).
- look carefully at each thumbnail, noting all the details (reference points, shape, colors, lines). Sometimes a very small detail will be of great importance.
- pay attention that a thumbnail shows two states of folding: the result of the execution of the previous thumbnail, and what to do to move to the next thumbnail.
- scrupulously respect the folding sequence proposed by the author_: there is no point in skipping steps thinking that we will save time!
- get used to using diagrams without explanatory text. When the diagrams are well done, the explanations are useless. In addition, this habit allows you to understand folds explained in any language, and therefore to be interested in creators from all countries.

Thereafter, you will find a "*solfège du plieur*", and, by way of ranges to be made every day, the diagrams of some bases and simple models to fold.

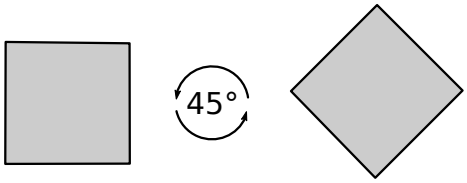
One "*solfège du plieur*"



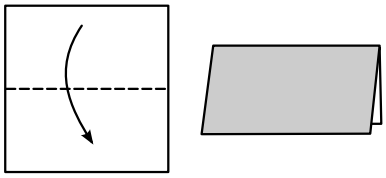
Couleur dessus
Color up



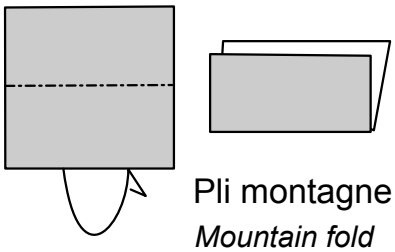
Retourner
Turn over



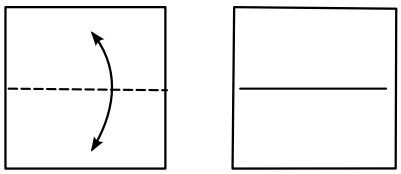
Tourner de 45°
45° turn



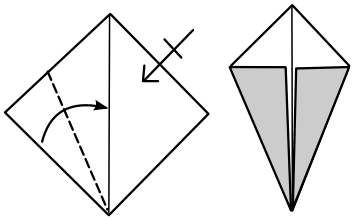
Pli vallée
Valley fold



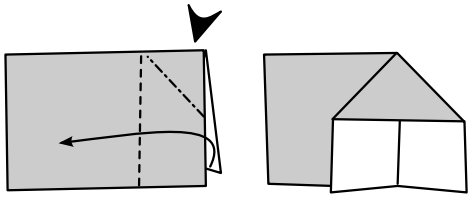
Pli montagne
Mountain fold



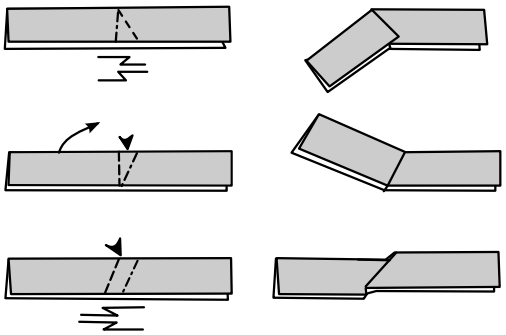
Plier, déplier
Fold, unfold



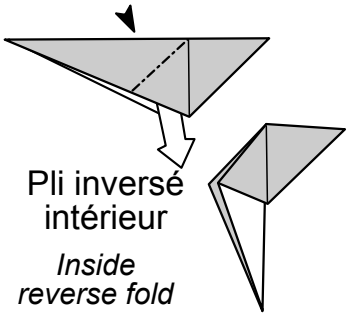
Répéter 1 fois
Repeat 1 time



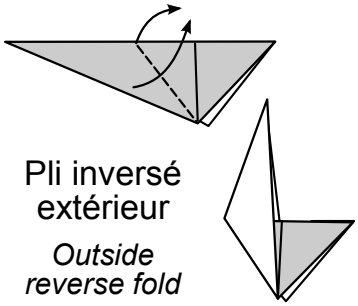
Pli écrasé ou aplati
Squash fold



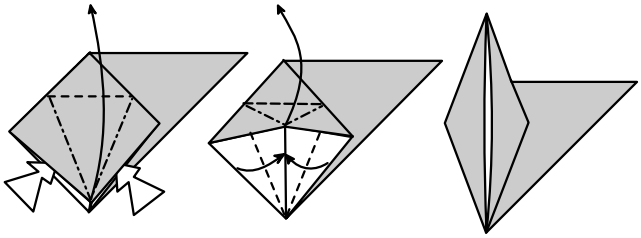
Trois replis différents
Three different crimps



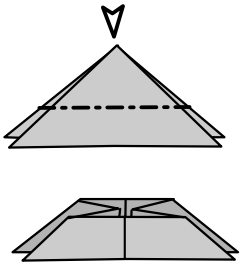
Pli inversé intérieur
Inside reverse fold



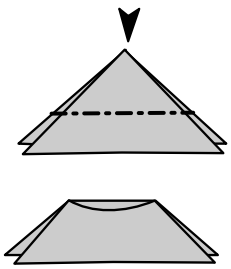
Pli inversé extérieur
Outside reverse fold



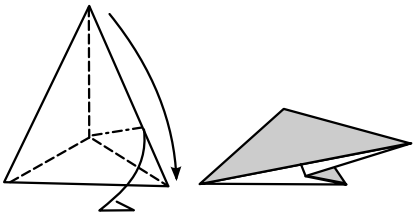
Pli pétale
Petal fold



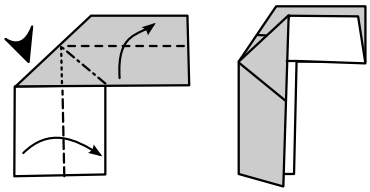
Pli enfoncé ouvert
Open sink



Pli enfoncé fermé
Closed sink



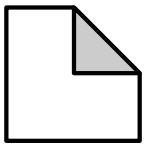
Oreille de lapin
Rabbit ear



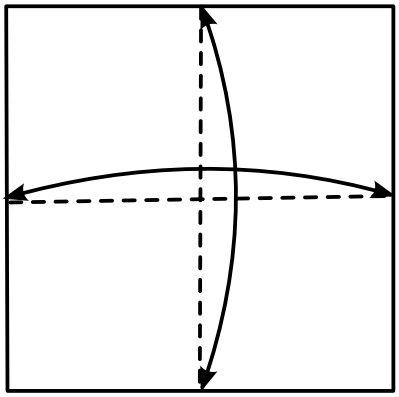
Pli pivot
Swivel fold

Preliminary base

In certain cases, the origamist is invited to start by folding a base, that is to say a starting form consecutive to a characteristic sequence of folds. We can compare this basic notion with that of openings to chess: very useful, but not compulsory! We will start with a commented diagram, that of the preliminary base (French: *base préliminaire*).

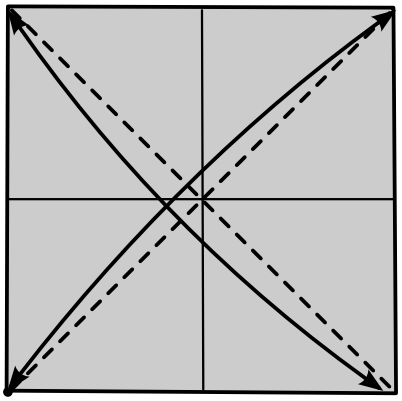


1 - put down the sheet color below



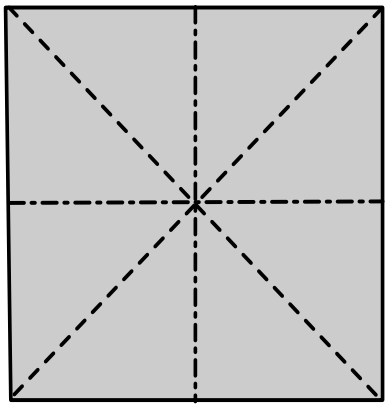
2 - fold, unfold them medians

3 - return the folding

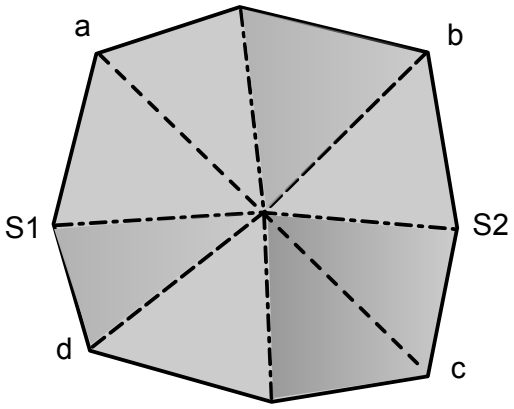


4 - fold, unfold them diagonals

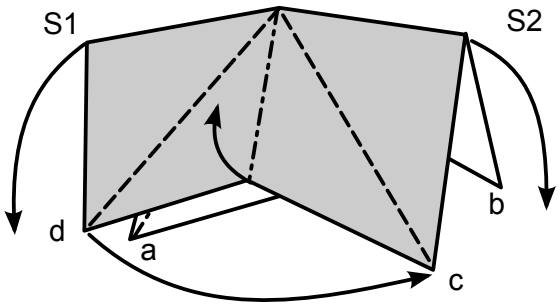
Top view
This is called a crease pattern



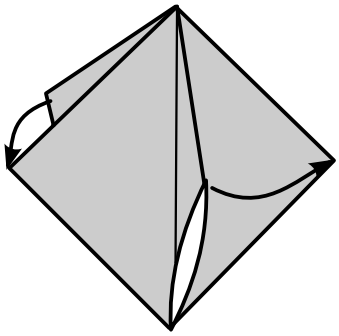
5 - check that the medians are mountain folds and diagonals valley folds



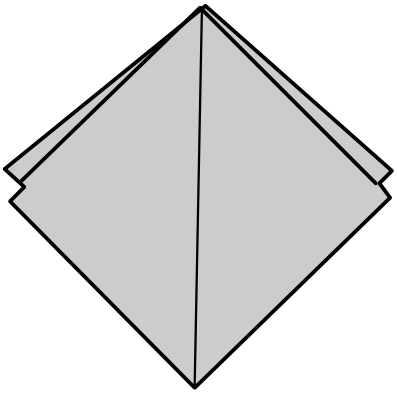
3D view
The cebter of the sheet must point towards you



6 - take the two points S1 and S2, bring them down while seeking to assemble the points a, b, c and d at the same point.



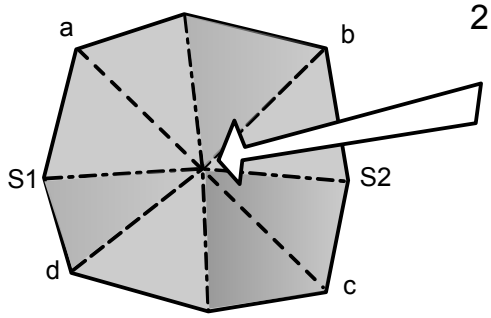
7 - fold down the flaps well flat. The folding must be symmetrical: two flaps left, two flaps right



preliminary base, square shape with four flaps

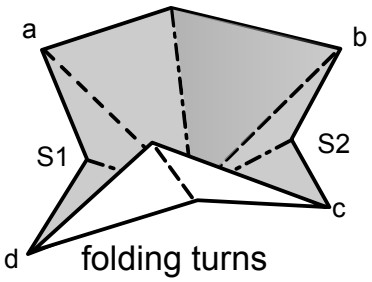
Other traditional bases

Waterbomb base *Base de la bombe à eau*



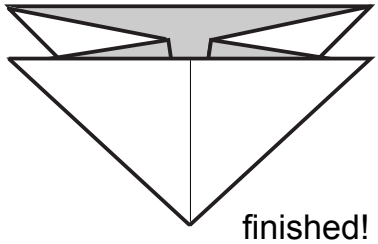
1 - start from step 5 of the preliminary base

2 - the folding placed on your open hand, press on the center



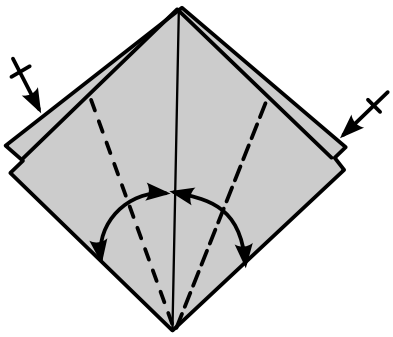
folding turns like an umbrella!

3 - finish the same way that for the preliminary base

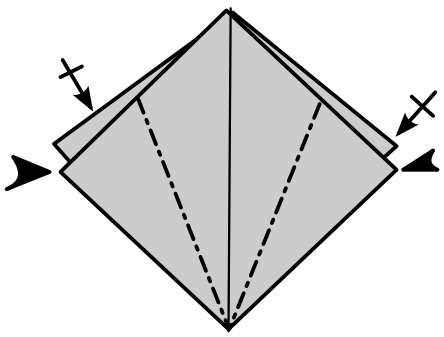


finished!

Bird base *Base de l'oiseau*



1 - start from a preliminary basis closed point towards the top



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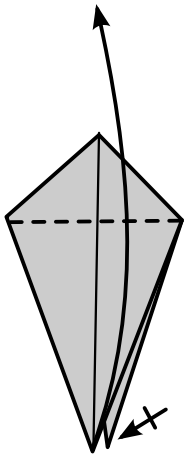
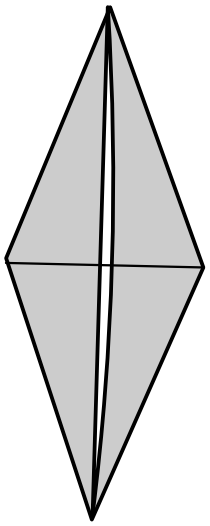


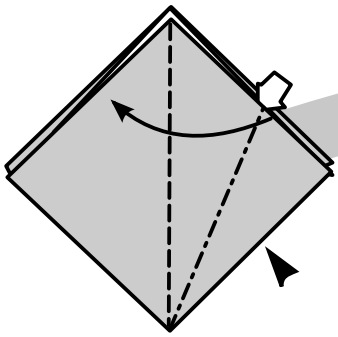
3

note: the arrows mean repeat once

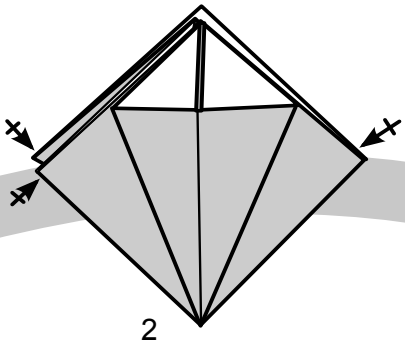


finished!

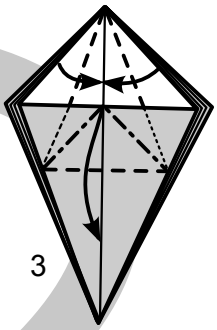
Frog base *Base de la grenouille*



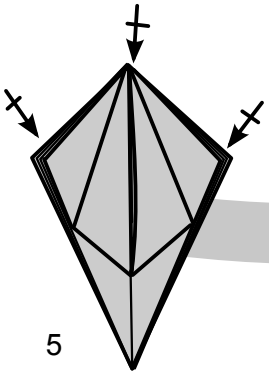
1 - start from a preliminary base closed point towards botton



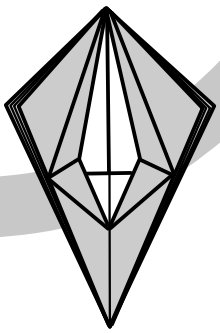
2



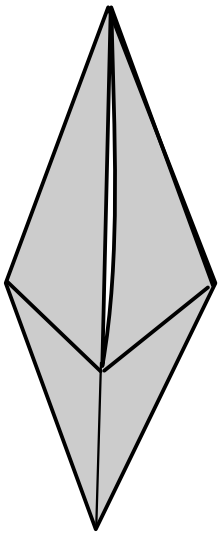
3



5



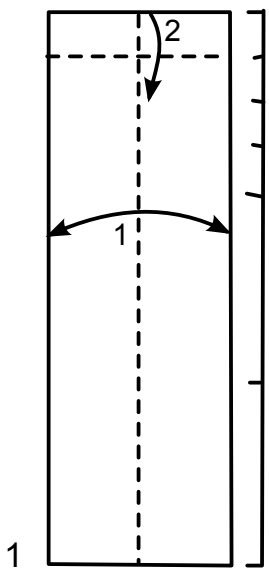
4 - in progress



finished!

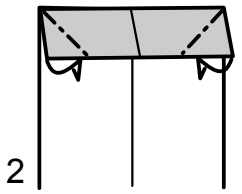
Pajarita and Heart, Francis Ow

design and diagram Francis Ow



1

rectangle 3x1
Heart color below



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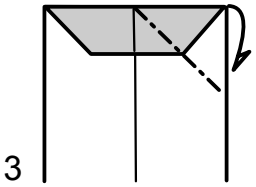

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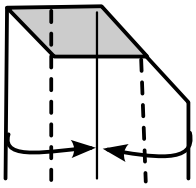

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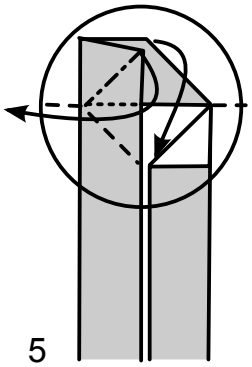

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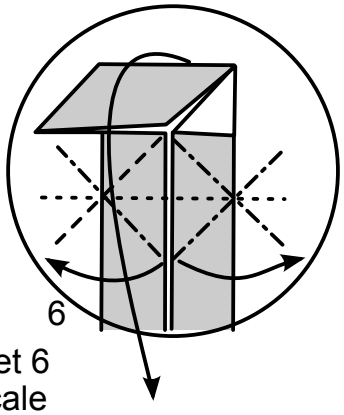
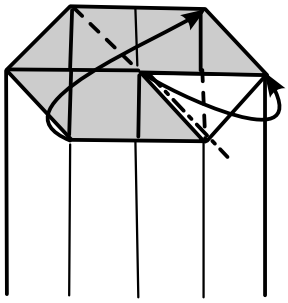


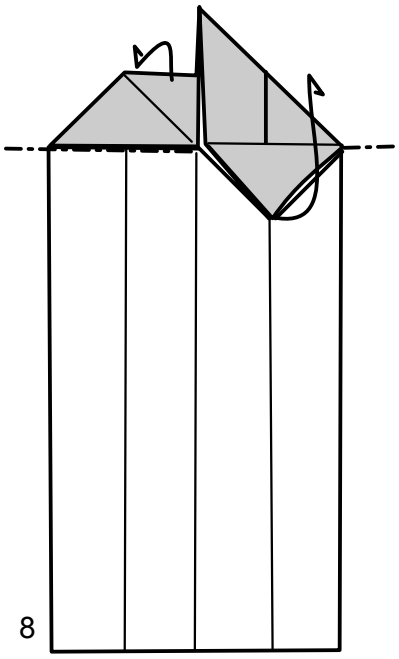
6

attention : 5 et 6
change of scale

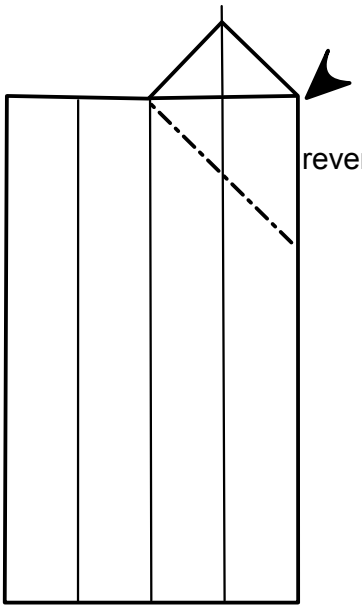


7

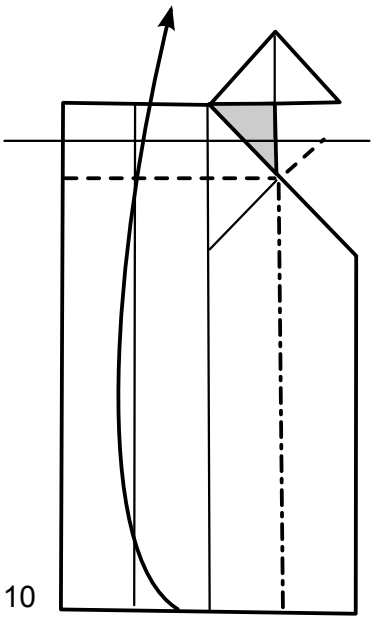
back to the
original scale



8



9



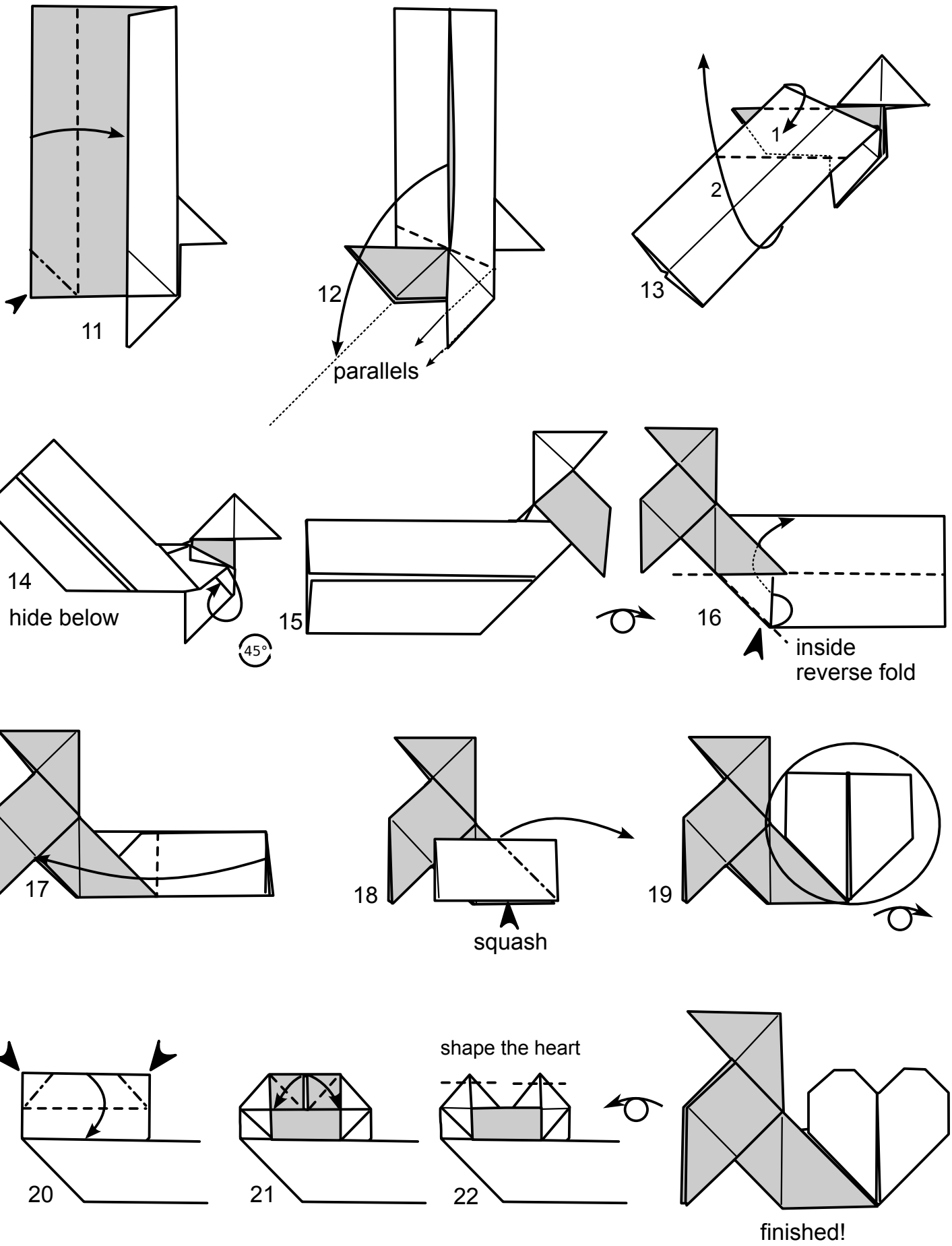
10

To make a pretty heart

Apply the advice given on page 6 to the letter.

Warning! the scale can change from one thumbnail to another, to highlight this or that detail.

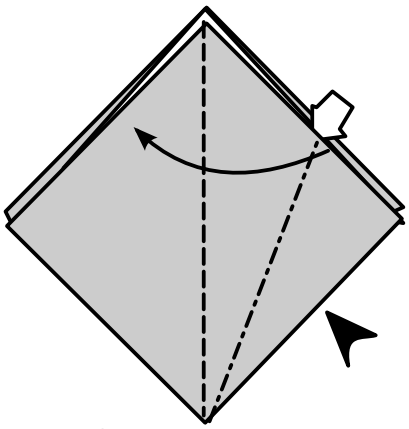
Pay attention to the order of the steps, carefully following the numbering. Look carefully at the differences between the thumbnails of the successive stages, you will better understand the meaning of the symbols used.



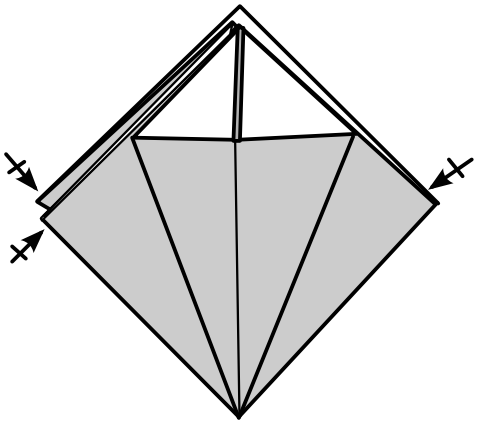
A photo awaits you page 5

Traditional Lily

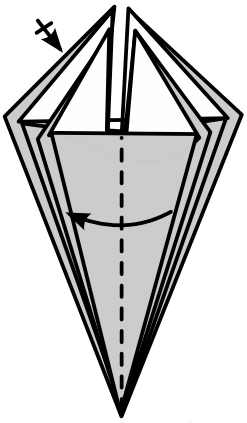
This traditional model requires a little attention. Observe the differences from one sticker to another. Some steps require manipulation of the flaps to be able to fold. Don't get lost!



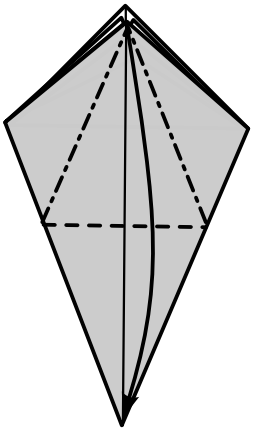
1 - start from a preliminary base
turn the upper right flap
to flatten it



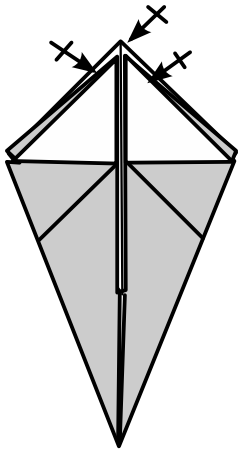
2 - flatten the three
other flaps



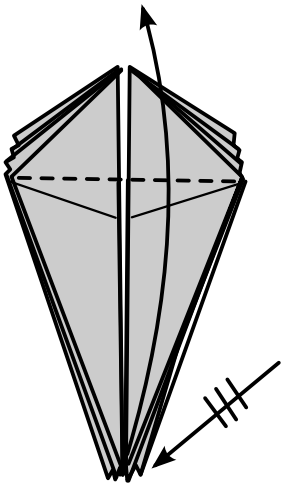
3 - turn the right flap
towards the left
start behind



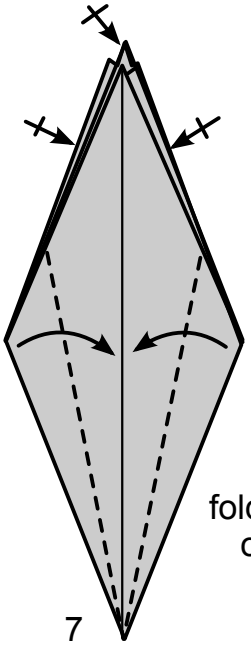
4 - petal fold



5 - start again on
three other flaps

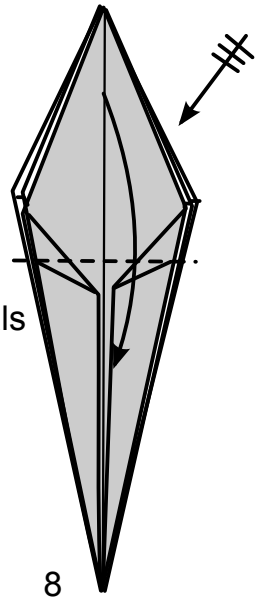


6 - raise the four flaps



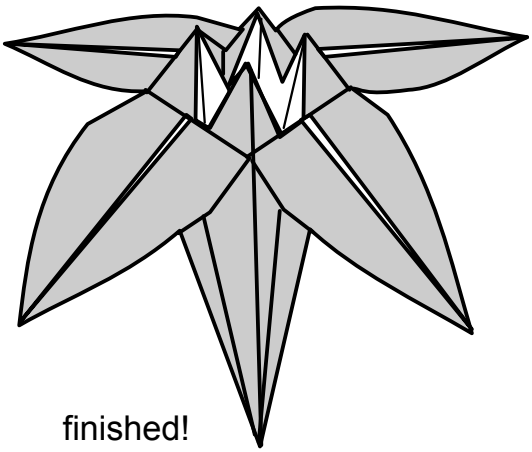
fold the sides
of 4 flaps

7



lower
the 4 petals

8

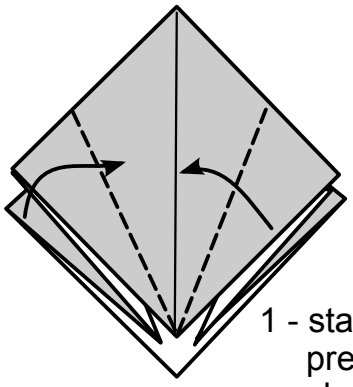


finished!

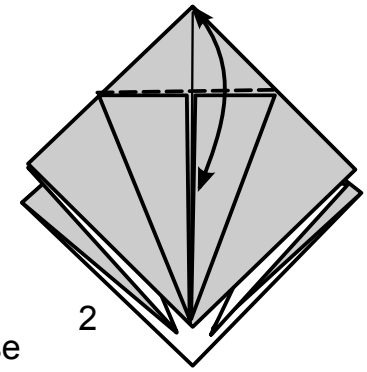
Visit the internet with
keywords *origami lily*

Traditional Crane

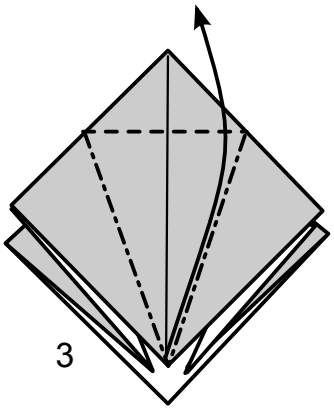
In this diagram of a traditional Japanese model that has survived the ages, you will find another way to fold the bird base.



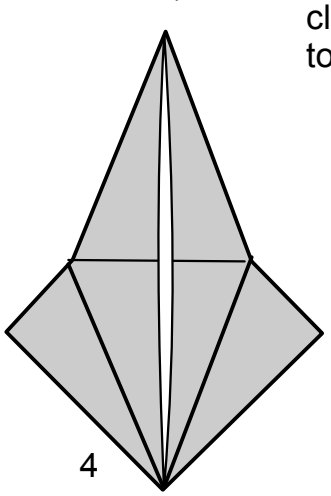
1 - start from a preliminary base closed point on top



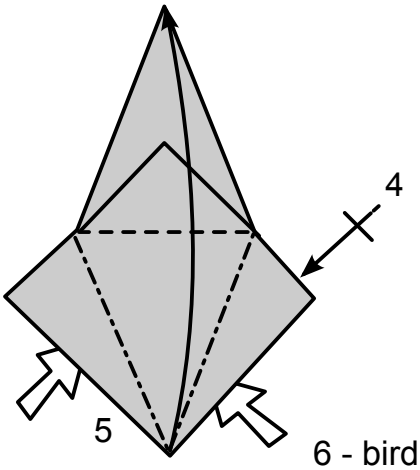
2



3

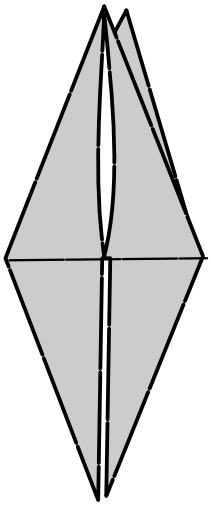


4

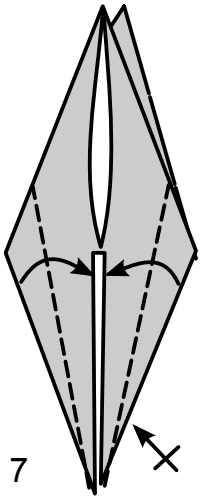


4

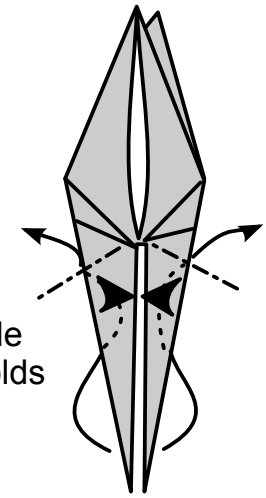
5



6 - bird base

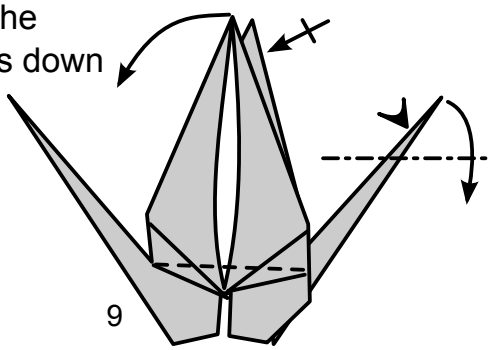


7



8 - two inside reverse folds

fold the wings down



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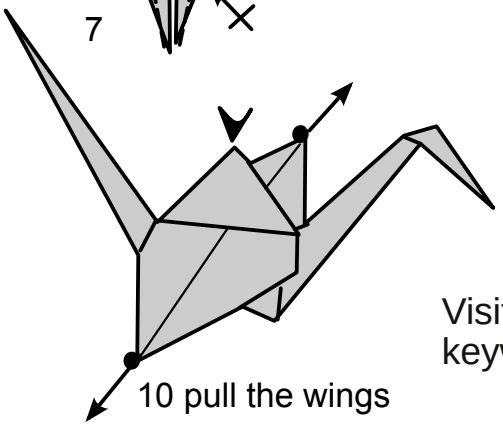
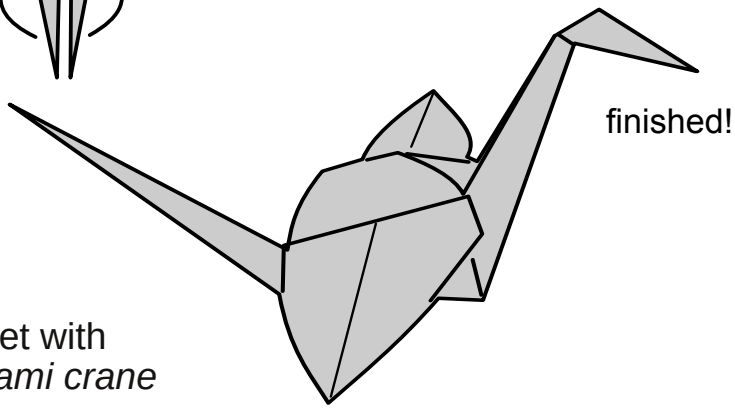


10 pull the wings

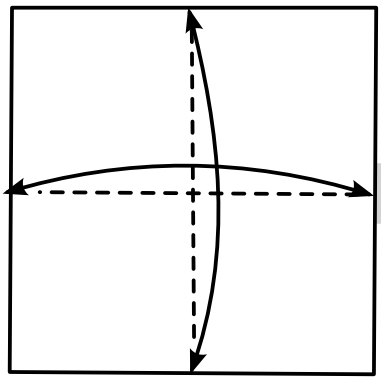


finished!

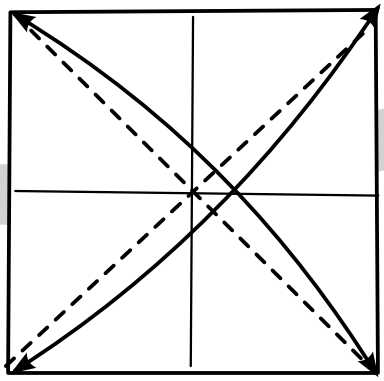
Visit the internet with keywords *origami crane*

Traditional Pajarita

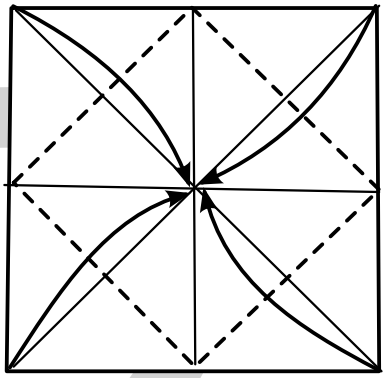
Very present in French origami imagery, this model has known and still knows many variations. Discover them on the internet, with the keyword *pajarita*!



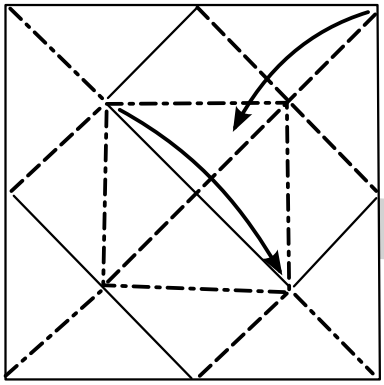
1



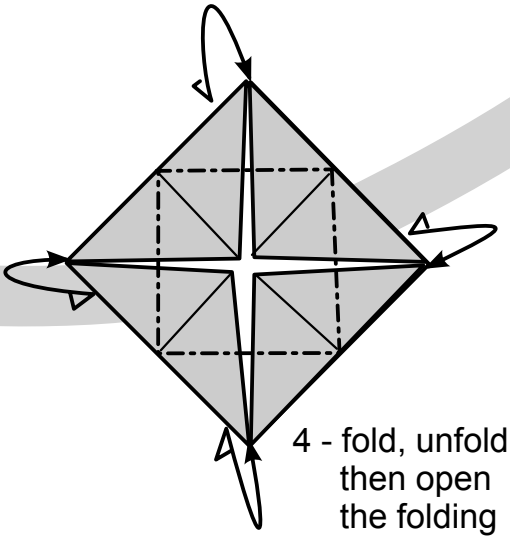
2



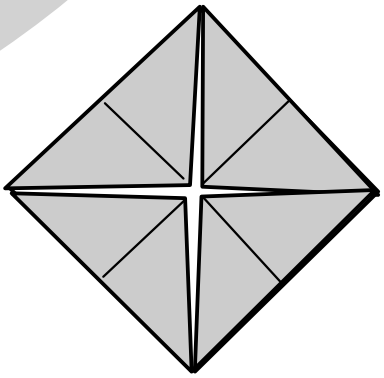
3



5 - rearrange the folds mountain or valley according to the scheme. Fold in first by the mountain folds.

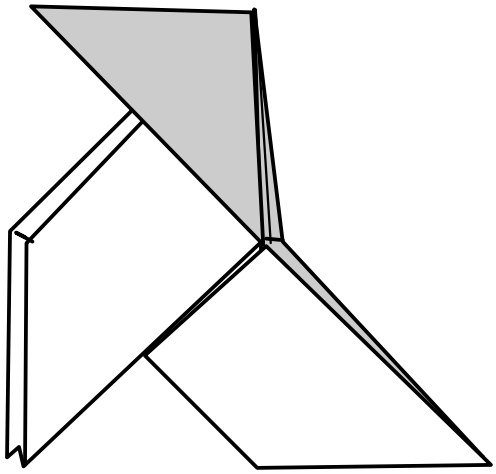


4 - fold, unfold then open the folding

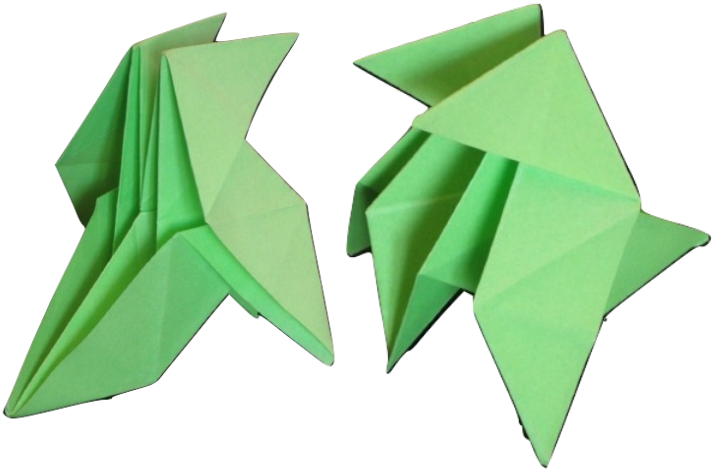


this is a blintz base

base doublée



cocotte en papier



Siamese Pajaritas
Pajarita themed variation

Walk in the land of folding

Dancers
design Florence Girard

Crane, design and
folding Nicolas Terry

Ring-Tailed Lemur
design Roman Diaz

Giraffe
design Victor Cœurjoly

Yénante
design Eric Vigier

The Dancer
design Jozsef Zsebe

Organist
design Robert J. Lang

Surfboard with its wake
design Bernie Peyton

Geometric constructions

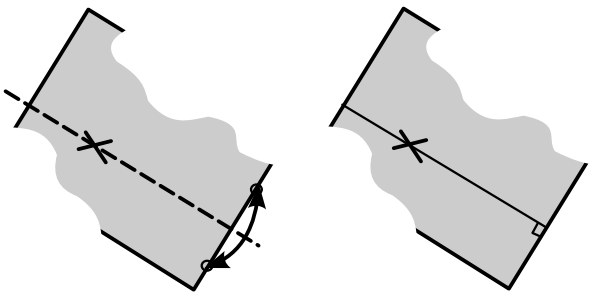
One of the magic aspects of folding paper is the possibility of carrying out geometric constructions without using the ruler or the compass.

Among the first constructions, folding along a parallel to a given direction, or perpendicular to a side, or even obtaining the bisector of an angle are in common use.

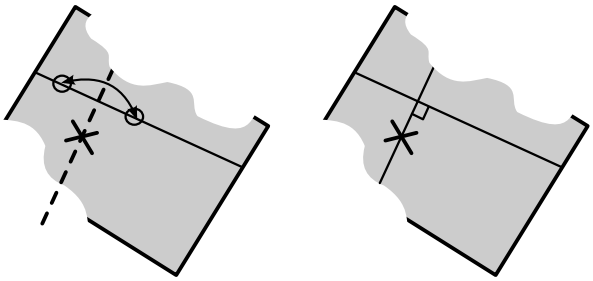
But, also, knowing how to divide into 2, 3 or 5 a sheet of paper allows to prepare orthogonal grids very useful for certain folding.

Many articles can be found on the internet, often in teachers' publications in geometry. Books offer a compilation of these techniques.

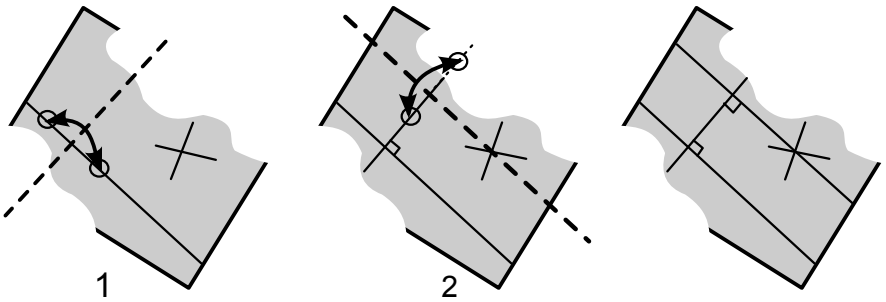
So start with the next few things, and keep having fun with what you find!



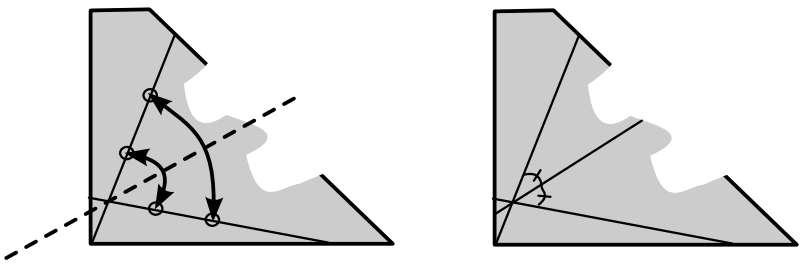
passing through a given point,
perpendicular to an edge



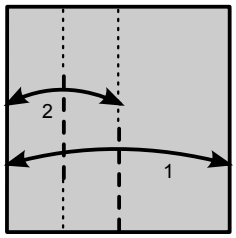
passing through a given point,
perpendicular to a crease



passing through a given point,
parallel to a crease

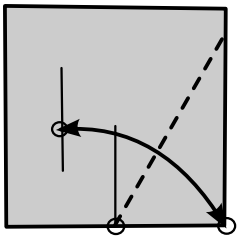


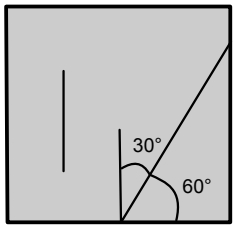
bissector of an angle



1 - pinch as indicated

2 - notice the reference points

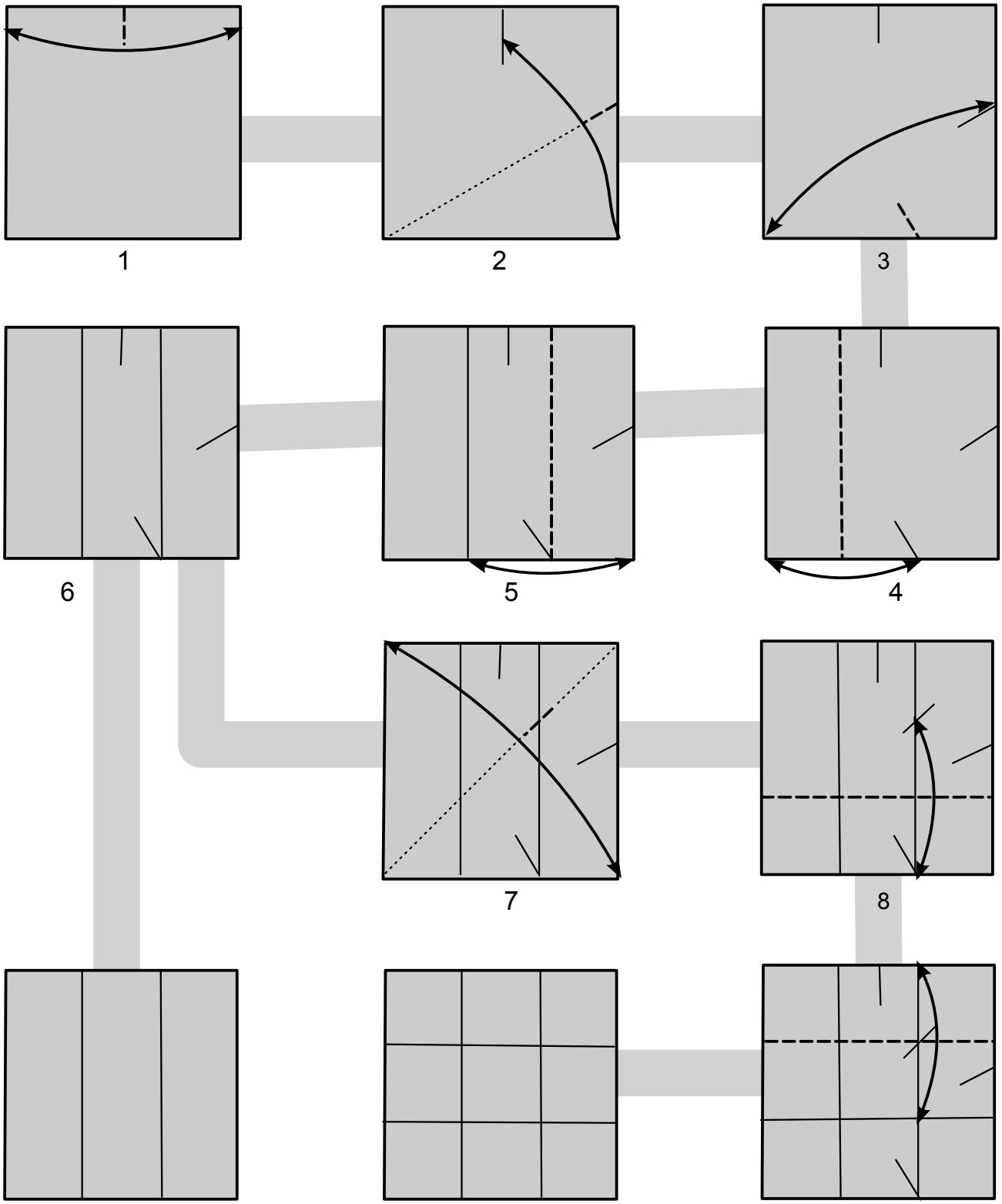




angles at 30° or at 60°

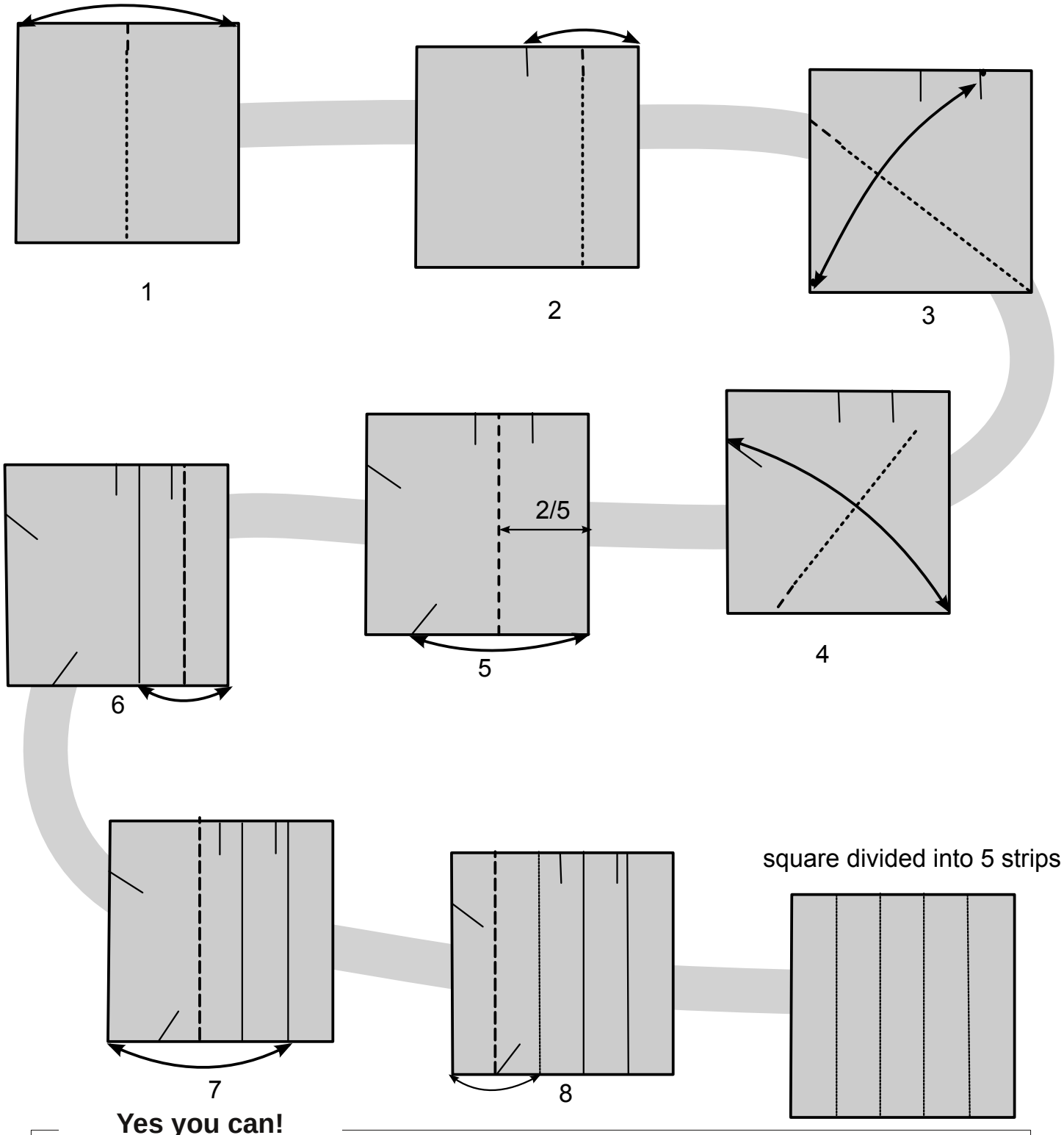
Divide into three

diagram after Francesco Decio



Divide into five

diagram after Francesco Decio



Yes you can!

The method used to divide into five vertical bands is similar to the method used to divide into three vertical bands.

Find out how to add the horizontal divisions.

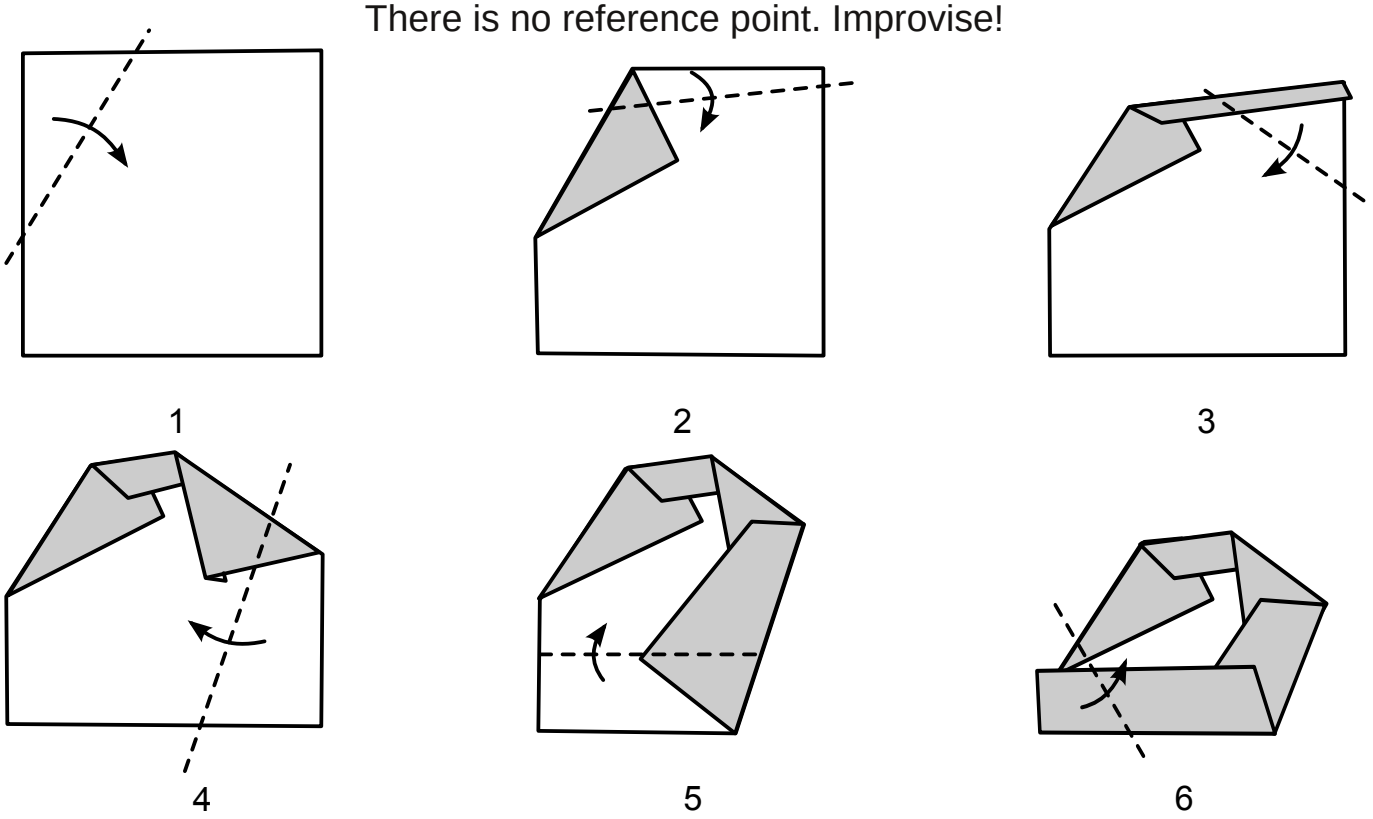
Know how to create elementary forms

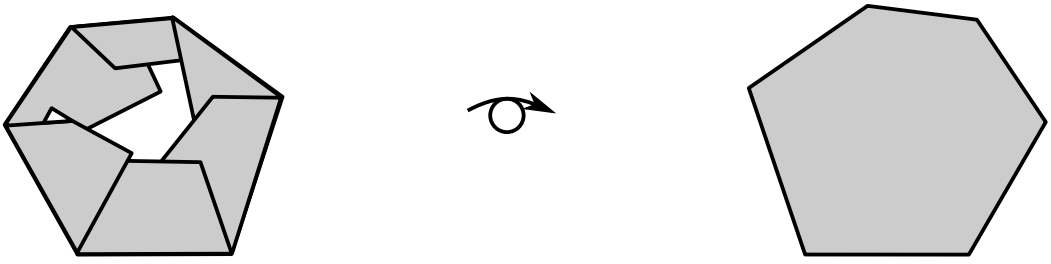
The origamist uses both squares and rectangles with precise proportions. He even folds in triangular, pentagonal, hexagonal or octagonal sheets. Knowledge of some methods to obtain one or the other of these forms, by simple folding, without the use of rulers or compasses is therefore necessary.

The following techniques are only a small part of what can be found on the internet or in the literature. So search and train!

Create any convex hexagon

There is no reference point. Improvise!





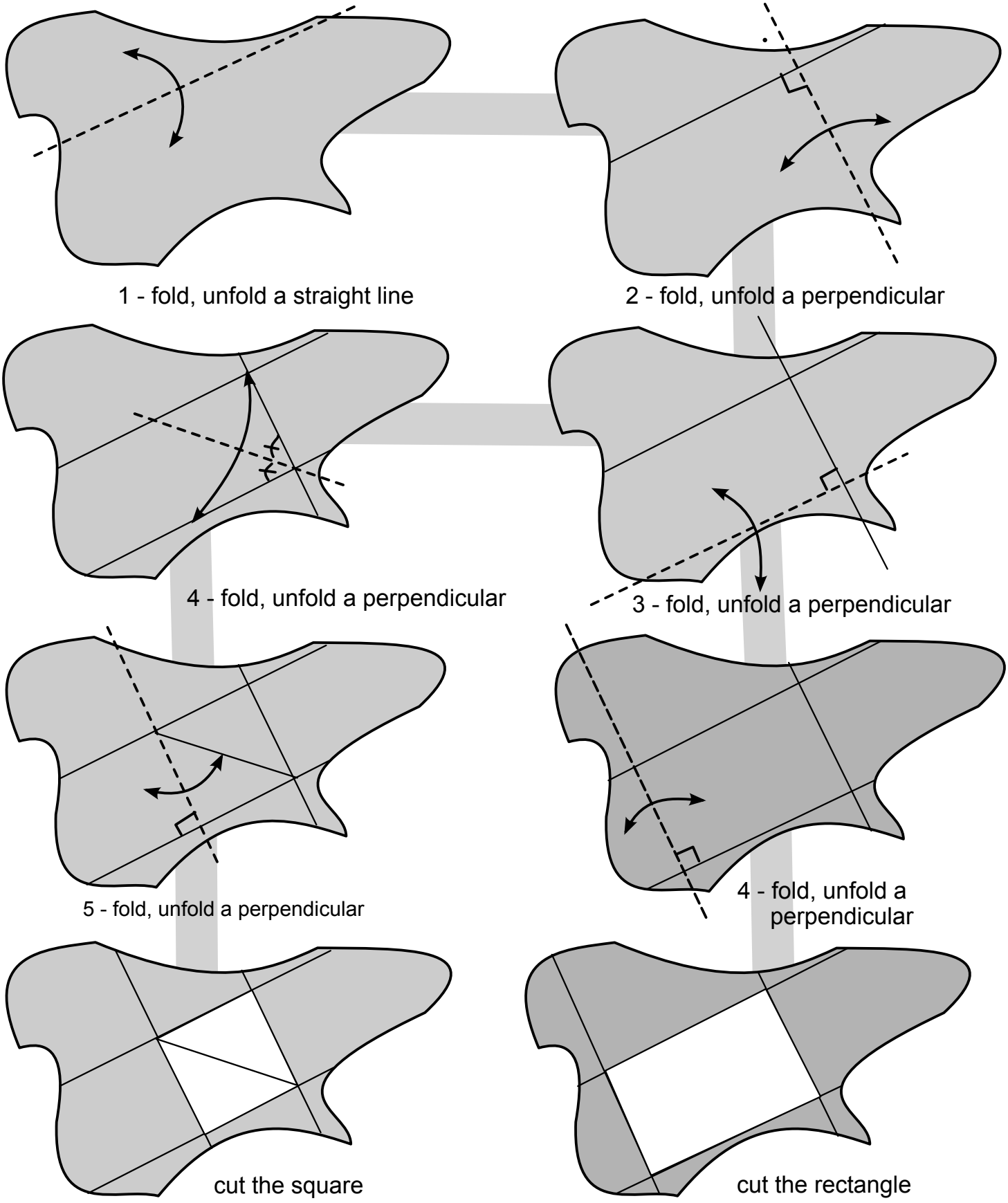
any hexagon
recto

any hexagon
verso

Try to fold any other convex polygons: quadrilaterals, pentagons, with any given number of sides, ...

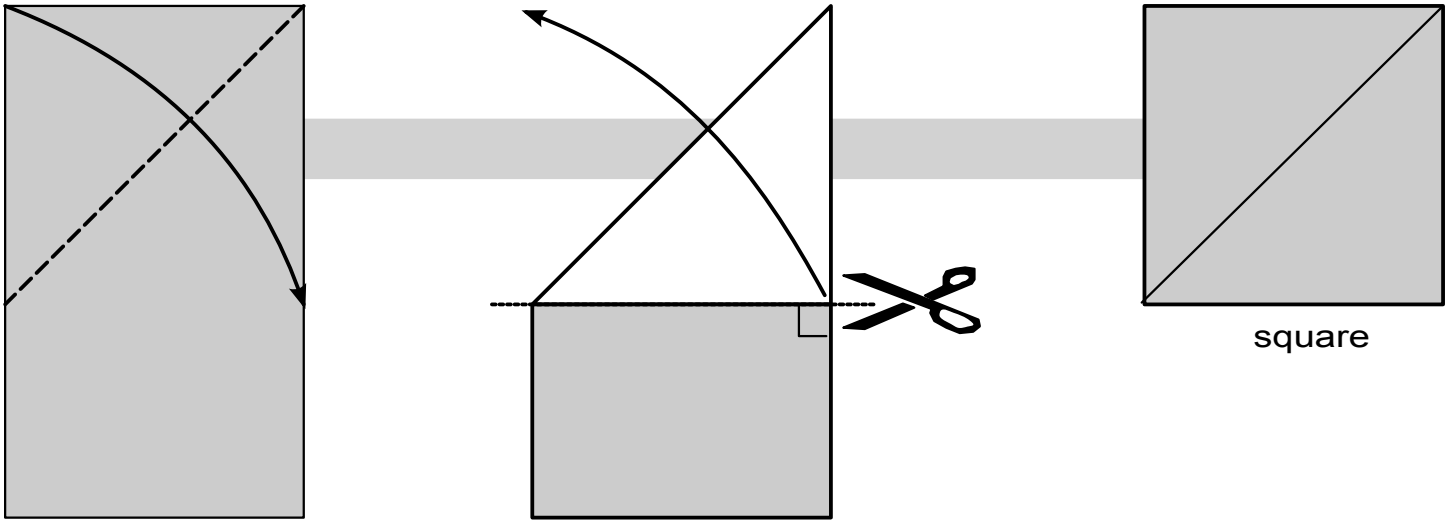
Can you fold any non-convex polygons?

Create a square or rectangle in any sheet



Create a square, or a rectangle in format A

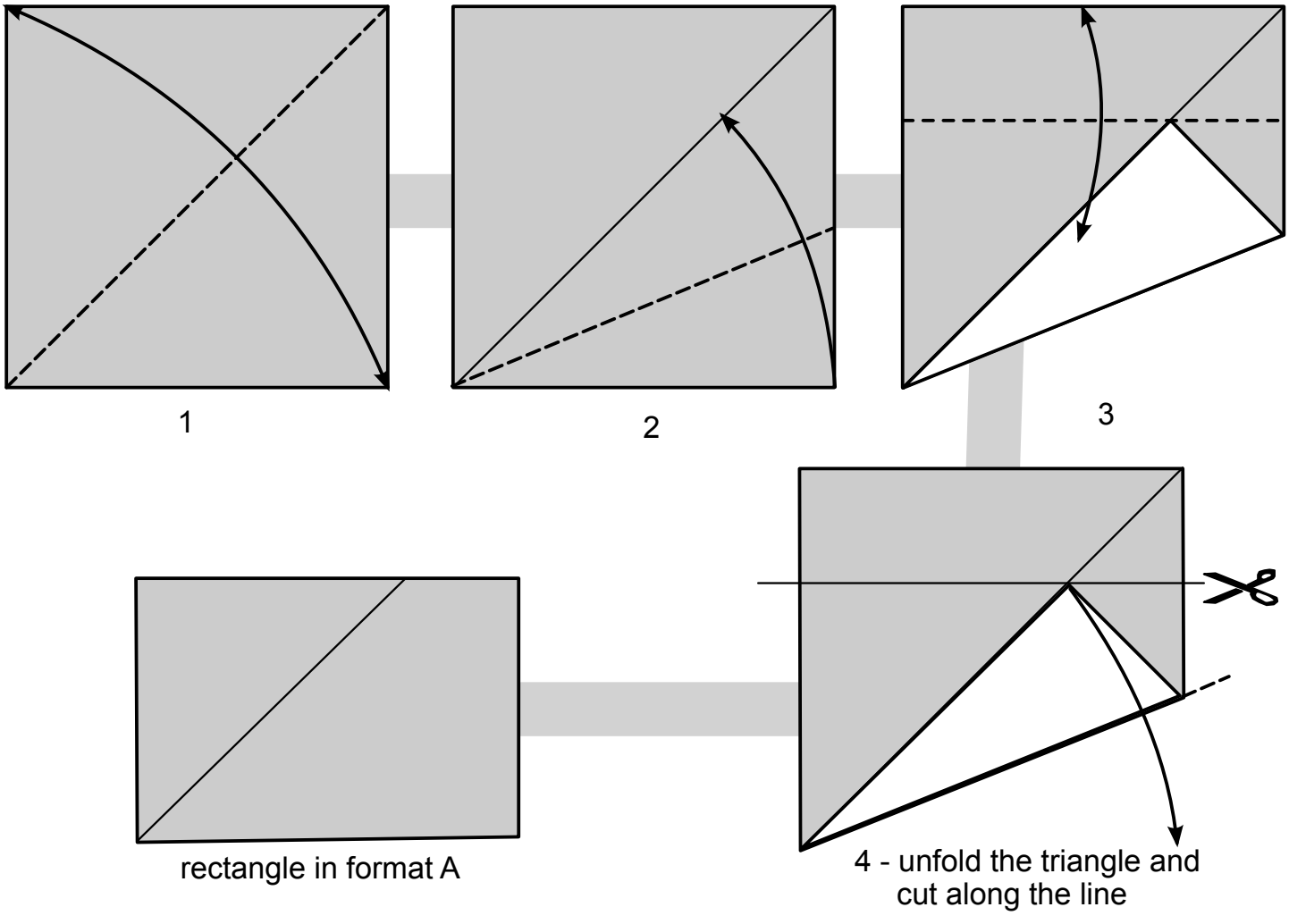
Create a square from a rectangle



1

2 - cut along the bottom of the white triangle, then unfold the latter

Creation of an A format from a square



1

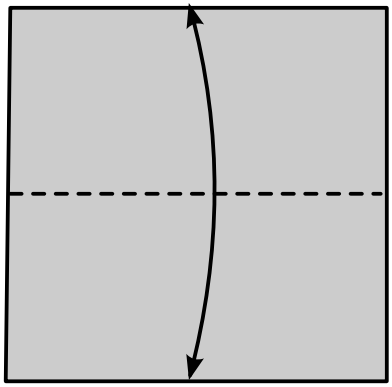
2

3

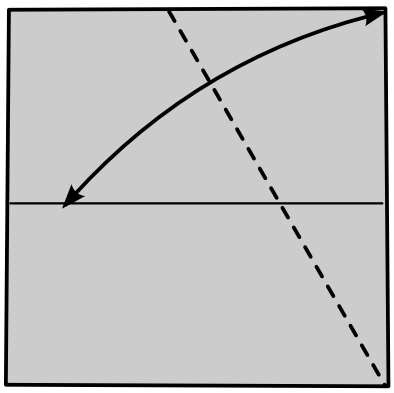
rectangle in format A

4 - unfold the triangle and cut along the line

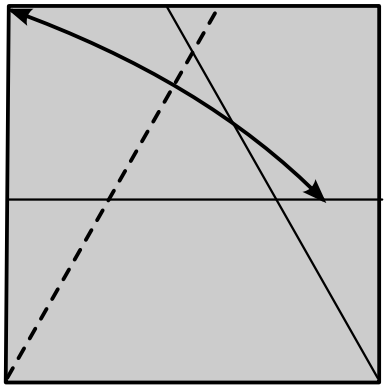
Create an equilateral triangle



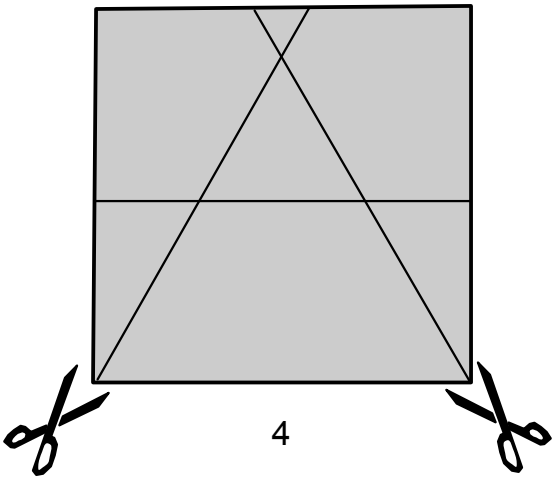
1



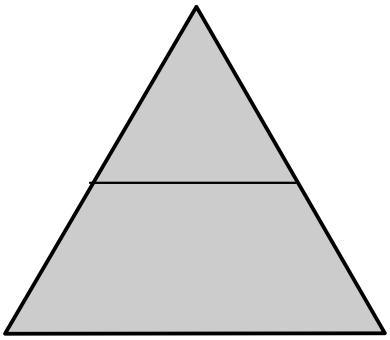
2



3

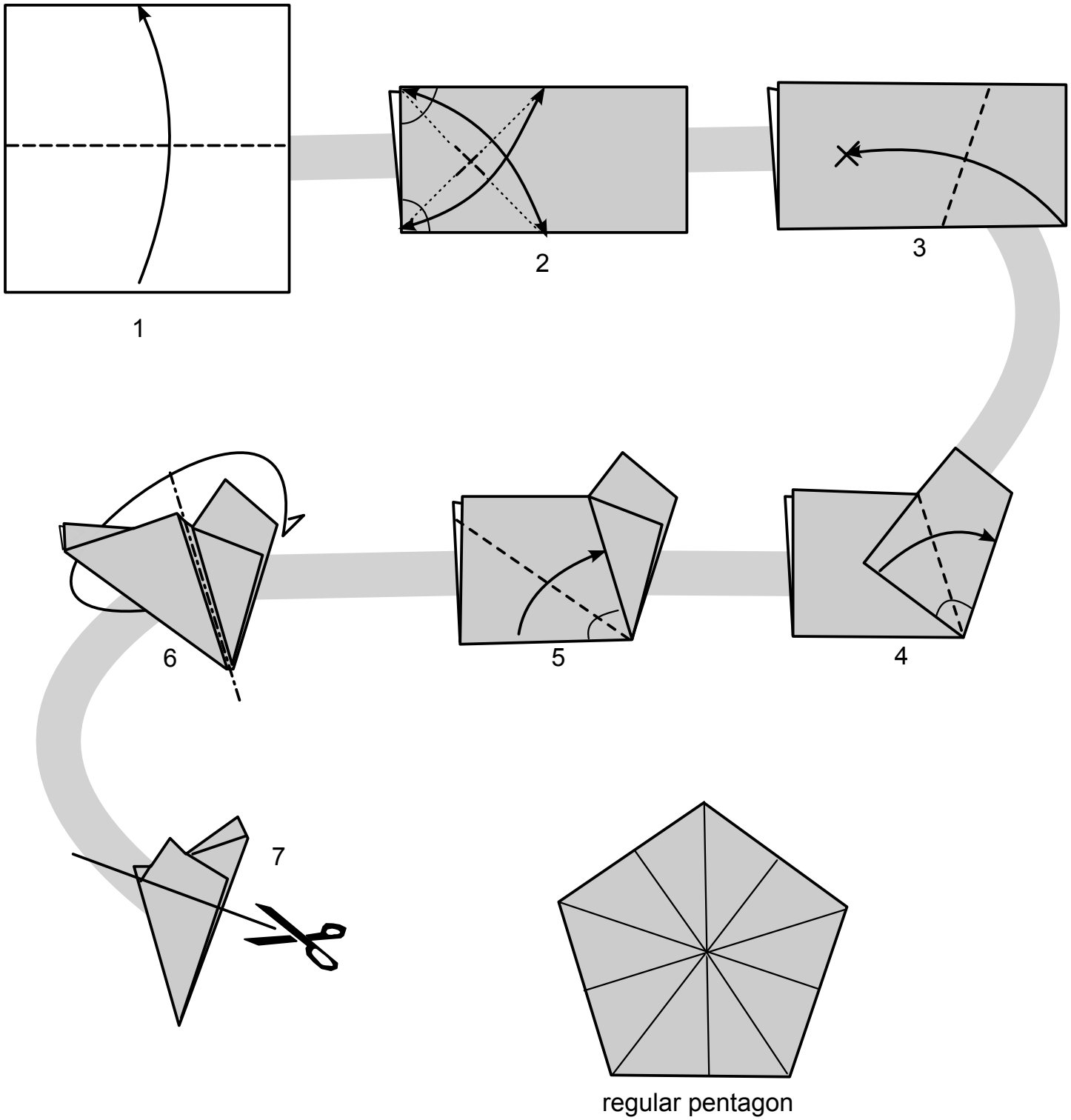


4

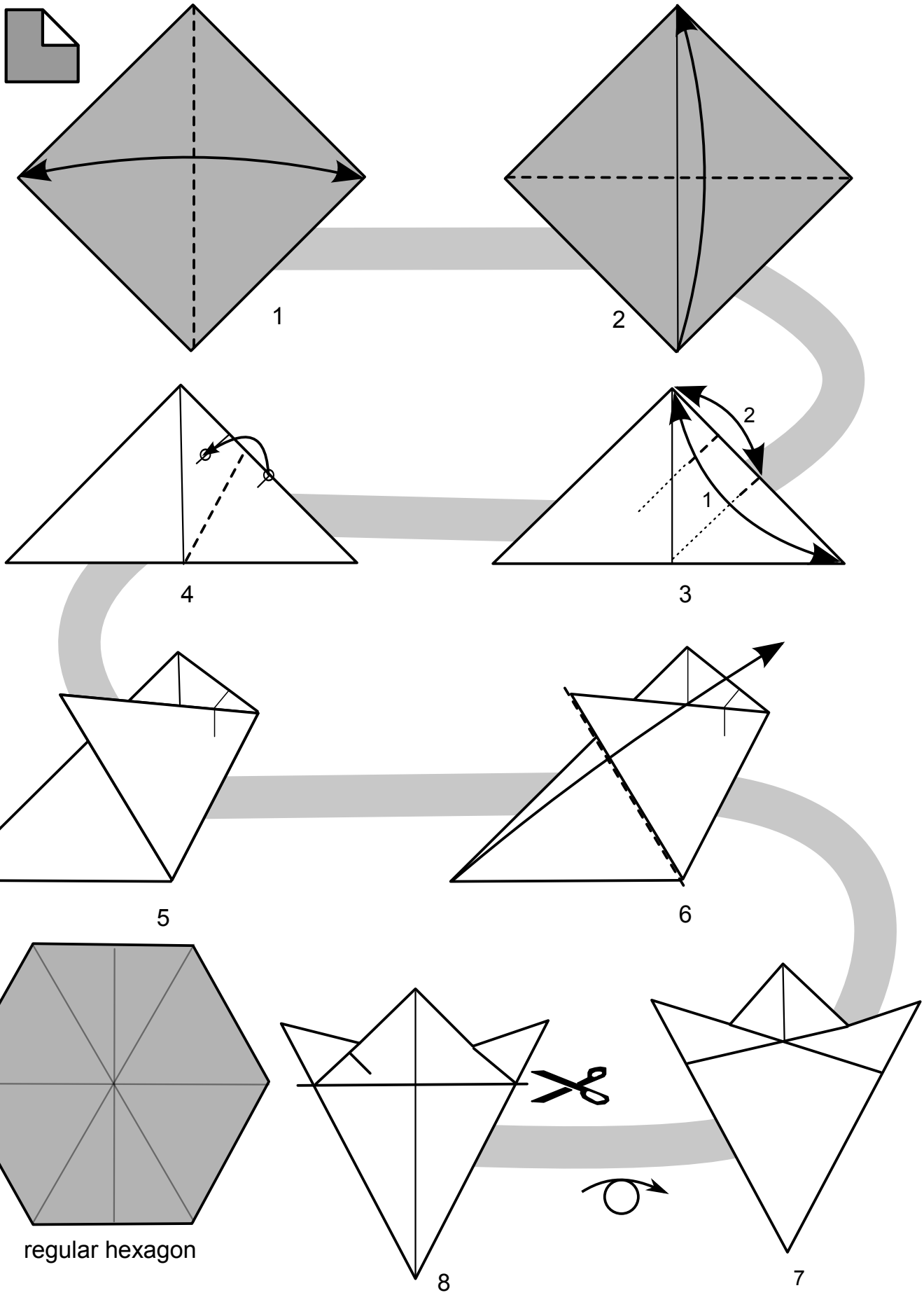


equilateral triangle

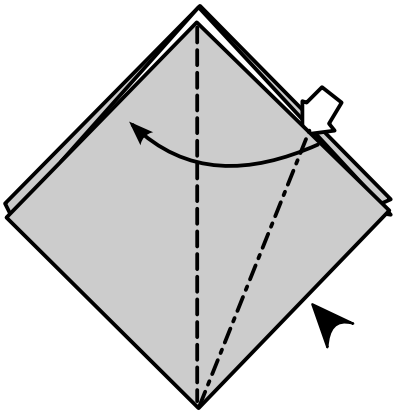
Create a regular pentagon



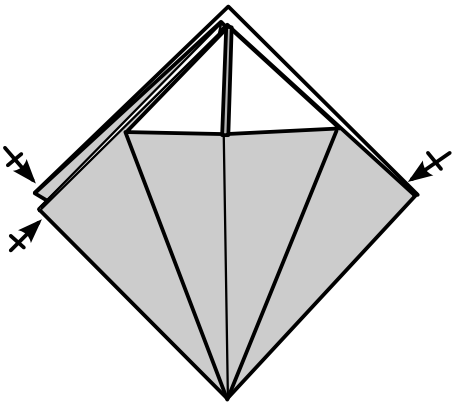
Create a regular hexagon



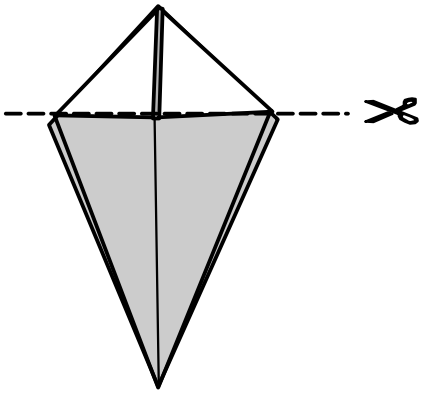
Create a regular octogon



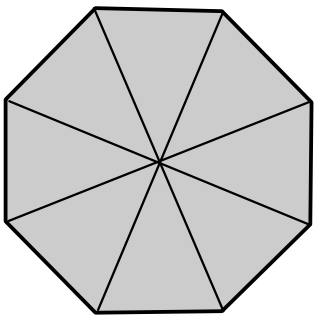
1 -start from a preliminary base, closed point towards the bottom



2



3



regular octogon

For further

Do not confuse the use of origami for mathematics and the mathematics underlying origami

In the first case, a certain number of theorems or practices of mathematics can be illustrated by folds. Many geometric constructions without rulers or compasses belong to this category: division of sheets, construction of particular angles, creation of particular polygons, up to the trisection of an angle. Valérie Larose and Didier Boursin have written a book on the subject. In the context of primary education, an experiment in teaching geometry to blind children using folds has been successful.

In the second case, we are interested in the theorems which explain and justify the practices of paper folding. Seven theorems attributed to Jacques Justin, Humiaki Huzita and Koshiro Hatori form the mathematical basis for paper folding. They list the seven ways to create a fold by aligning one or more combinations of dots and lines on a sheet of paper.

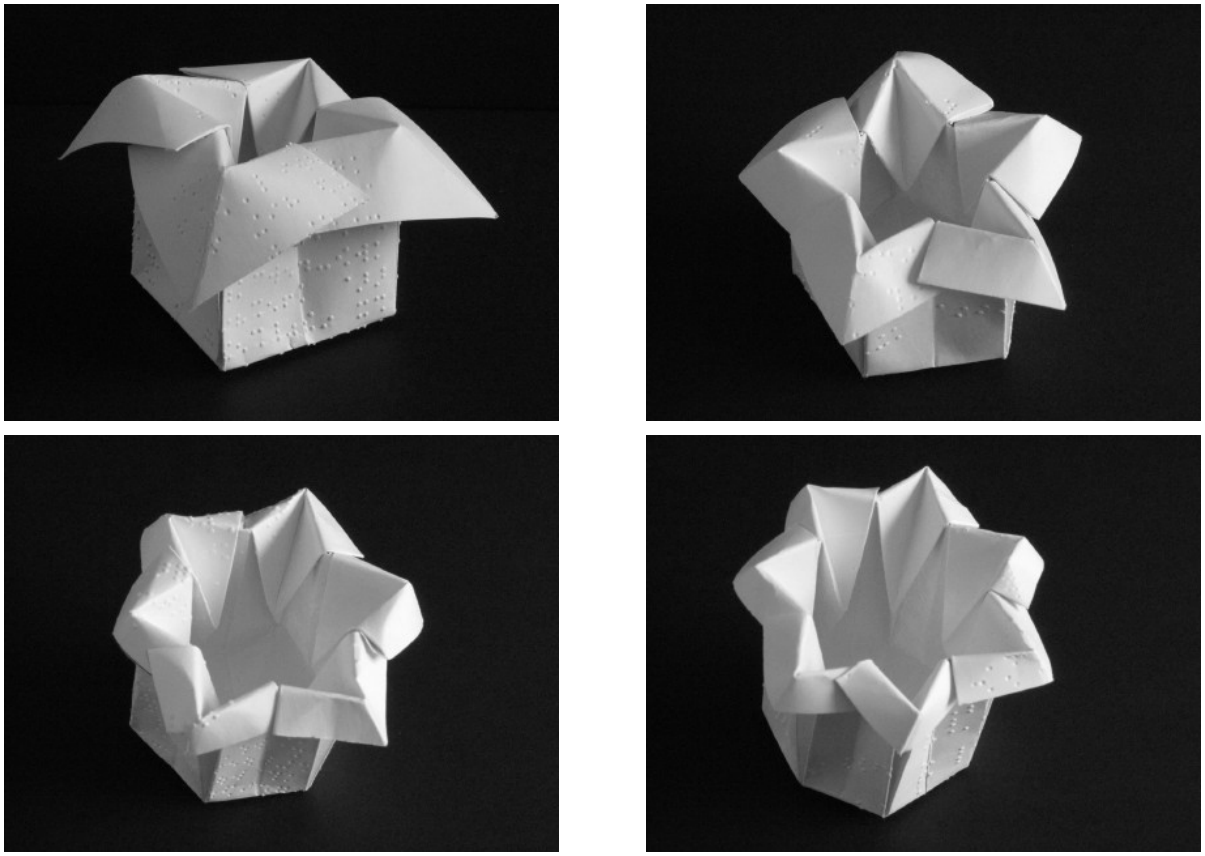
Since then, origami mathematicians have deepened the question. For example, they demonstrated the conditions for a set of valley and mountain folds to be effectively foldable. They organize, every four years, the OSME (Origami in Science, Mathematics, and Education) congress which reviews research. These theorists include Eric D. Demaine, Thomas Hull, Robert J. Lang, Joseph O'Rourke, Tomohiro Tachi. Their articles are easily found on the internet.

Decline a model from various formats

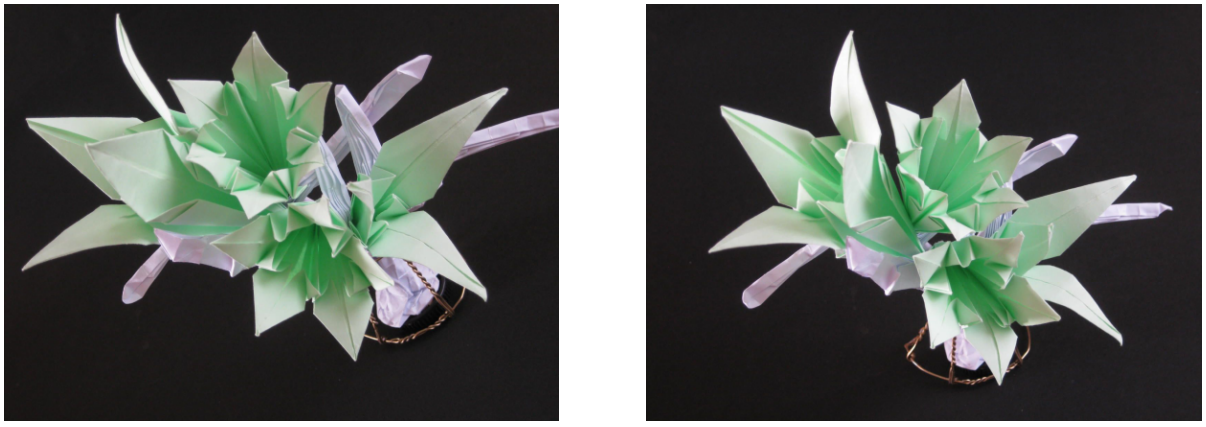
The use of regular polygons is a source of creativity. For example, many decorative tesselations or stars are folded into hexagons.

Some models are suitable for folding from different formats. They change their appearance, and are often very pleasant to look at.

You should try! It's easy, but ... it doesn't always work!



Vase, Peter-Paul Förcher



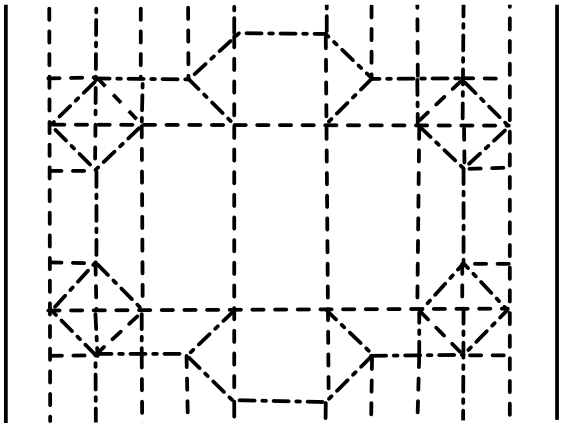
Bouquet of lilies with 3, 4, 5, and 6 petals

Box pleating

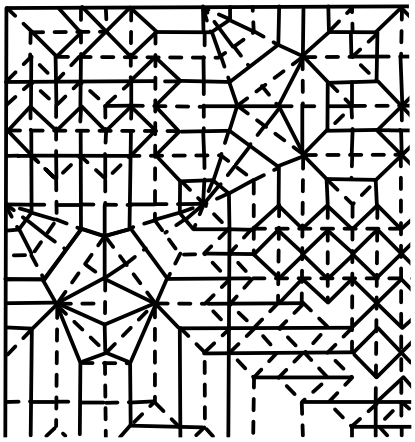
In 1962, Emmanuel Mooser published (very discreetly) a train folding whose innovative technique would amaze the world of origamists (photo below left). For the first time, a set of complex objects was folded into a single sheet of paper, without cutting. Rediscovered later and widespread throughout the world, this process was to be the basis of a revolution: accordion folding (French pliage accordéon).

The basic principle consists in preparing a regular grid comprising folds parallel to the edges of the sheet (square or rectangular) and to the diagonals. This set of alternating valley and mountain folds provides 3D reliefs and as many peaks as desired. An extract from the crease patern (CP) of E. Mooser's train is shown below on the left. A photo of a later variation, much more elaborate, appears at the bottom right, showing the evolution of these folds.

Many folds have since been built on this principle. The technique has been explored from top to bottom, leading to extraordinary achievements. Models created by Robert J. Lang, Andrey Ermakov and Éric Joisel are included in this book. Below right, an extract from the crease pattern of a modern model (Glaucus Atlanticus, p. 44). It illustrates the degree of complexity achieved!



Train, E. Mooser
Extract from the CP by R. J. Lang



Glaucus atlanticus
Extract from the CP by
A. Ermakov

Train, design E. Mooser

Train, design J. A. Iranzo

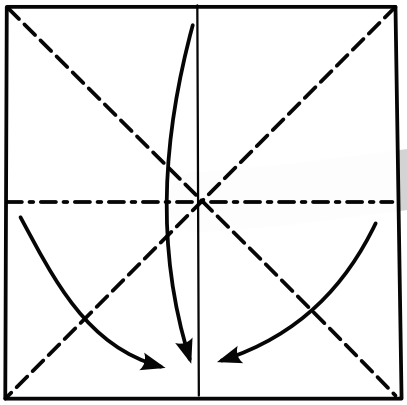
Interlocking Rings, Jeremy Shafer

Here's a fun model for parties (or weddings) because everyone thinks there are two separate rings.

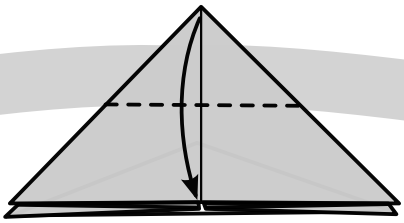
But when we pull on the two rings to separate them, then, miraculously, it appears that there is only one leaf!

Jeremy Shafer

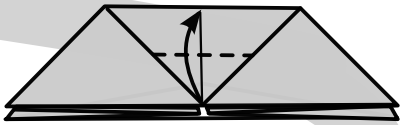
after the diagram by Jeremy Shafer



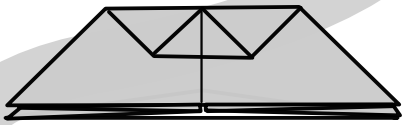
1 - start with a waterbomb base



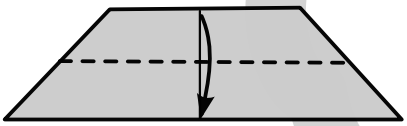
2 - valley fold the upper point towards the bottom edge



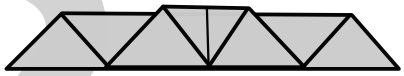
3 - valley fold the same point towards the upper edge



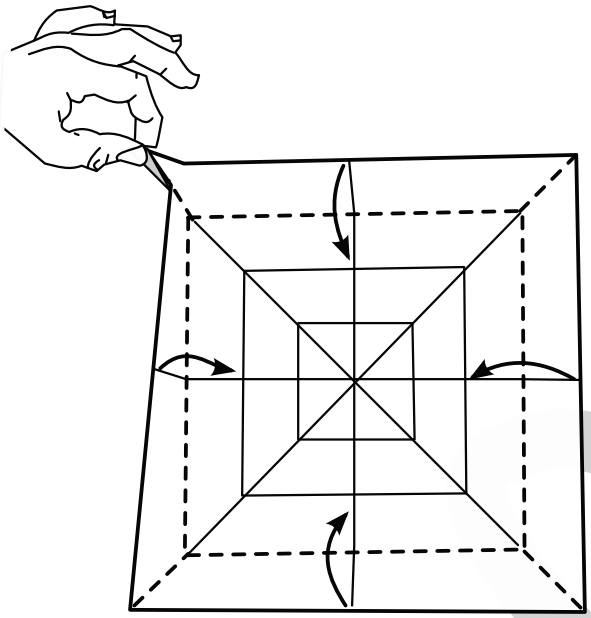
4 - like this.
flip the folding



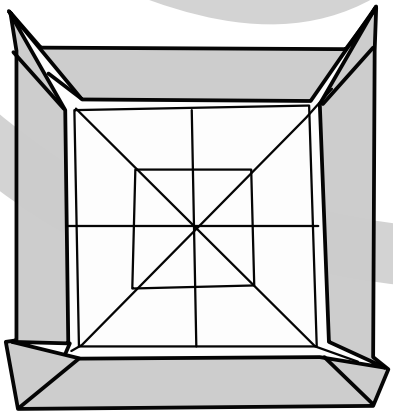
5 - valley fold, through all thicknesses, top down



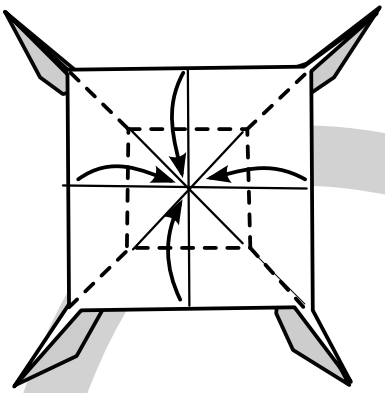
6 - the waterbomb base has been folded. (For thinner rings, make more folds). Now without hesitation, unfold the model entirely.



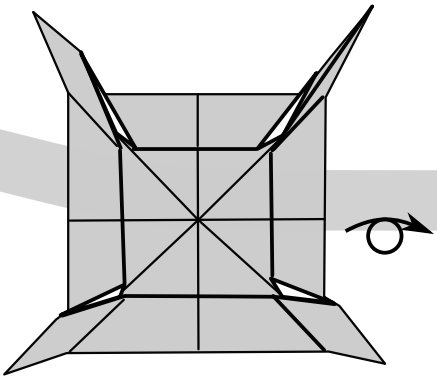
7 - fold all four sides inward using the existing folds, while pinching the corners so that they stand out.
The model will look like a table upside down with very short feet.



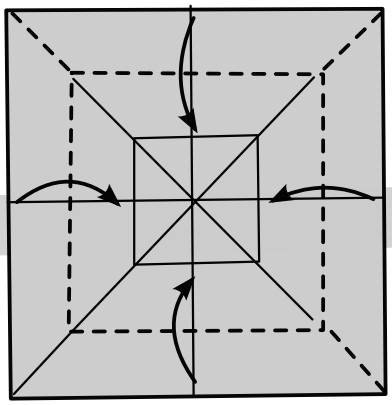
8 - like this.
flip the table



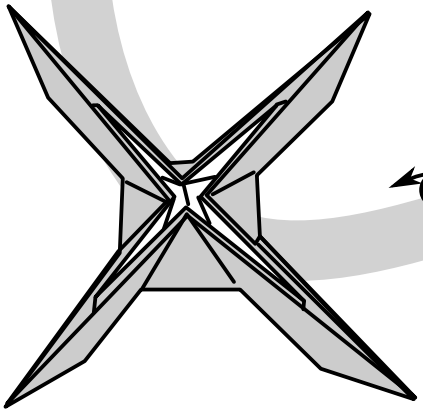
11 - fold inwards the four sides along existing folds while pinching the corners as in step 7



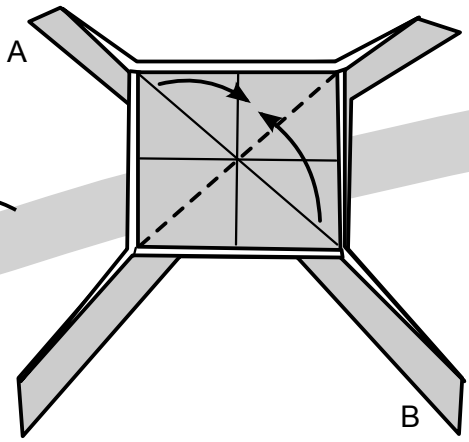
10 - the table is now smaller with feet taller.
flip the model



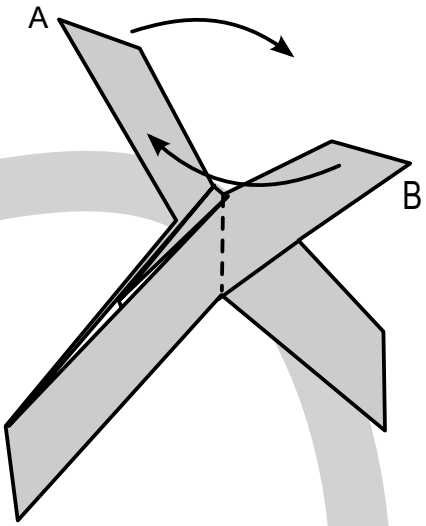
9 - fold inwards the four sides along existing folds while pinching the corners like in step 7



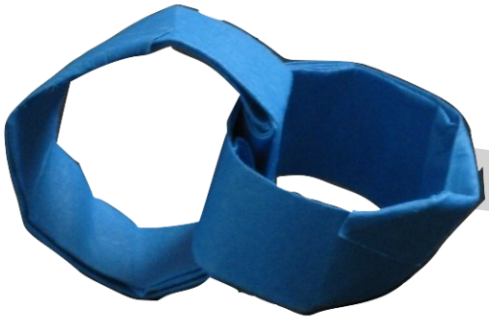
12 - the table is now very small with very big feet.
Ideal for racing!



13 - valley fold on the diagonal of the square so that both opposite feet A and B will rise

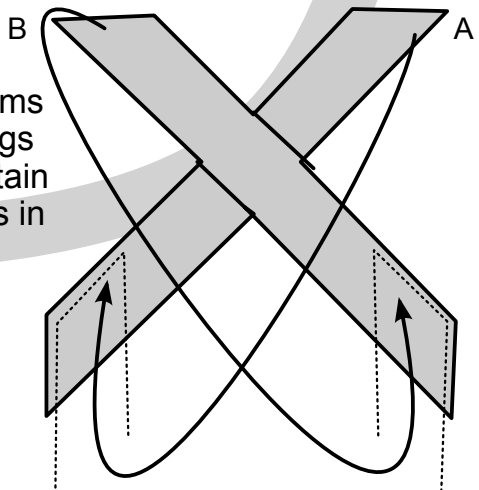


14 - swap A and B horizontally clockwise, as if you were screwing a corkscrew. You obtain 2 flat strips which overlap



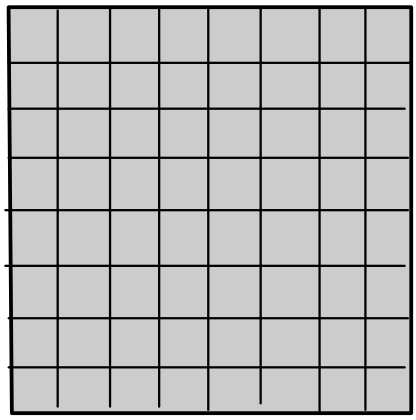
Here! It's finish

15 - Siamese worms!
Transform these worms in two interlocked rings by inserting, at a certain angle, the little bands in the biggest,

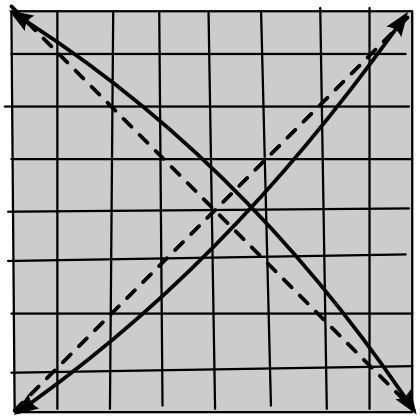


Stickman, Christophe Boudias

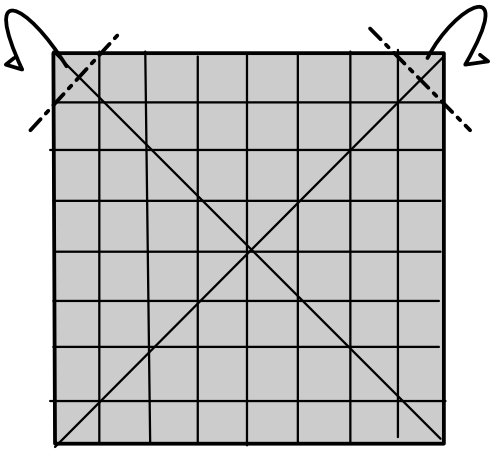
from the diagram by Christophe Boudias



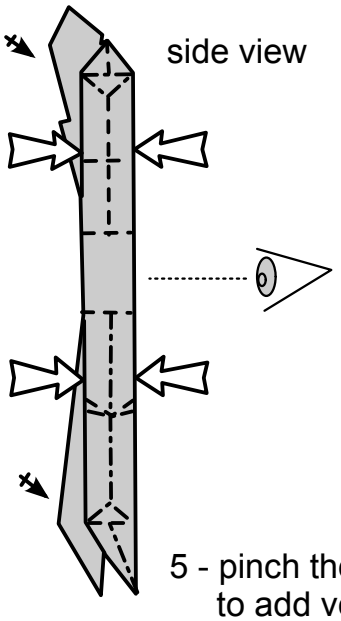
1 - prepare a 8x8 grid



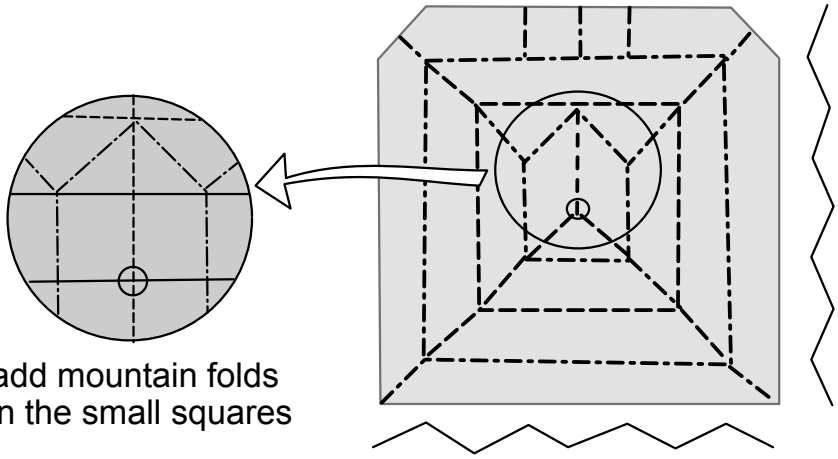
2 - fold, unfold the diagonals



3 - fold the corners behind

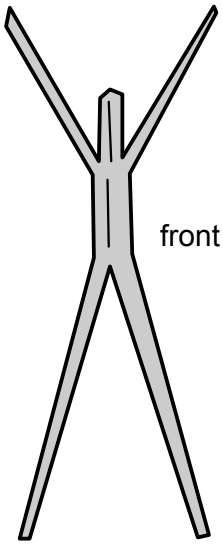


5 - pinch the members to add volume



add mountain folds on the small squares

4 - mark the valley and mountain folds as indicated, then shape the guy.
You have to get four long points and a little tip.



Walk in the land of folding

Some variations on the stickman. Practice!

folding and photo Christophe Boudias

Opposite, in a half A4

The Agitator

Stick Woman

folded in a 16x16 grid

Modular origami

A very lively branch of paper folding is the manufacture of various objects by assembling modules. A module, the basic part of modular origami, has two functions:

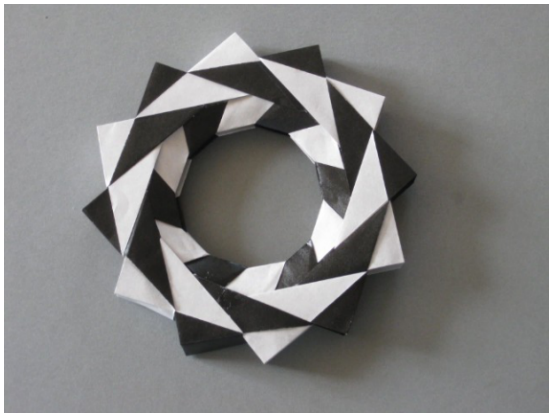
- receive another module thanks to a pocket (English pocket),
- hang on to another module thanks to a free flap.

The modules are folded from different formats, and generally only require a maximum of ten folds. The variety of combinations of shapes and colors makes folding modular objects very attractive, even if it can sometimes seem a bit long.

The assembly involves a few pieces (from 4 to 16 for the stars) to several tens for large mosaics or decorative balls. Some models hold without glue, others must be glued or sewn to hold.

On the internet, you will find a large number of models of stars, rings and other mandalas. You will also see mosaics constructed from square, rectangular, triangular, hexagonal or any other shape.

You will also discover dozens of models of decorative balls, boxes or flowers in pieces and pieces. The variety is not lacking!



Ring « Yin Yang »
design Aldos Marcell

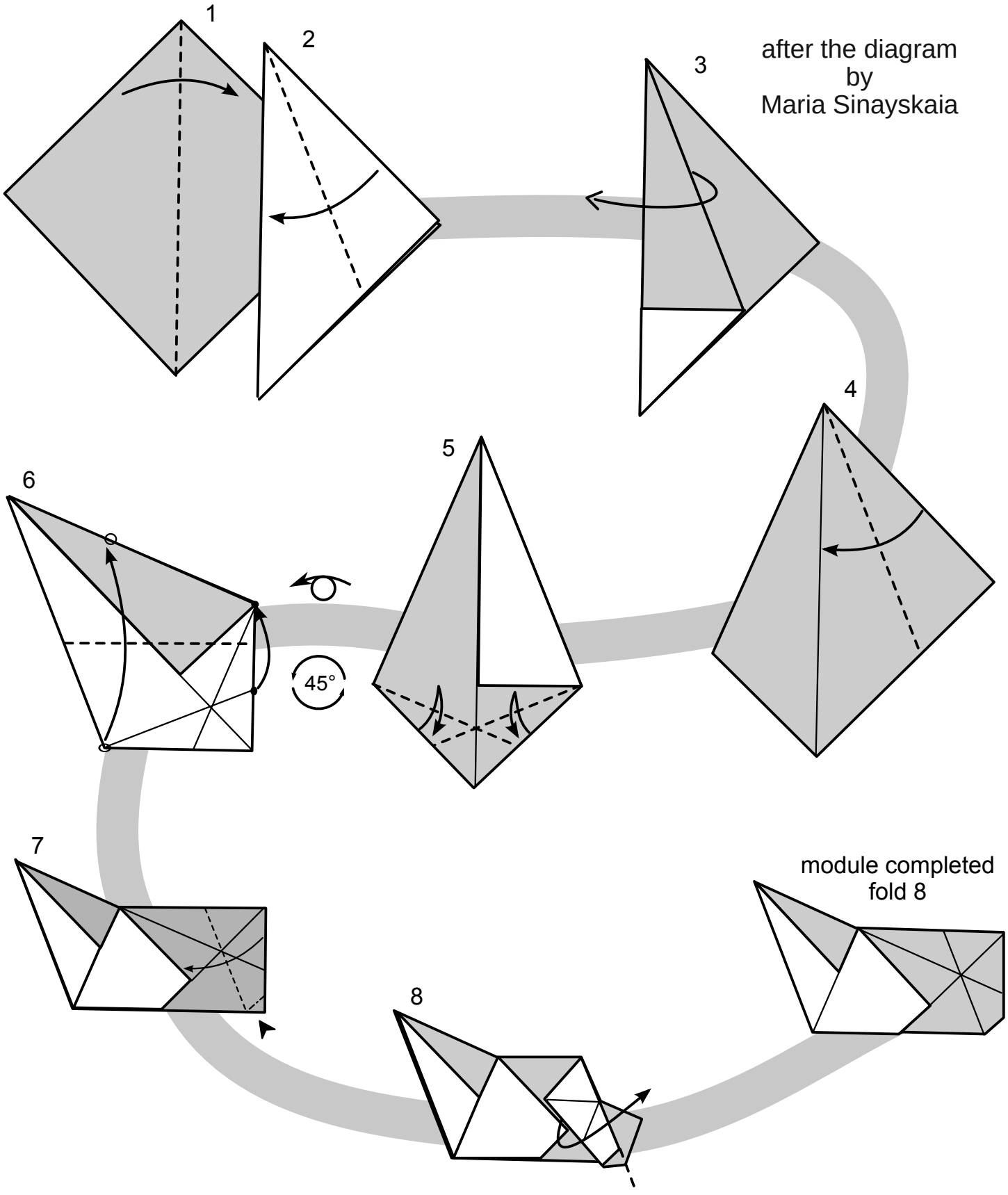
Ring made of 18 rings
design Mette Pederson

For further

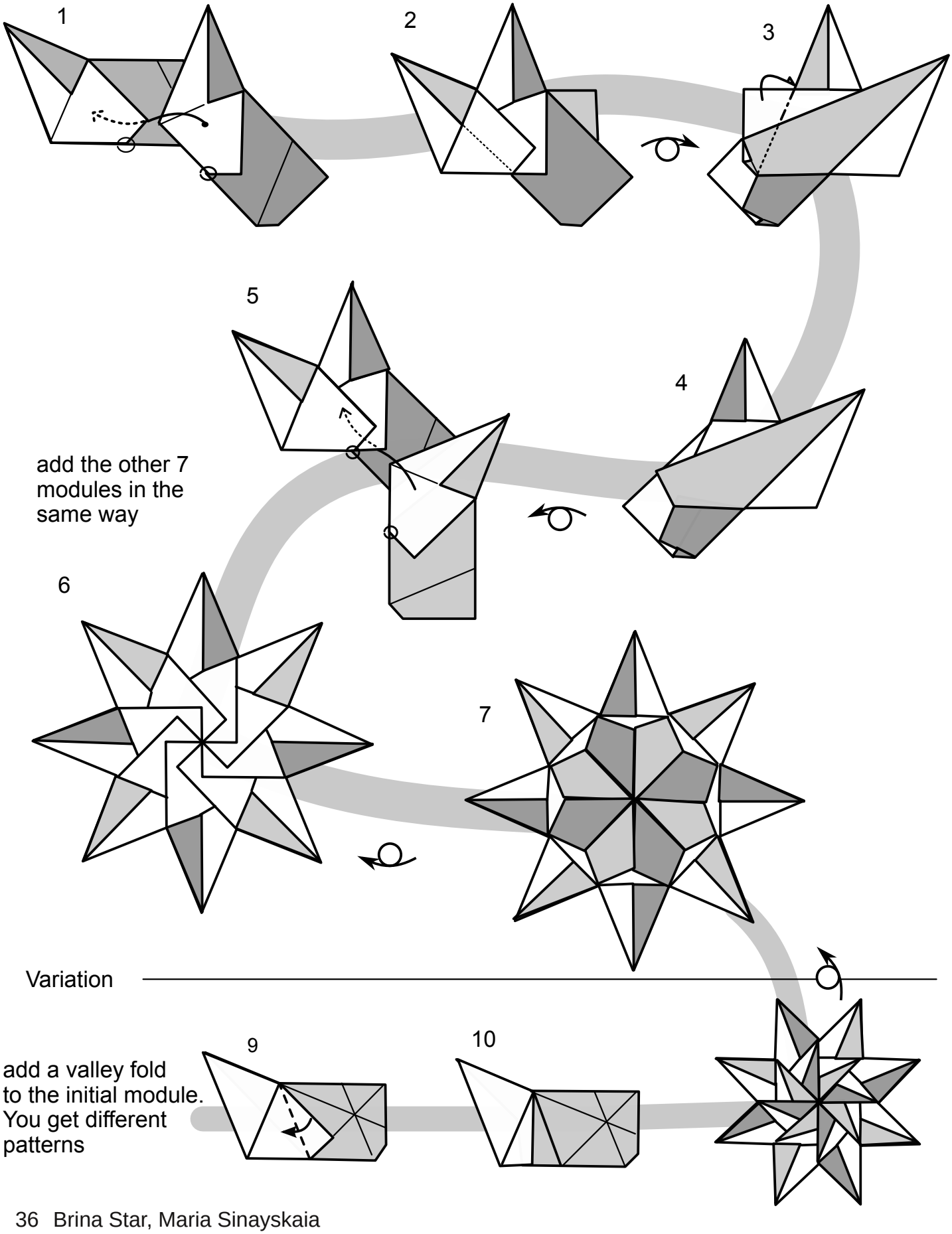
Among the great modular specialists, search the internet for the following names: Paolo Bascetta, Tomoko Fuse, Ekaterina Lukasheva, Aldos Marcell, José Meeusen, Mélisande *, Francis Ow, Halina Rosciszewska-Narloch, Maria Sinayskaya, Vera Young and Flaviane Koti. Some have written magnificent books. You will have fun folding and your folds will make great gifts!

Brina Star, by Maria Sinayskaya

Here is a typical example of modular origami. Easy to make, savor the proposed variant. And then find your own variations!



Assembly

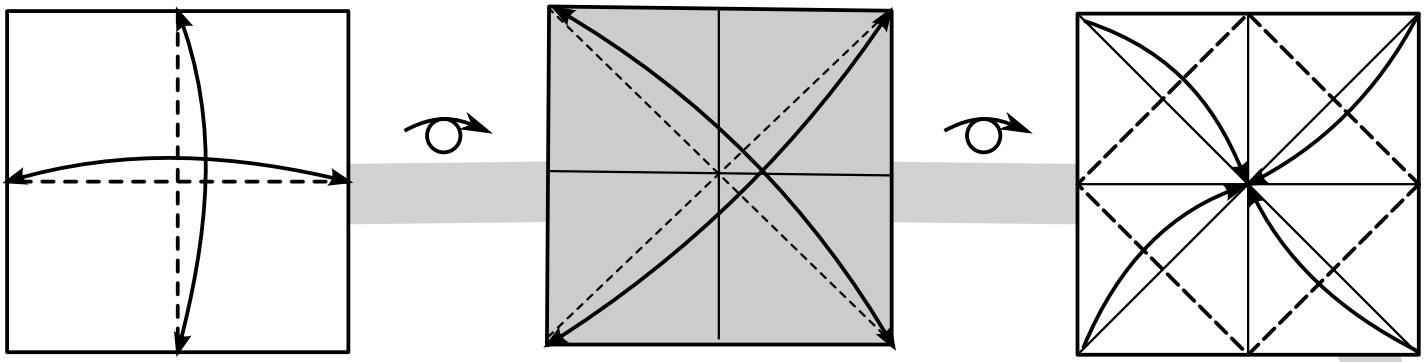


Variation

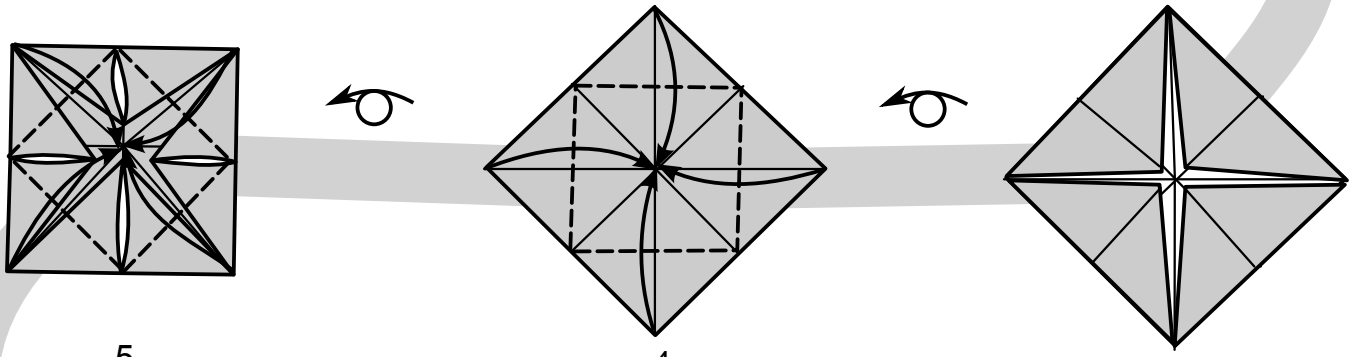
add a valley fold
to the initial module.
You get different
patterns

Making mosaics

unknown designer

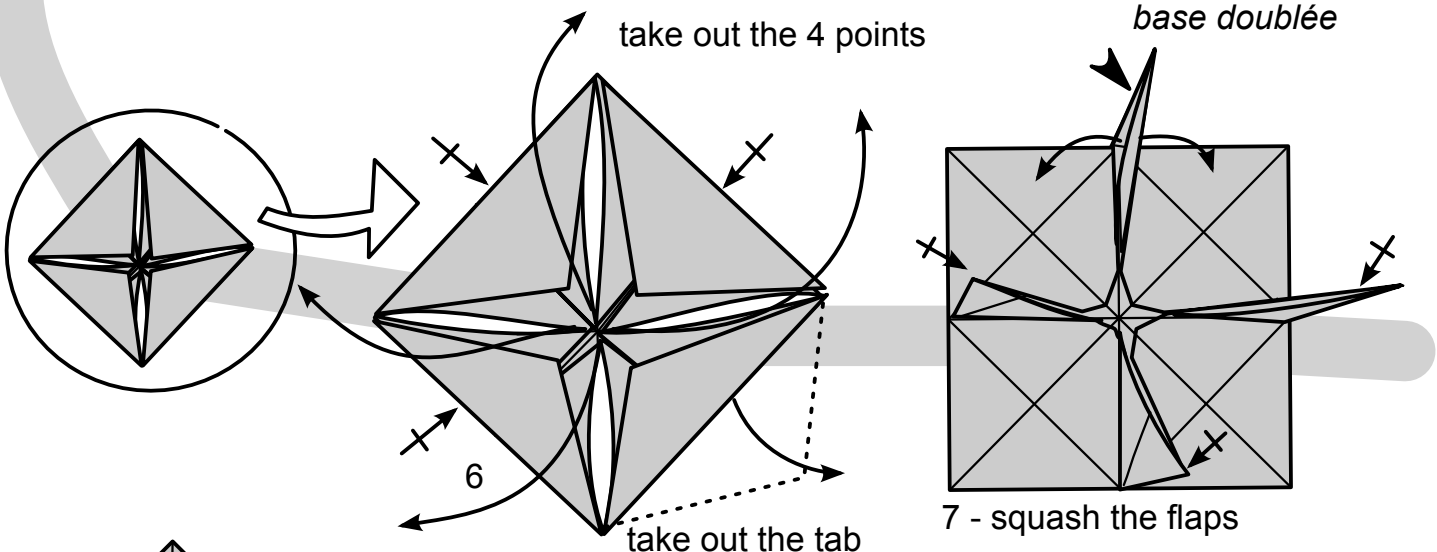


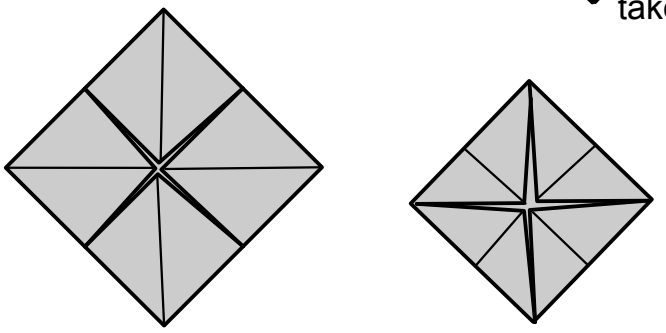
1 2 3



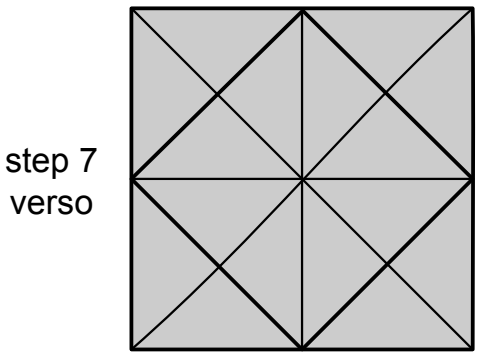
5 4 This is a blintz base

base doublée

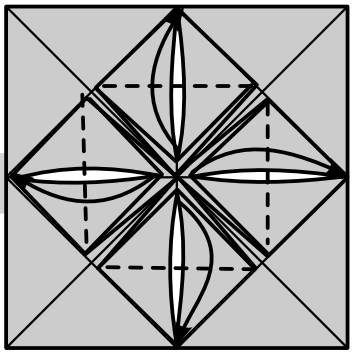




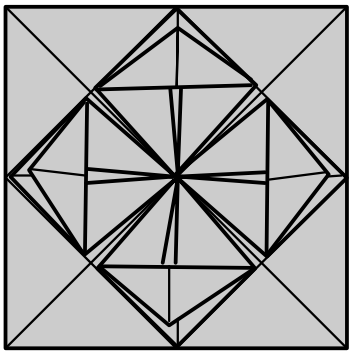
step 4 verso step 5 verso



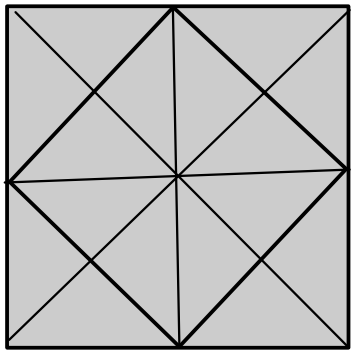
step 7 verso



8 - fold the small flaps towards the edges

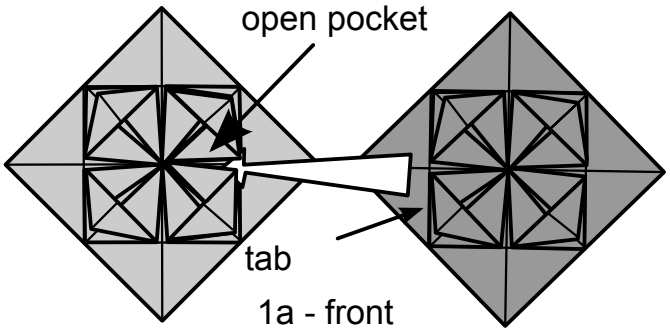


completed module, front

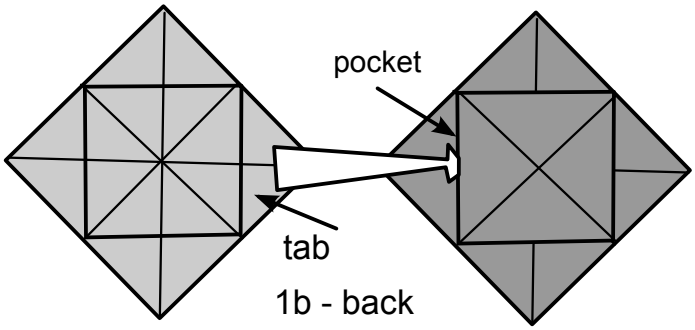


completed module, back

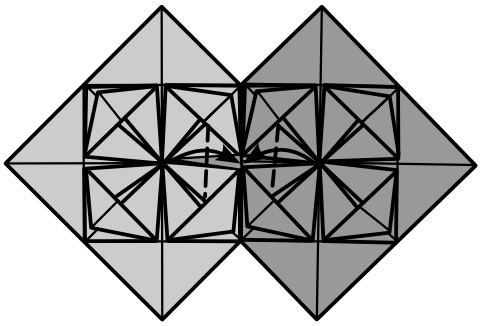
Connecting two modules



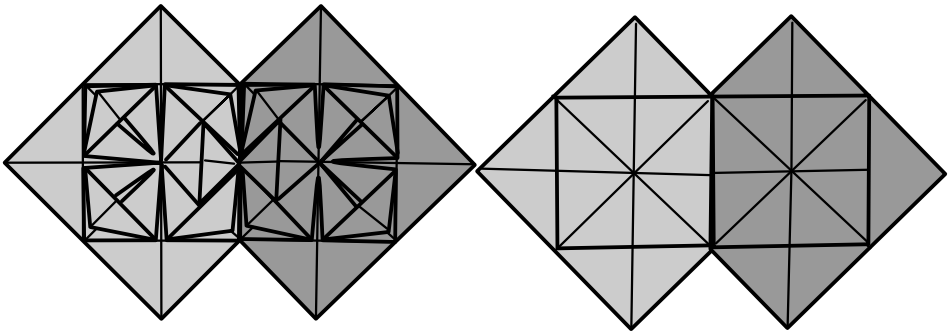
1a - front



1b - back



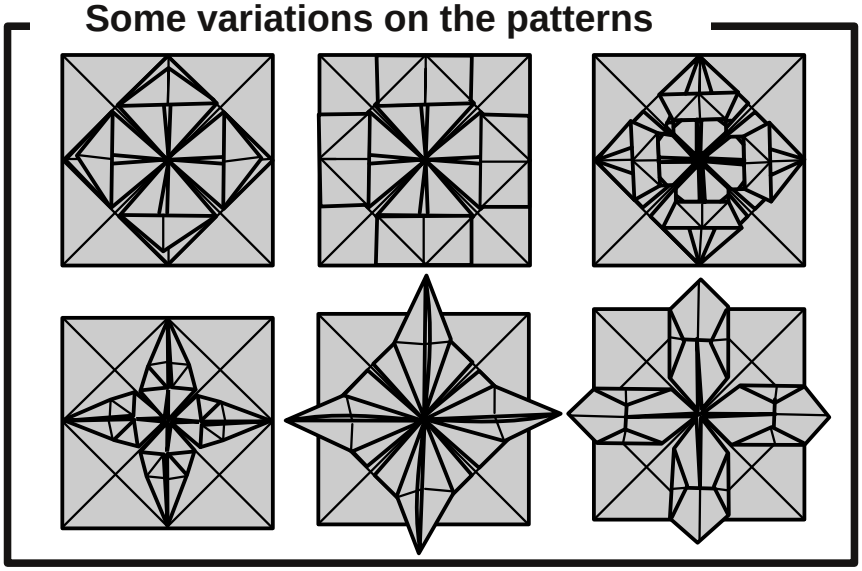
2 - fold the two flaps to block



completed junction, front and back

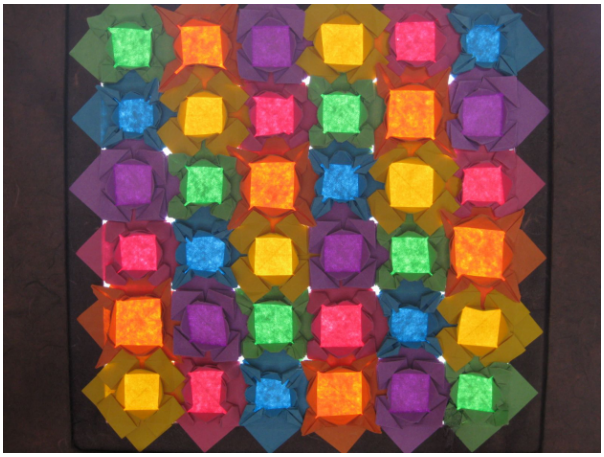
Some variations on the patterns

6 variants



Yes you can!

Naturally, mosaics, according to your creativity.



« Sudoku » 6-color display, recalled by 6 patterns.
Based on a painting by Richard-Paul Lohse, exhibited at the Musée de Grenoble.

« Stop War »

Some details:

- 26x23 modules = 598 modules, folded into 8.5x8.5 cm squares.
- the table measures 95x95 cm and is mounted on a plexiglass plate of 1x1 m.
- words are also coded in Braille and Morse code.

And why don't you make a cube?

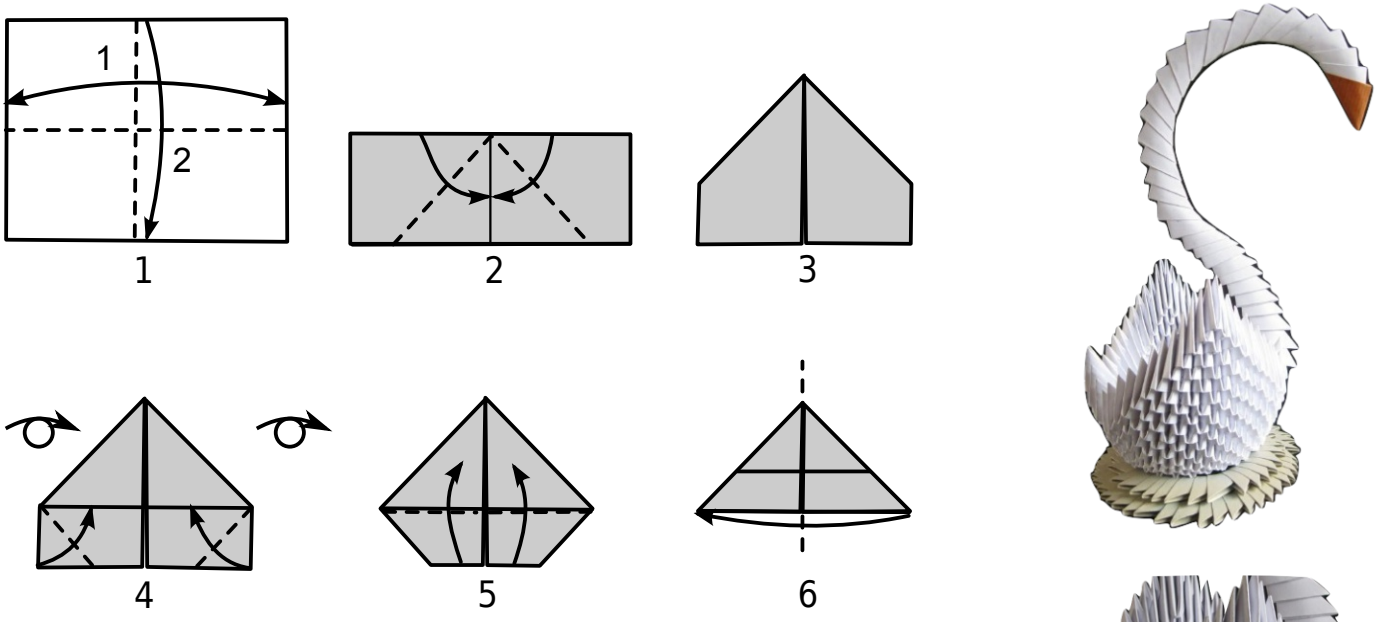
- 3 colors, to be distributed on opposite sides or on vertices,
- 6 different patterns (page 38) distributed on the 6 sides.

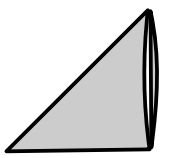
The Chinese module

Very simple module, very simple assembly, but large number of modules to manage, here is the summary presentation of the Chinese module.

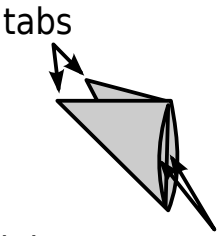
Incredible constructions are carried out, comprising tens of thousands of parts. The most classic for amateur origamists is the swan, whose overall and detailed photos can be found below.

It suffices to prepare 458 rectangular modules, for example of A4/16 size. Ten short hours of work (or pleasure), and this achievement will make you proud.

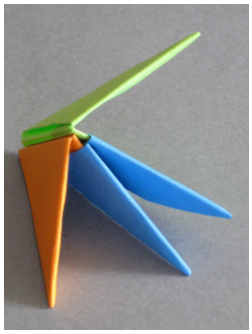




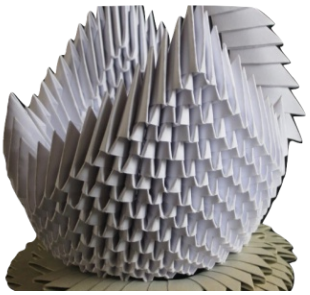
completed module



pockets



one module receives two modules



For further

You can easily find swan making diagrams on the internet, using the keywords "*chinese swan*" or "*chinese module*".

You can also visit Stéphane Gérard's website: http://orizuka.free.fr. You will find the Chinese swan, and many other folds.

To find books, diagrams and photos of impressive achievements, use the keywords "*origami-3D*" or "*chinese origami*"

Constructions using bus tickets

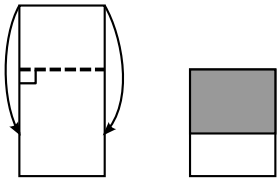
An abundant and pleasant material to fold is at your fingertips: any support (tickets, business cards, playing cards, advertising cards etc.) a little cardboard (but not too much), rectangular in proportions about 1: 2.

With a little imagination, you can make tables or objects based on cubes joined to each other by simple entanglement, without glue.

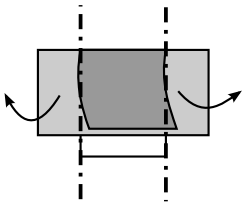
You will find, to follow, the description of the construction of a cube using 12 modules. Ideas for more complicated objects are given next.

Happy hunting for modules!

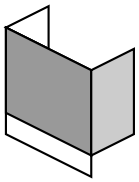
Folding tickets



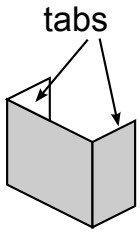
Construction of a template



Insert the ticket to fold in the template, centered, well at the bottom

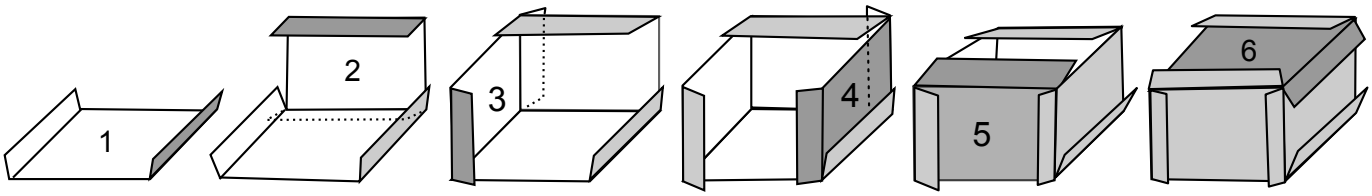


Fold the ticket



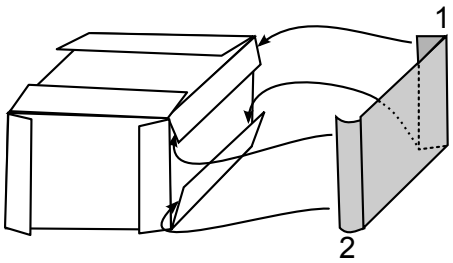
Folded ticket

Inside of a cube



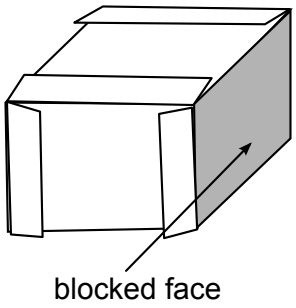
Be careful to interlock the tabs

Blocking a cube



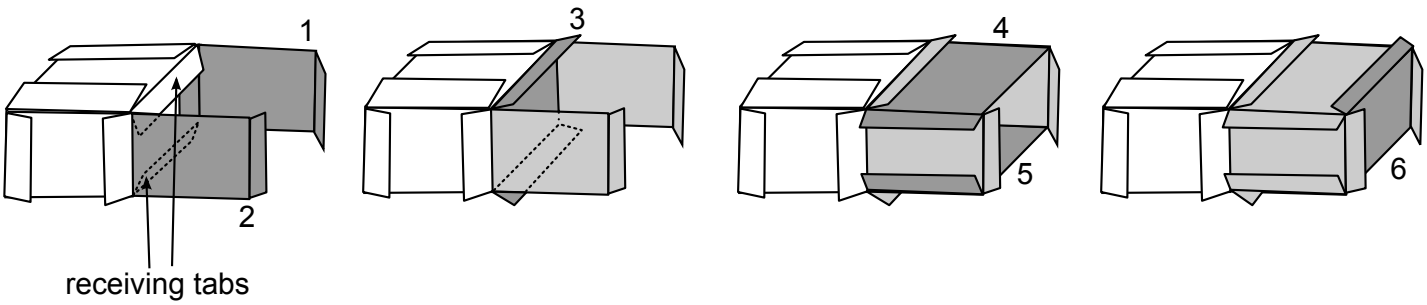
Insert a flap tab
under the two tabs located
on the same edge on the side to block.

Bend slightly the second tab
of the flap and slide it under
the two tabs of the opposite edge



Once the 6 faces blocked, the cube will be very strong.

Assembling two cubes



It is recommended to perform the blocking as each cube is placed.

order 0
12 tickets

order 1
292 tickets

Menger Sponges built with bus tickets

order 2
3 456 tickets

order 3
66 048 tickets

For further

The first Menger sponge of order 3 in paper was created by Jeannine Mosely in 2006. It used 66,048 business cards, of which only the white faces are visible. Michel Lucas built a Menger sponge of order 3 with 66,048 bus tickets in 2009. Go visit the website http://www.defi66000.fr

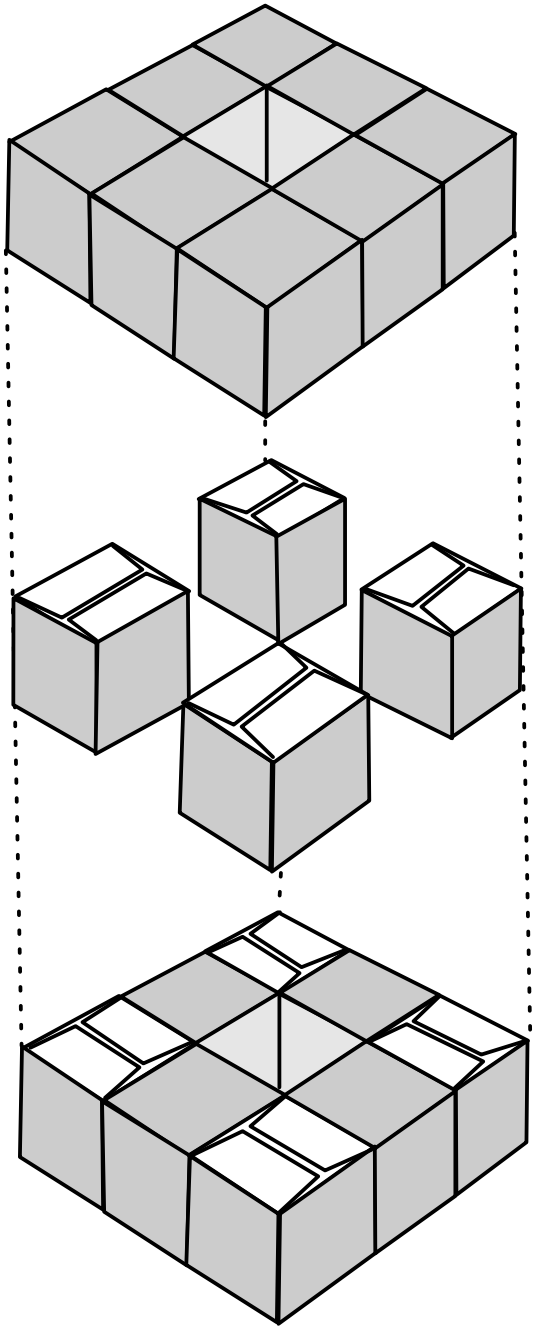
To get some more simple and fun folding ideas, do an internet search with "*metro ticket folding*".

Menger sponge order 1

To build a Menger sponge of order 1, you have to create three layers of cubes. The lower and upper layers are formed from the same arrangement of 8 cubes. The middle layer has only 4 cubes, which will create the holes in the sponge.

The cohesion of the assembly will be ensured by the blocking of the external faces and of the faces bordering the holes. It is this blockage that will allow for any decor. It's up to you to imagine based on the tickets you have. Remember to use both the back and the place of the tickets to form patterns.

You will need 292 tickets, or business cards, or playing cards, or ...



3 - construction of the upper layer

Create a crown of 8 cubes by hanging the corner cubes as you build.
The top is blocked (8 flaps), as well as the sides (12 flaps).
The hole is blocked (4 flaps).

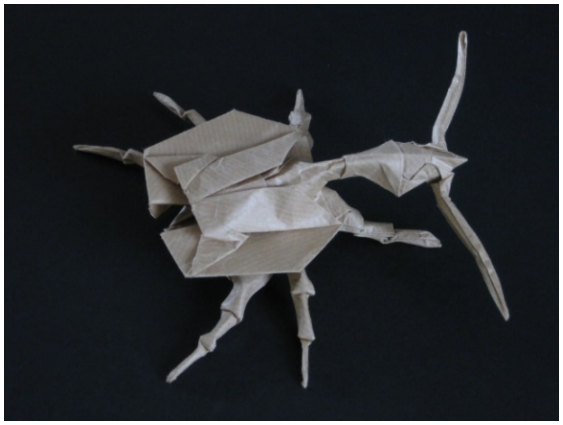
2 - construction of the middle layer

Build four cubes on the four unblocked faces of the bottom layer.
Only the side faces of the cubes are blocked.
The upper layer will be attached to the free upper faces.

1 - construction of the lower layer

Create a crown of 8 cubes.
The bottom is entirely blocked (8 flaps), as well as the sides (12 flaps).
The hole is blocked (4 flaps), as well as the faces located in the middle of each side of the crown (4 flaps).
The cubes in the middle layer will hang on the corner faces.

Walk in the land of folding



Escarabajo Violin
design Manuel Sirgo

Shore Crab
design Pham Hoang Tuan

Dancing Cranes
design Robert J. Lang

Glaucus Atlanticus
design Andrey Ermakov

Horned Owl
design Hideo Komatsu

Peacock
design Jun Maekawa

3D balls, *kusudama* et other polyhedra

The use of decorative balls, called "kusudama", has been known for a very long time in Japan. Used in particular during big festivals, they gave life to a very important creative activity, still alive today.

The creation of a decorative ball is done in two steps:

- folding of a more or less large number of modules, depending on the assembly model chosen,
- assembly of modules. This assembly is done with or without gluing. Models without gluing are the most sought after, but sometimes give rise to acrobatic assemblies, the whole taking hold only when the last module is put in place_! Furthermore, nothing prevents assembling as the modules are folded forward. Do as you see fit!

A great variability characterizes the modules_:

- the starting format can be a square, or a rectangle with more or less simple proportions to obtain 1: 2, 1: 3, 1: √2, etc. The question of mass production of sheets in the right format then arises. Some effective methods are described on the following pages.
- the number of folds to be made can range from half a dozen to several tens! The folding phase of the modules can then take a considerable time.

Today, the most common assembly models use the properties of well-known polyhedra, such as for example the Platonic solids: tetrahedron, hexahedron (cube), octahedron, icosahedron, dodecahedron. Making cubes (6 or 12 modules) or dodecahedra or icosahedrons (30 modules) is a common activity. But there are also some realizations comprising several hundred modules, for example to model chemical molecules.

The inventiveness of the creators seems limitless. The most unexpected visual effects are sought, the variations playing on the color changes are countless. If the making of a kusudama can turn out to be somewhat off-putting, the result makes it a sympathetic and sought-after gift.

For further

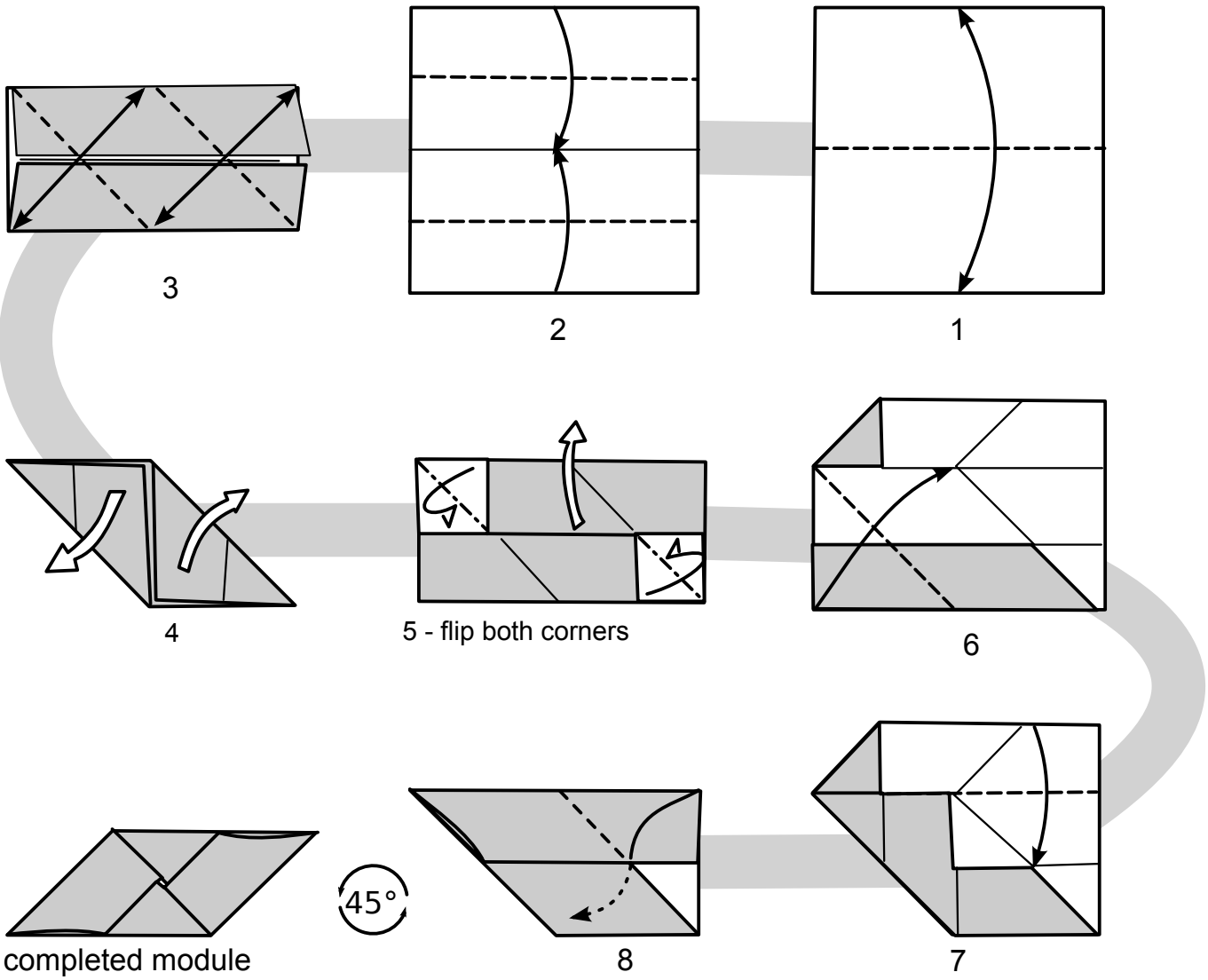
You will find hundreds of models on the internet by searching with the keywords "*kusudama origami*". A wonderful trip!

Also visit the sites of some big names: Paolo Bascetta, David Brill, Tomoko Fuse, Denver Lawson, Thomas Hull, Ekaterina Lukasheva, Yoshihide Momotani, Meenakshi Mukerji, Natalia Romanenko, Maria Sinayskaya, Vera Young and Flaviane Koti ... and many more 'other!

Most have published very affordable books. Out of curiosity, look for John Montroll's book, which strives to fold polyhedra with a single sheet of paper, without cutting or gluing!

The Mitsunobu Sonobe module

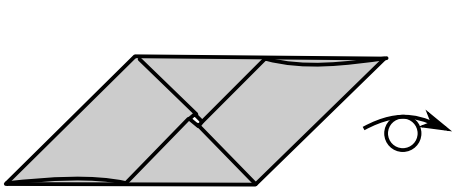
Mitsunobu Sonobe was the first to design a very simple, but basic element of the construction of balls on the model of a large number of mathematical polyhedra. In particular, the Platonic solids (cube, octahedron, icosahedron, dodecahedron) now form the framework of a large number of decorative balls.



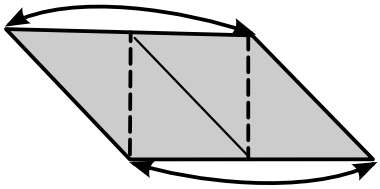
Variations on a theme

Many variations on the Mitsunobu Sonobe module can be found on the internet. They consist essentially, starting from two-tone sheets, of practicing folds and folds on the flaps, so as to reveal patterns of different colors on the result.

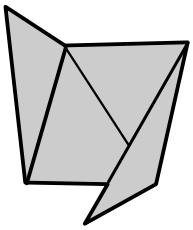
Buildung a cube



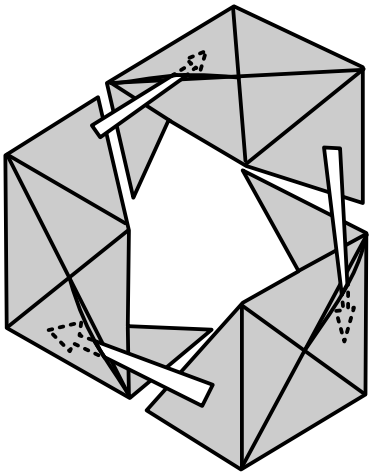
1 - start from a completed module

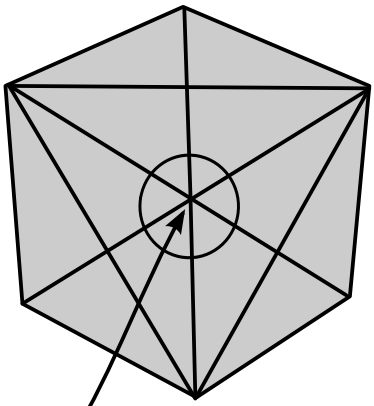


2 - fold the points, unfod them halfway

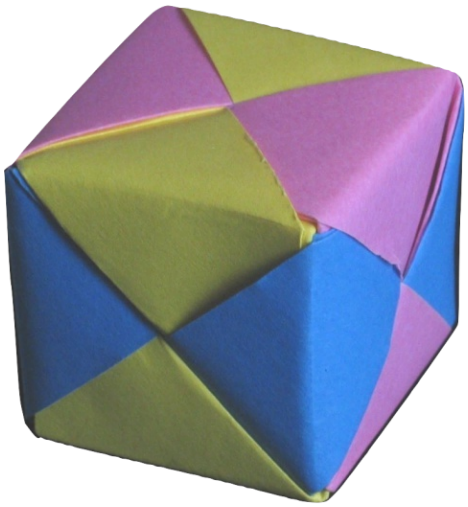


3 - completed module fold 6 modules





Three interlocked modules make a vertex

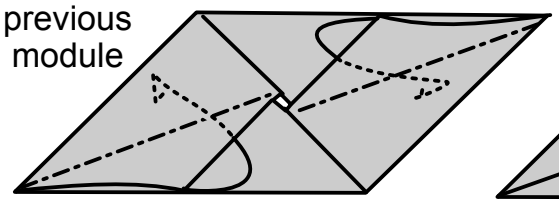


The three other modules join in the back in the same way

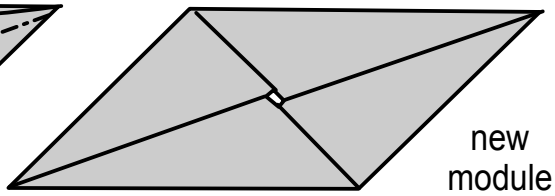
Build a cube

The cubes constructed using Mitsunobu Sonobe modules are an inexhaustible source of original gifts. You can customize them by choosing the color scheme, but also by looking for various patterns. The Internet is full of suggestions_!

Try, for example, a simple modification of the final module. It consists in folding back part of the free flaps of the module. With monochrome paper, only the visual structure changes. With two-tone paper, if you make valley folds instead of mountain, new patterns appear. Try! Invent! Surprise!



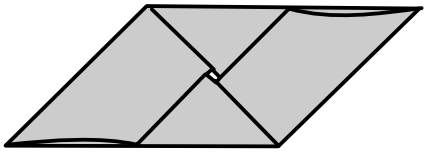
previous module



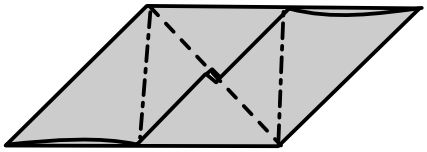
new module

Construction of a decorative ball

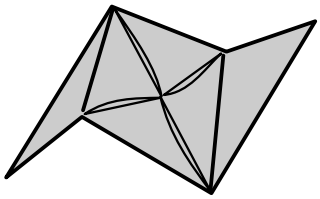
Sonobe modules allow you to create many objects with a mathematical polyhedron structure. The choice of colors makes it possible to create magnificent decorative balls. You will learn how to build a ball with an icosahedron structure using 30 modules. Courage! the result is worth it.



a) start from a completed module

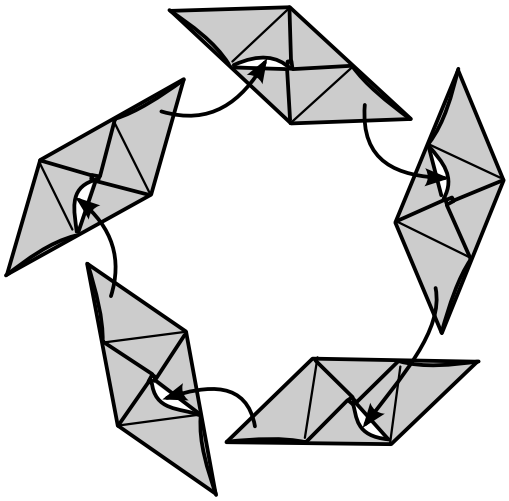


b) follow the diagram

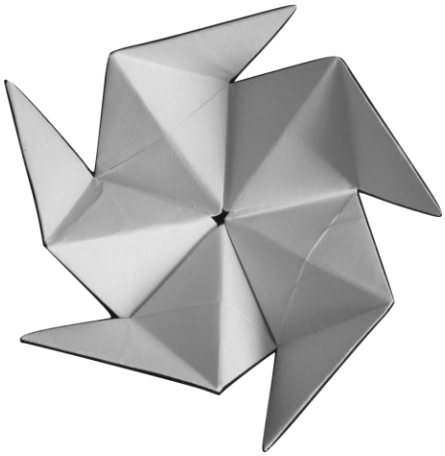


completed module

1 - Assemble a round of 5 modules. The result is three-dimensional.

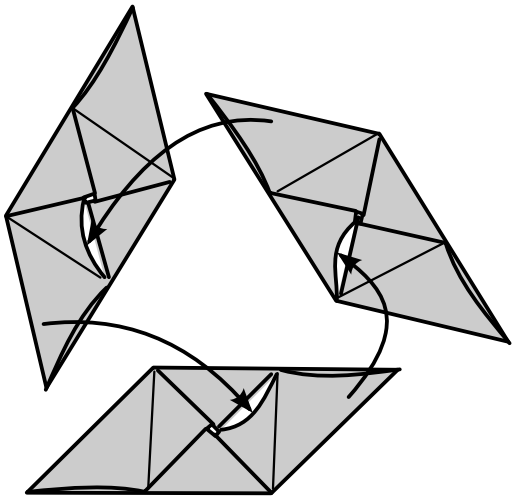


Assembly of 5 modules

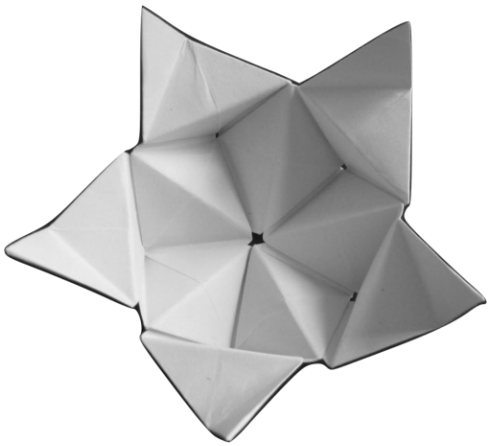


Result, interior view

2 - Close the ring by creating 5 small pyramids using 5 modules joining one side with a free point

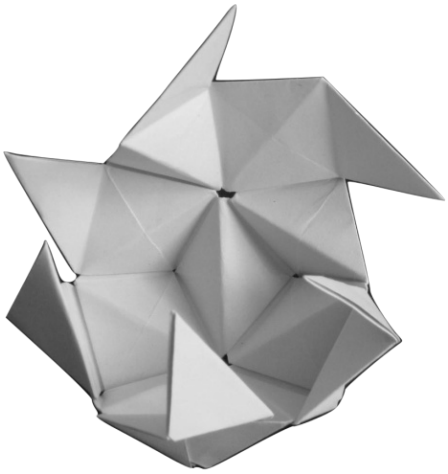


Assembly of 3 modules

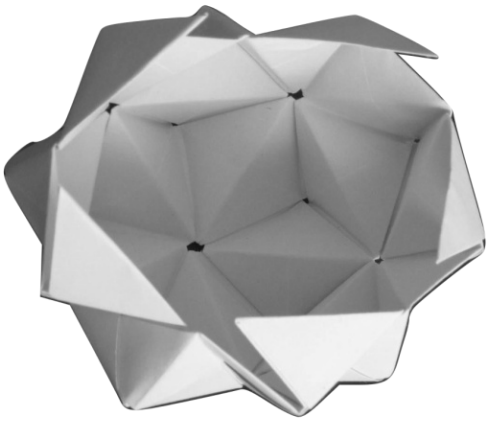


Result, interior view

3 - Join the free points using 2 modules per pair of points. You build 5 new pentagonal faces and 5 pyramids.

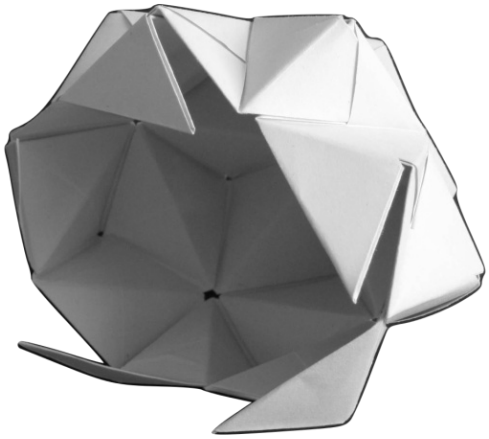


In progress

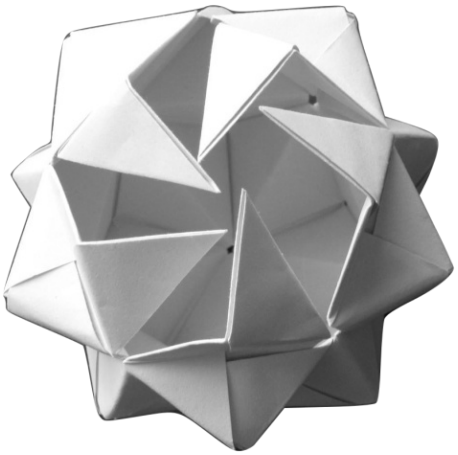


Result, interior view

4 - Build 5 new pyramids



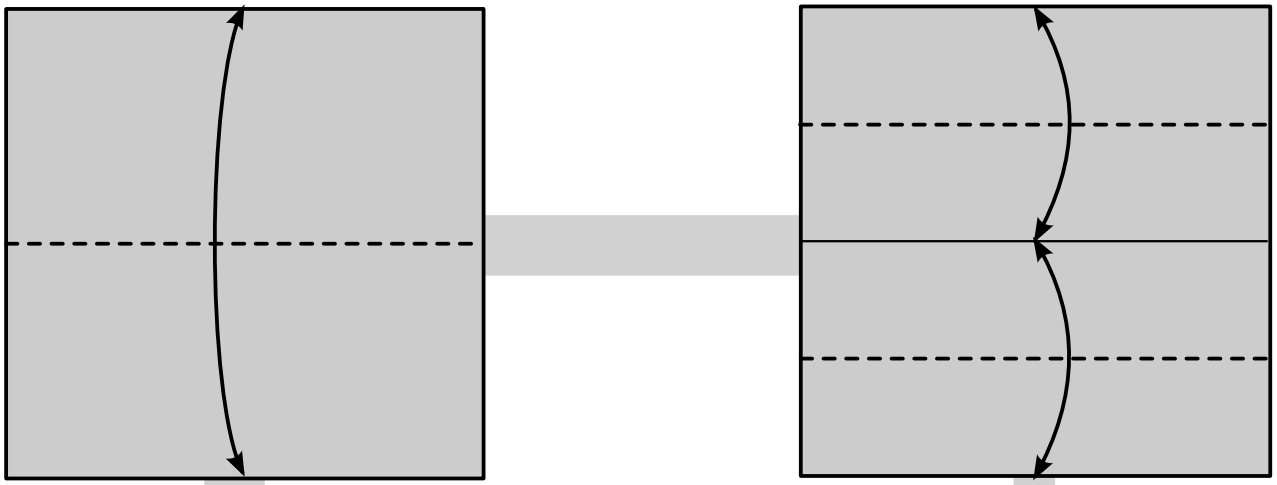
5 - Form another 5 pyramids



6 - Close completely

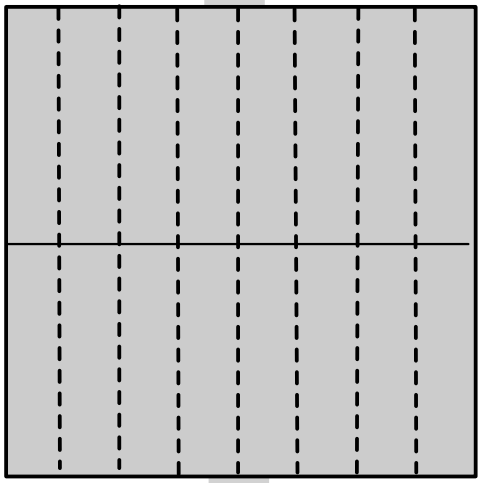
Two views of the end result

Create 1: 2 or 1: 4 rectangles in a square

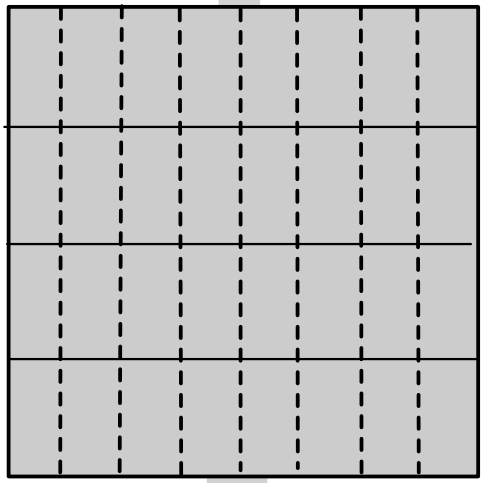


1

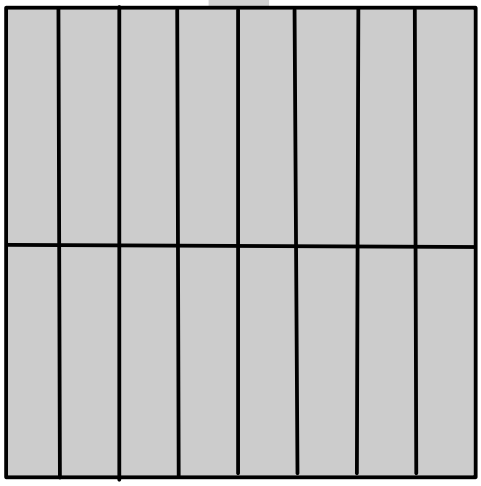
2b



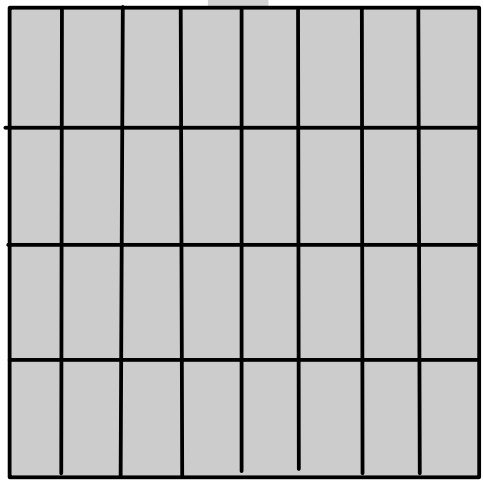
2a - fold into 8, unfold



3b - fold into 8, unfold

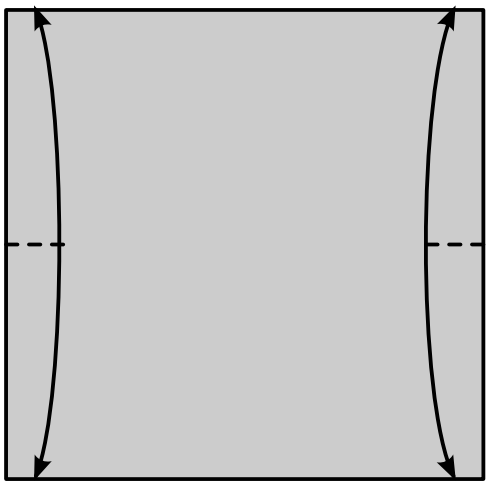


16 modules 1:4

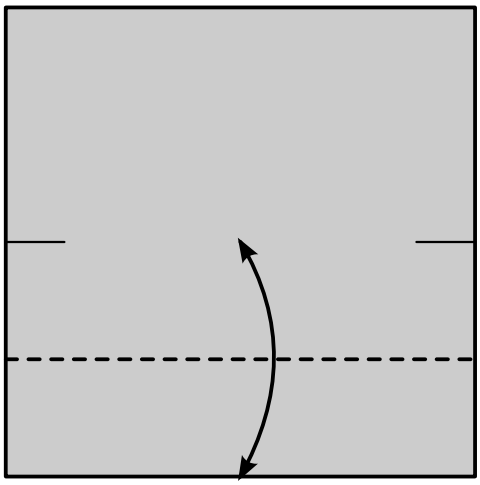


32 modules 1:2

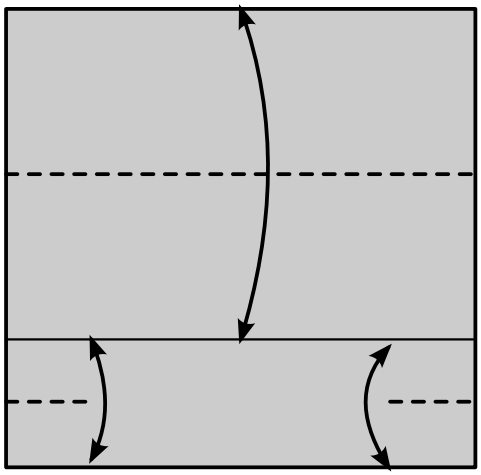
Create 1: 3 rectangles in a square



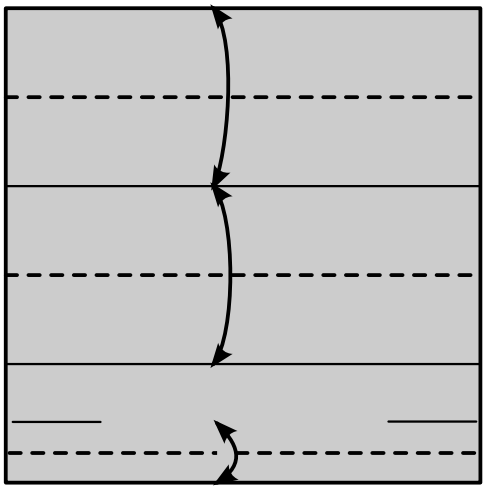
1



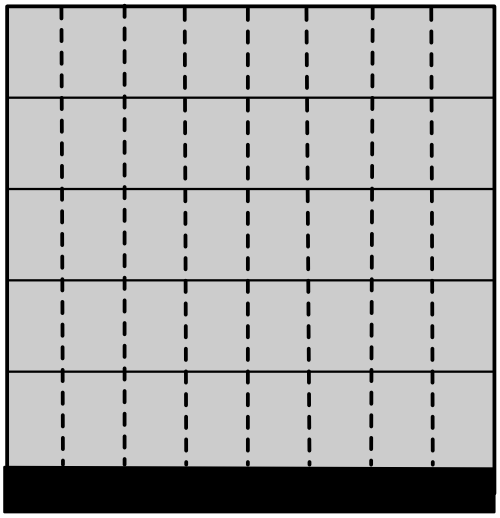
2



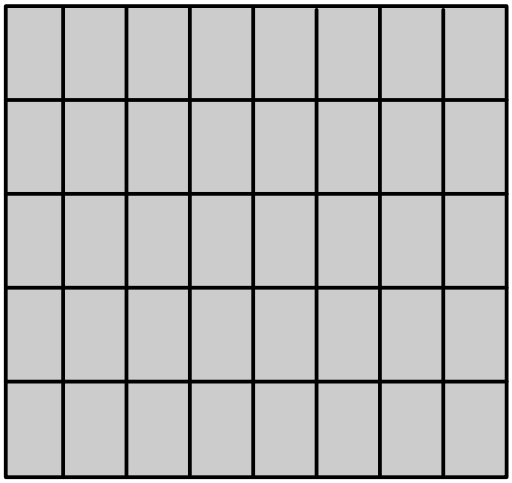
3



4

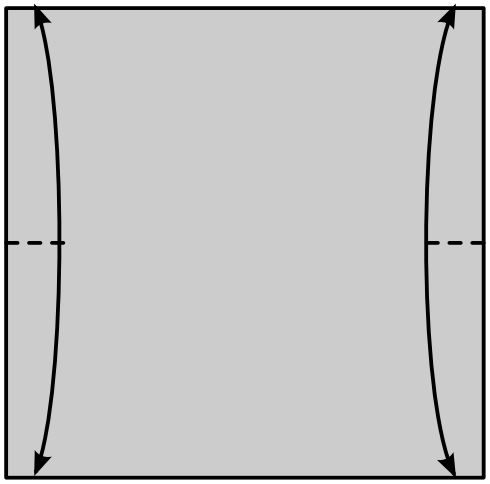


5 - fold into 8 vertically
remove the black part

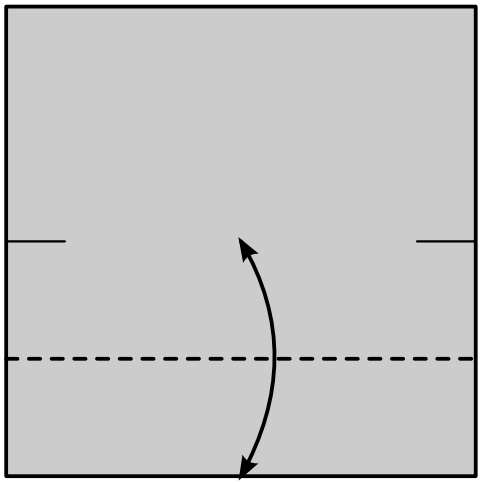


40 modules 1:3

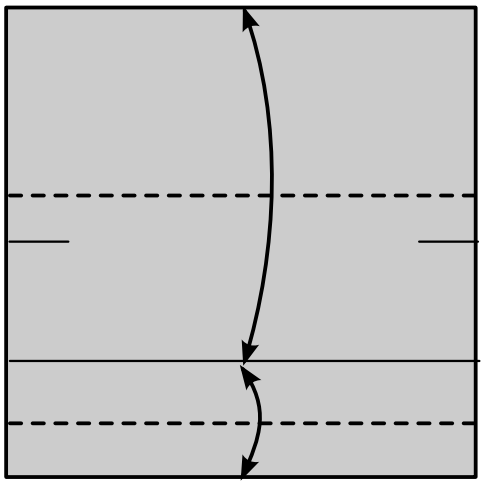
Create 2: 3 rectangles in a square



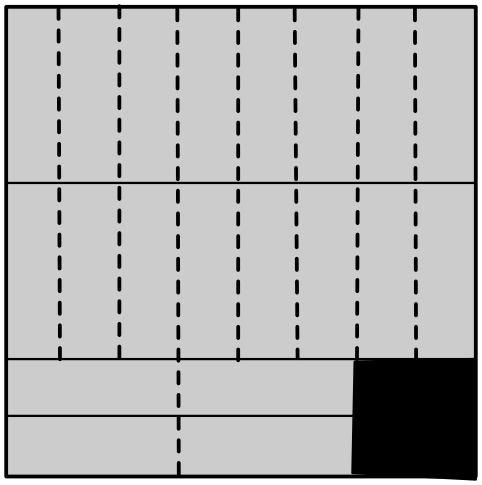
1



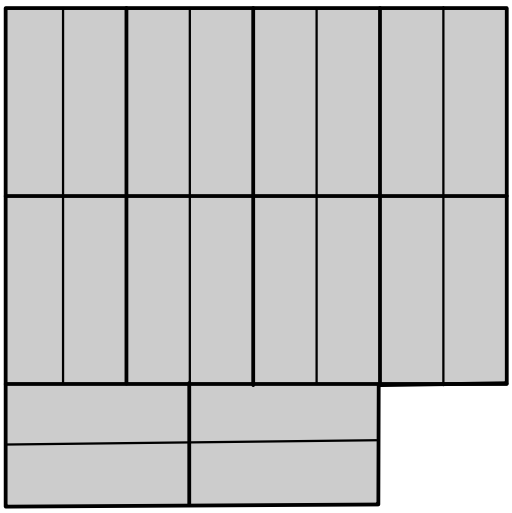
2



3



4 - fold into 8, unfold
remove the black part



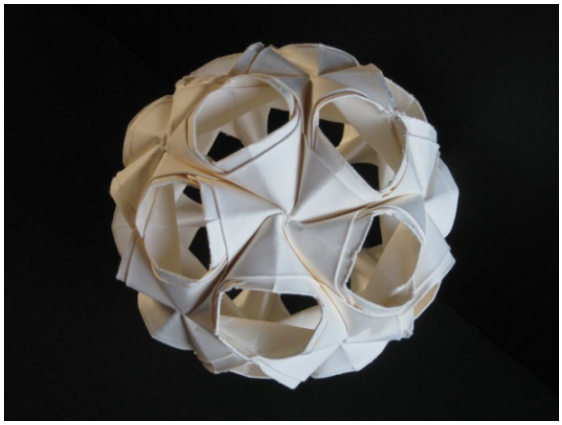
10 modules 2:3
20 modules 1:3

Walk in the land of folding

Warning! the basic modules used in these folds are not Sonobe modules. We can find dozens of others! Look for ...

Tourbillon
design Meenakshi Mukerji

Butterflies - type III
design Tomoko Fuse



Variation on Little Island
design Maria Sinayskaya

Tigra
design Ekaterina Lukasheva

Twirled Ammonit
design Krystyna Burczyk

Bouquet
design F. Koti and V. Young

Tsunagiori style folding

n the book entitled *Hiden Senbazuru Orikata*, Gido Rokoan, a Buddhist priest who lived from 1761 to 1834, describes 49 models of cranes attached to each other by the wings, the beak or any other part of the body. The models are obtained from a single sheet of paper, using more or less elaborate systems of slits. This type of folding, called tsunagiori style (tsunagi: connect, ori: fold), makes it possible to constitute sets of cranes ranging from 2 to 97 in Rokoan's book. In practice, some models allow you to build sets as large as you want, by composing real tables.

Gido Rokoan’s work was to imagine processes for obtaining sets of cranes attached to each other by a system of cutouts from a single sheet of paper. The basic principles of the tsunagiori style are as follows:

- use of a single sheet of paper, square or rectangular, of which no part is deleted,
- use of a cutting system to produce sets of squares (from 2 to 100...), a square which can lead to a traditional crane,
- use of different slot systems, allowing the cranes to be connected by the ends (wings, beak and tail) or by the body.

To do this, we cut out, in a single square or rectangular sheet, squares delimited by slots occupying almost all of the edges. In order to keep all the squares connected, we introduce connection points, that is to say vertices which are not fully released (slots ending a little before the vertex itself). Many variations are possible.

Very important: it is recommended to transfer in each square the outline of folds of the base of the bird (page 78) and to perform a pre-folding of the assembly before making the cuts.

Two generalizations are easy to implement and allow great creativity_:

- use various arrangements, for example combining squares of different sizes,
- use models suitable for this type of assembly. For example, the lily, the casserole dish and the snowman by C. Boudias combine wonderfully well.

For further

G. Rokoan, Hiden Senbazuru Orikata, 1797, 66 pages, facsimile visible and leafable on http://www.origami.gr.jp/Model/Senbazuru/index-e.html

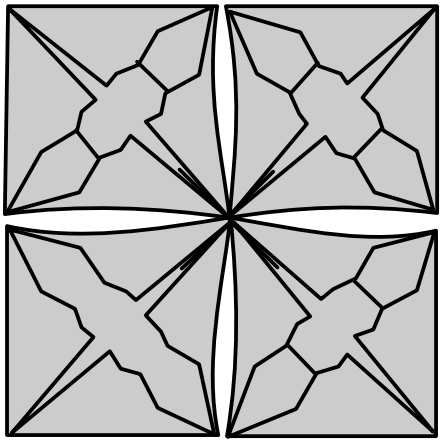
Michie Sahara and Masako Sakai have published two books incorporating all of Gido Rokoan's models, with very clear diagrams. Some models are incredible of invention.

Examples of crane layout

Several parameters are involved:
- the number of cranes and their size,
- the type of slits, depending on whether they are on an edge or inside the sheet,
- the position of the crane,
- connection by beak, tail or wings.

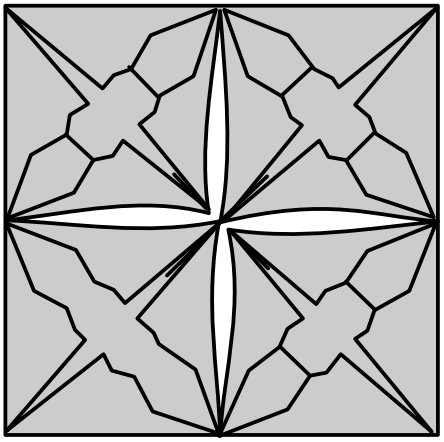
Sazanami - Rippling Waves

4 cranes linked by the beak



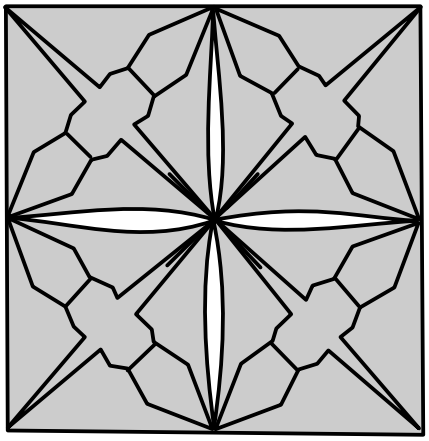
Yottsu No Sode - Four Sleeves

4 cranes linked by the wings,
2 by the beak



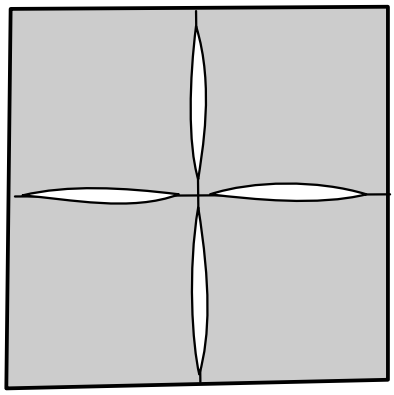
Kazaguruma -The Windmill

4 cranes linked by the wings
and the beaks

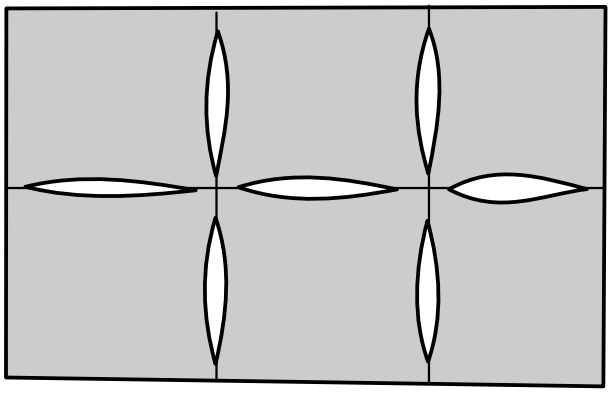


Some layouts try

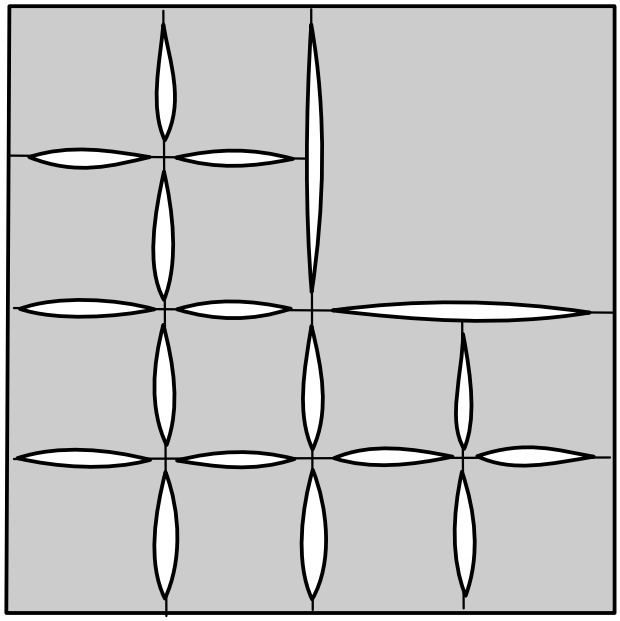
Two tips: don't forget to complete the canvas with the layout of each crane and pre-fold all the folds before making the cuts!



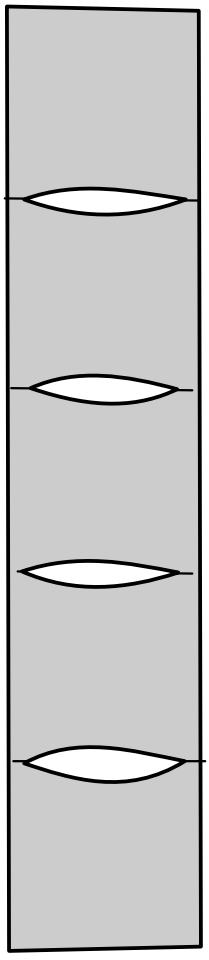
4 cranes
same size



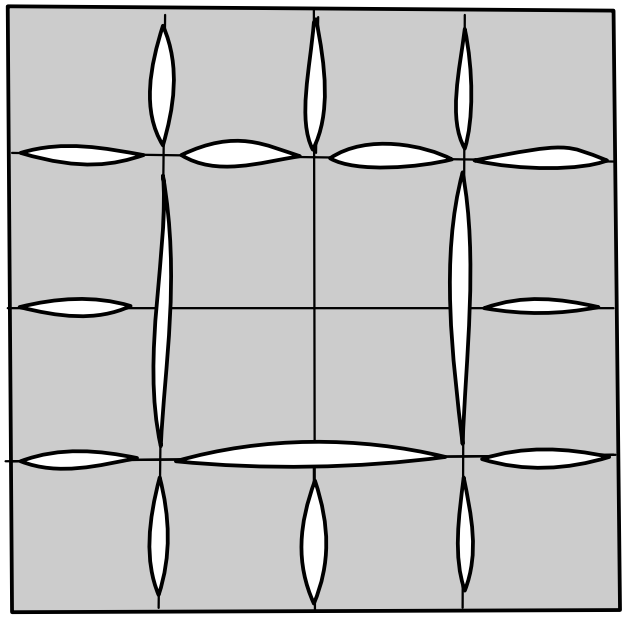
6 cranes
same size



1 large crane
12 small cranes



5 cranes
same size

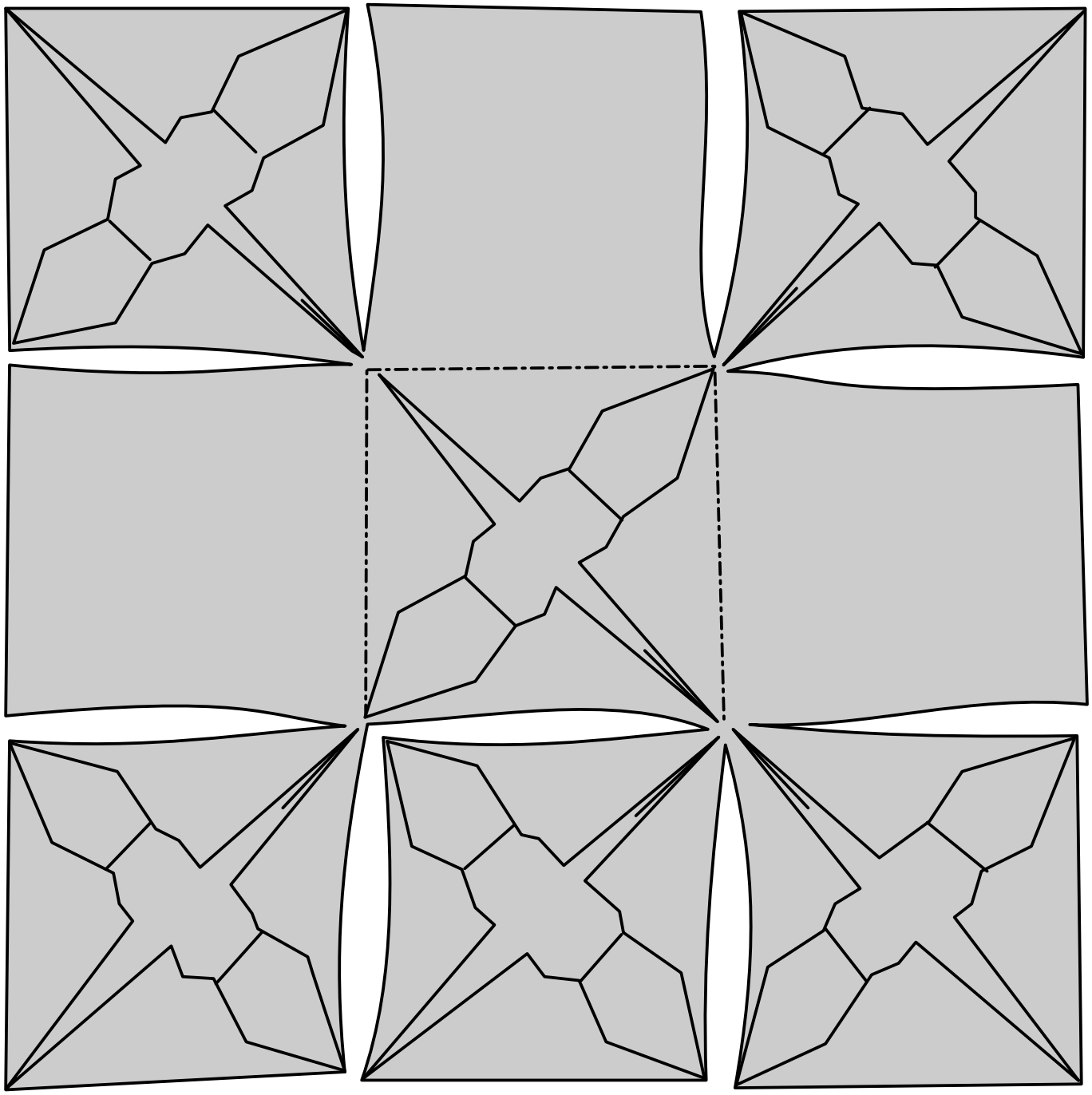


1 large crane
12 small cranes
all connected to
the central crane

★★ One solution, the withdrawal!

You can fold the table below. Pay attention to the slots and the arrangement of the heads.

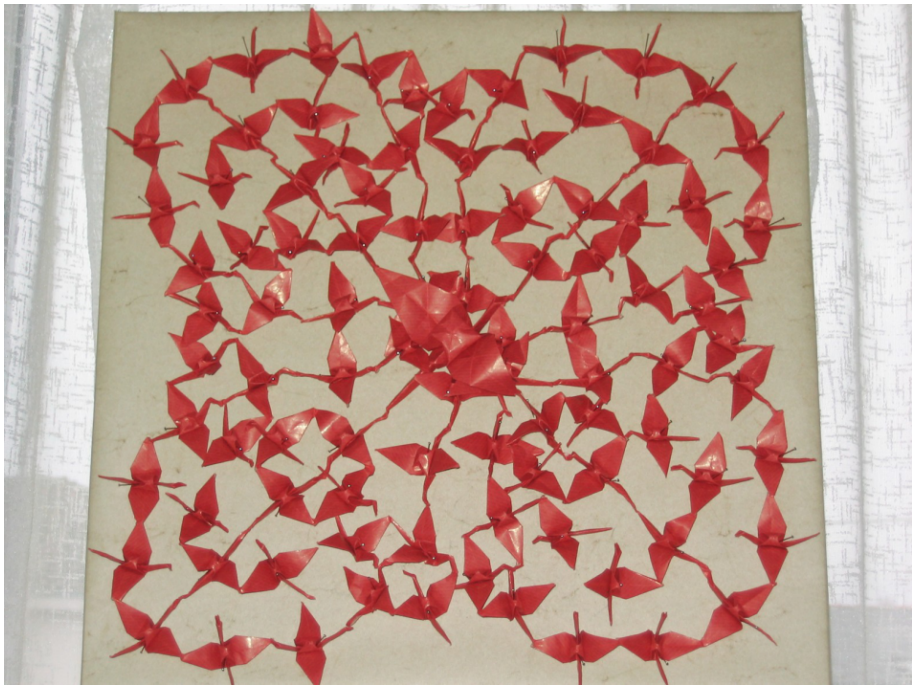
The three mountain folds indicate that the flaps not carrying cranes must be folded back. In the diagram below, the three flaps are folded under the central crane, which gives a certain thickness for folding. Other solutions are possible, by slightly modifying the slit system. Try !



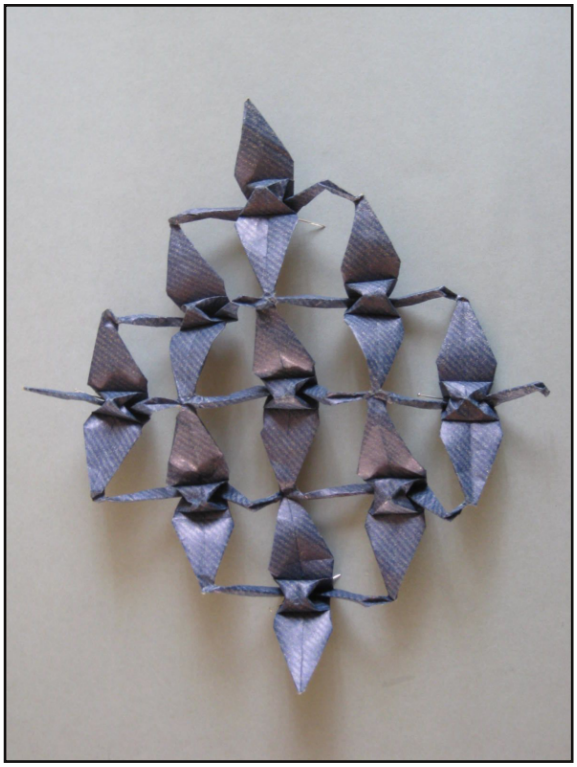
Asagao - Morning Glory
photo page 87

Three great models of Gido Rokoan

They are not necessarily the most difficult to fold, but they are beautiful!



Hyakutsuru
The 100 Cranes



Seikaiha
Blue Ocean Wave

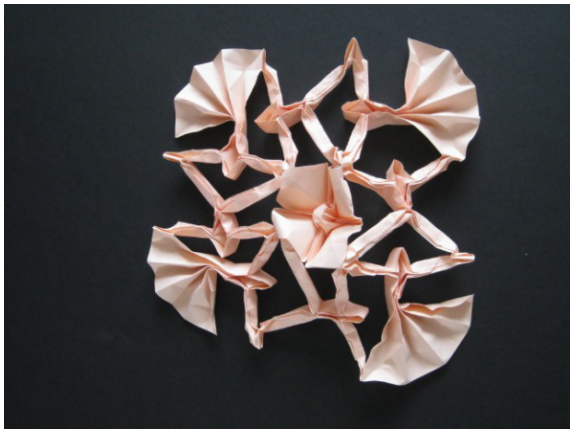
Tsuri Fune
The Fishing Boat

Walk in the land of folding

Some folds in the Rokoan style, with a mix of genres!

Crane carying three lily flowers

Parasailing



Round dance around a flower

Stickman and lily

Pajarita with a flowery heart

First of rope

Introduction to tesselations

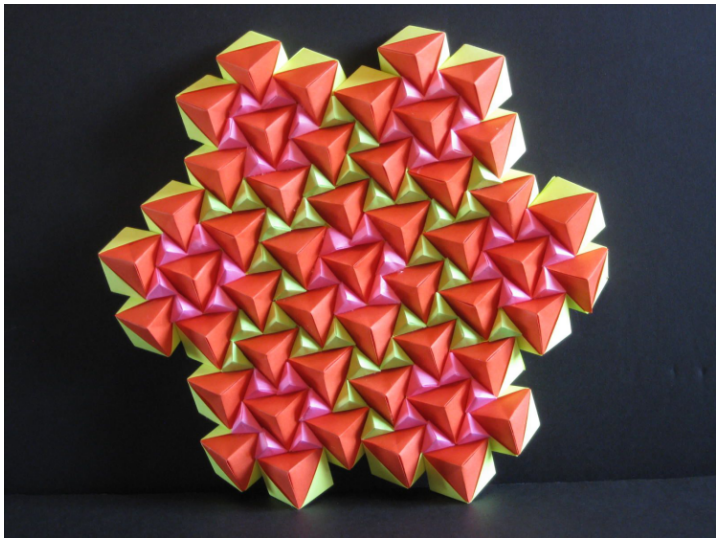
Modular tesselating (French: *pavage modulaire*) has been practiced for a long time in origami, even if it was not known by this name. A typical example is the making of mosaics, with or without gluing, using square, rectangular, triangular or hexagonal tesserae of paper, and so on. Two examples are photographed on this page.

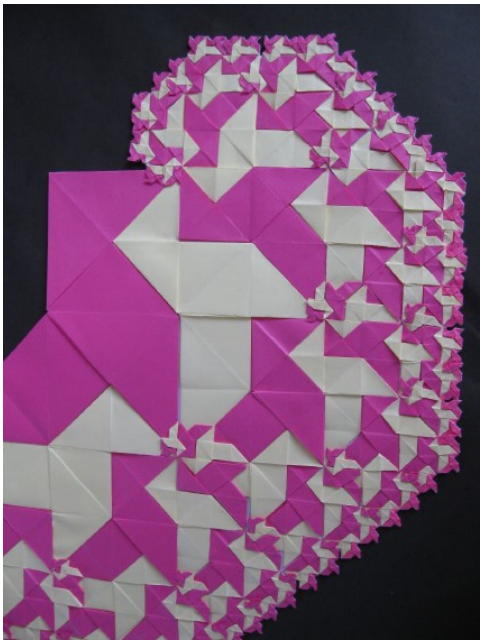
The appearance of the first origami tiling is attributed to Shuzo Fujimoto and Yoshihide Momotani. Made with a single sheet of paper, without gluing or cutting, these tables actually offer two works for the price of one:

- the crease pattern, which forms a tiling in the mathematical and graphic sense of the term. It disappears when folded.
- the result of the actual folding, which forms such an impressive tesselation, upside down and seen in transparency.

The twisting technique (French: *vissage*) is the heart of the realization of the tesselations. It allows you to create patterns that can be repeated endlessly (in theory!), in compositions with regular tiling or not. Master it!

Cubes, design Paolo Bascetta





After 'Cancion de la pajarita', design Assia Brill

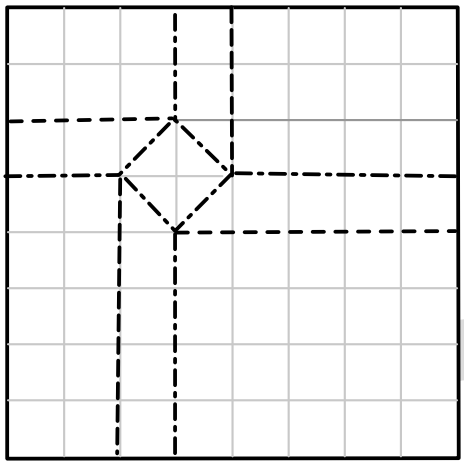
For further

You will find countless achievements by searching the internet with "*origami tesselation*". Also look for the sites of Alessandro Beber, Joel Cooper, Ilan Garibi, Halina Rościszewska-Narloch, Eric Gjerde, Robin Scholtz. Some have published books that are a mine of ideas.

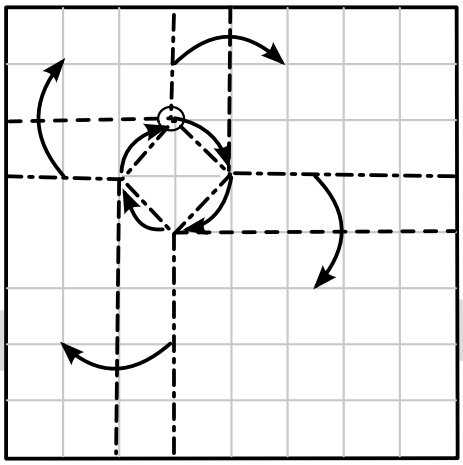
And do not miss the work of Lydia Diard, a great French artist, specialist in tesselations, whose patterns are in 3D. She is the only one in the world to create this type of tesselations.

Twisted Squares, Shuzo Fujimoto

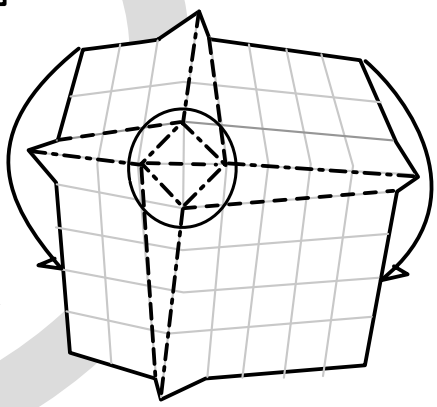
Basic technique highlighted by Shuzo Fujimoto, twisting (French: vissage) is one of the fundamental gestures of tesselations. Very simple in itself, twisting requires acquiring a little knack that must be worked. Persevere!



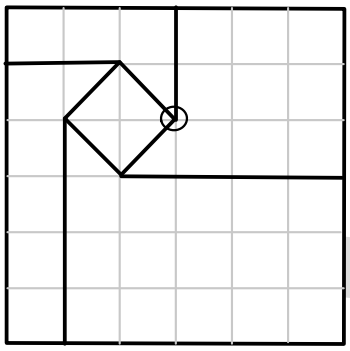
1 - Prepare an 8x8 grid.
Carry over the fold pattern.
Pinch all the creases to make.



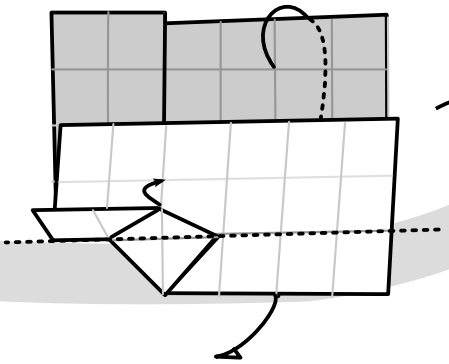
2 - Apply the twist.
Bring the mountain folds on the valley folds.
A small square is formed.



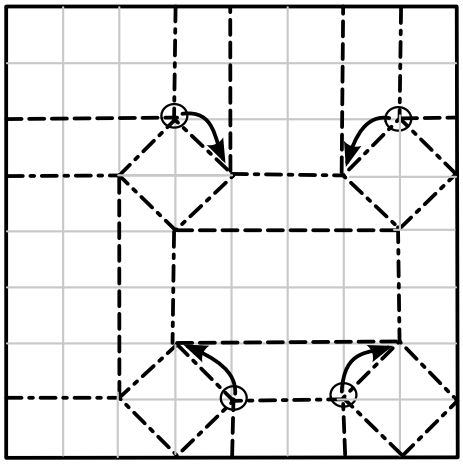
3 - Keep folding the sheet in half.
A new valley fold forms.

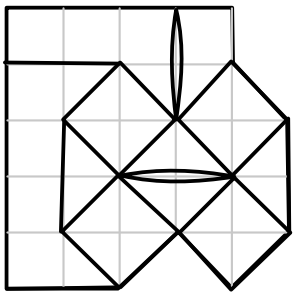


Result of twisting.
Note the movement of the circled point.



4 - Tilt the tip of the triangle backward .
Bring back the back flap forward.





You will now combine four twist connections.

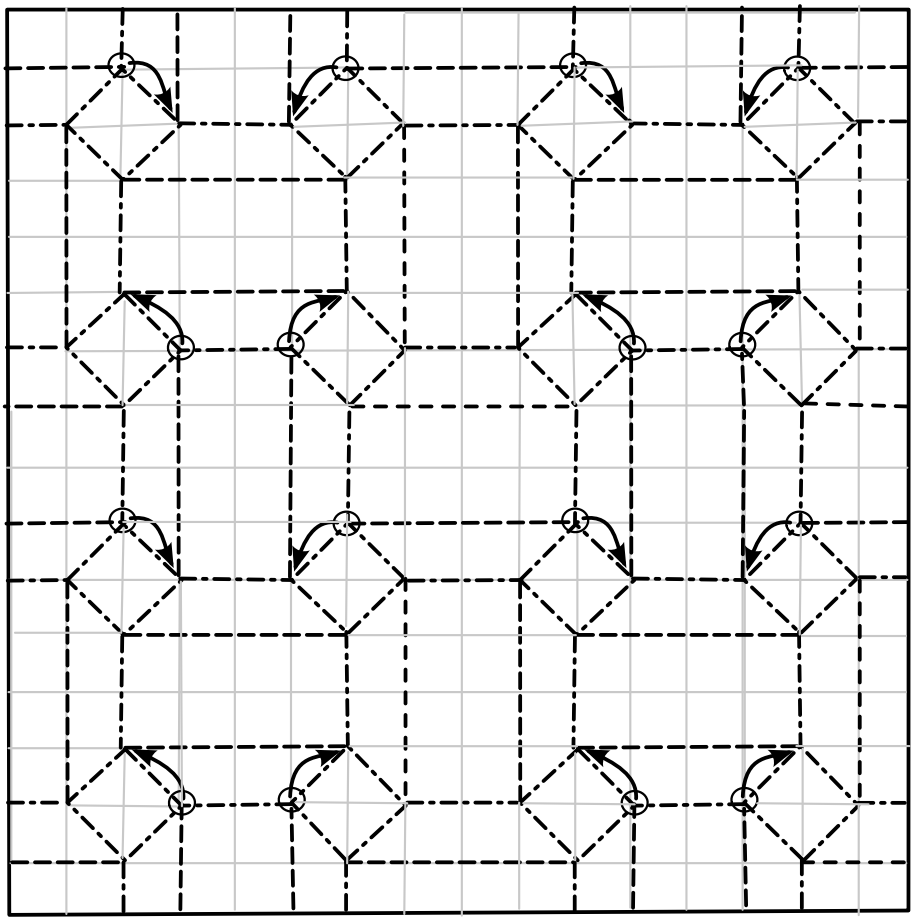
On an 8x8 grid, transfer the opposite crease pattern.
Pinch the valley and mountain folds to do.

Make the twist connections. Carefully follow the movements of the circled points. The direction of rotation varies from point to point.

★★Orthogonal tesselation

Orthogonal tesselations are made using sheets which have been divided in both directions in multiples of 2 (in general). We speak, for example, of 8x8, 16x16 or 32x32 grid. The more the sheet is divided, the more patterns can be repeated. So, courage!

You will find below the pattern of folds allowing to realize a tight paving using the twisting of squares on the previous page. This crease pattern is presented on a 16x16 grid, but nothing prevents you from choosing other grids!



front view, detail
orthogonal grid 32x32
back view, détail

For further

Variations are possible, by playing on the arrangement of the square patterns:
- regular tesselation, but keeping the patterns apart from each other.
  You can, for example, place them at 4, 5, ... units away.
- an irregular tesselation, by removing the patterns from different distances.

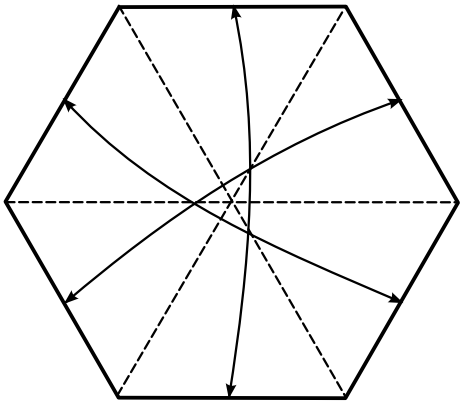
The result is always nice!

Look at these tesselations in transparency. You will be amazed!

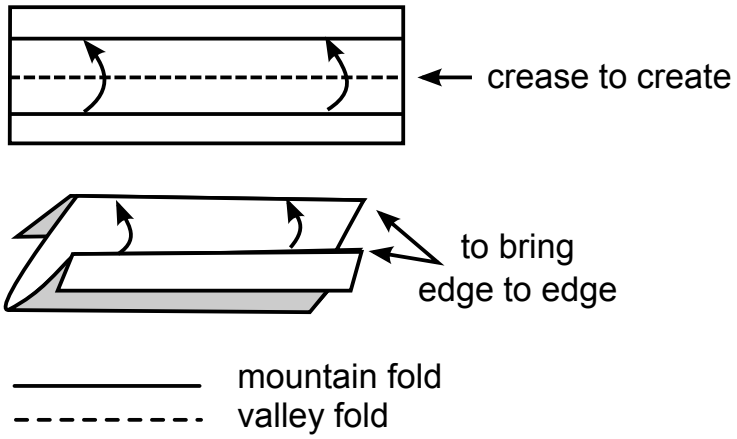
Create a hexagonal grid

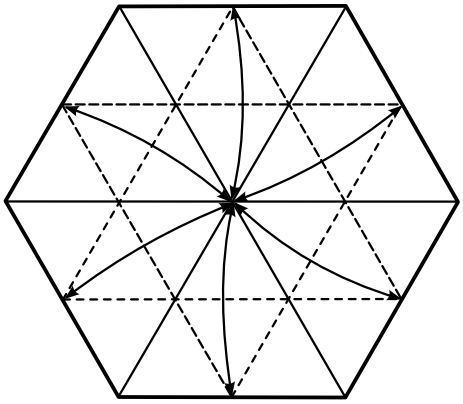
The proposed method consists in creating valley folds by bringing together two consecutive mountain folds. Great folding precision is obtained, but this means that every other fold must be turned over to pass it from valley to mountain. The result is an accordion grid.

Some folders recommend using "neutral" grids, that is to say all of whose folds have been folded once in the valley and once in the mountains.

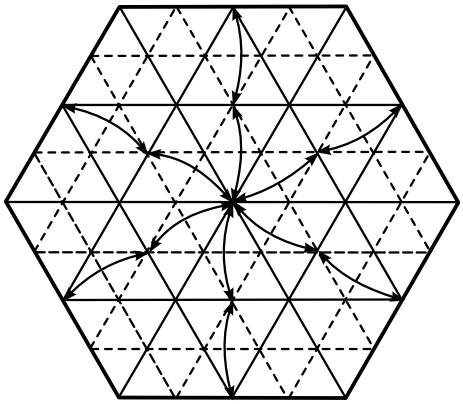


1 - start from an hexagon fold, unfold the diagonals

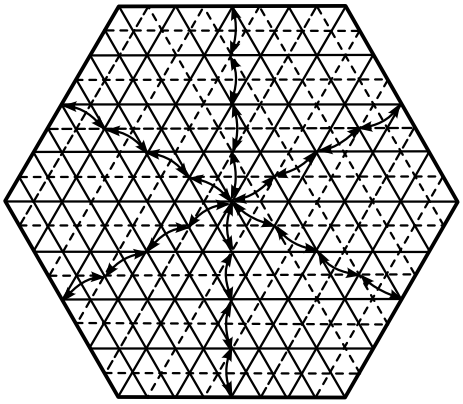




2 - 4x4x4 grid



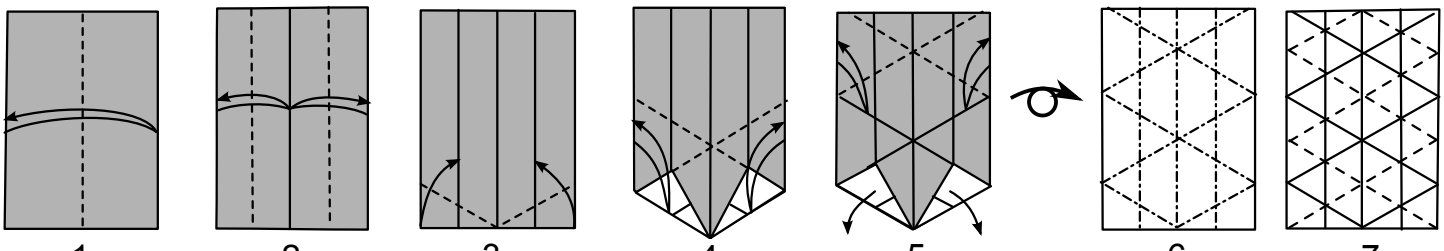
3 - 8x8x8 grid



4 - 16x16x16 grid

Create a hexagonal grid in a rectangle

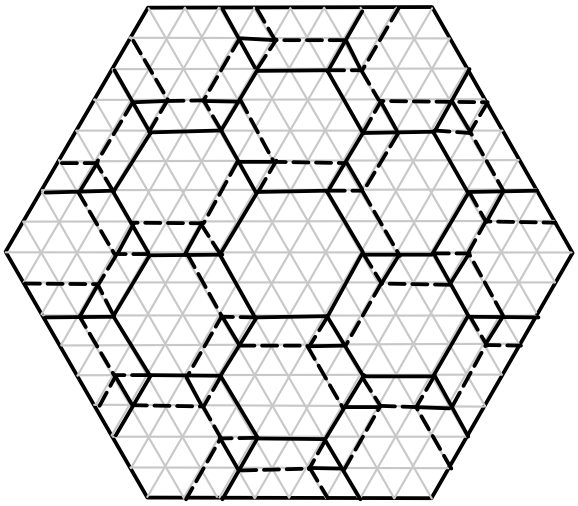
It is not essential to use a regular hexagon to create a hexagonal grid. Starting from a rectangle breaks the symmetries that are too present in a hexagon. You can see an example on page 69.



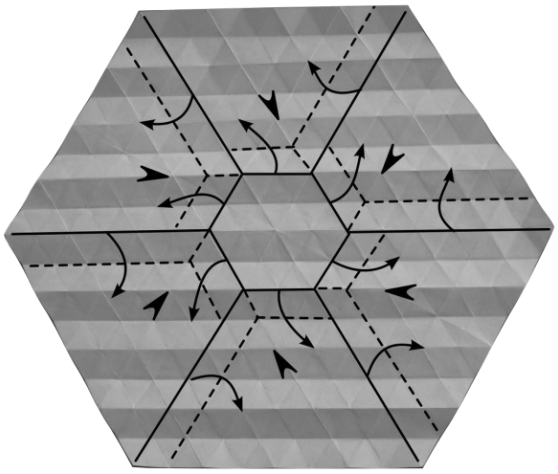
1 2 3 4 5 6 7

Spread Hexagons, Yoshihide Momotani

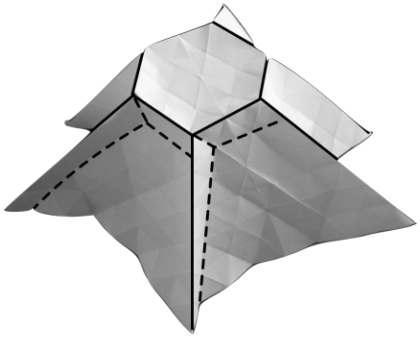
Here is a model of tesselation that is both simple and spectacular. It lends itself to many variations. For your first try, start with a 16x16x16 grid.



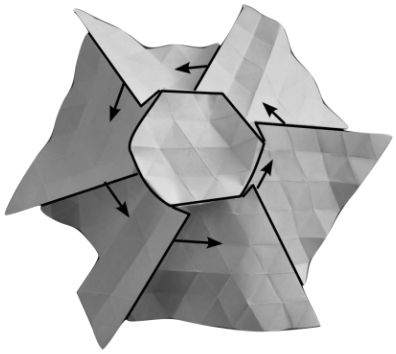
pli montagne
pli vallée



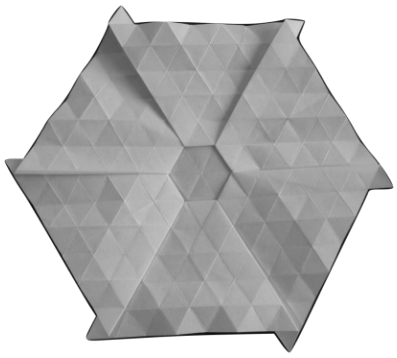
Prepare the valley and mountain folds as shown. Start shaping the hexagon from side 2 by folding the sides down.



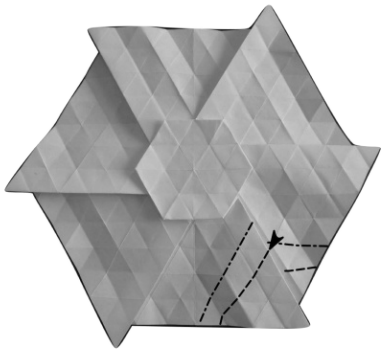
Keep folding down



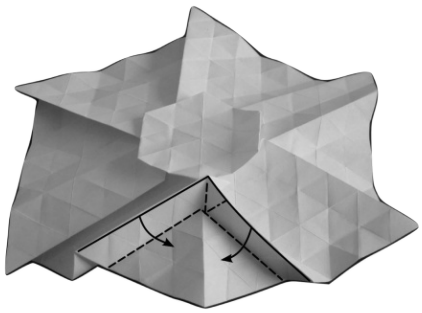
Start flattening the whole



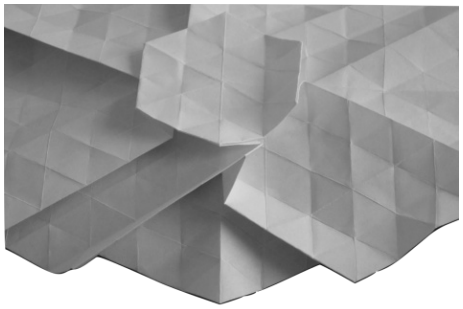
final result front view



Right side, prepare a 120 ° fold to one unit from the edge of the hexagon

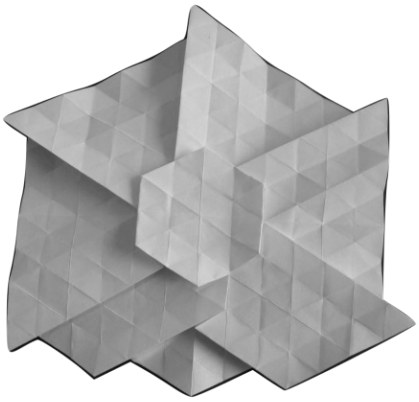


Flatten everything

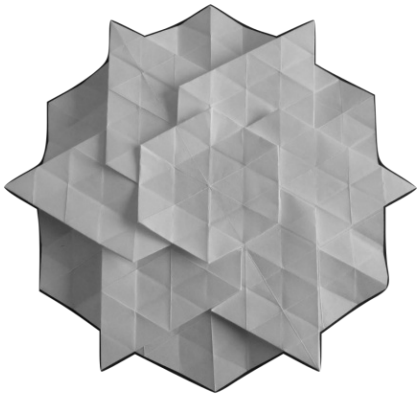


in progress

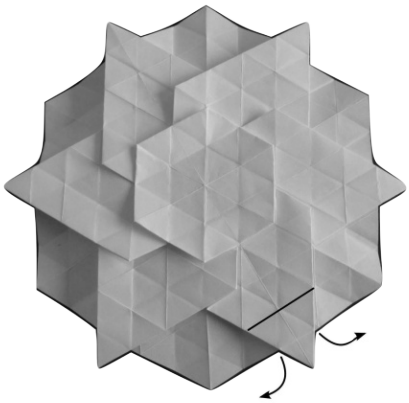
diagram and crease pattern after Eric Gjerde



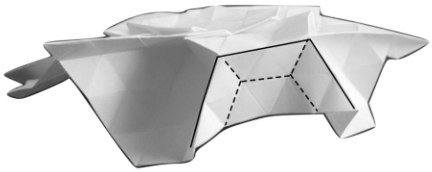
result



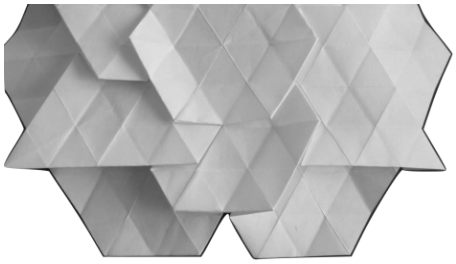
result after the 5 other folds have been processed



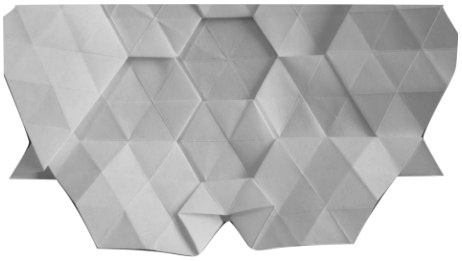
open a point over a width of 2 units



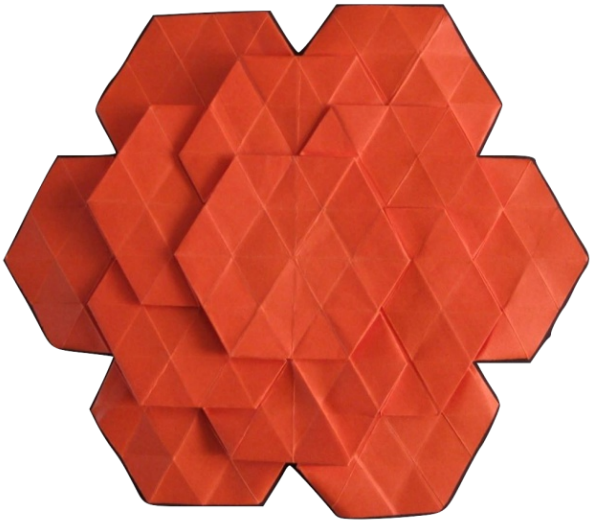
fold back following the valley folds



flatten everything



upside down result start over the other 5 tips



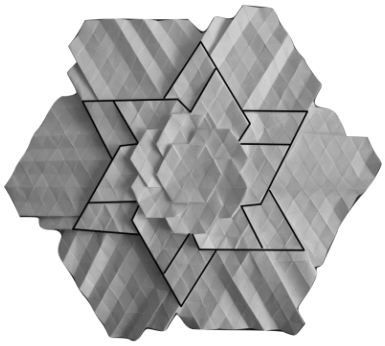
final result front view

final result back view

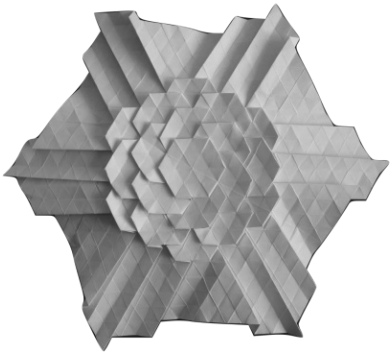
Now try with a 32x32x32 grid.
The crease pattern is given on page 67.

To create the tesselation on a 32x32x32 grid, we apply the techniques seen above: creation of spikes by folds at 120 ° then opening of the spikes.

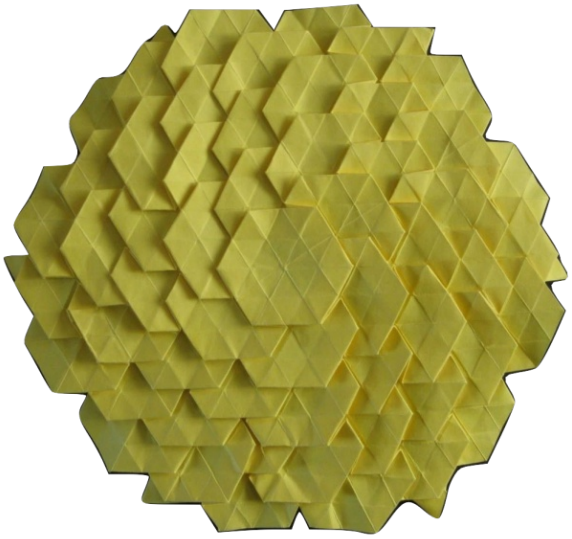
central hexagon
six spikes



twelve points for the next
two rows



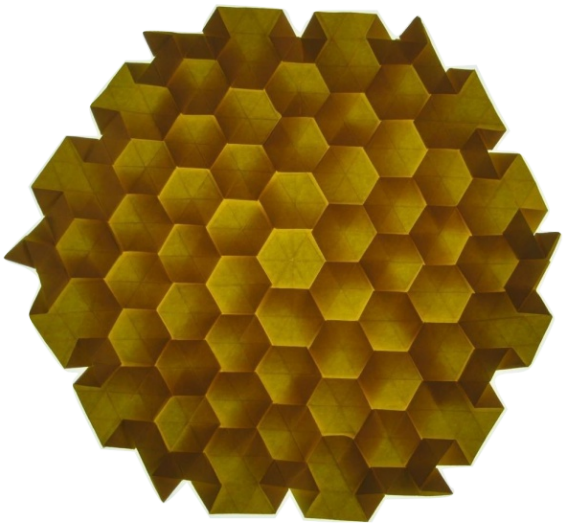
two rows completed



end result, front view

end result, back view

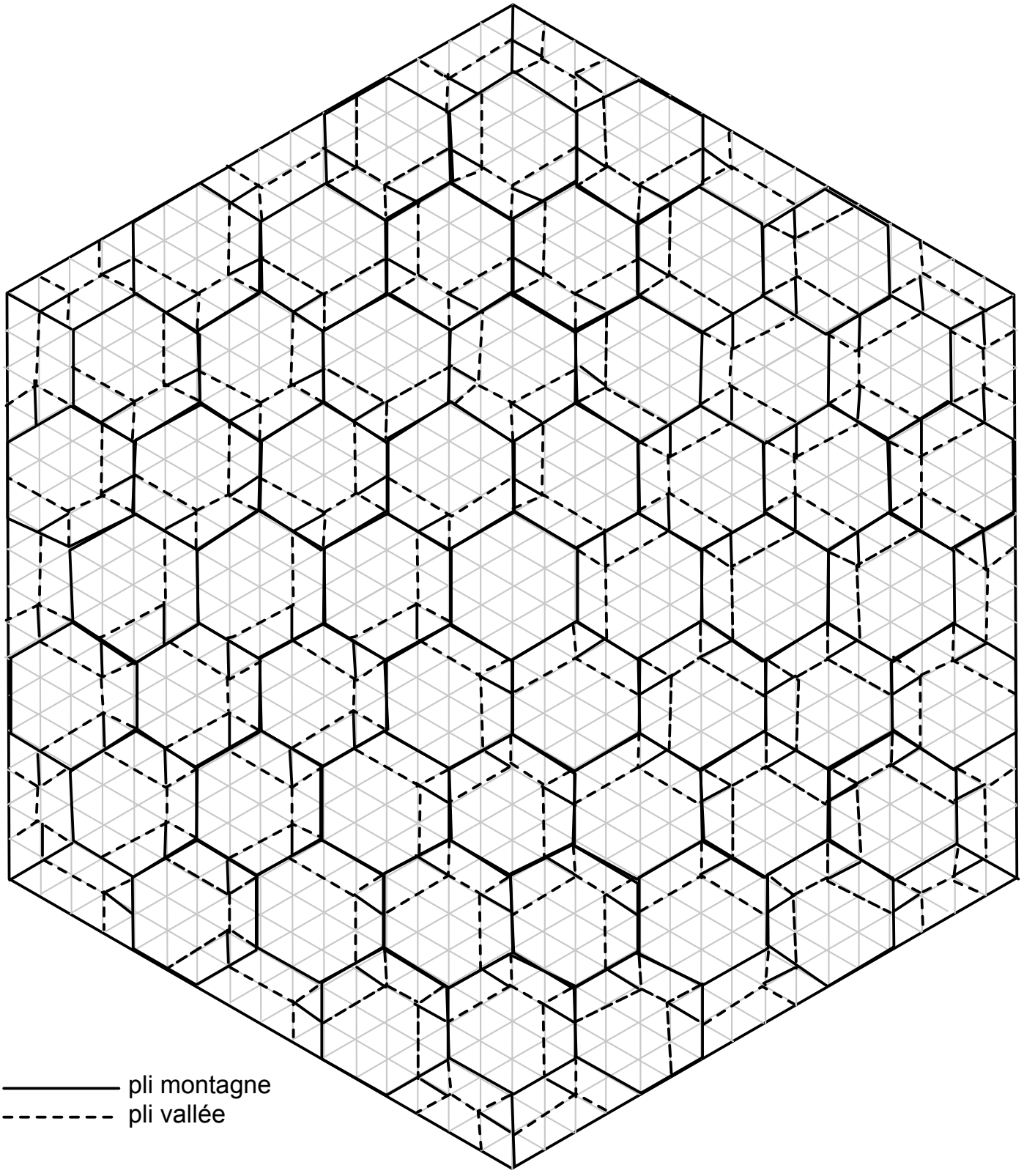
transparency, front view



transparency, back view

Spread Hexagons

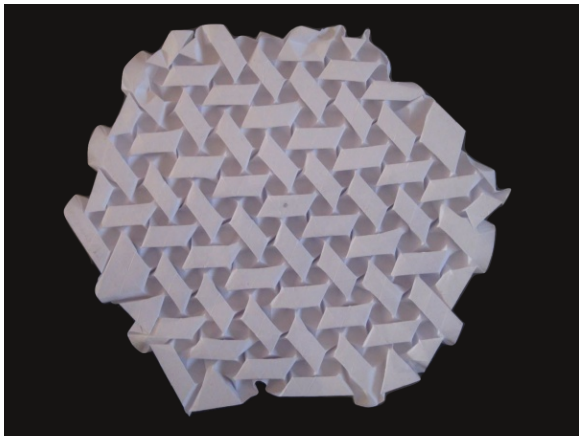
crease pattern, after Eric Gjerde
grid 32x32x32

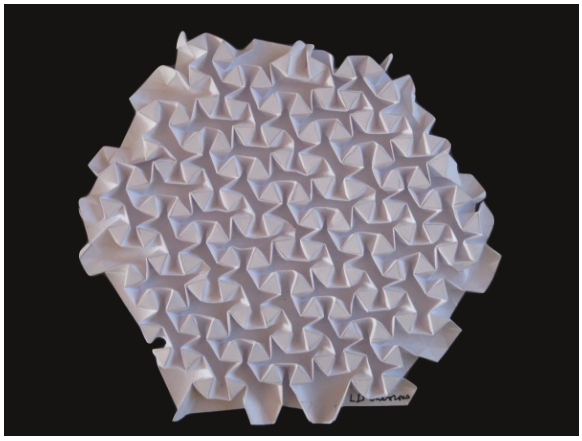


The folds around the edge depend on the finish of the fold

Walk in the land of folding

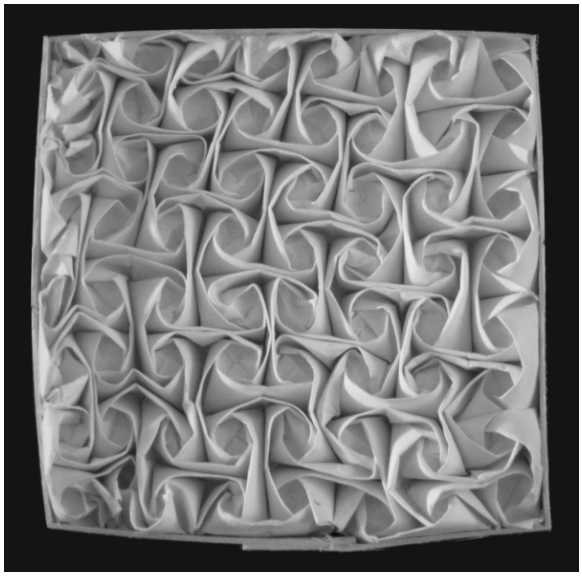
front view



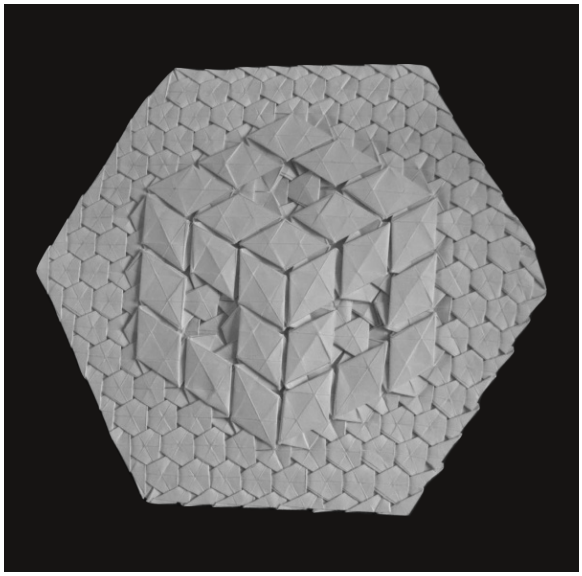


back view

Herringbone Pattern, design Lydia Diard

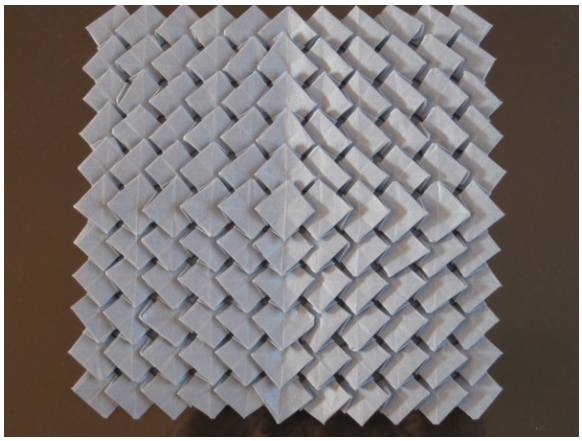


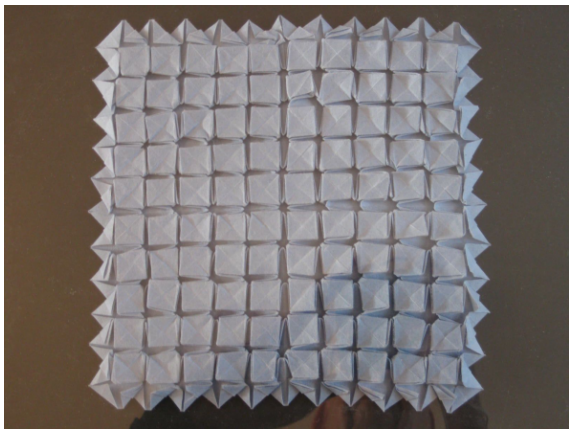
Rose Crystallisation
design Toshikazu Kawasaki



Menger Sponge #1
design Alessandro Beber

front view



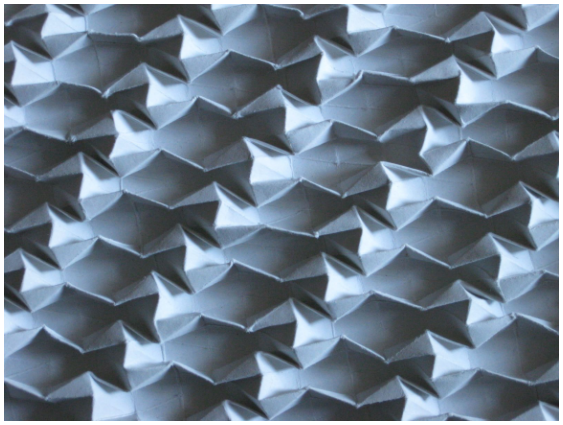


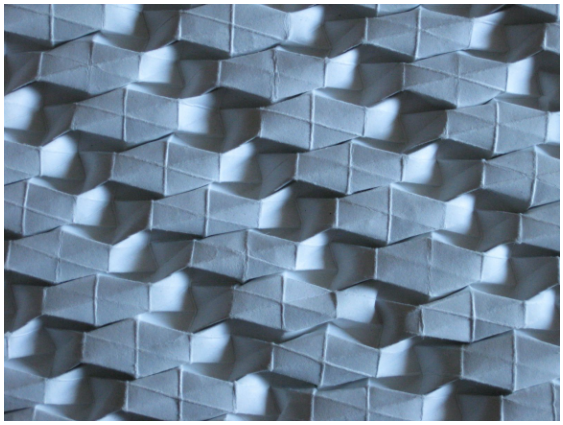
back view

Diagonal Squares, design Shuzo Fujimoto

Three examples of GMOs (Genetically Modified Origami), variants of classic tesselations. Author of diversions: Michel Lucas.

front view

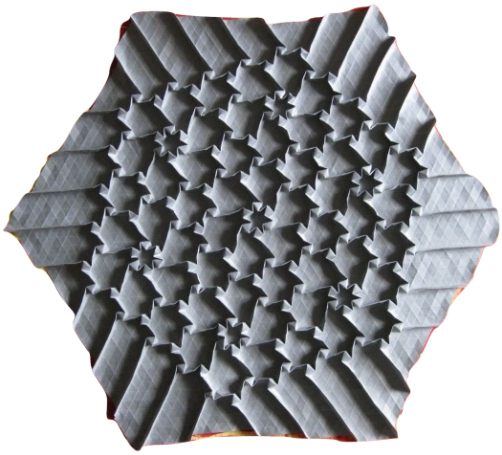


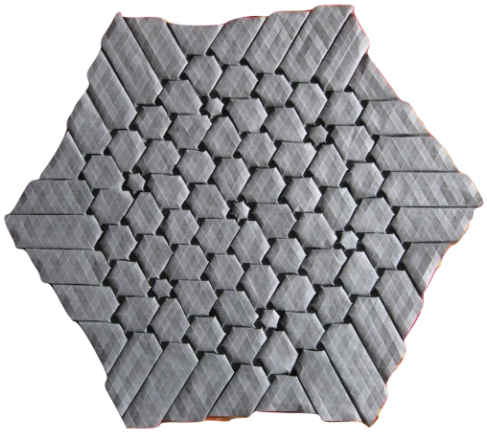


back view

OGM1049-LD-2013-757530
grid 64x64x64, angles 75°x75°x30°

front view





back view

OGM1049-LD-2012a
grid 64x64x64

front view

back view

OGMstarPuff-RK-2010
grid 50x50x70

Crumpling

Resuming and surpassing the work of Paul Jackson, the Frenchman Vincent Floderer has developed, over the past few years, folding techniques from crumpling, pinching and twisting of the paper. These techniques make it possible to create new origami shapes, including flowers, mushrooms, sand roses, trees, corals or sea anemones. If the procedure is relatively simple, the results are very visually stunning. Crumpled origami favors the use of hitherto little-used papers: tissue paper, butcher or bakery wrapping paper, tablecloths, gift wrap or paper towels. An extraordinary world has appeared.

Note: the French origamists invented the word *“froissage”* (English: *crumpling*) to designate this type of folding.

The basic crumpling gesture

The objective of creating a multitude of small folds is obtained by tightening the part to be crumpled and by making a friction movement always in the same direction (no tight round trip) along the part to be treated.

After a few rubs, the crumpled part is opened to rearrange the existing folds. This gesture promotes good distribution of folds in the crumpled area.

Practice with papers of different weights and sizes, such as kraft, tissue paper, or wrapping paper.

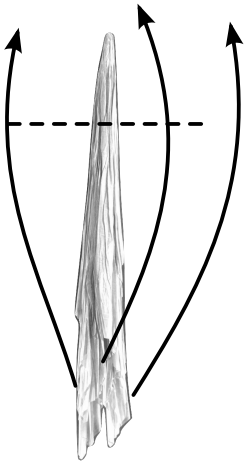
For further

You will easily find many examples of crumpled folding by searching the net with the words "*crumpling origami*". Many videos show how to get beautiful wrinkles.

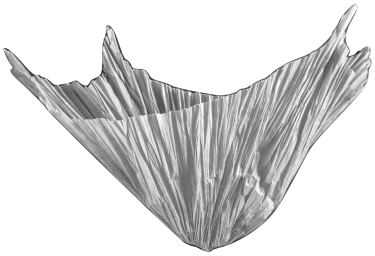
The site http://www.le-crimp.org of the International Research Center for Folding Modeling (CRIMP), in addition to magnificent photos, gives the list of its members. Hours of hunting for beautiful photos in perspective!

Crumpling a flower

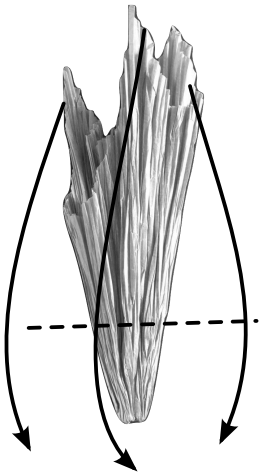
Warning! the thumbnails are not on the same scale!



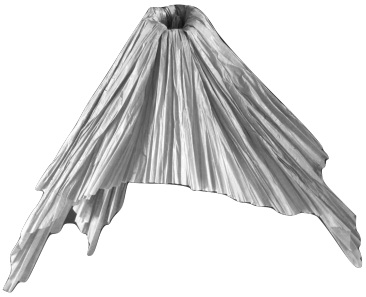
1 - start from a crumpled base that you flip like a glove



2 - crumple strongly



3 - return as a glove



4 - crumple strongly

5 - return as a glove

6 - **optional**! tighten with a link

7 - crumple strongly

8 - **optionnel** half open for crumple the corolla

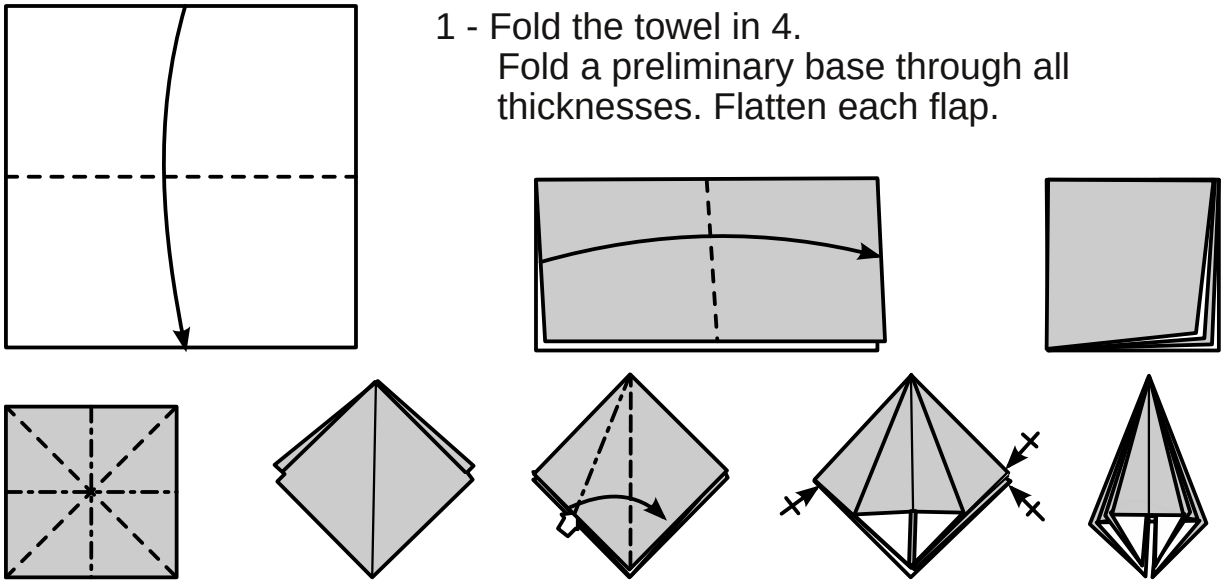
9 - get in shape the corolla and the chalice

A basis for endless variations. To fold without restraint!

Use thin papers, such as tissue paper, light kraft, butcher paper.

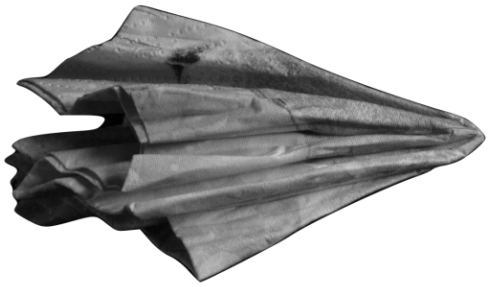
Crumpling a paper towel

The following folding is the basis of many crumpled creations. The principle is very simple, and encourages to make many tests, with any paper.



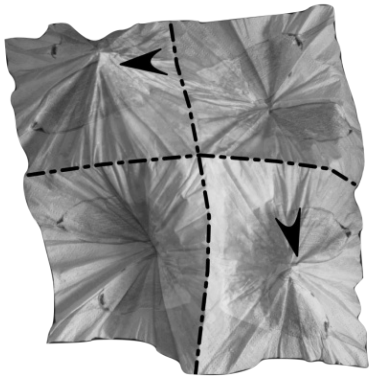
1 - Fold the towel in 4.
Fold a preliminary base through all thicknesses. Flatten each flap.

2 - Tighten strongly, open a little, crumple. Repeat several times.

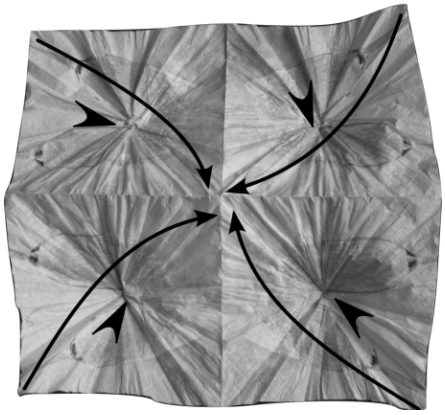


Result

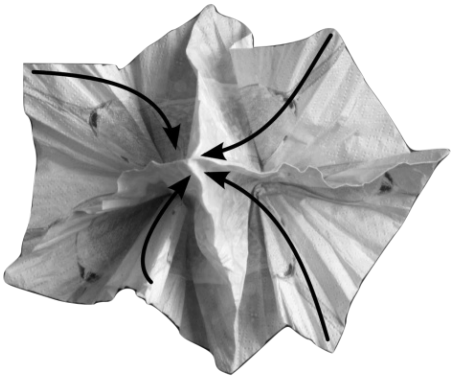
3 - Open without flattening



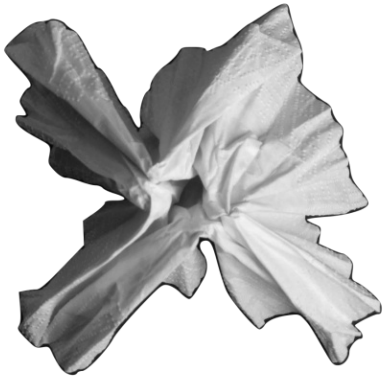
4 - Mountain pinch the separation folds.



5 - bring the points closer together while digging the pockets



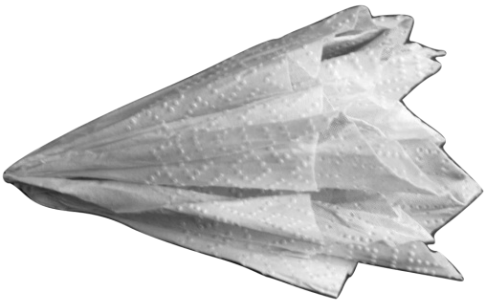
Nearly spaced tips



Bottom view

6 - Tighten, crumple

7 - Open a little
Reform the mountain folds



8 - Tighten, crumple...

And There you go!

Always stronger

This process, popularized by Vincent Floderer, can be generalized.

Use large sheets (tissue paper, paper tablecloths) and produce checkerboards of 4x4 boxes (or more). Several examples are given on page 74.

Walk in the land of folding

8 flowers
silk paper

16 flowers
paper tablecloth

Crmpled flower
kraft paper

a thousand folds
butcher paper

crumpling in transparency
woven paper

Boarding School
paper tablecloth

Folding books

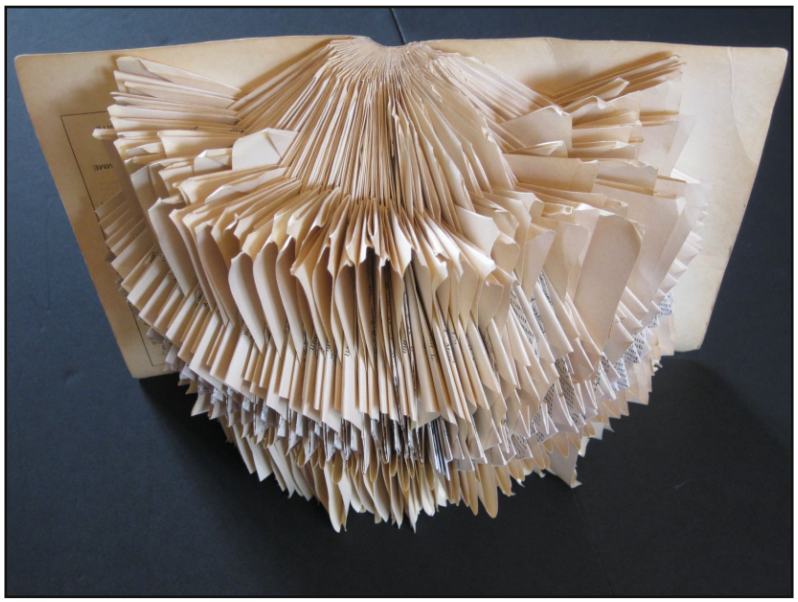
Who has not seen hedgehogs made from books at school or retirement homes? It is a fun and friendly activity, but it hides the tree of creations made by folding the pages of books.

Indeed, real works of art created by great artists can be found on the internet. Books ready to fold are starting to appear in bookstores. So why not give a second life to books you will no longer read? Folding a book takes creativity, time, care, but the result makes an unexpected and surprising gift.

This area of paper folding has still been little explored. However, the basic principles are very simple:

- give a shape (shapes) to each page (a rectangle in general), playing with the constraint of the fixed edge. It is a matter of a few folds.
- draw a visual landscape using all the folded pages.

Finally, the difficulty of folding books is not so much in technique as in the inventiveness and creativity of the origamist. Then you can do it!



For further

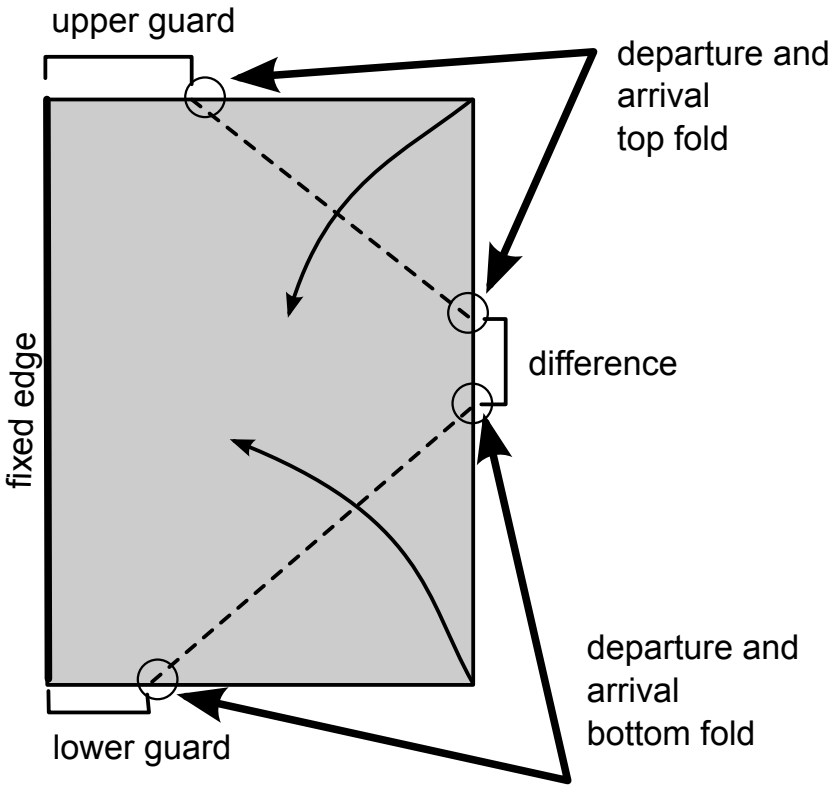
The pioneer in the field is Brig Laugier. In Google, search for "*Brig Laugier*", then click on "*images*".

We can easily find other examples on the internet with the keywords "*folded books*". Some are amazing to watch!

A book on making folded books, "*How to Make Folded Books*", by Heather Eddy, is available on the internet. Many videos show how to do this. Watch Hanny Trompke's technical lesson.

Folding a page

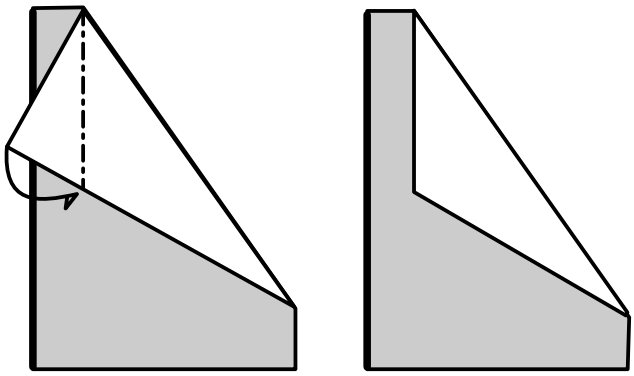
Here are some things about folding a single page. The folds can be valley or mountain. Your choice is part of the aesthetic possibilities.

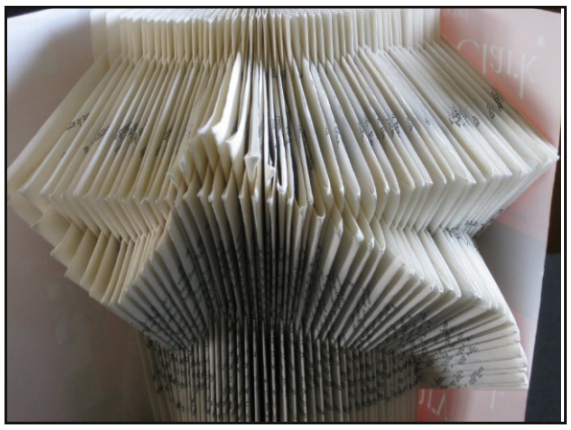


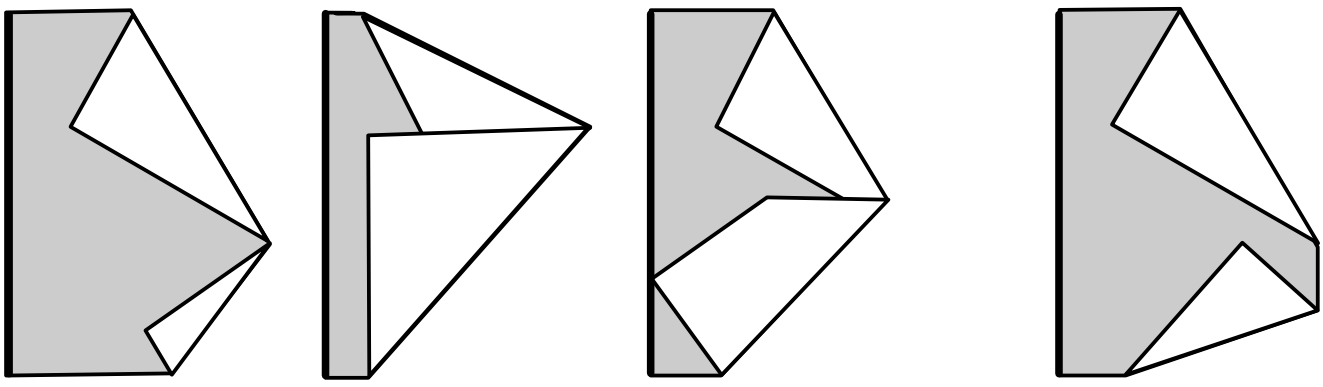
- there are not necessarily two folds

- the guards can be fixed or variable. The smaller a guard, the more difficult it is to properly fold the page at the starting points.

- the difference between the points of arrival of the folds represents the distance between the outlets along the edge. We speak of "*point closed*" if the distance is zero, "*point open*" if the distance is not zero.





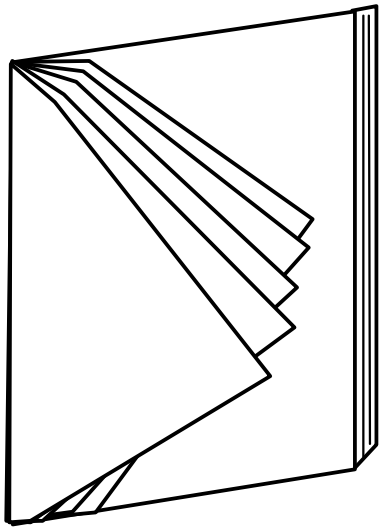


Folding a set of pages

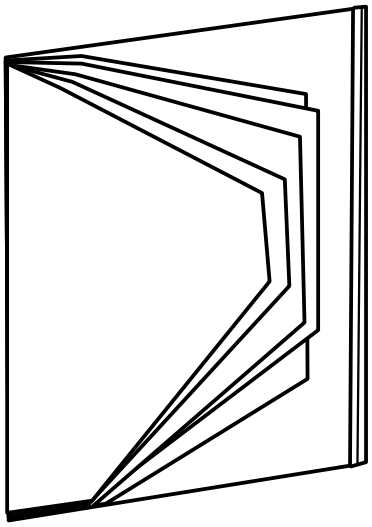
It is the folding of all the pages of the book that will form the visual landscape.

We will have to manage the drawings formed by the points of the successive pages:

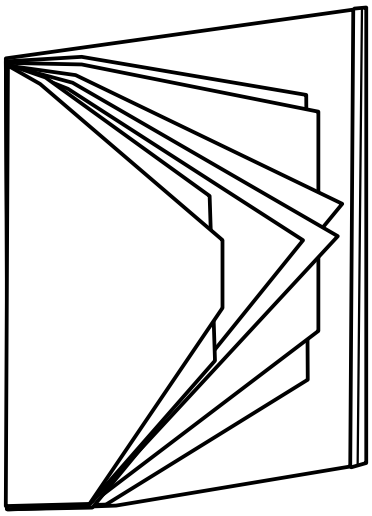
- the closed points will form lines,
- the open points will make it possible to form "*surfaces*",
- it will suffice to mix the patterns to obtain a beautiful image.



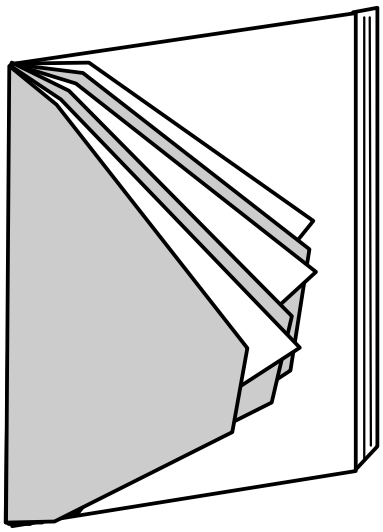
close points series



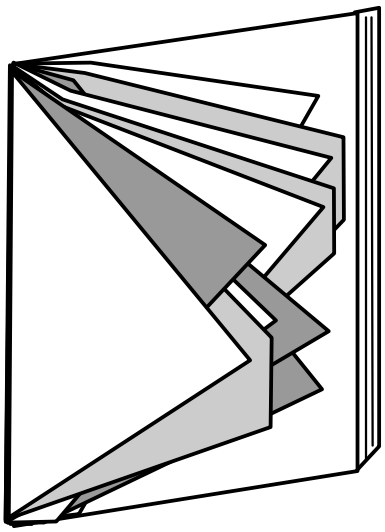
open points series



mixed points series



two series system

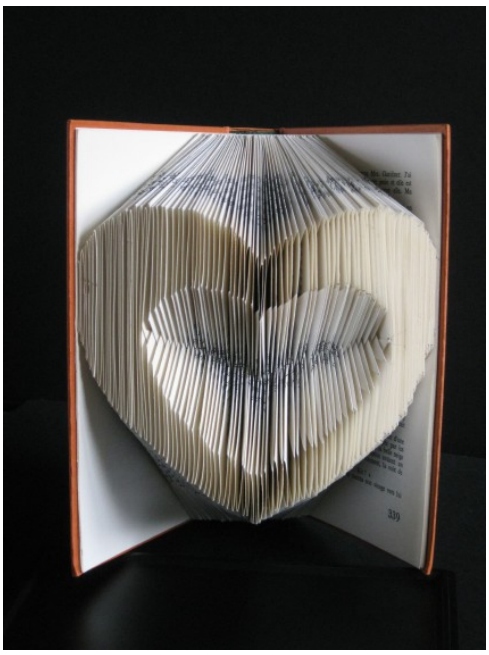


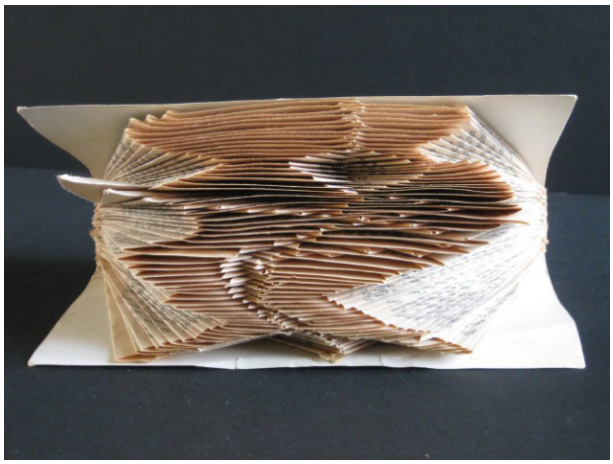
three series system

To create landscapes, use a series of spikes. A series is used to create a pattern (continuous line, surface, ...). Just fold one page per series and start again until the end of the book. For example, to manage three series, we will use groups of three pages to gradually form the pattern.

Walk in the land of folding

Some examples of folding books. There is space for your creativity!





Notion of crease pattern

The invention of diagrams brought about a revolution in the world of paper folding. For years, the diagram has been the only way to describe how to fold, apart from photo-diagrams or videos. Considerable progress has been made in the area of drawing diagrams:

- highlighting the importance of the folding sequence,
- development of an internationally recognized solfege of folding machines,
- transition from drawing by hand to drawing assisted by computer.

It quickly became apparent that making diagrams required a lot of time and care, and some creators began to leave the diagrams of their models to others than themselves, preferring to devote all their time to creation.

Furthermore, the progress made in mastering folding techniques (in particular accordion folding) and the growing number of seasoned folders and folders have led to the appearance of what have been called **crease patterns**. (French: *canevas de plis*, CP). A crease pattern is the drawing (not always exhaustive) of the valley and mountain folds to be made in order to go from the blank sheet to a given stage of folding. It is sometimes the only document describing a complete folding. For example, the tesselations are all described by a crease pattern. It only remains to find the folding sequence! Solving a complex crease pattern is a classic test of the International Origami Olympiad by Internet (IOIO).

Relatively reserved for connoisseurs at its beginnings, the crease pattern quickly became a tool for designing models, analyzing the general structure of a fold (location of points, for example). Aid software for drawing crease patterns, capable of verifying whether the drawing corresponds to a foldable model, and, sometimes, of showing the result of folding have been made available to the creators. It is fascinating to listen, during meetings of origamists, people debate the elegance of a crease pattern or the improvement of such or such point of the structure by studying the projection on the big screen of a crease pattern with hundreds of lines!

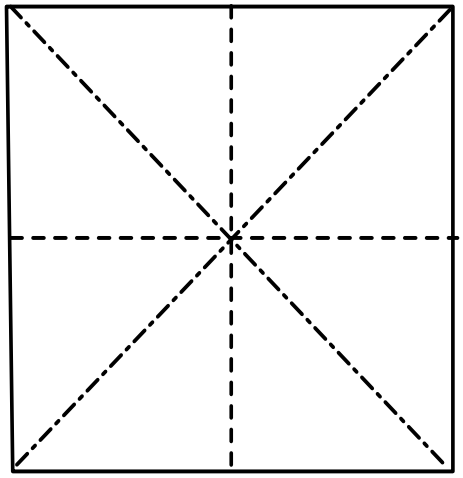
Solving a crease pattern generally goes through the following steps:

- making a grid,
- pre-folding of valley and mountain folds,
- progressive folding of the crease pattern.

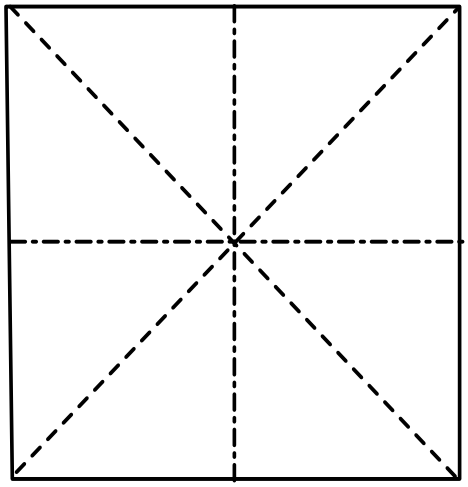
Once this is completed (sometimes a few hours ...), it only remains to do the shaping and modeling. But we can start more modestly! In the following pages, you will find the crease patterns of some traditional bases. Knowing how to recognize them at a glance saves time for understanding a fold. You will then find the crease patterns of some models presented in this book. Try! Persevere! You can do it!

Crease pattern of traditional bases

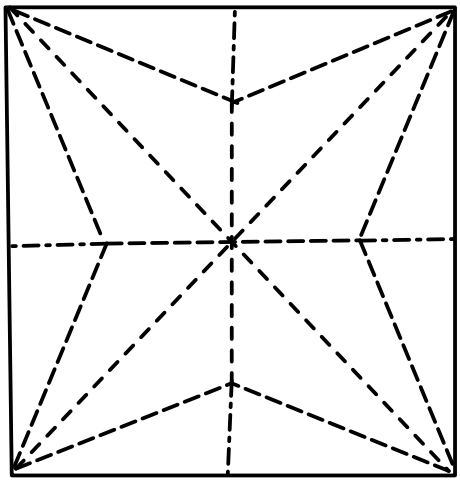
Below are the most common base crease patterns. Each crease pattern is accompanied by a number identifying the page containing the base described. To identify this base, start folding the mountain folds of the canvas, then gradually complete with the valley folds.



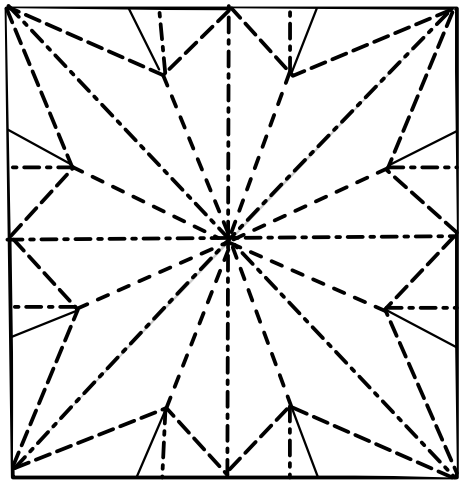
page 10



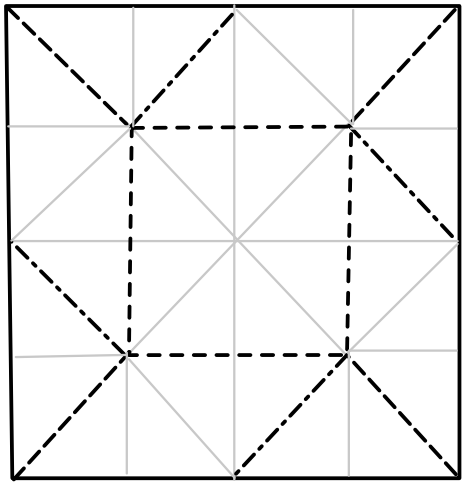
page 11



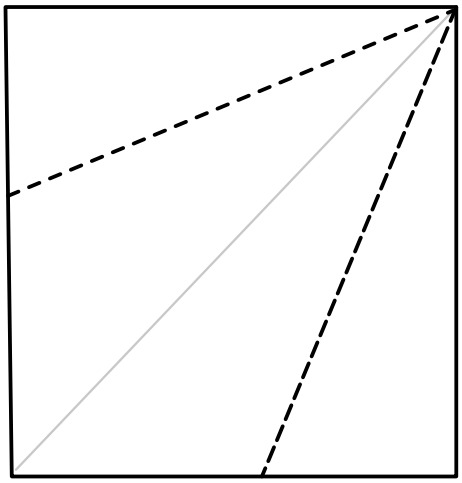
page 11



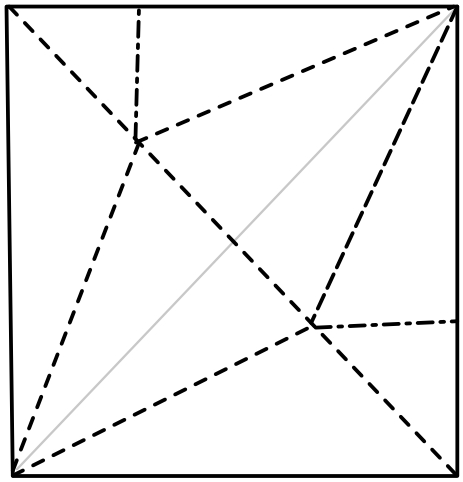
page 11



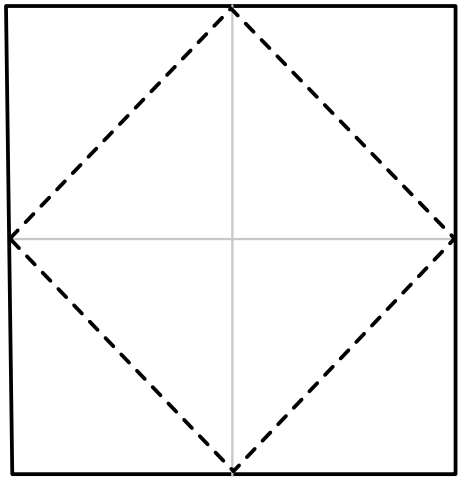
windmill base



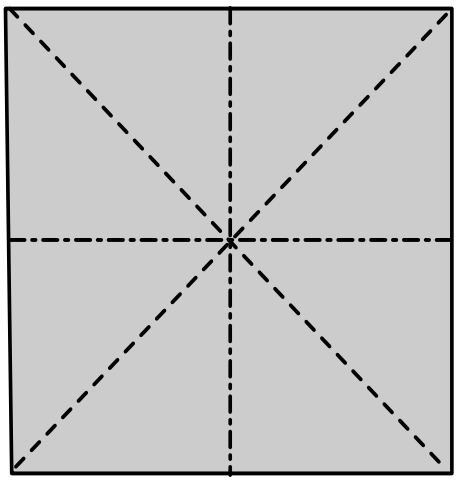
kite base



fish base



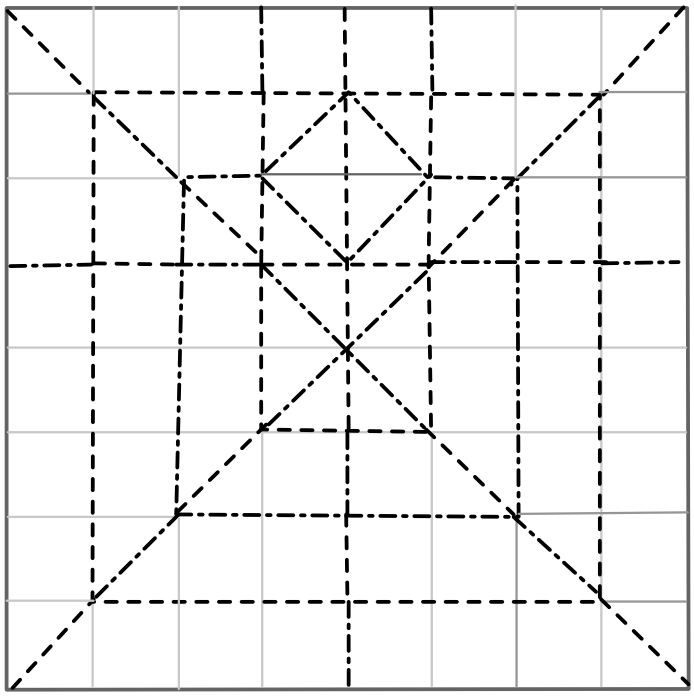
page 37



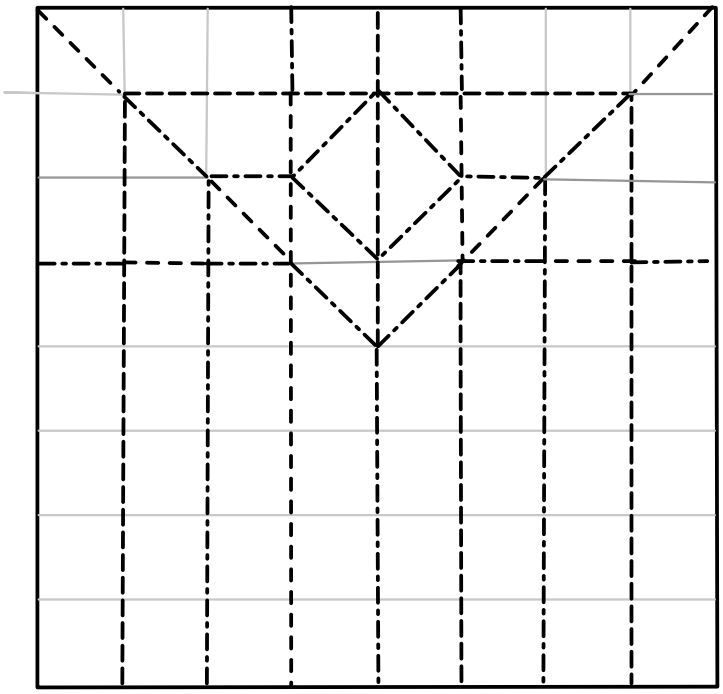
who am I?

Examples of crease patterns

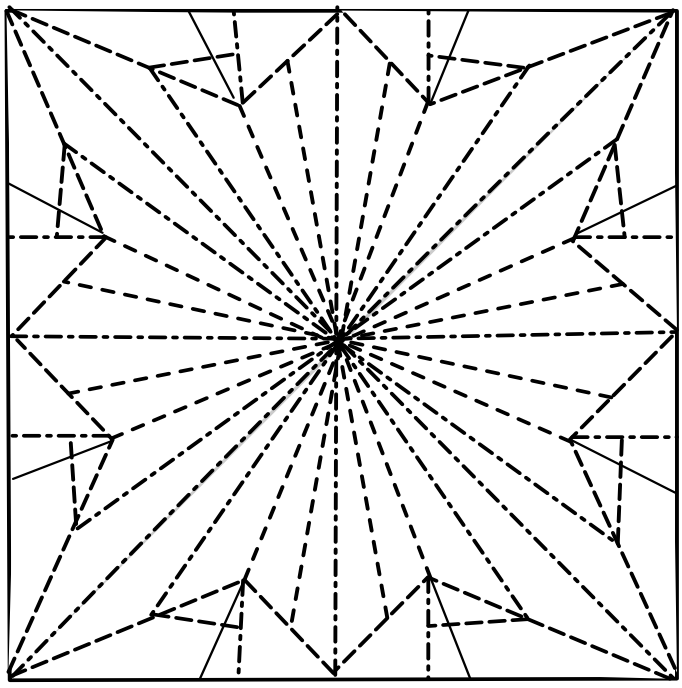
The crease patterns on this and the next page correspond either to diagrams or to photos. Try it, you will be able to fold them.



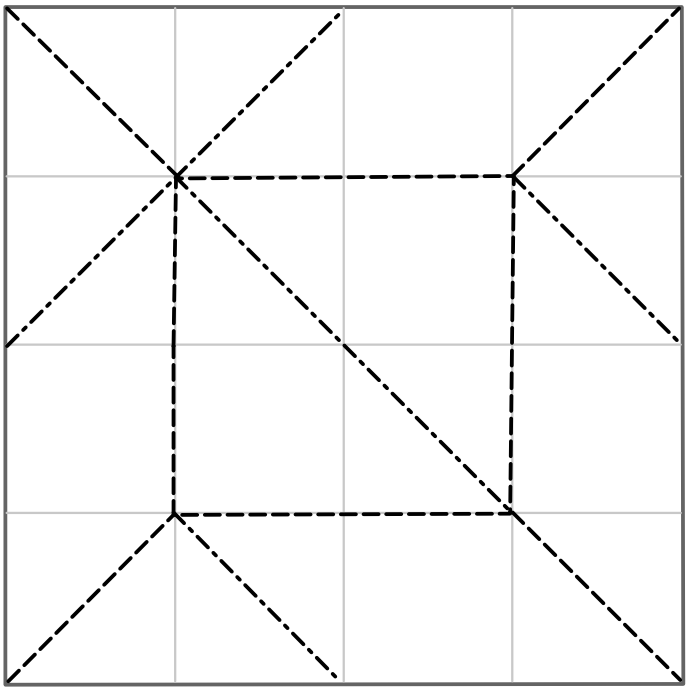
page 32



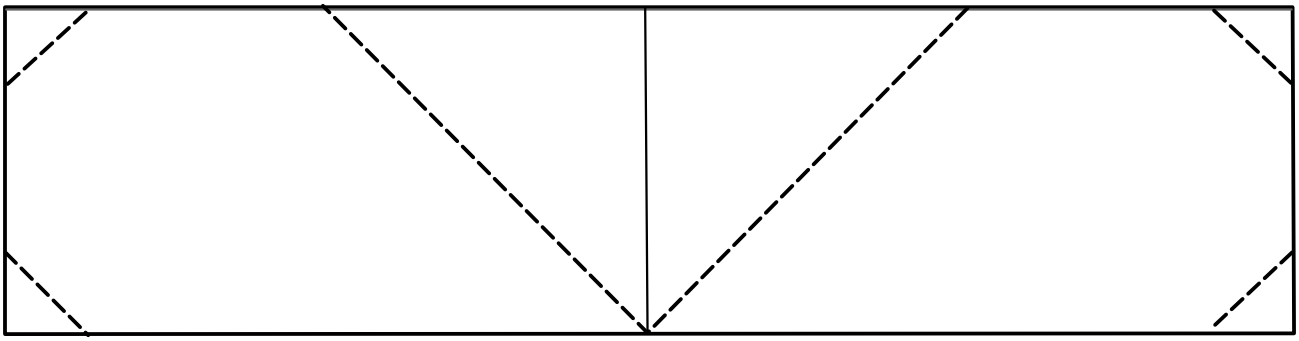
page 33



page 14



page 16



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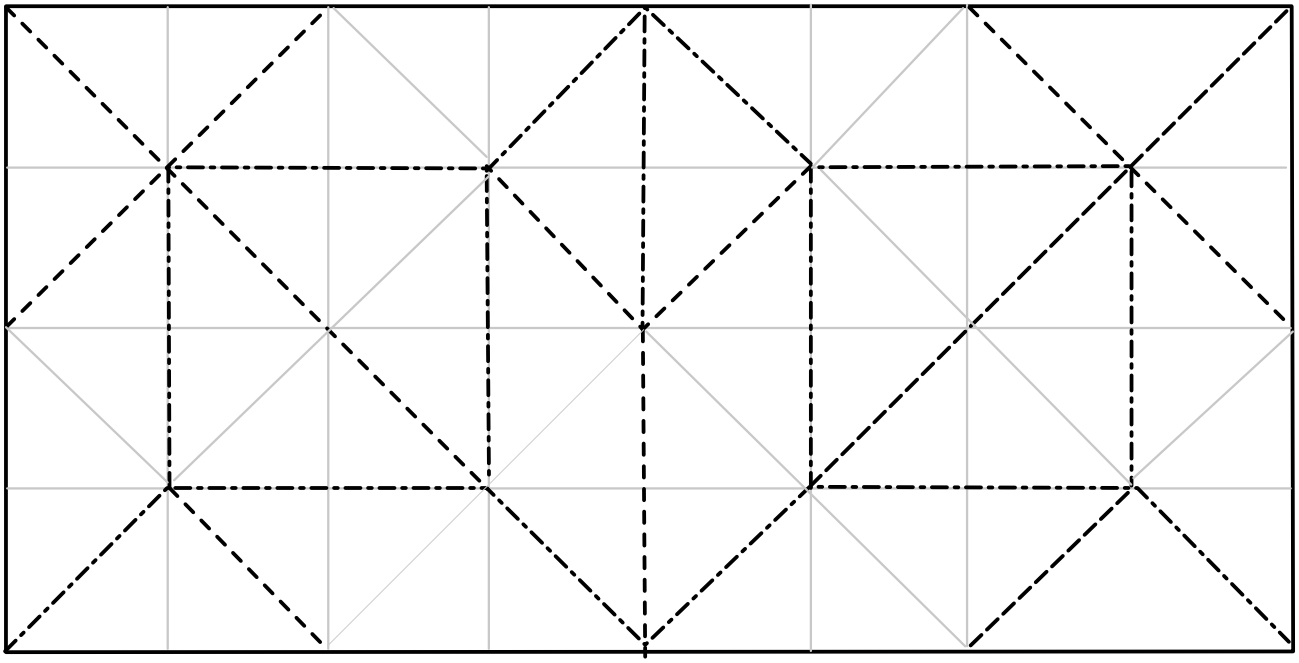
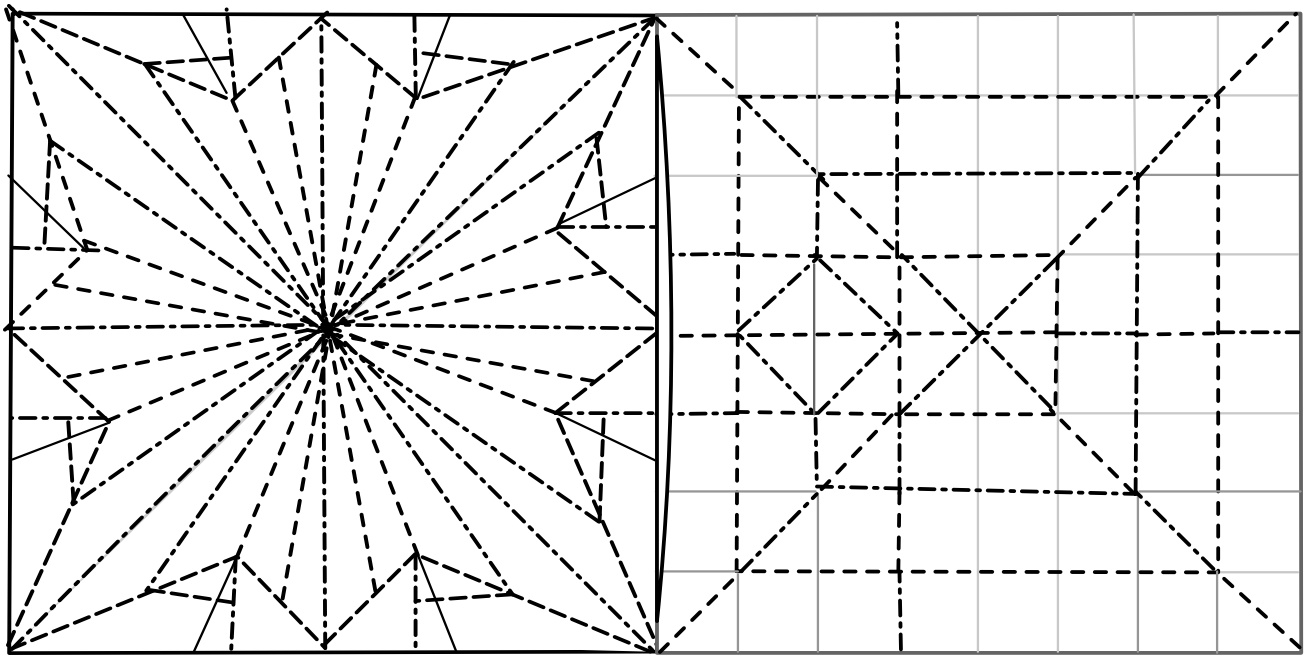


page 16



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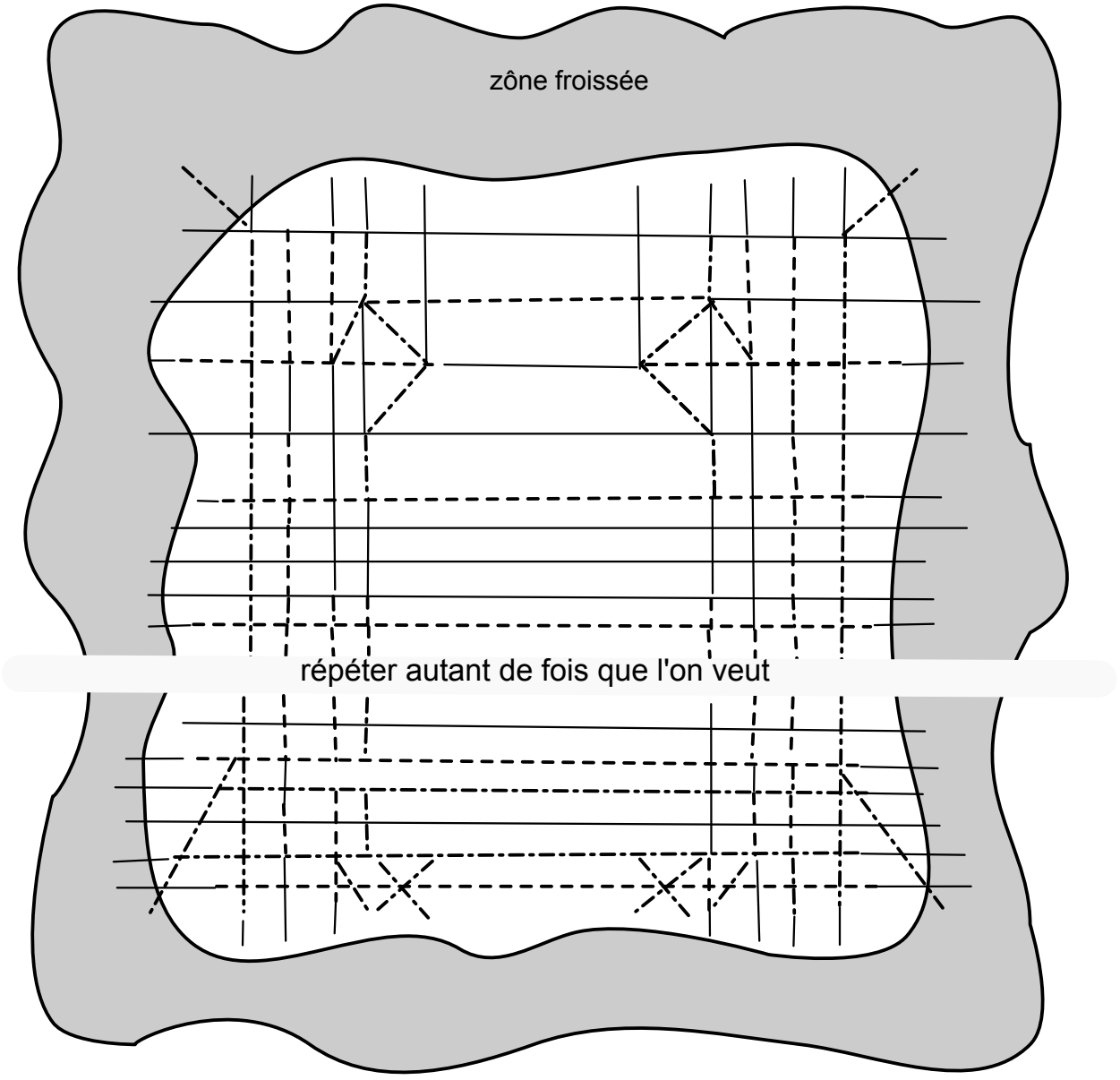
Neil Armstrong, Michel Lucas

This model obtained a gold medal at the International Olympiad of Origami by Internet (IOIO 2015) in the category "*personal creation*". The imposed theme was "*Space Sweet Space*".

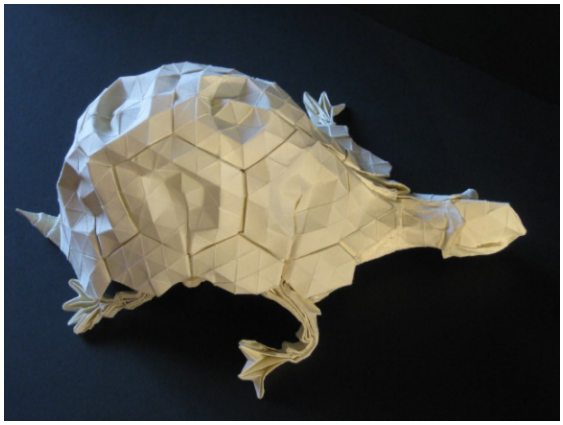
Made in a sheet of kraft paper 50x50_cm, it has the originality of mixing a geometric part (the trace of the sole) and a crumpled part (the ground of the moon).

Below is a fairly coarse fold pattern. There is no particular difficulty. It's up to you to create a beautiful collection of footprints!



Walk in the land of folding

Scarlet Oak Leaves
design Jens-Helge Dahmen



Turtle, design Éric Joisel

Roses, design Naomiki Sato

Orchid, design
Alexander Oliveros Avila

Owl
design Sébastien Limet

To go out into the beau monde

This collection is necessarily limited. However, if you have understood and happily practiced the techniques it contains, you can go ahead and look for other models on your own. Some tracks:

*** to see nice foldings**

- Robert J. Lang's site, which takes stock of the state of the art of paper folding seen by a great creator. The reference_! http://www.langorigami.com/
- the site of Mukerji Meenakshi, which offers photos of folding of his creations and, regularly, the 20 most beautiful photos of folding of a given theme http://www.origamee.net/
- the rendering by the best folders of the world of the tests of the International Olympiad of Origami by Internet (IOIO International Origami Internet Olympiad) at the address https://www.flickr.com/groups/ioio2016/ or / ioio2017 /

*** to find diagrams**

- David Petty's site: http://www.davidpetty.me.uk/
  a treasure made up of diagrams of traditional models (almost 200!)
- the Origami Resource Center site: http://www.origami-resource-center.com/
- the Origami Club site: http://en.origami-club.com/

*** to practice video lessons**

- Jo Nakashima series: https://www.youtube.com/user/jonakashima/
- Leyla Torrès series: http://www.origamispirit.com/
- Sara Adams series: http://www.happyfolding.com/
- Jeremy Shafer's series, full of inventiveness and fantasy:
  https://www.youtube.com/user/jeremyshaferorigami

*** to walk on the internet**

- Launch your favorite search engines with keywords to sort through the responses. Systematically put the word origami: "*origami flowers*", "*crane origami*", "*lily origami*", "*rose origami*", ... You will collect ideas by the thousands!

*** to find out the content of books, magazines and other resources**

Consult (among others) the following bibliographic referencing sites:

- Gilad Aharoni's site, which, according to its creator, houses the largest catalog of journals and books, as well as numerous photo galleries. A wealth of information: http://www.giladorigami.com/
- Michel Lucas' site, which also gives access to a list of recommended books: http://www.bibliogami.fr,

Happy hunting!

Some famous names in the Art of paper folding

This list is only a tiny part of the long list of all actors in the field. There are many others! Look for them ...

Who are you Michel Lucas?

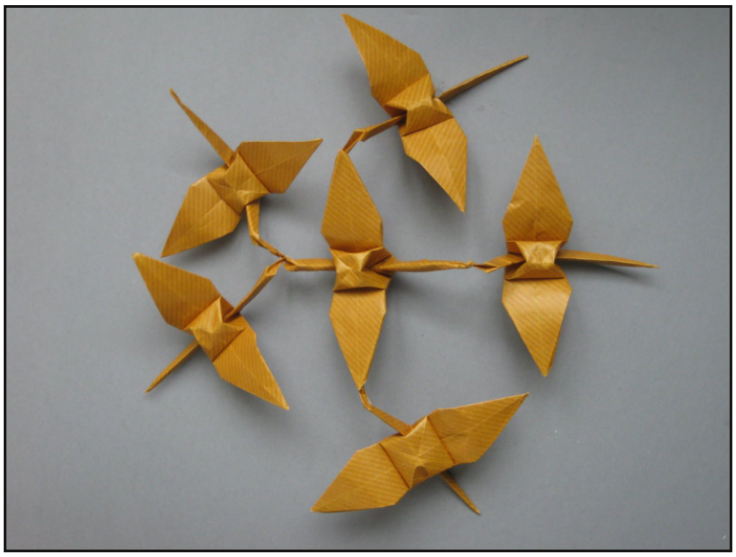
Teacher-researcher in computer science having started in 1966 at the university, then in an engineering school until 2004, I had the chance to experience a first permanent revolution.

I came across origami by chance in 1980, following the acquisition of books by Robert Harbin, then by John Montroll. Become an inveterate bender, I am happy to live another permanent revolution, that of the art of folding paper, whose technical and artistic progress never cease to amaze me.

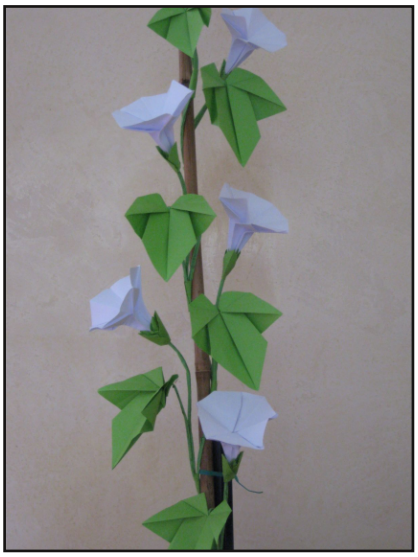
A large accumulator of books (almost 250 now!), I quickly became a jack-of-all-trades in paper folding. I am interested in the various branches which are explored by the great master folders, which allows me to constitute a collection of foldings in perpetual renewal. My site http://www.bibliogami.fr can attest to this.

To publicize the modernity of this art, I lead various and varied workshops. I also do exhibitions in the salons of collectors, which allows me to reach a varied audience, often incredulous when I say that this or that folding is done in a single sheet of paper.

My greatest pride is the success of the *Aveuglami* project, launched in 2004. Since that date, I regularly lead workshops for the blind. What a pleasure to see them folding models of easy to intermediate level today, even to animate, in their turn, workshops of origami! The site http://www.aveuglami.fr gives all the information on this activity.



Asagao - Morning Glory
design Gido Rokoan

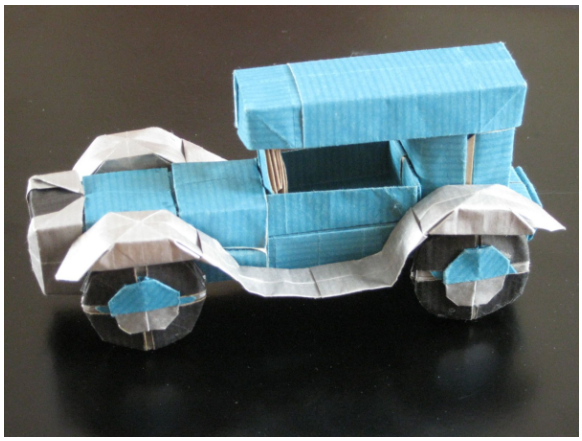


Morning Glory
design Yoshihide Momotani

Walk in the land of folding

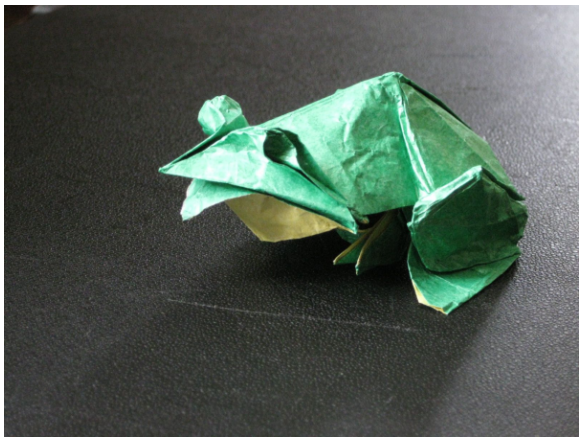
Kusudama « rose Mariquinha »
design F. Koti et V. Young

Lyrebird
design Satoshi Kamiya



Bugatti Royale
design Carlos Gonzalez Halle

Staunton Style Chess Set
design Max Hulme



Bull Frog
design Roman Diaz

Artichoke
design Denver Lawson

I would like to thank all those who contributed to the realization of this project and who will recognize themselves. Special mention to Christophe Boudias, Francesco Decio, Eric Gjerde, Francis Ow, Jeremy Shafer and Maria Sinayskaia who authorized me to publish their models or their diagrams.