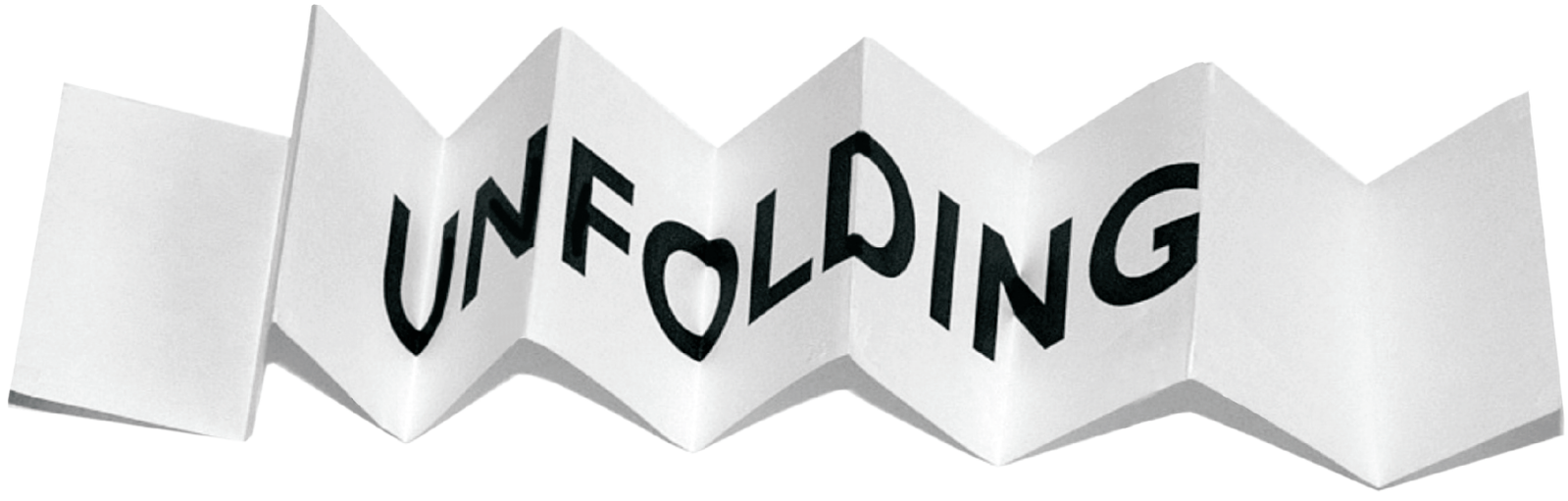

Project Three

Title: UNFOLDING

Submitted by
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M.Des VC 02625002

Guide:
Prof: Kirti Trivedi

Industrial Design Centre
Indian Institute of Technology
Bombay-
2004

Approval Sheet

The Visual Communication Project Three entitled **“UNFOLDING”** submitted by Mohini Kotasthane is approved for the partial fulfillment of the requirement for the post graduate degree in Visual Communication.

Guide:

Chairperson:

External Examiner:

Internal Examiner:

Contents

Inspiration

“The waves of the sea, the little ripples on the shore, the sweeping curve of the sandy bay between the headlands, the outline of the hills, the shape of the clouds, the unfolding of the leaves and flowers, all these are so may riddles of form and function, so many problems of morphology”.

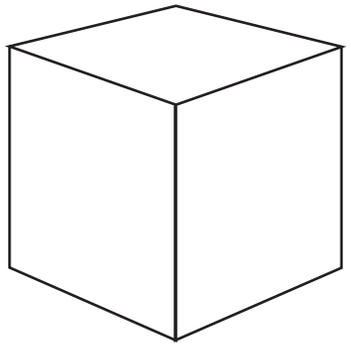
D’Arcy Thompson

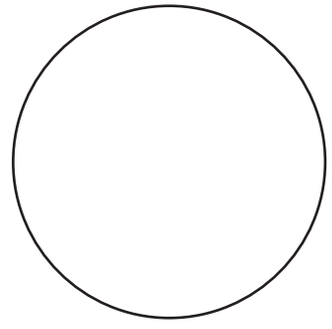
Abstract

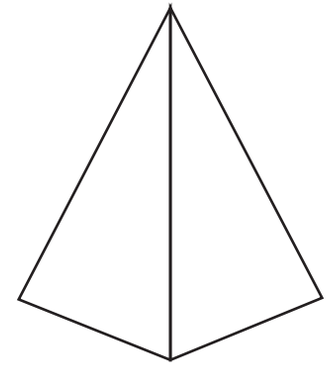
The order of growth unfolds in nature. Unfolding is a process that occurs in the growth program of every living organism. Life unfolds every moment and in every aspect from the beginning to the end. Unfolding bears all the changes with the increasing complexity of growth. Hence a tender young leaf of a plant looks very different from that of a matured leaf.

This metaphor of unfolding happens in our lives as well, life unfolds with different seasons. Seasons unfold with days unfolding. Every day unfolds differently with changing time, events, moods and people unfolding. A person unfolds with different happenings and stories around him. Thus lies the beauty in unfolding.

Philosophy

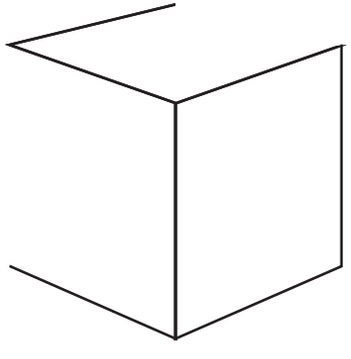


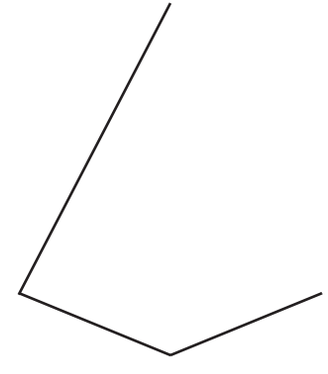




Closed Forms

Haste is waste. Silence is golden. For men must work and women must weep. A cube, pyramid and sphere are closed forms.





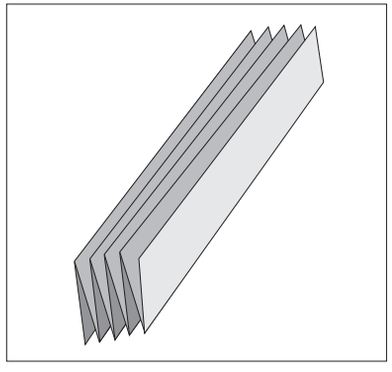
Unclosed Forms

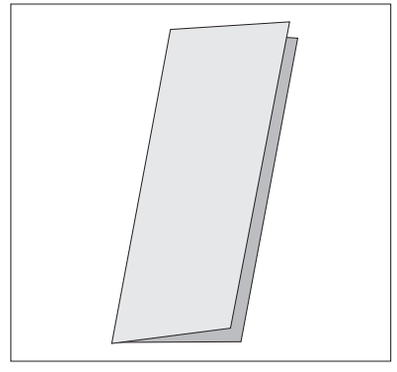
What is in the cosmos is in your body and what is in your body is in the cosmos. The unclosed ideas can be noticed on a larger scale in our vision of environment and nature.

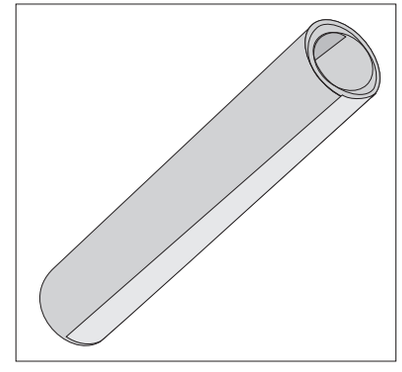
पूर्णमदः पूर्णमिदं पूर्णमुदच्यते ।
पूर्णस्य पूर्णमादाय पूर्णमेवावशिष्यते ॥

This is whole. That is whole. Whole emerges from whole. Whole subtracted from whole results in whole.

Philosophy

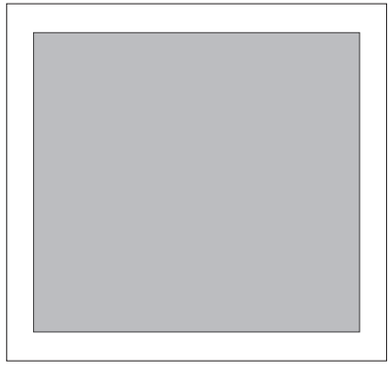


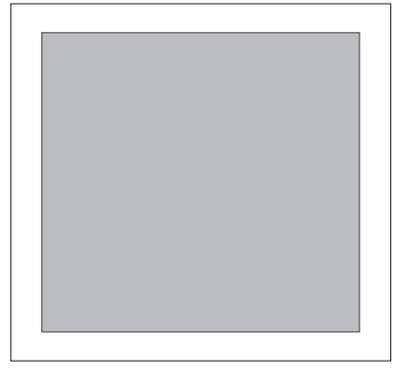


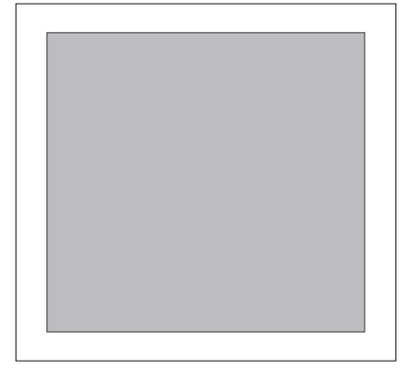


Folded Forms

Folded forms are like capsules which have information stored in them. Folded form are like closed ideas which has a lot of potential to grow in various directions. They are the first stage or beginning of a story or a process.







Unfolded Forms

Unfolded forms is the end result of a process or phenomenon. It is the outcome of all the changes that occurs in it. Unfolded forms are like unclosed ideas which can be explored in many directions and have a larger viewpoint.

Meaning

- Progression
- Procedure
- Growth
- Maturation
- Opening
- Spreading
- Revelation
- Explication
- Flowering
- Multiplication
- Transformation
- Development / Advancement
- Movement / Out growth

Moving Plants

Plants have great capacity for moving, although slowly, since they are low energy devices. There are many types recognized, on the basis of the origin of the stimulus Bose (1927). Plants respond to gravity (geotropism), light (heliotropism), touch (thigmotropism) and almost anything. Their response is either slow, when it is associated with growth, or quick when it is associated with a change in turgor (internal pressure) of a few strategically placed cells or an elastic mechanism. Examples are the response of a twining plant and the movement of leaves of Mimosa.

Unfolding happens in space and time i.e.

* **Spatial Unfolding**
* **Temporal Unfolding**

Unfolding according to the Forces that act upon:

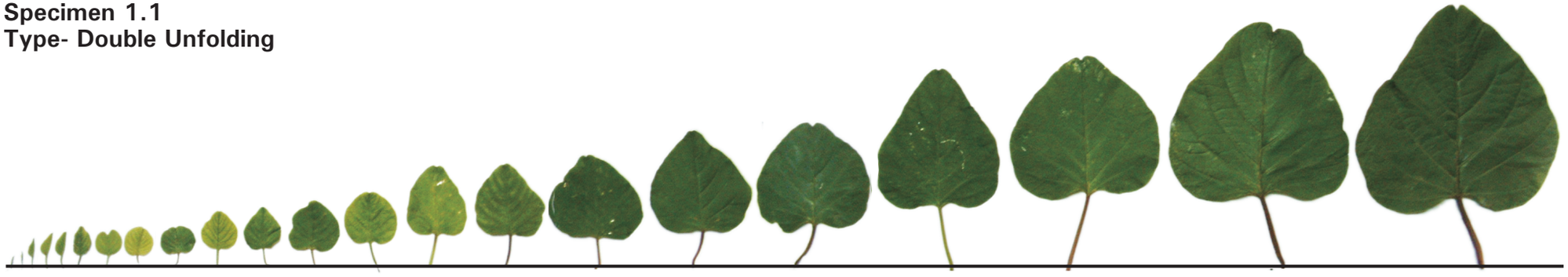
* **Physical Forces**
* **Chemical Forces**
* **Biological Forces**
* **Structural Forces**

Understanding

Nature is a very rich resource for studying various types of unfolding. So I Studied different plants, how their leaves unfold and documented them. The process involved collecting the youngest leaf to the matured leaf and then studying the in-between stages and forces which results in the unfolding. I especially concentrated on the leaves because it gave a wide variety of the different types of unfolding. Hence I have documented them and then studied in detail the changes that occur during unfolding like colour, shape, form, details, texture etc. This became like a starting point for my understanding of the complex phenomenon of unfolding in nature. Then the study further moved on to how flowers unfold and their changes. Same principles of unfolding were understood in objects like paper, cloth and so on.

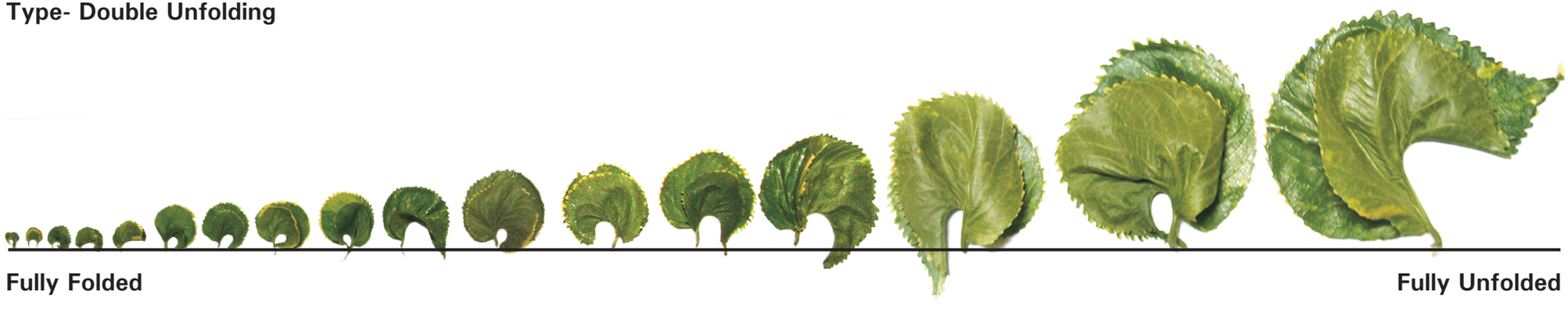
Leaf Growth

Specimen 1.1
Type- Double Unfolding



Fully Folded **Fully Unfolded**

Specimen 1.2
Type- Double Unfolding



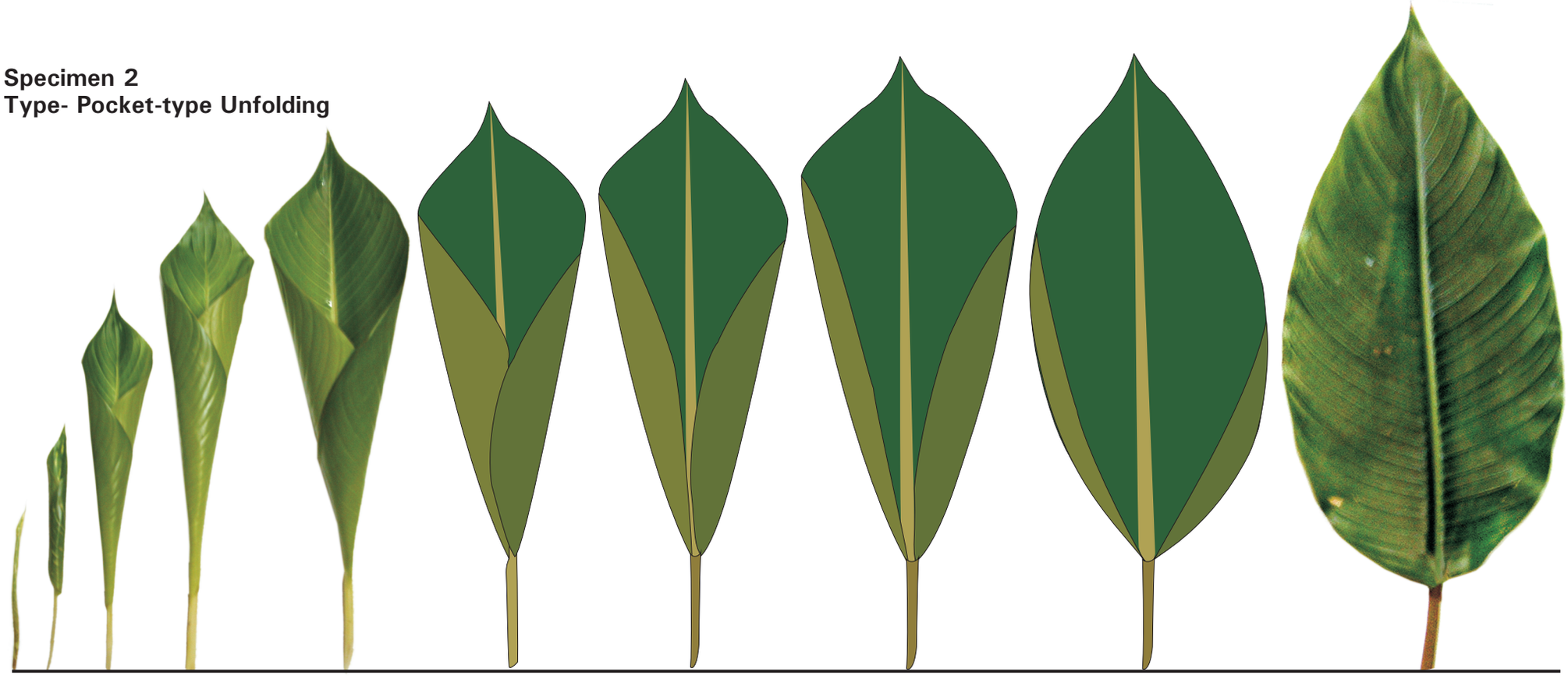
Fully Folded **Fully Unfolded**

Leaf Growth

Specimen 1.3
Type- Double Unfolding

Fully Folded **Fully Unfolded**

Specimen 2
Type- Pocket-type Unfolding



Fully Folded **Fully Unfolded**

Leaf Growth

Specimen 3
Type- Spiral Unfolding

Fully Folded

Fully Unfolded

Leaf Growth

Specimen 3.1
Type- Spiral Unfolding

Fully Folded

Fully Unfolded

Leaf Growth

Specimen 1.4
Type- Double Unfolding

Fully Folded

Fully Unfolded

Leaf Growth

Specimen 1.5
Type- Double Unfolding

Fully Folded

Fully Unfolded

Leaf Growth

Specimen 4
Type- Spiral Unfolding

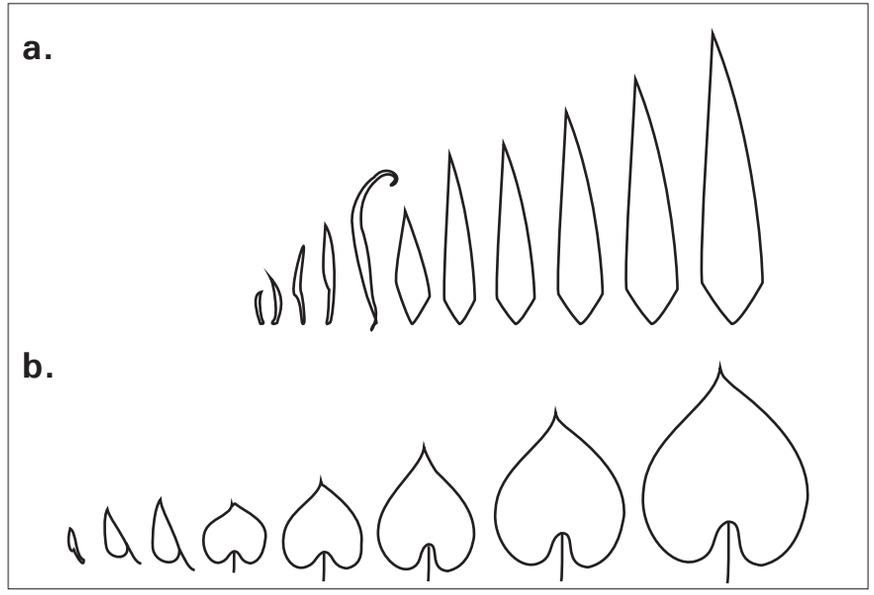
Fully Folded

Fully Unfolded

Changes during unfolding

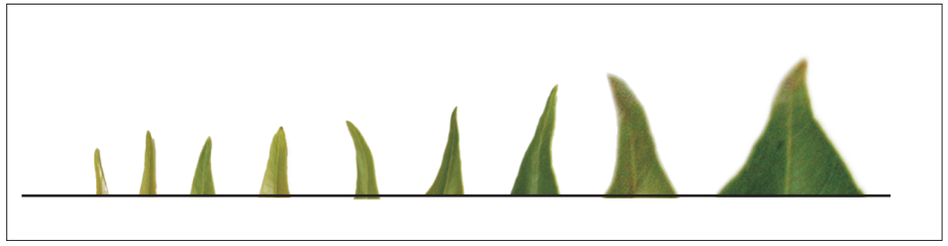
Colour

In the unfolding process of most of the leaves colour change is evident. It changes from light pale green to intense dark green thus making the matured leaf look more brighter. Along with colour even texture changes as hair starts growing, spots start appearing in some cases while in others leaf turns softer to crisp



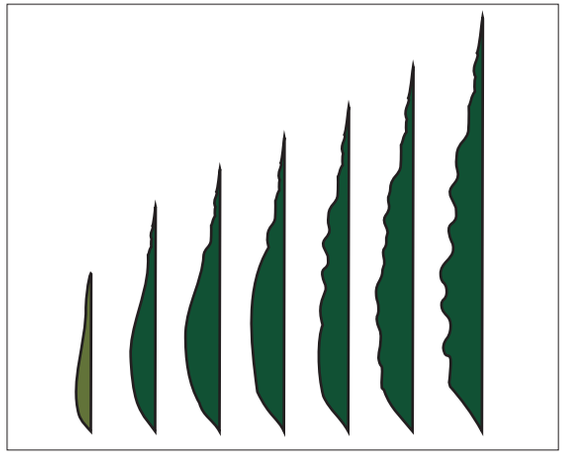
Change in Form

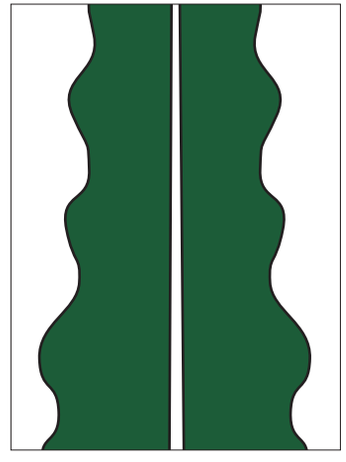
The form of an organism is determined by its rate of growth in various directions. In the growth program of different leaves the growth rate is different and hence the resultant form is also different. The matured leaf has a definite form which is complete with all the details. This form is multiplied innumerable times on the tree which gives rise to the general shape of a leaf of that particular plant.



Apex

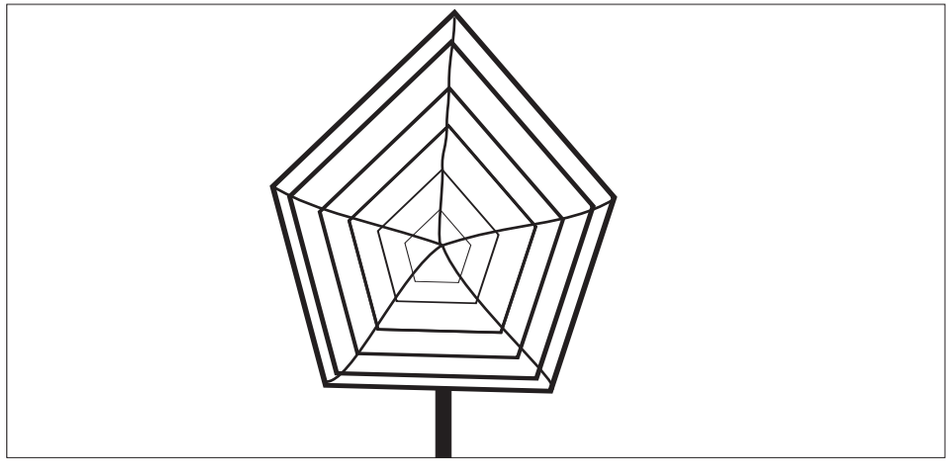
In the unfolding of a leaf the apex start gradually developing and changes to various angles like acute, obtuse, apiculate etc depending upon the degree at the top and bottom of a leaf.





Edge Detail

As the leaf grows it starts undulating on the leaf edge from an entire surface. The leaf margin becomes more sharp and details start appearing on it. Thus we can see a variety in edge details of leaves like serrate, double serrate, dentate etc.



Overall Geometry

As the leaf unfolds its overall geometry gets defined. As in the visual example, the growth of a pentagon is seen in the unfolding of lady finger leaf. The Underlined geometry remains unchanged form the infant stage to the last stage of unfolding.

Project direction

Unfolding is an interesting phenomenon which is visually rich and constantly changing its form but at a different (pace) time line. Thus project moves in the direction of a short film which is like a visual experience of unfolding. The task was to make a comprehensive list of all the things that unfolds and then classify and categorize them according to their type (principle). Then convert it into a graphic form for repetition, scaling to create visual dynamism. The film will be experiential and informative about the different types of unfolding, how does it happen and the changes that take place.

“Unfolding” a visual experience.

Medium: Animation
Animation is an art-form in which all the other art-forms flow in. Like photography, illustration, music, lighting, choreography, narration and direction.

Things that Unfold

- ✻ Nature
- ✻ Flowers
- ✻ Leaves
- ✻ Season
- ✻ Day
- ✻ Person
- ✻ Smile
- ✻ Film
- ✻ Book
- ✻ Story
- ✻ Journey
- ✻ Career
- ✻ Type
- ✻ Line
- ✻ Paper
- ✻ Cloth
- ✻ Birth
- ✻ Universe

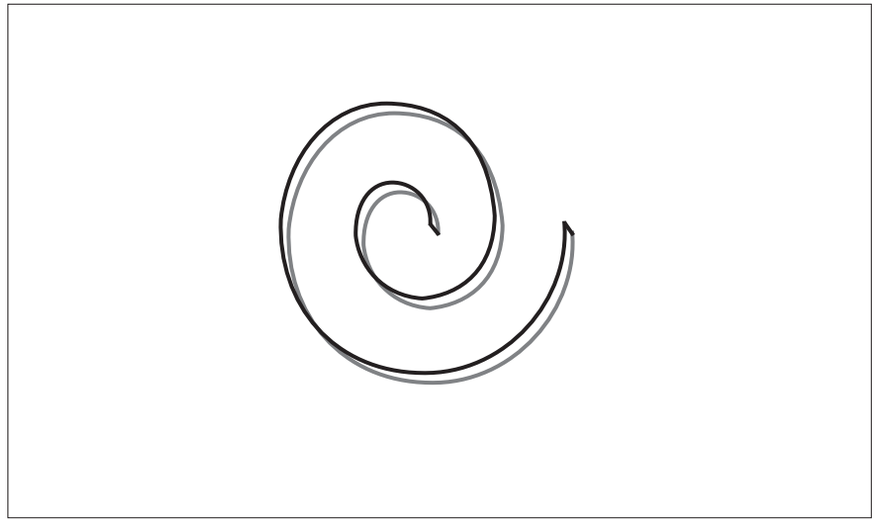
Five types of Unfolding

- Radial Unfolding
- Spiral Unfolding / Unrolling
- Dual Unfolding
- Tube-like Unfolding
- Fan-like Unfolding

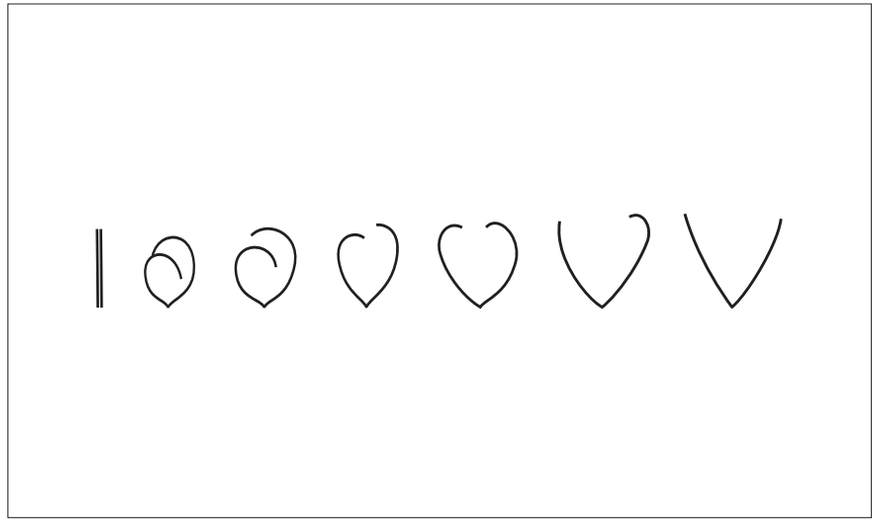
Spiral Unfolding

Spiral Unfolding

Plan



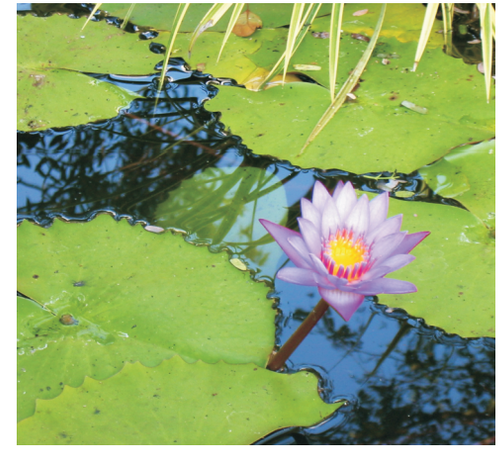
Section Drawing



This type of Unfolding is also called unrolling. In this kind the entire surface is rolled as a complete folded form and as it unfolds the surface unrolls as if revealing something. This kind of unfolding is most commonly found in leaves. Especially in the fern plant where the fiddlehead is the rolled-up leaf bud. This is a classic example of Spiral Unfolding. Even the leaves of rubber plant are rolled up in the bud which uncurls into the matured leaf. The growth is three dimensional and the rolled up tubes in the buds unfurls into a leaf. The force acting is equal on both the areas of the leaf form the mid-vein. This metaphor of unfolding is used for storing tons of paper sheets and cloth. In some cases it is observed that the leaf itself is spiral.

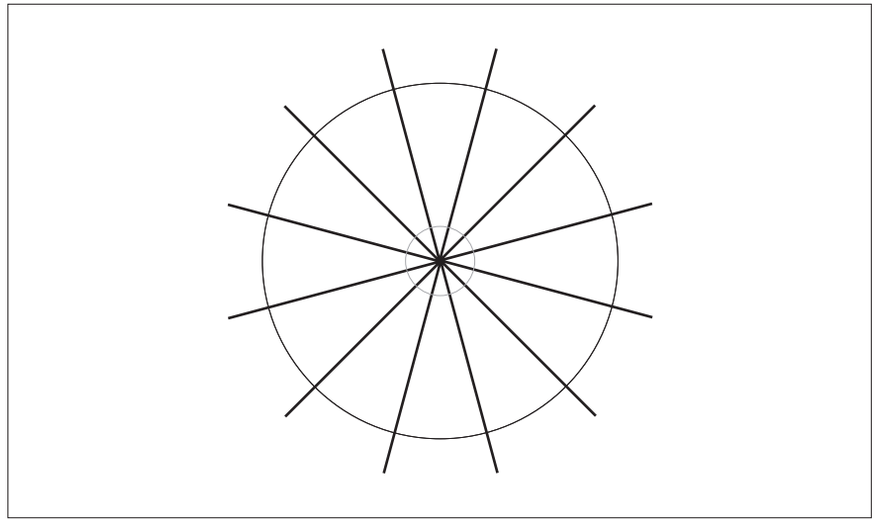
Spiral Leaf

Radial Unfolding

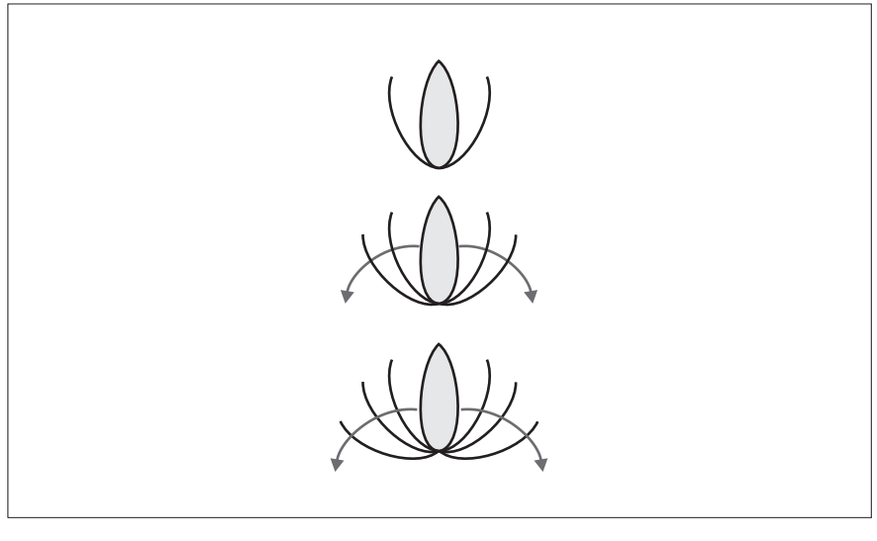


Radial Unfolding

Plan



Section Drawing

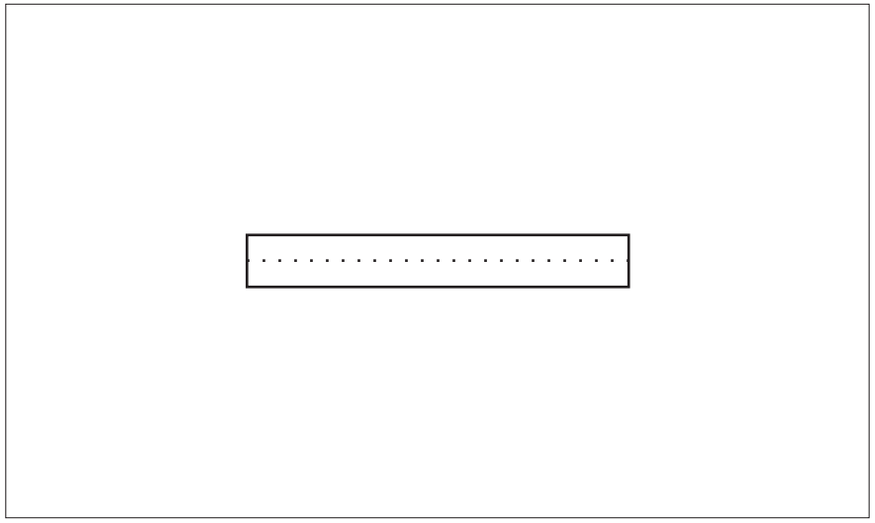


The Radial motion of unfolding envelops everything inside it. As it unfolds it expands from the center and grows bigger and bigger to infinity. This kind of motion is similar to that of a sun, as it emits heat. This motion is most common in flowers. Almost all flowers unfolds radially facing the sun. In this type of unfolding growth happens in layers in the form of concentric circles. The rate of growth is measured by the rate of change in length of a radius. The growth is three dimensional from one point as a ‘center’ and is also termed as flowering. In this kind of growth, at one point a viewer sees nothing while at one point everything is disclosed, (sees everything). This is the uniqueness of radial unfolding.

Dual Unfolding

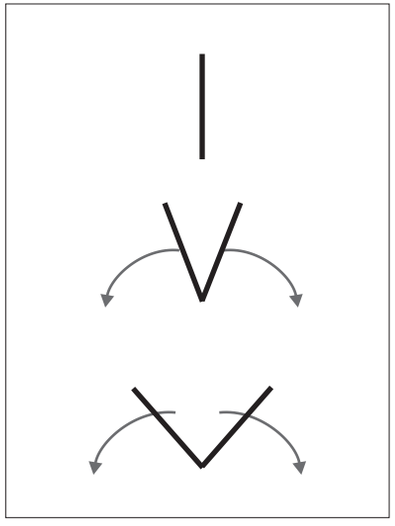
Dual Unfolding

Plan

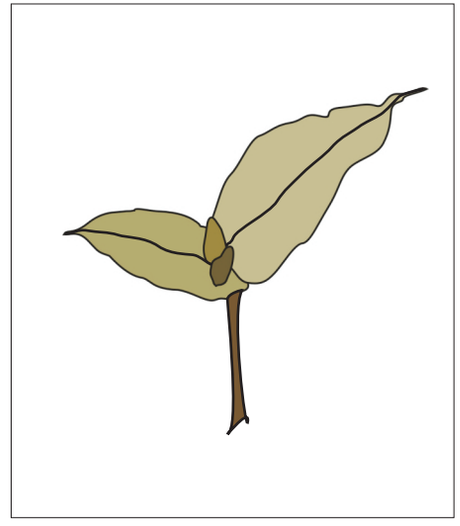


This is a simple kind of unfolding in which the leaf is closed symmetrically from the mid-rib. As the leaf opens up it faces each other in an opposite direction. This is a simple type of unfolding observed in most of the plants. There is just one main fold across the midrib or the primary vein of the leaf where the leaf is folded. ‘One is incomplete without another’ this principle is exhibited in dual unfolding. Both the halves of the leaf compliment each other to form a complete growth program. In this type one can either see growth in pairs or alternate growth on the main stem. This metaphor of unfolding is seen in our day to day life... of folding files, envelopes and so on.

Section Drawing



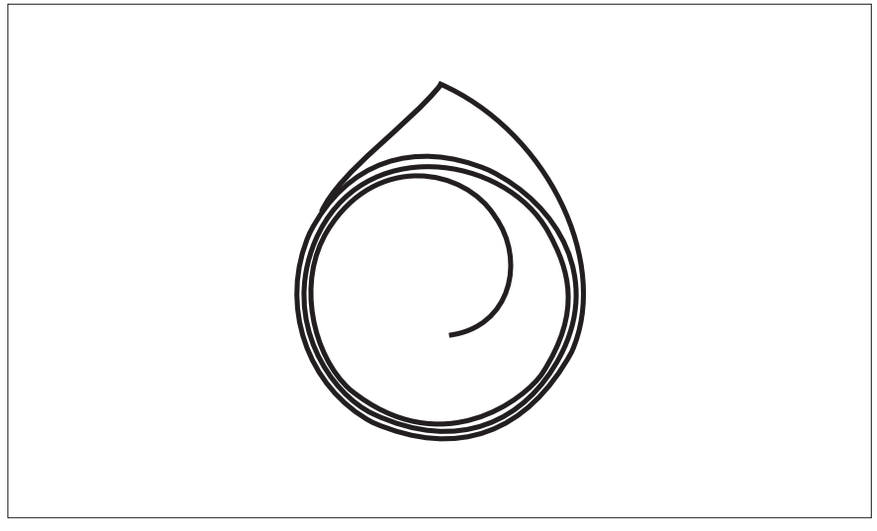
Growth in Pairs



Tube-like Unfolding

Tube-like Unfolding

Plan



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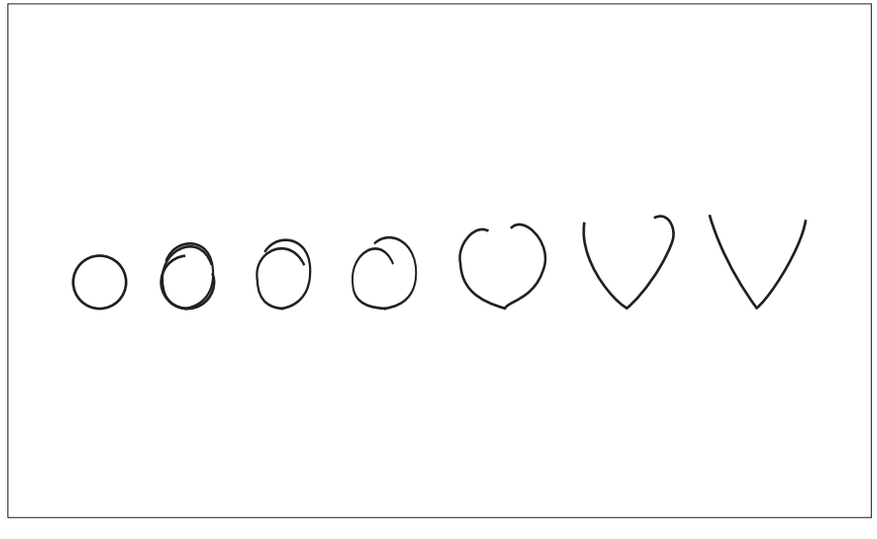
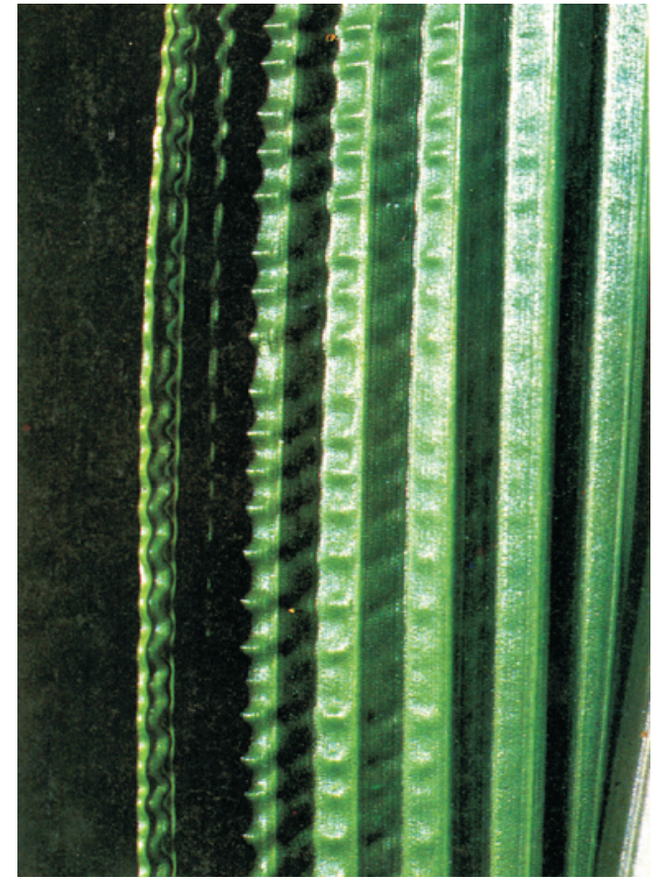


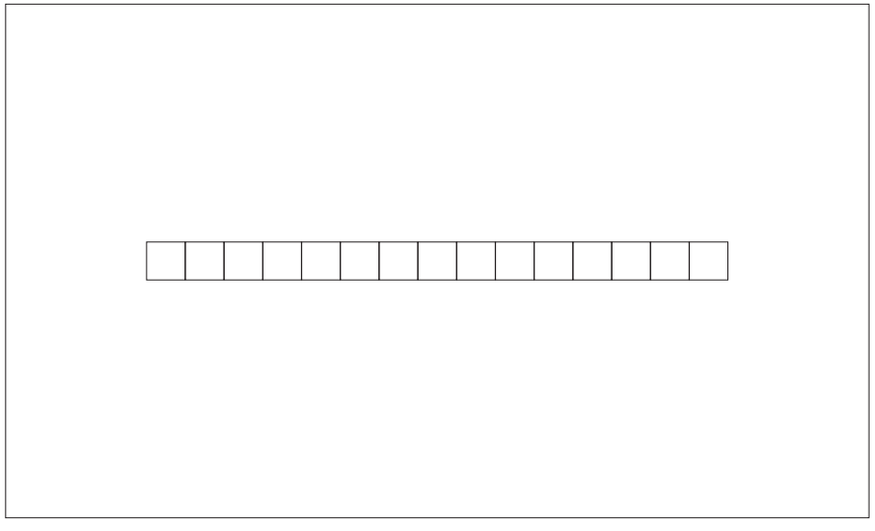
In this type of unfolding the surface is folded like that of a cylinder (pocket). As it unfolds the pocket opens up to a complete uncurled leaf. Mostly vertical orientation of leaves is observed in this type of unfolding. This Unfolding creates dynamic visual shapes in nature. In this kind the young leaf emerges as a tube which uncoils into a matured leaf. The stipules in this species are large tend to protect the young leaves. The growth is three dimensional and occurs at various angles to the ground surface. This metaphor of unfolding is commonly seen in our life where information is stored in the form of pockets.

Fan-like Unfolding

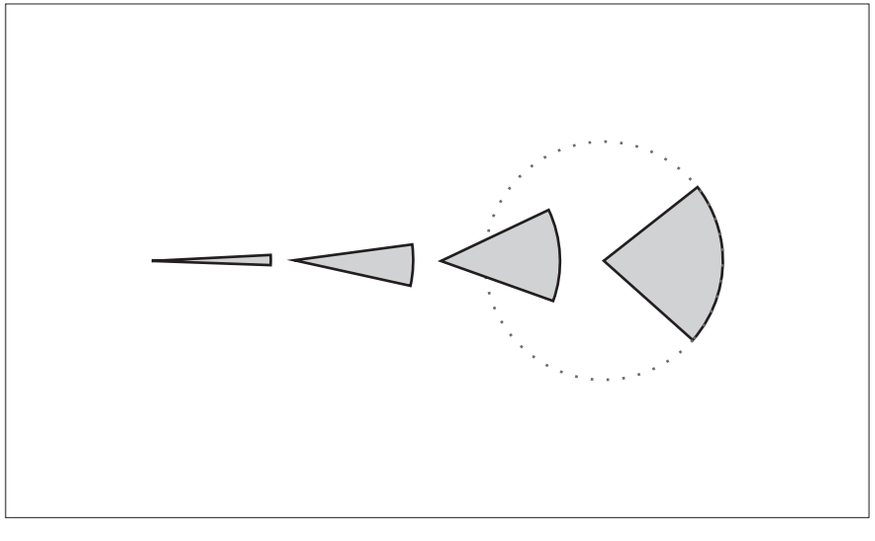


Fan-like Unfolding

Plan

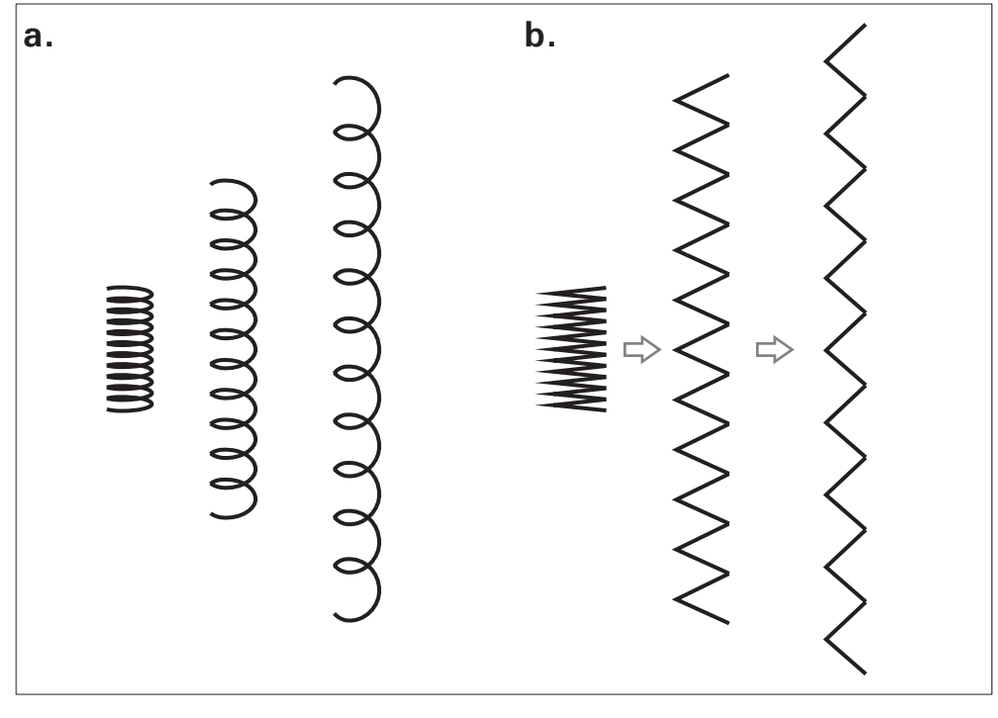


Section Drawing



This type of unfolding is quite unusual in nature. Because of the continuous folds at repeated intervals it gives the texture of a corrugated leaf. This concept we also see in Japanese fan or in a magician's magic stick. The repeated folds in this type gives a feel of a corrugated surface. In this type the unfolded leaf appears like a sector of a circle. There is a kind of springiness force which acts upon the unfolding process. The most interesting property of this pattern is that it allows simultaneous extension in two directions perpendicular to each other.

Force Action



Design Elements

- Nature- Flowers, Leaves
- Title- Typographic treatment
- Paper- Photographic treatment
- Linear Drawing- Diagrams
- Video- Live Action
- Music

Comprehensive Sketch

Final Design Concept

As there are four seasons in Nature, seven days in a week, so also there are five types of physical unfolding in Nature. All the different leaves and flowers have a underlined principle of unfolding. Thus identifying this principle in different plants and then grouping them together based upon their common unfolding.

The film will have five parts to it. Each of this five part will have the different unfolding i.e. radial, spiral, dual, tube-like and fan-like unfolding. Each part will be introduced with the title unfolding in a similar manner to that of the particular episode. It will be a simultaneous process where the different elements will be unfolding at different rate and different scales. Also there will be multiplicity in one particular kind of unfolding. Thus gives the visual variety and the richness of each kind of unfolding. For example in radial unfolding episode there will be different flowers like lotus, hibiscus, different types of leaves, papers, linear drawings that will unfold radially. Music will also unfold in the film synchronizing with various elements like flowers, leaves etc. The whole experience will be mesmeric and experiential about unfolding of five different types. There will be transitions from on type to another type of unfolding and schematic drawings explicating the phenomenon. It will be a synchronizing activity that will on the whole explain the idea of one type of unfolding. The variation is speed and pace gives a dynamic visual quality to the whole thing. Thus is the final output which will reflect the study of different types of unfolding in a visual manner.

Qualities

* **Multiple**- Different scales of objects to visually enhance the contrast.

* **Simultaneous Process**- Different types of unfolding occurring at the same time, a simultaneous process.

* **Scaling**- Different scales of objects and images that visually enhance the contrast.

* **Repetition**- Repetition at different pace and instances

* **Simulation**- Digitally simulating the different unfolding processes.

* **Transformation**-Transforming one completely unfolded form to unfolding of another form.

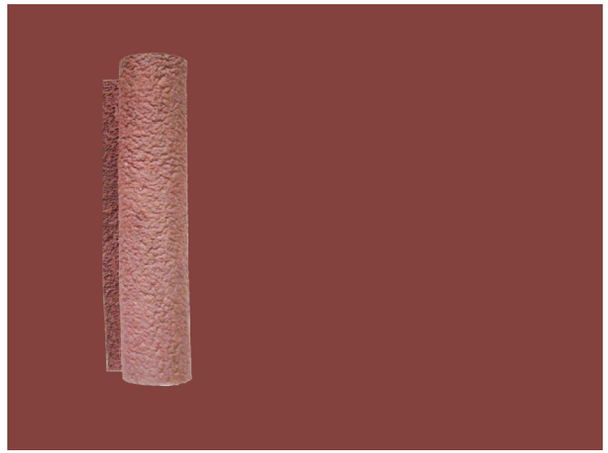
* **Textures**- The visual textures that different types unfolding create.

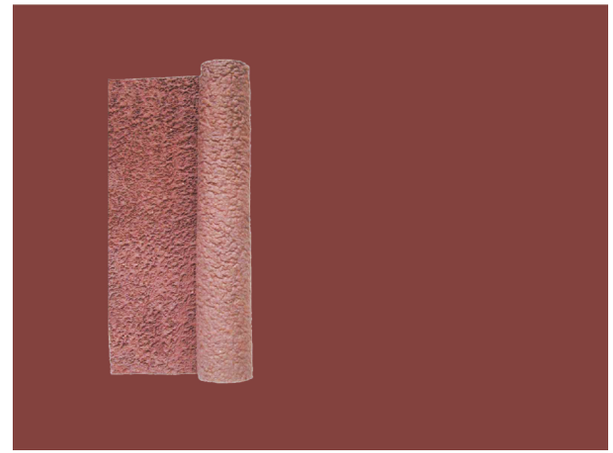
* **Abstraction**-Abstracting the unfolding in real life- for example a 'Day'

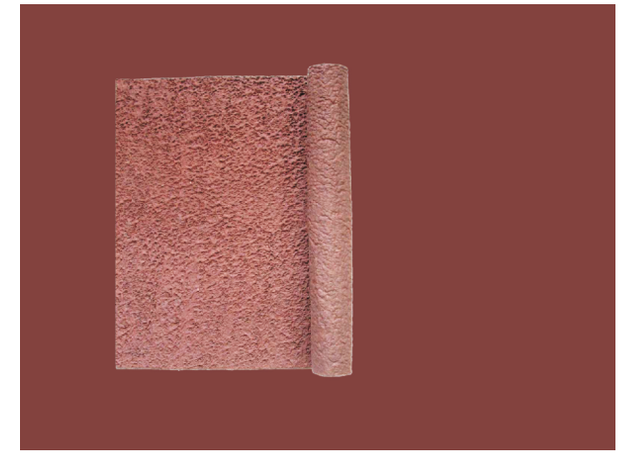
Technical Support

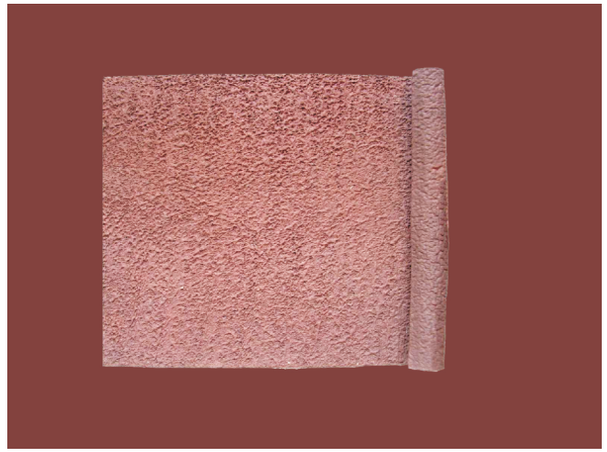
- Duration- 3 minutes
- Flash MX Movie
- Final Cut Pro- Photo Composition
- Sound Editing Software
- Stop motion animation
- Time- lapse Photography

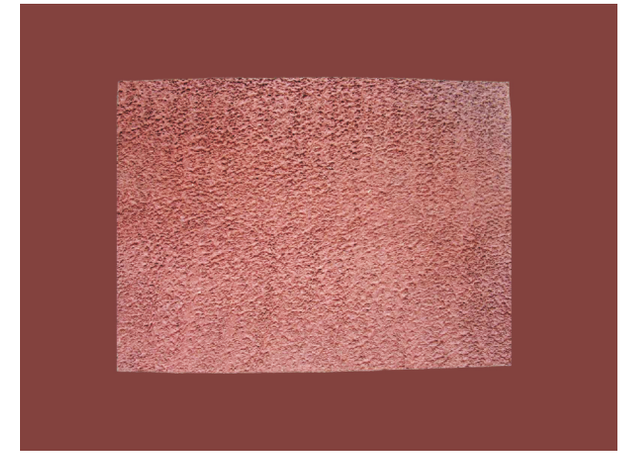
Paper Unfolding



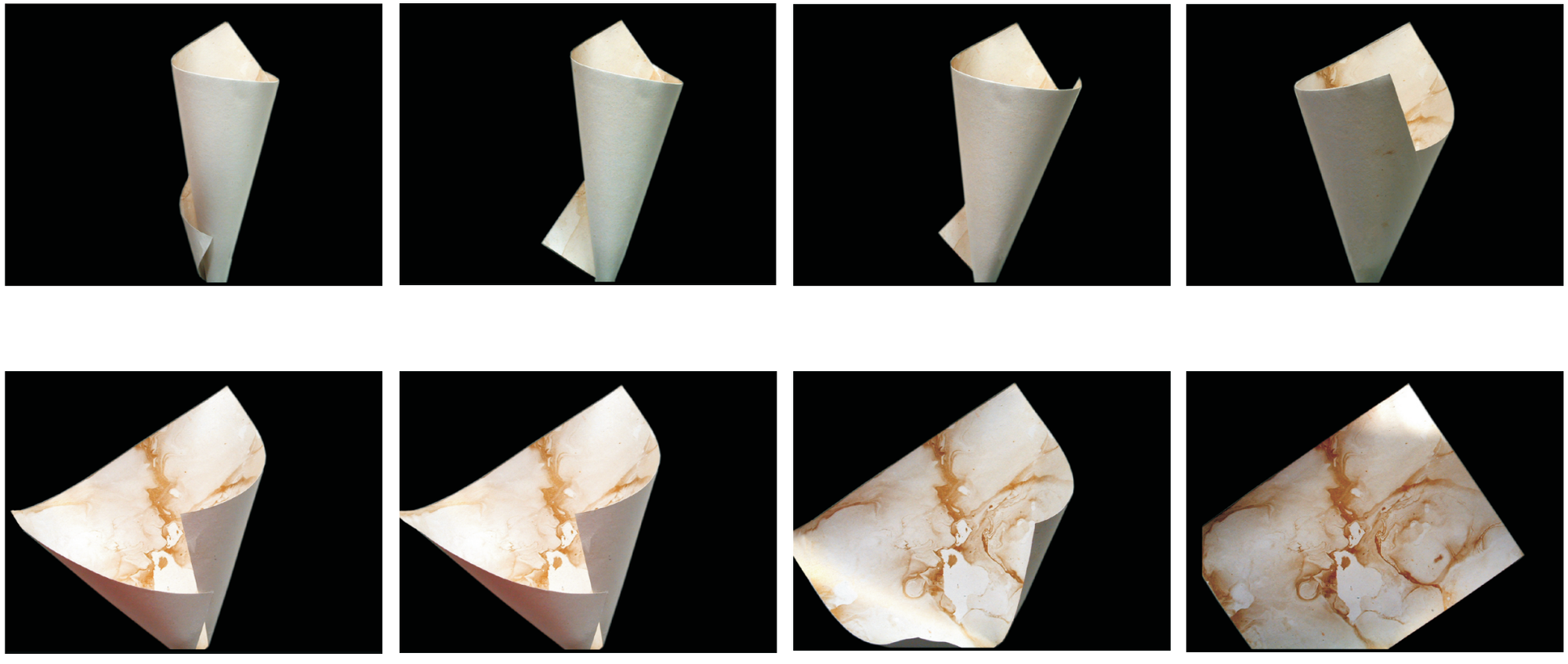




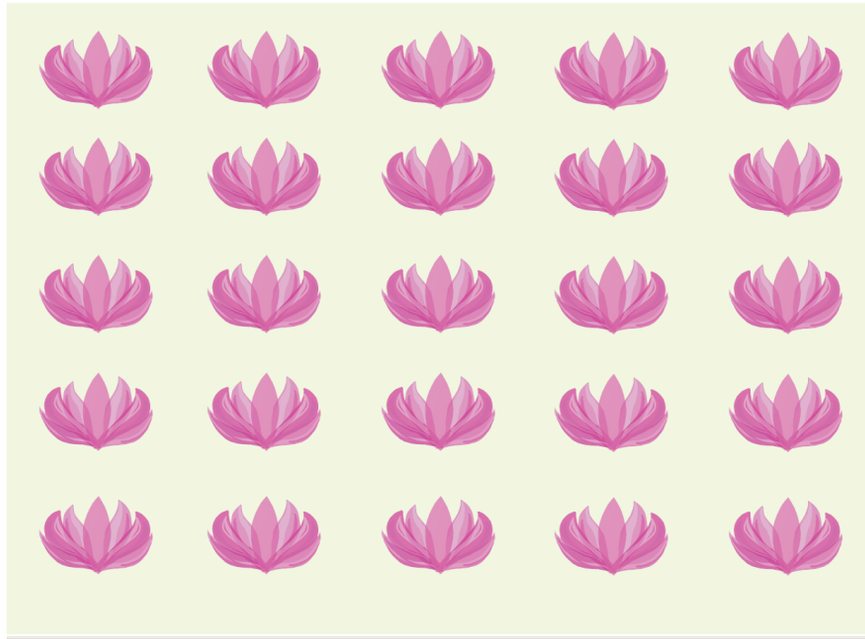


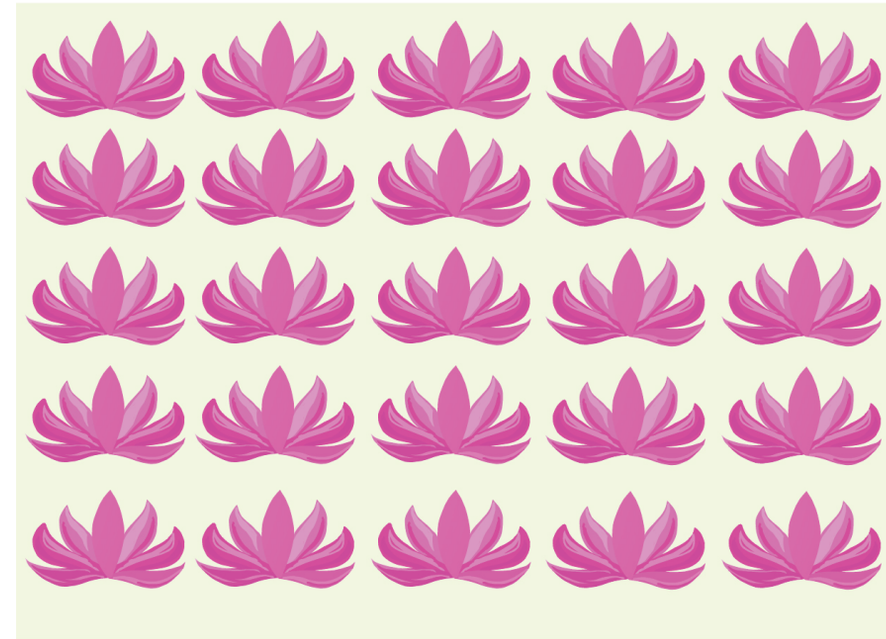


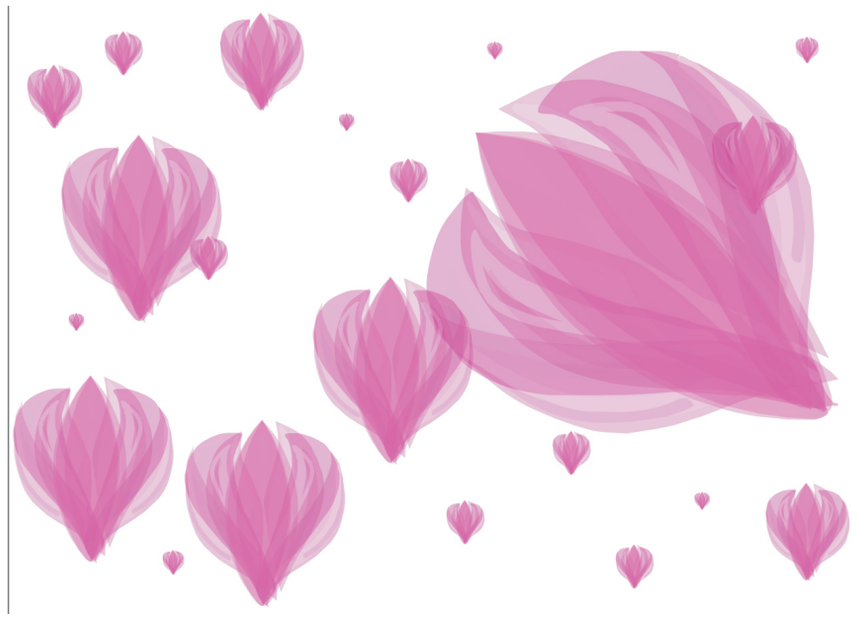
Paper Unfolding



Flowers Unfolding







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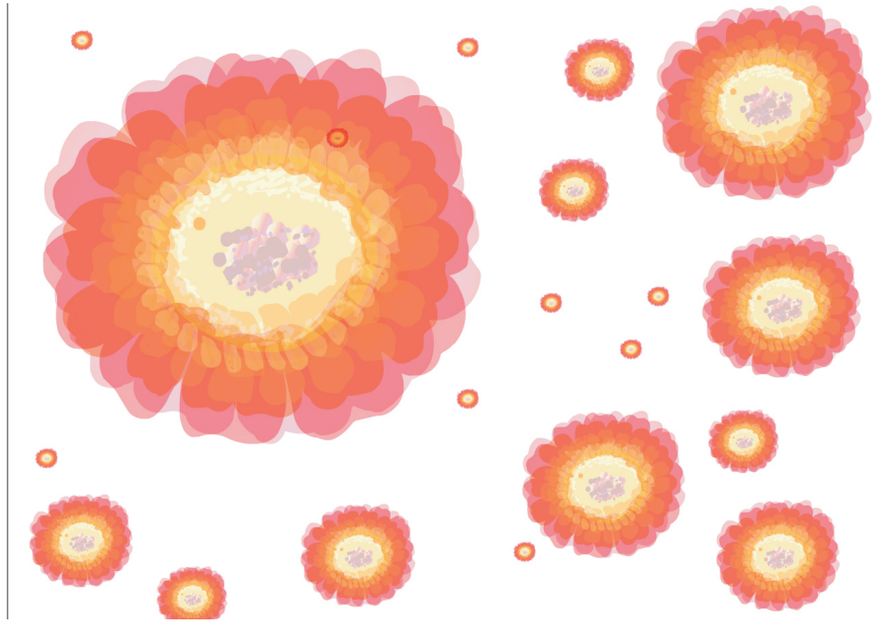
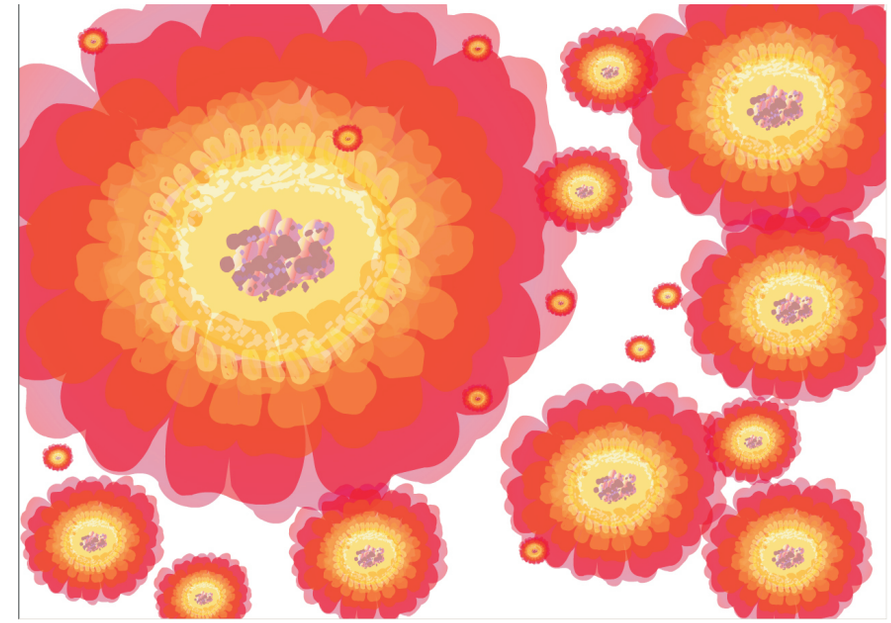
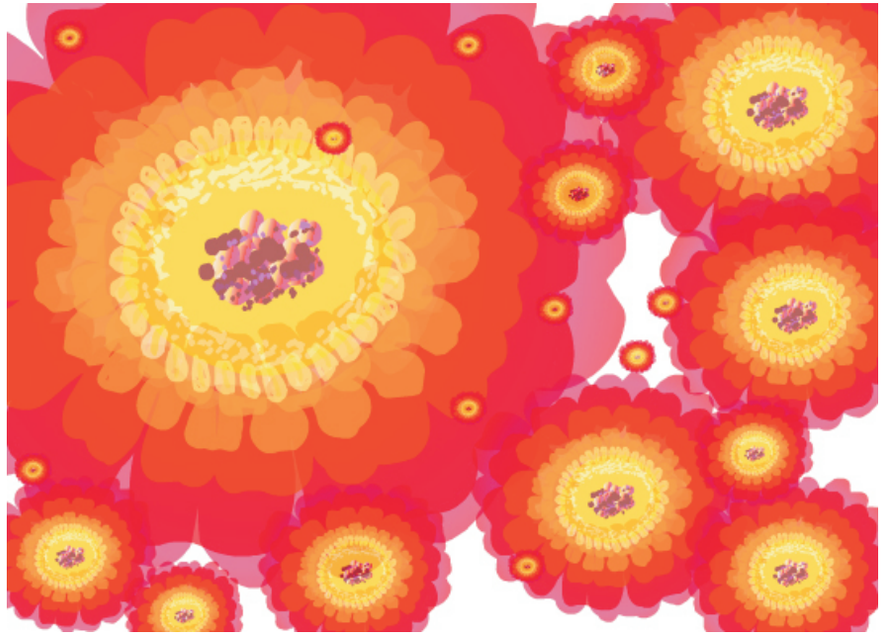
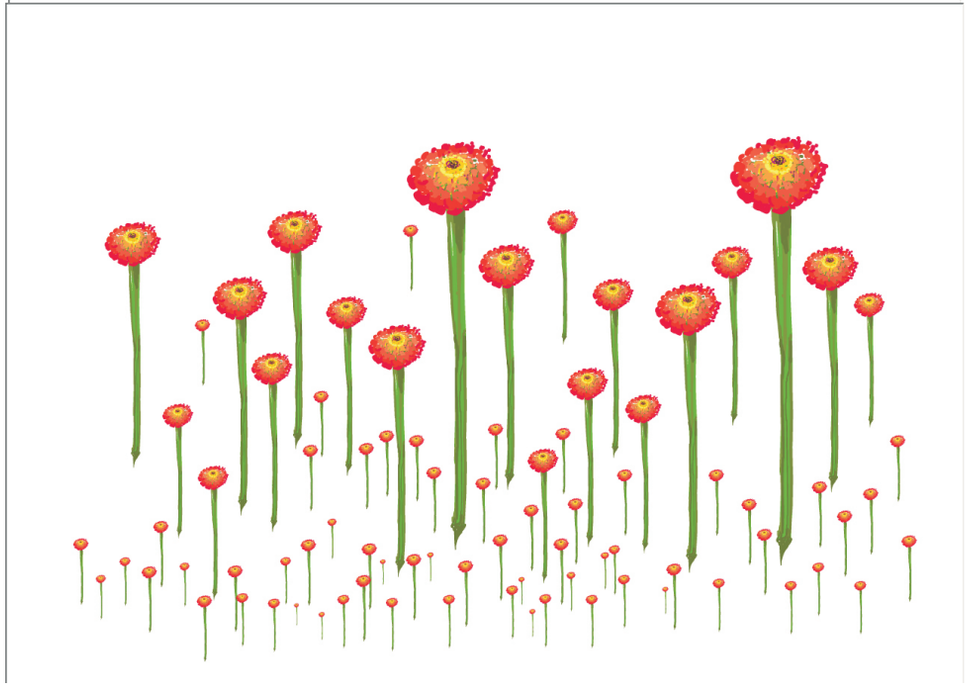


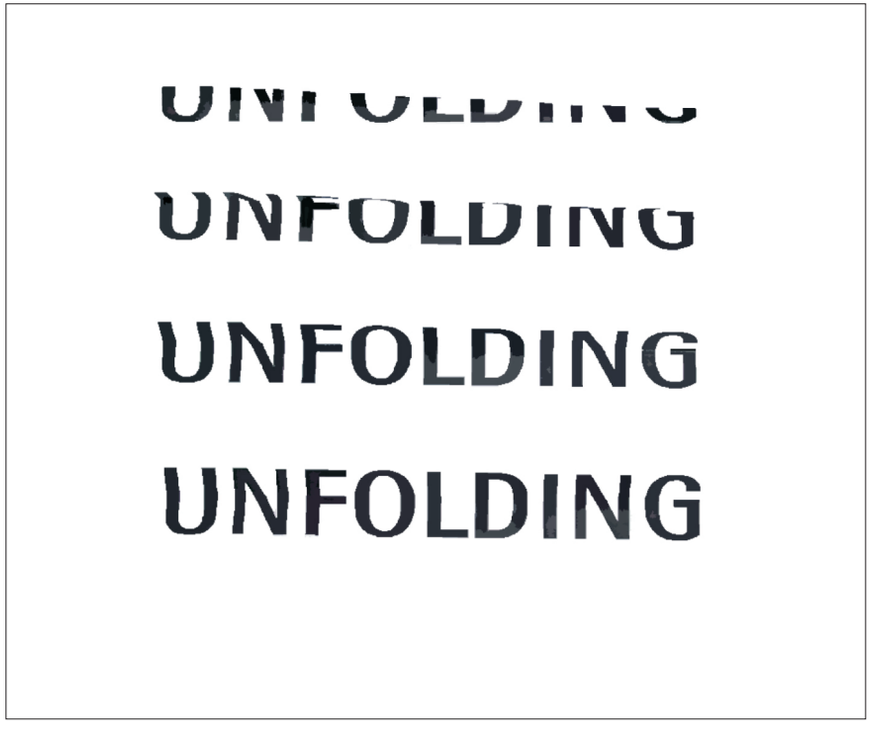


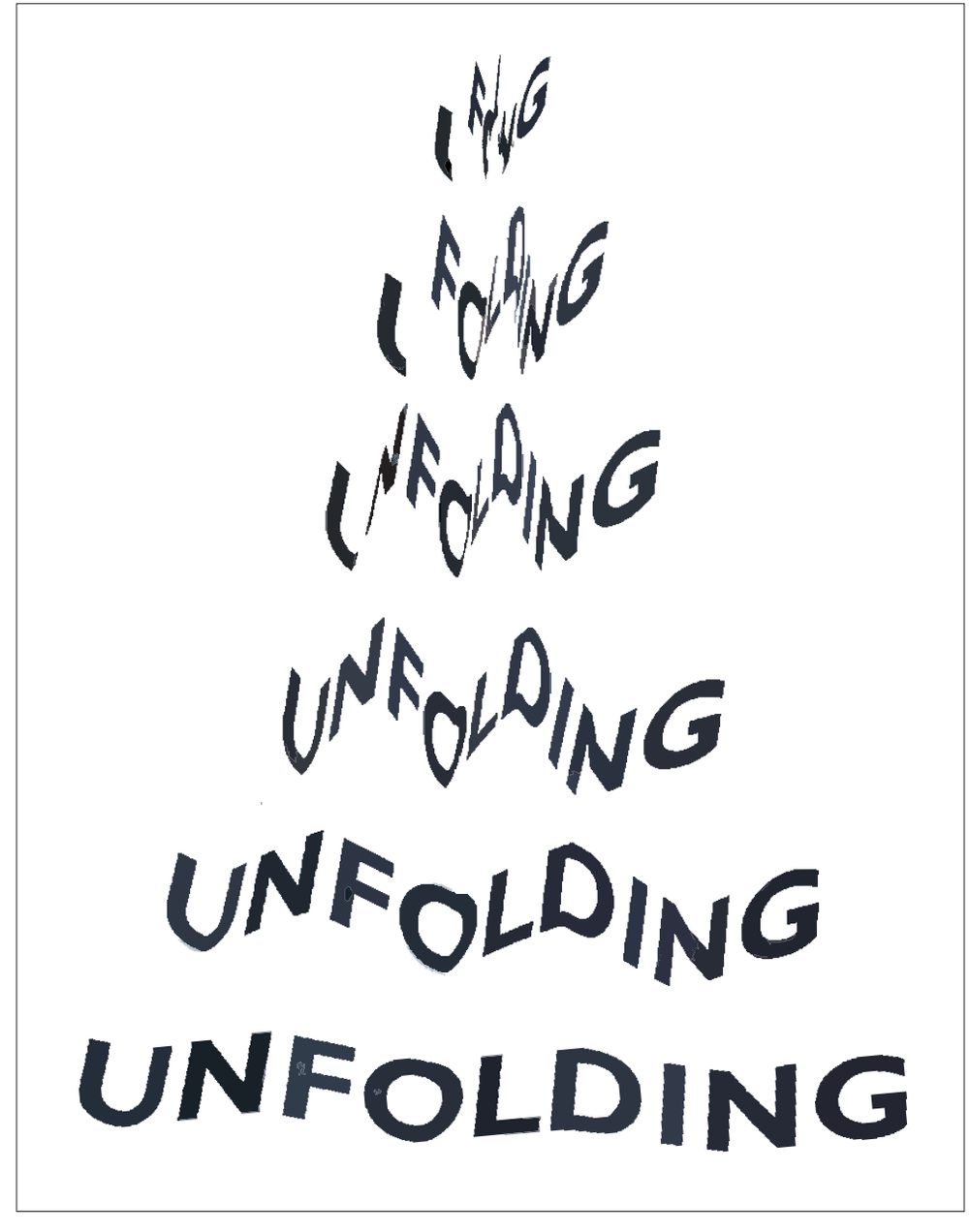


Flowers Unfolding



Leaves Unfolding


UNFOLDING
UNFOLDING
UNFOLDING


UNFOLDING
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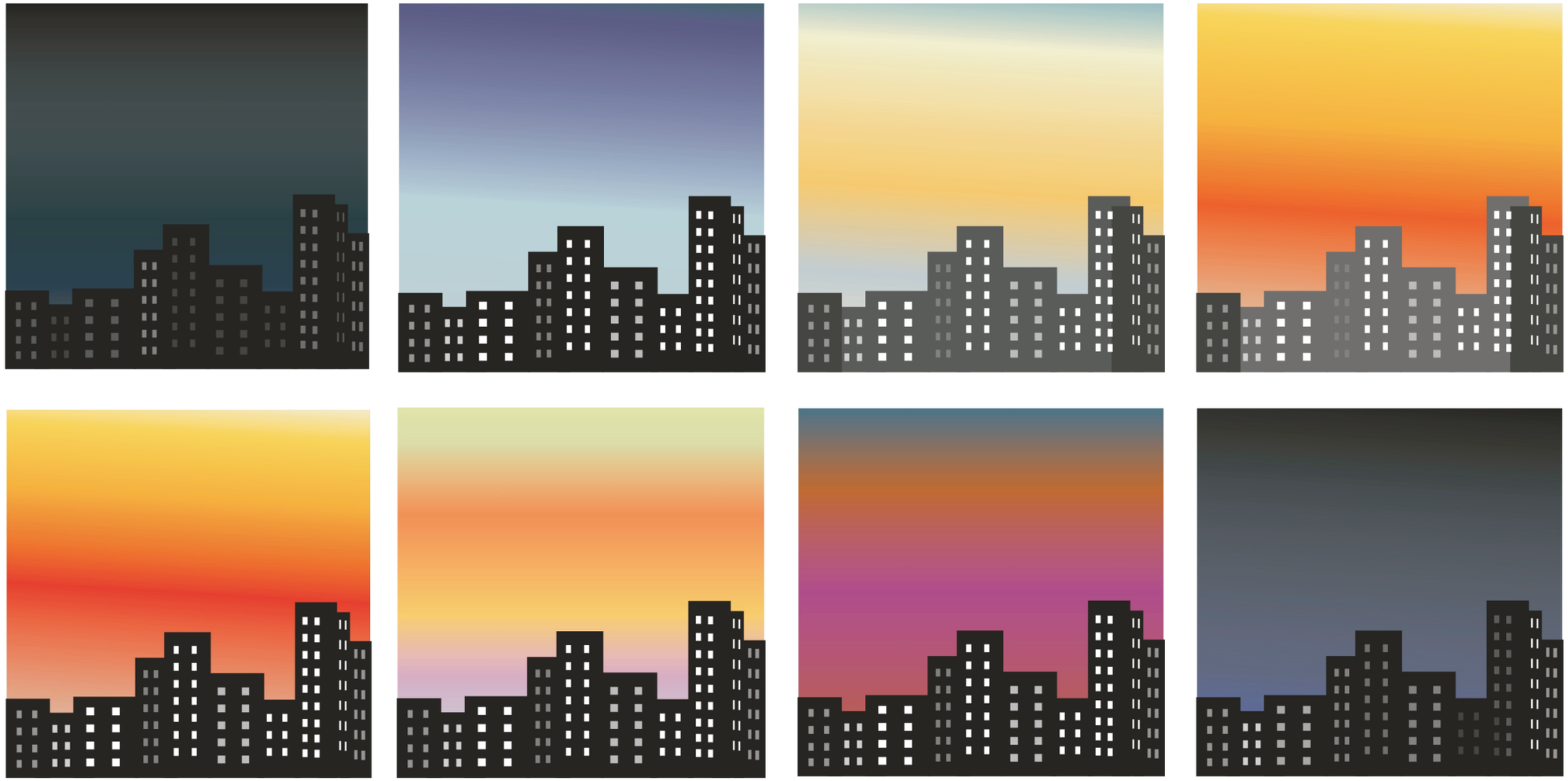
UNFOLDING
UNFOLDING

Temporal Unfolding

Apart from all these physical unfolding there exist unfolding on a complete different dimension i.e. Temporal or Spiritual unfolding. For example everyday is like another day but everyday doesn't unfolds like the other. A day unfolds with the change in time, moods, events and surroundings. This is the abstract form of unfolding. This can be the sixth part of the film.

Day Unfolding



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I would like to thank my classmates for their views.

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Others:

My class of **Indian Thoughts and Tradition** by **Prof: Kirti Trivedi**

The rich landscape of **IIT Campus** for studying and documenting various flowers and leaves.