

A Systemic Design Christmas: Fractals!

Systems & Snowflakes

December 12, 2017 | Alberta CoLab

Icebreaker

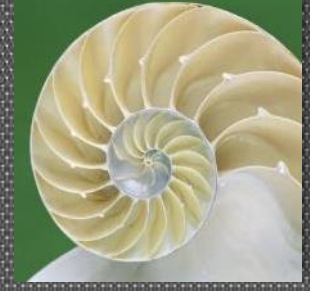
Collect one card from the top of the pile.
Show no one.

Each card has an image of a snowflake at some degree of magnification.

By asking questions, find the two people with the cards immediately before and after your card by degree of magnification.

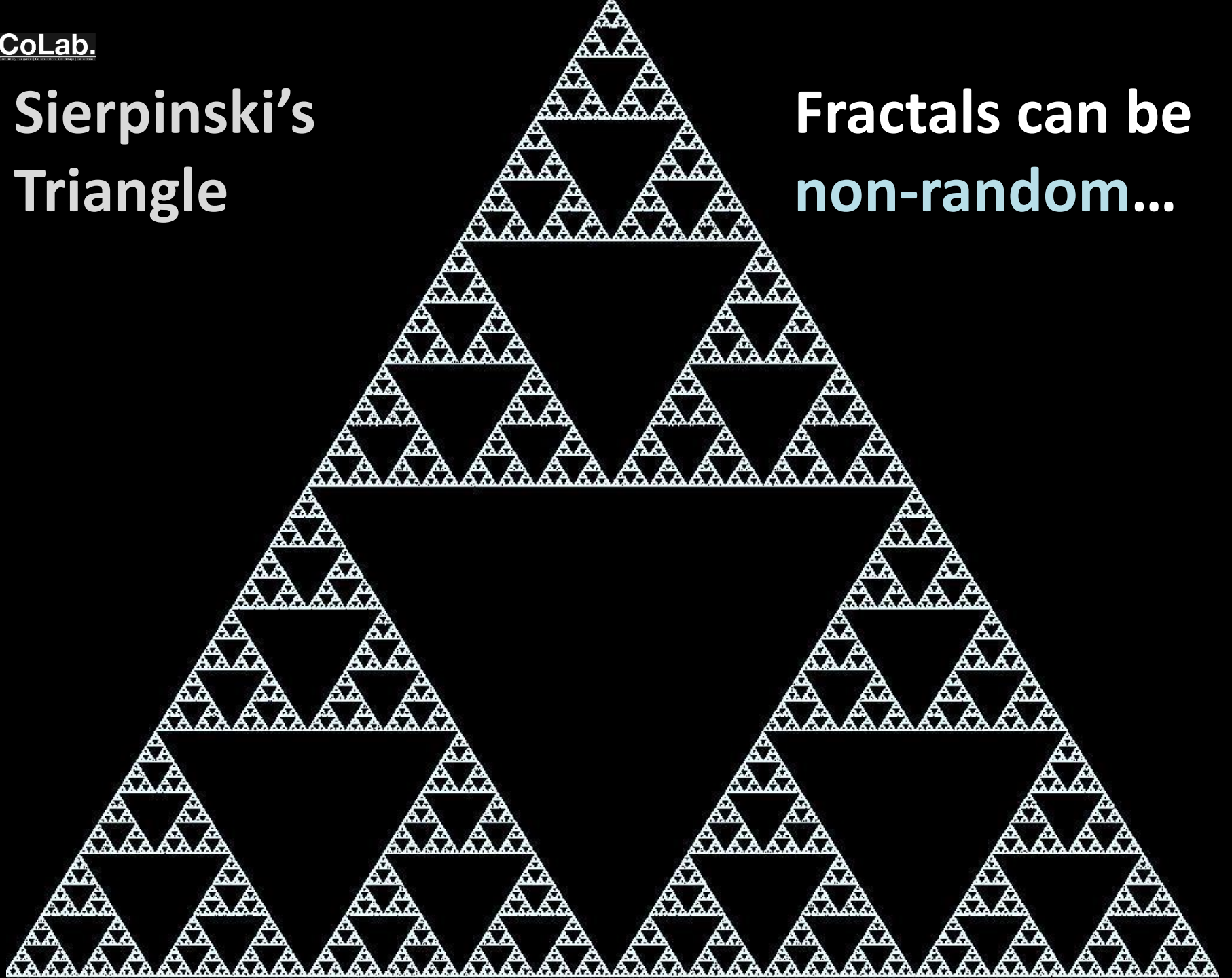
Once you have found them, try to find the two threesomes that border your group.

A fractal is a pattern that is **self-similar** – it repeats itself at different scales.



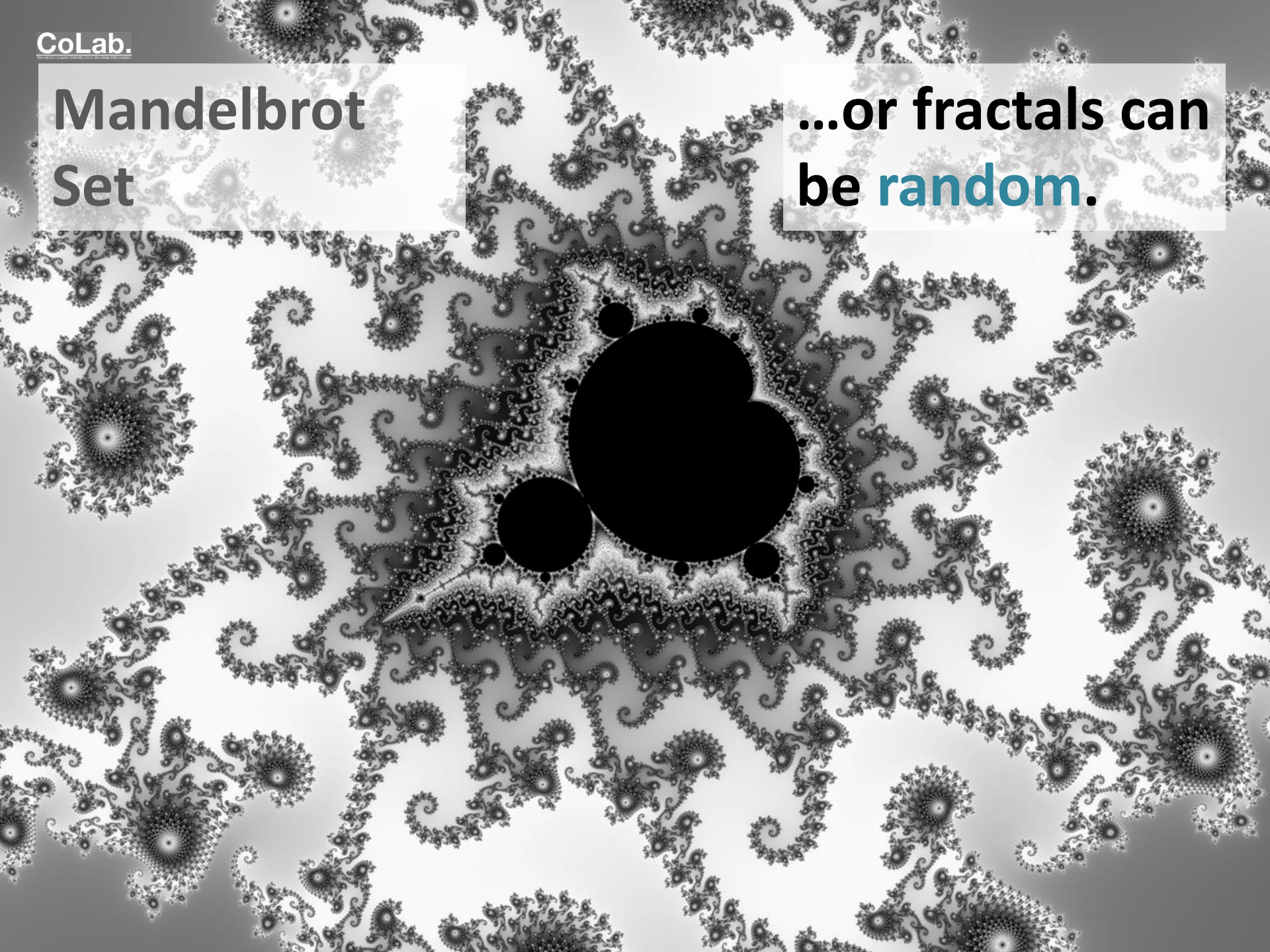
Sierpinski's Triangle

Fractals can be non-random...



Mandelbrot Set

...or fractals can
be **random**.



A fractal is a picture that tells the story of the process that created it.

- The Fractal Foundation

Can you identify a fractal pattern in your work (or life)?

Something that repeats at different scales?

What are the effects of this repeating pattern?

Individual Reflection – Share in Pairs – Table Conversation



Complex System

Many parts

Interactions

Non-linear

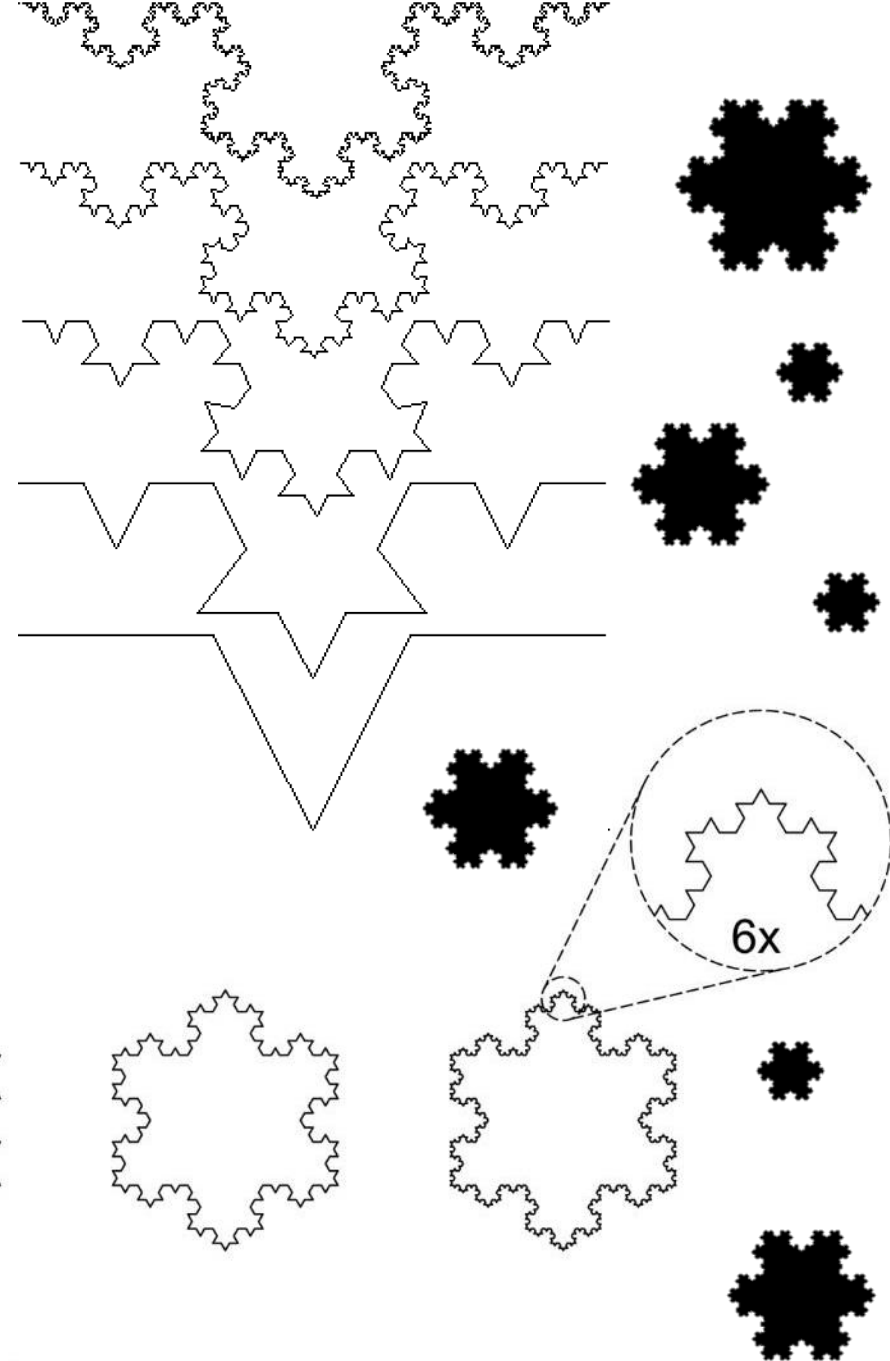
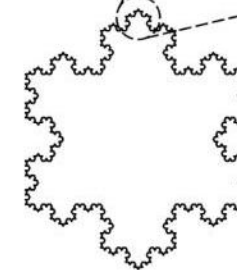
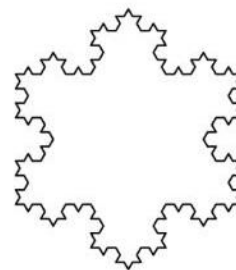
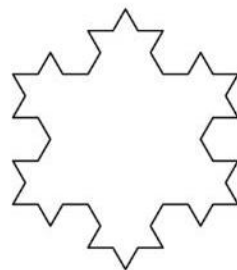
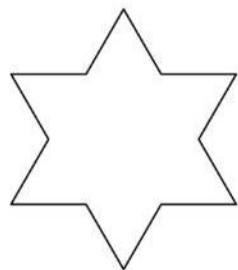
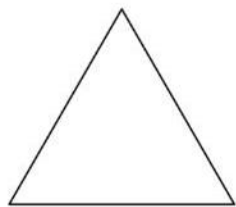
Chaos

May have many or few elements

Iterations

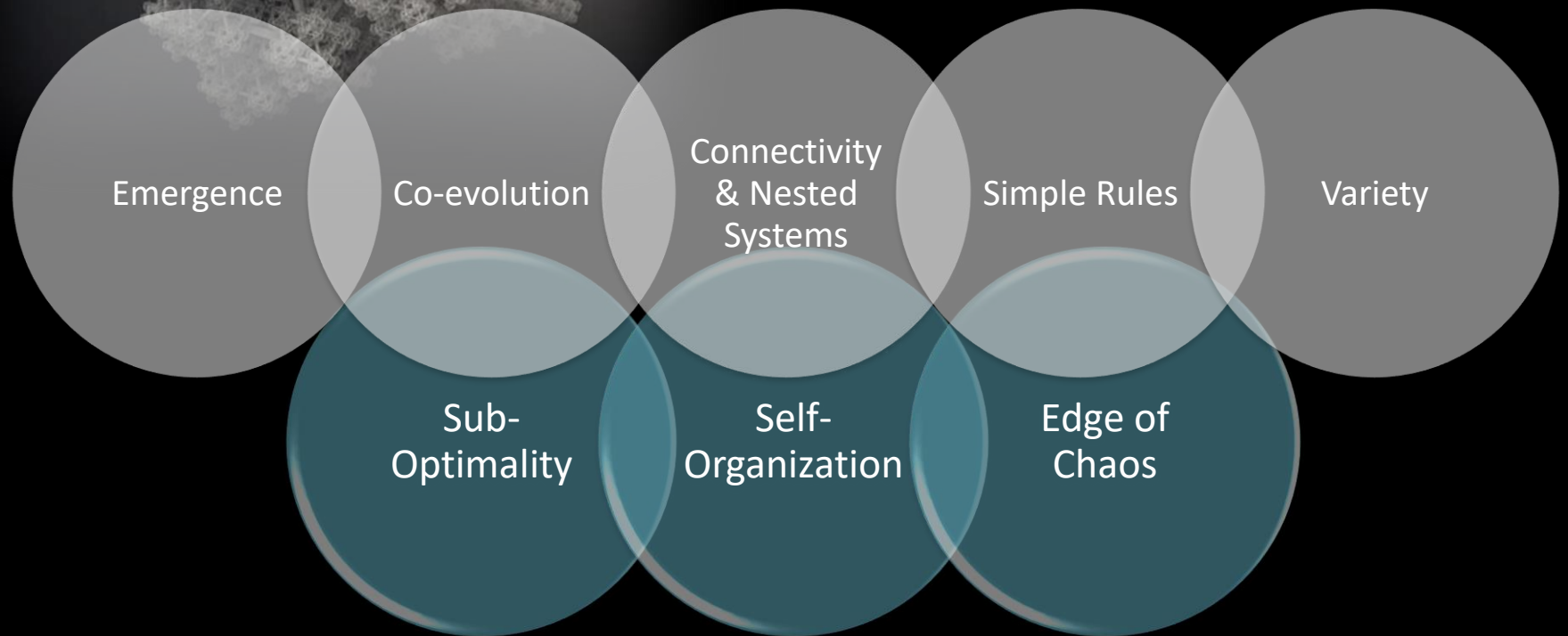
Non-linear

- **Fractal** means that a system is made up of several other systems, but obeys the same rules.
- Classic fractals such as the **Koch Snowflake** always consist of identical, repeating structures.

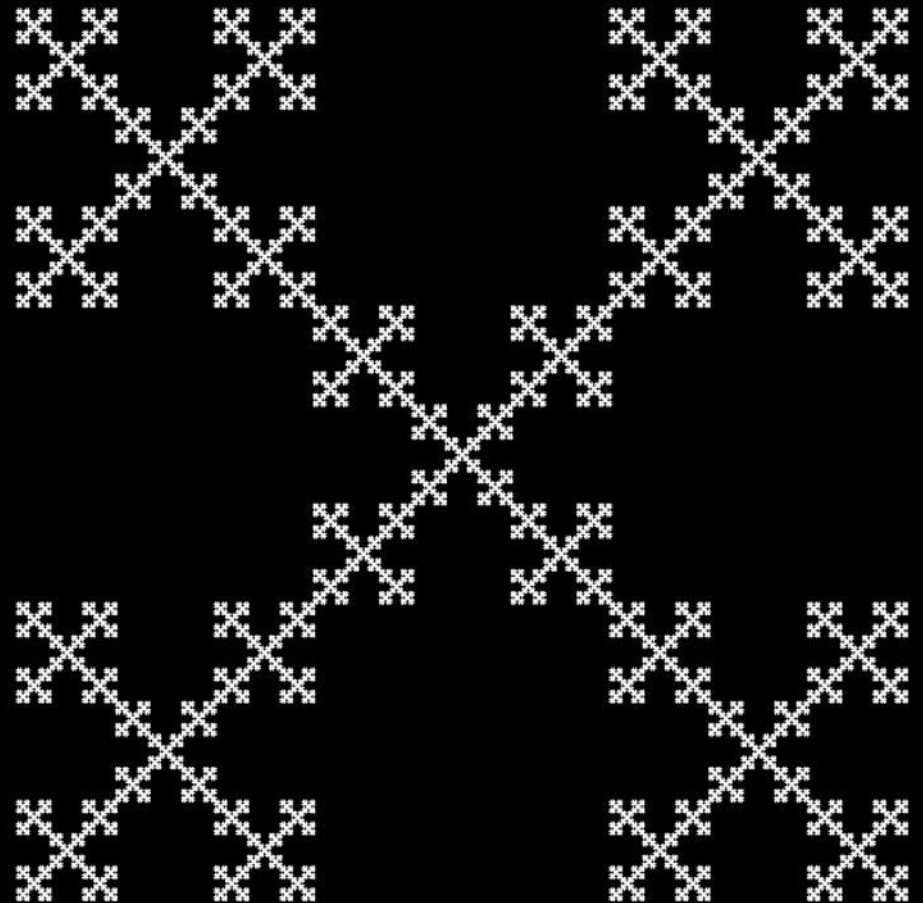


Koch Snowflake fractal - progression of scales

A **fractal system** is a complex, non-linear, interactive system that can adapt to a changing environment.



Sub-Optimal



Self-Organizing

No
Hierarchy

No
Planning

Emergence

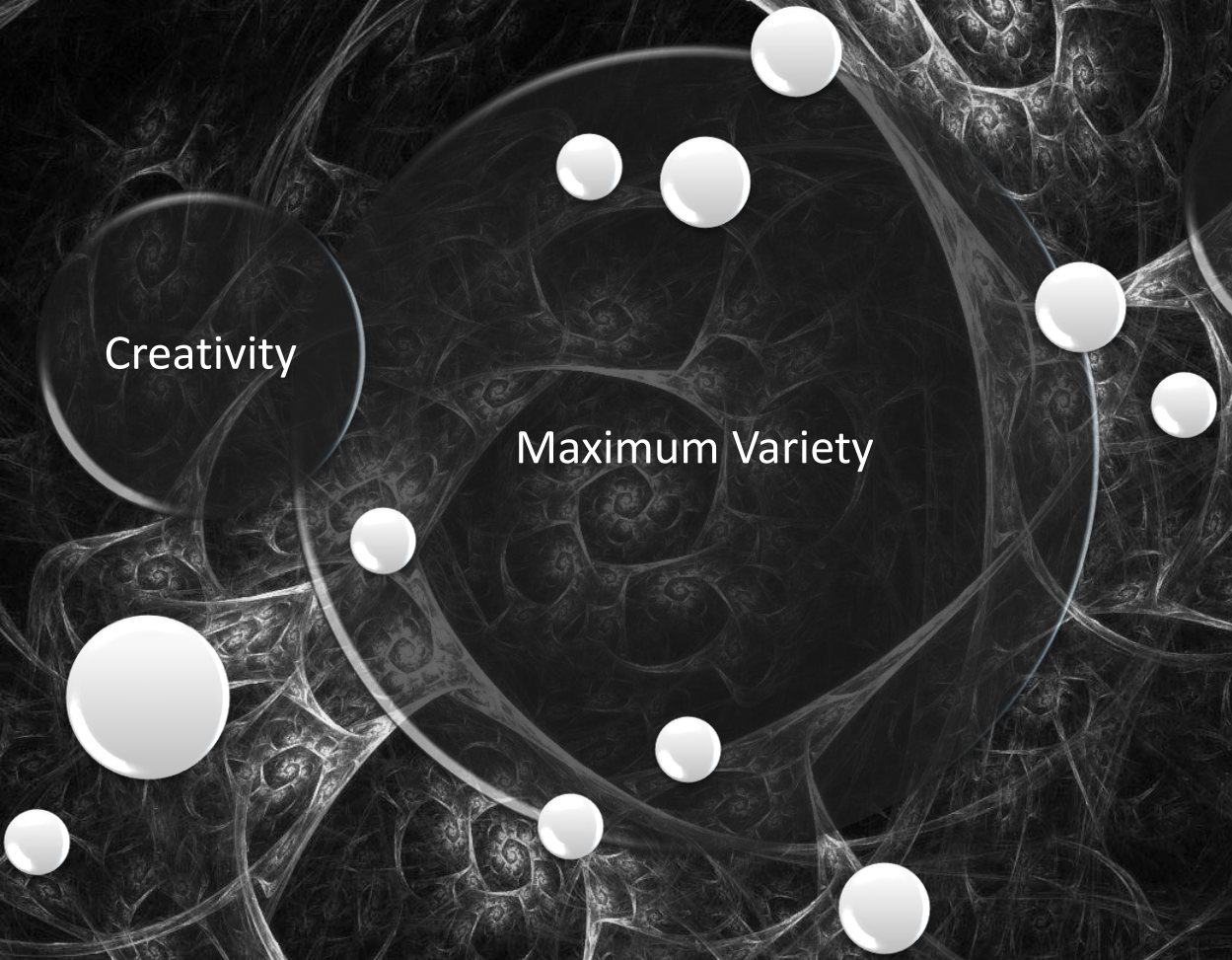
Feedback

Edge of Chaos

Creativity

Possibility

Maximum Variety



Fractal Organizations

“The very best organizations have a fractal quality to them [...] There is a consistency and predictability of behaviour [...] Fractal organizations, though they may have never heard the word *fractal*, have learned to trust in natural organizing phenomena.”

- Margaret Wheatley

Relationships are Key

Universal Participation

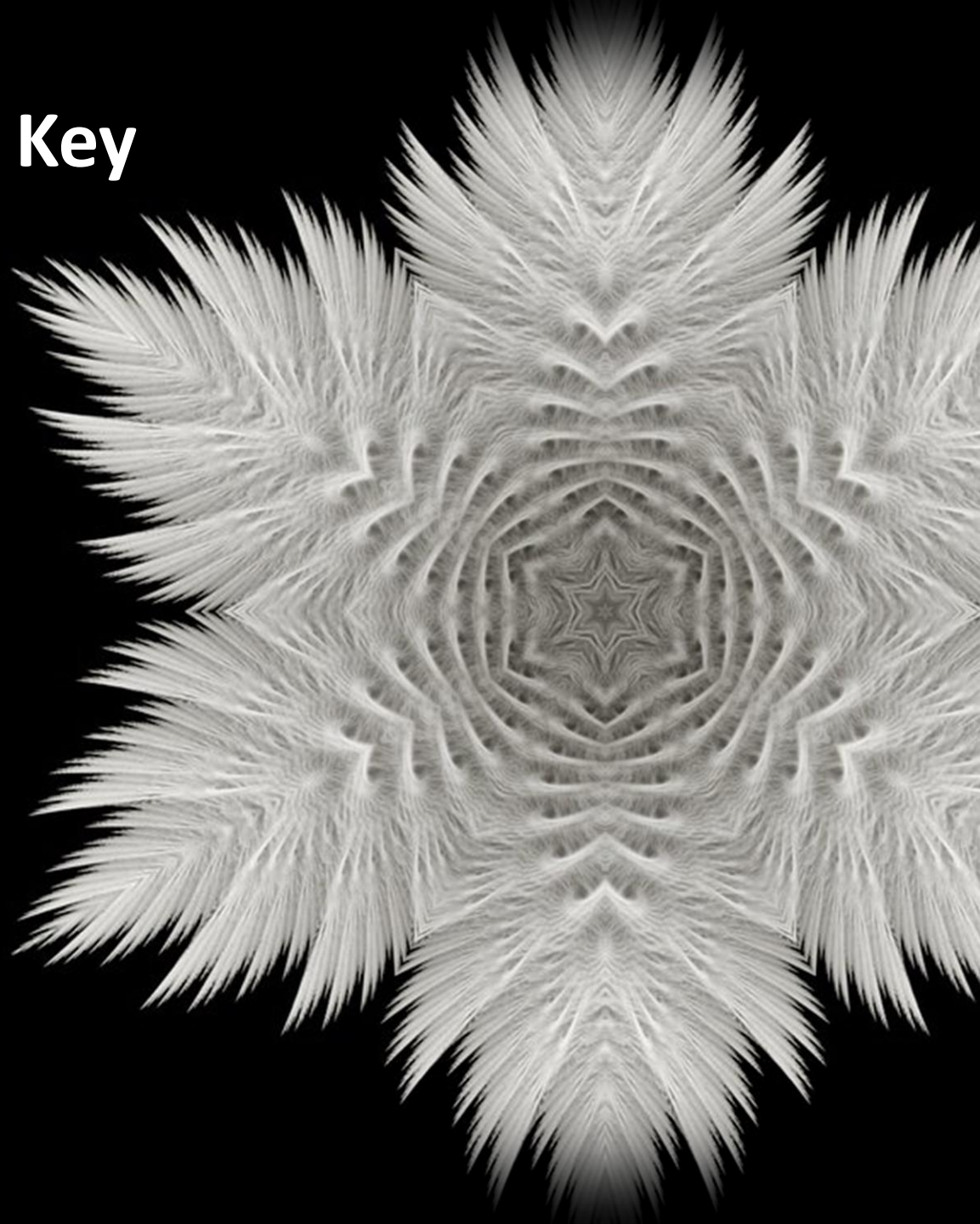
Effective Info Flows

Function-level Decision Making

Shared Purpose & Values

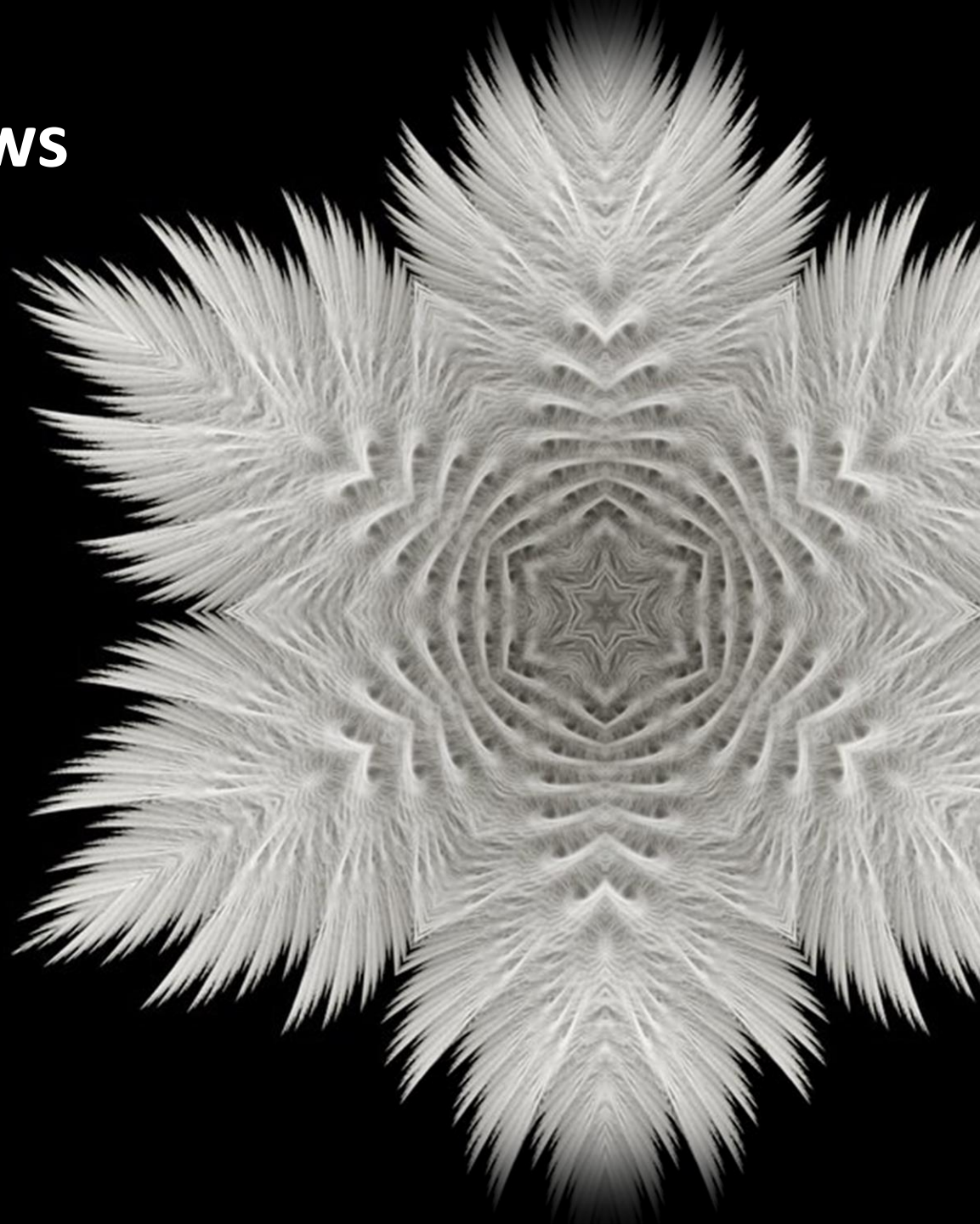
Relationships are Key

Relationship development enables the effective flow of information between individuals and teams.



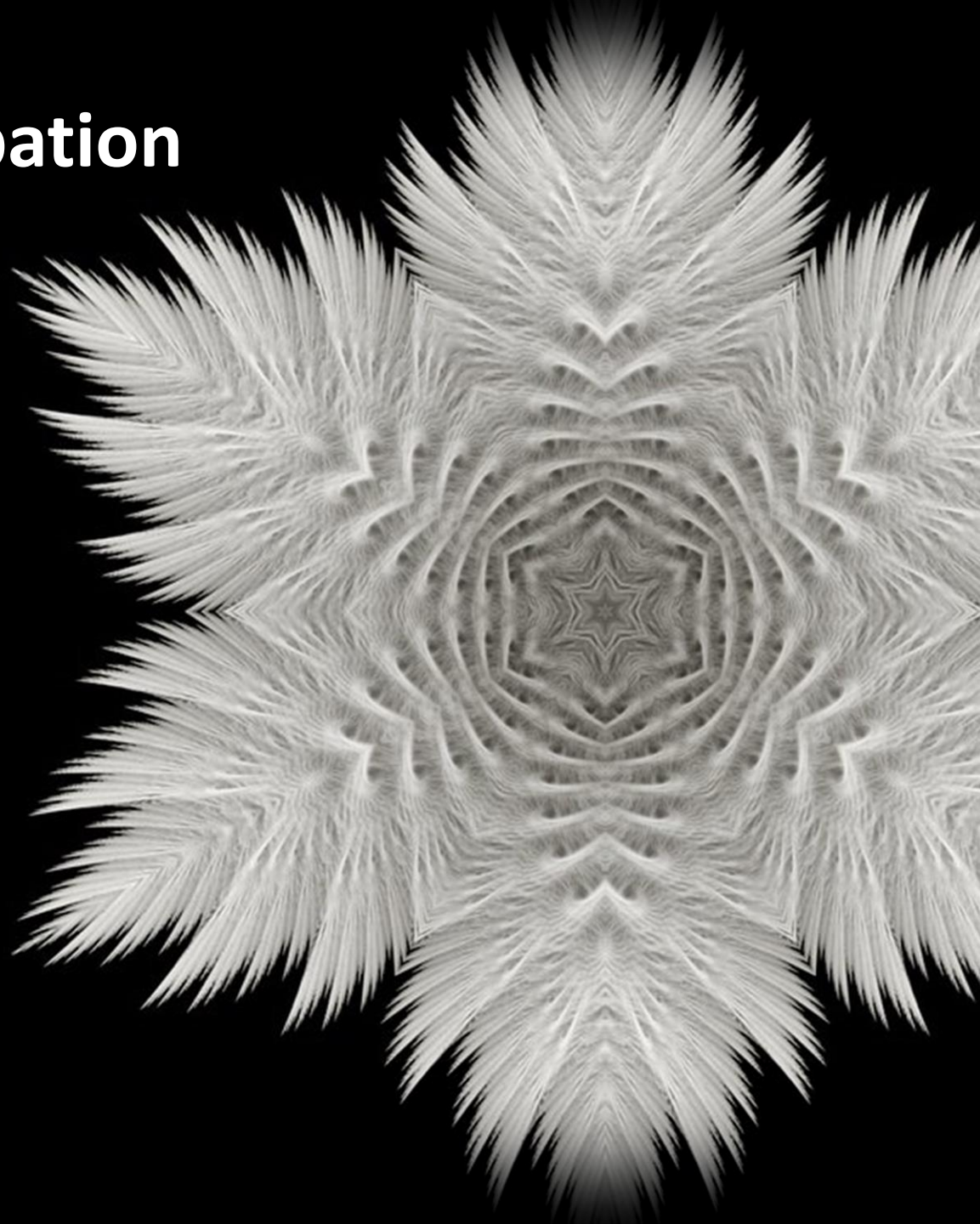
Effective Info Flows

Fractal organizations follow the laws of nature in which information and resources flow in the same channel.



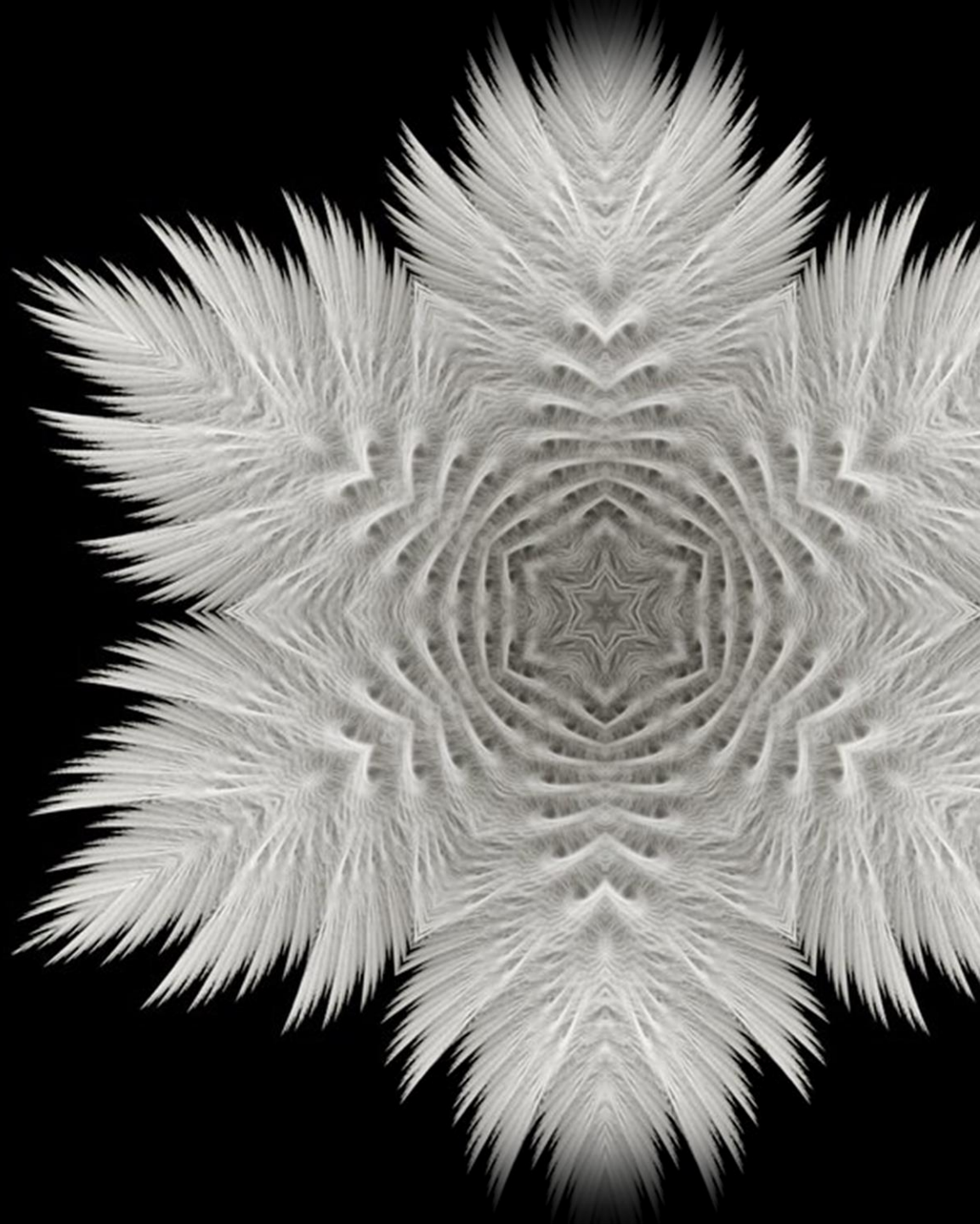
Universal Participation

Fractal organizations involve everyone in ideas and solutions, with a commitment to universal leadership.



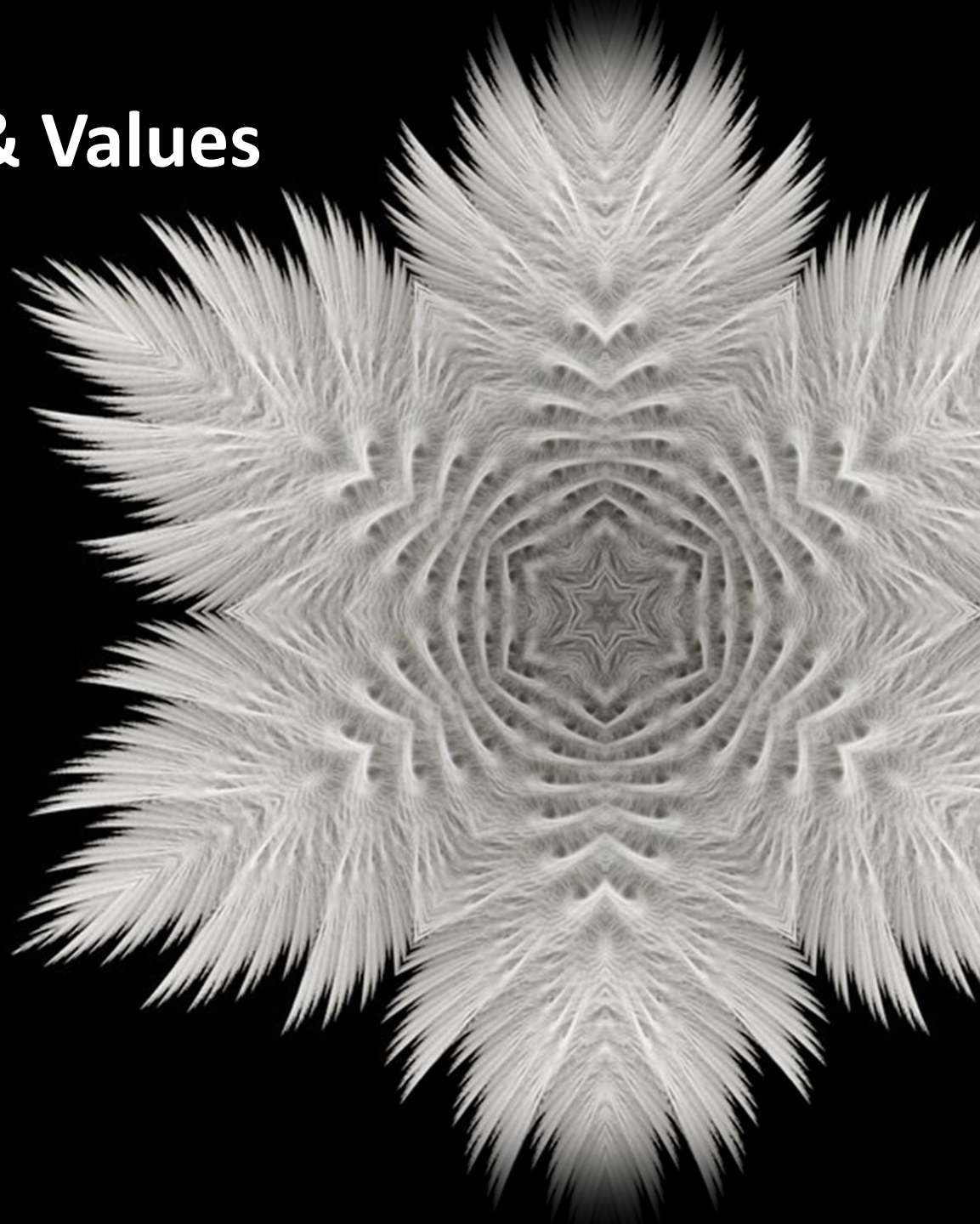
Functional-level Decision-Making

Fractal
organizations can
have both
centralized and
decentralized
decision-making
with centre and
edge leaders.



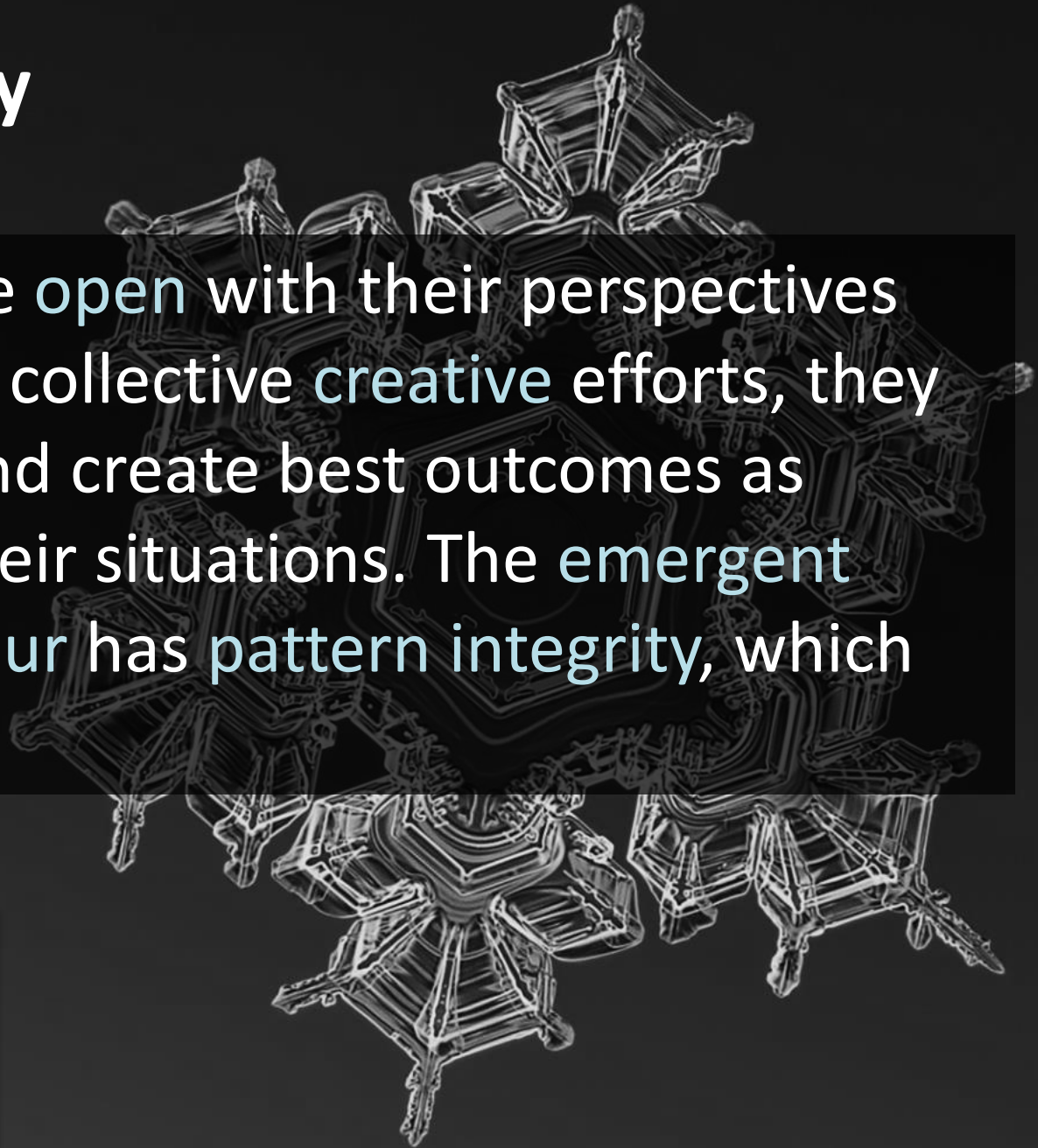
Shared Purpose & Values

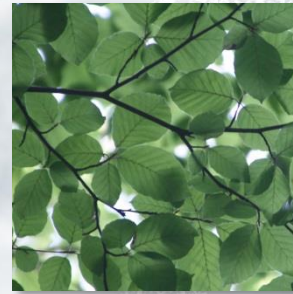
Fractal
organizations
keep members
connected
through shared
purpose and
values.



Pattern Integrity

When humans are open with their perspectives and participate in collective creative efforts, they naturally thrive and create best outcomes as stakeholders in their situations. The emergent collective behaviour has pattern integrity, which generates trust.





Fractals as Metaphor

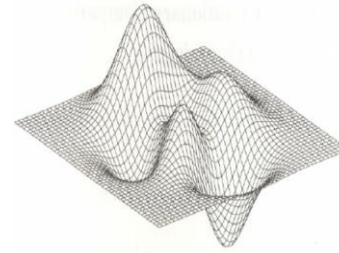
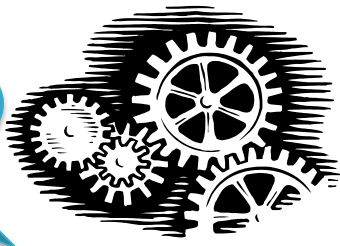


MicroStructures – Liberating Structures

The five design elements for a conventional presentation or lecture are illustrated below:

1. A **structuring invitation** (listen to me);
2. **How the space is arranged and what materials are needed** (rows or U facing presenter, screen, projector and PPT slides);
3. **How participation is distributed** (nearly 100% of total time for presenter);
4. **How groups are configured** (one group, one presenter); and,
5. **A sequence of steps and time allocation** (presentation; possibly Q&A).

Lab.
Clockwork: You gain from control



Anti-fragility: You gain from disorder

Simple/Complicated Machine Metaphor

Complex Biologic Metaphor

Role defining - specify job and task descriptions

Relationship building - work with patterns of interaction

Conflict management - restore order in each part

Uncover paradox - draw out differences as source of creativity

Tight structuring - use formal chain of command

Loose coupling - work with informal communities of practice

Simplifying - prioritize or limit simple actions

Complicating - add more degrees of freedom & multiple actions

Socializing - seek homogeneous values & ideas

Diversifying - draw out & exploit difference

Decision making - find the "best" choice

Sense making - many right answers in different local contexts

Knowing - decide & tell others what to do

Learning - act/learn/plan at the same time

Controlling - tightly managed execution w/ max specs

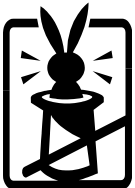
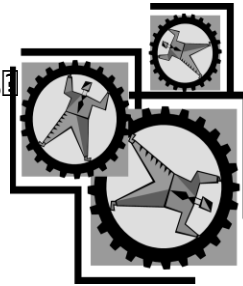
Improvising - acting in an instant w/ minimum specs

Planning via forecasting - plan & then roll out

Shaping adaptive strategies - co-evolve & hedge strategies

Staying the course - align & maintain focus

Noticing emergent direction - build on what works



Mondragon
Corporation
Assembly
Line

Examples of
Microstructures

Alberta
CoLab Rules
of
Engagement

Your MicroStructures

Think of a challenge you presently face. This may be at work or elsewhere.

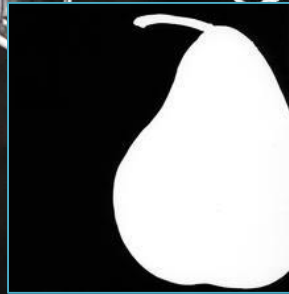
What microstructures are holding that challenge in place? How so?

What opportunities do you see to move forward: what alternative microstructures might unleash latent potential?

Individual Reflection – Share in Pairs – Table Conversation

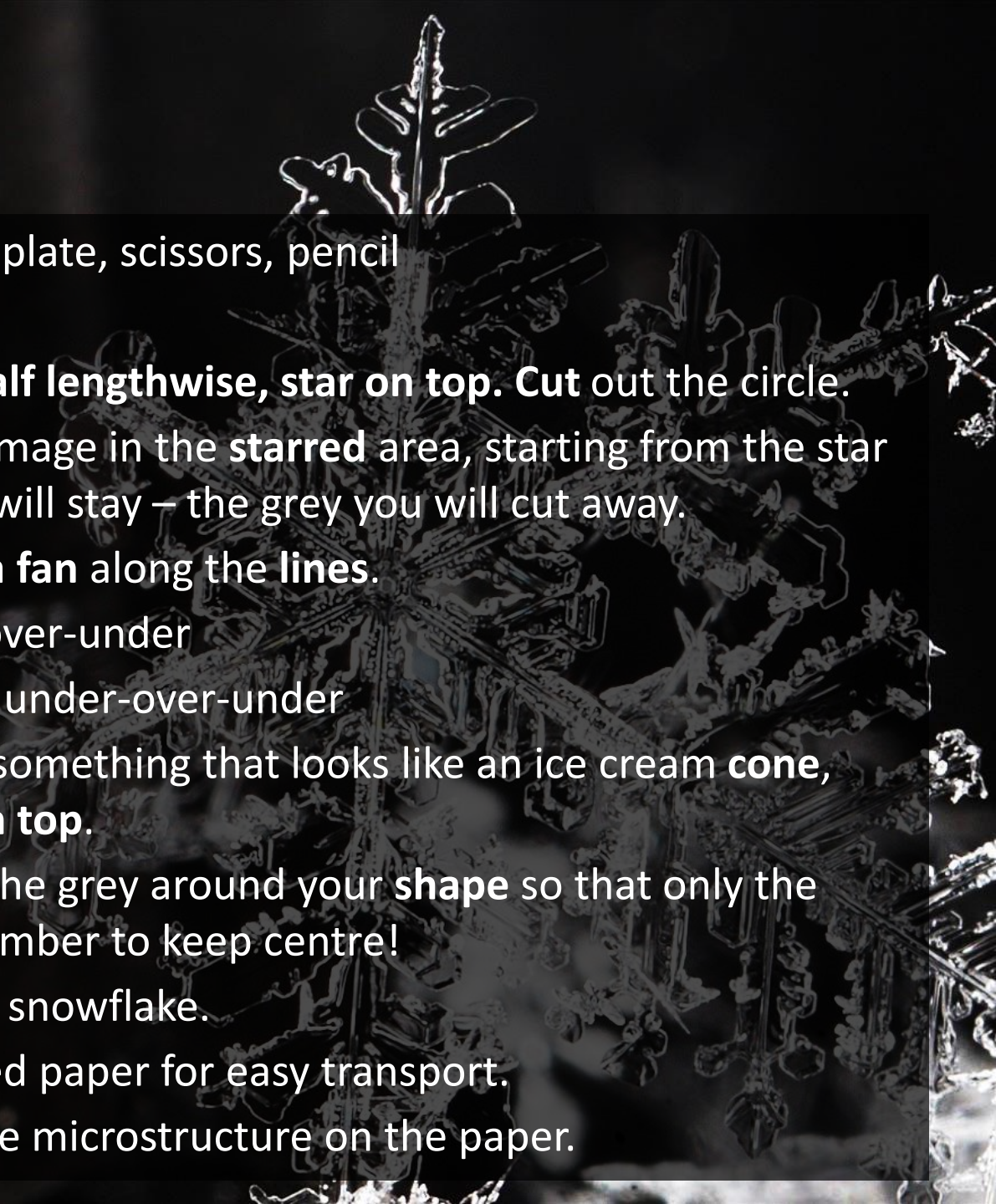
Visualizing Promising Microstructures

- Choose a promising microstructure – one that may help you address the challenge you identified, or that could be amplified or scaled to make things even better.
- Create a simple image, or icon, to represent that microstructure. Draw it on a post-it. Name it.
- Your image should have positive and negative space.



DIY Fractals

- **Materials:** snowflake template, scissors, pencil
- **Instructions:**
 - **Fold your paper in half lengthwise, star on top. Cut out the circle.**
 - **Draw your shape or image in the starred area, starting from the star side. The white area will stay – the grey you will cut away.**
 - **Fold your paper like a fan along the lines.**
 - Left of the star: over-under
 - Right of the star: under-over-under
 - You will end up with something that looks like an ice cream **cone**, with your **drawing on top**.
 - **Folded**, cut away all the grey around your **shape** so that only the white remains. Remember to keep centre!
 - Carefully **unfold** your snowflake.
 - **Tape** it to the coloured paper for easy transport.
 - **Write** the name of the microstructure on the paper.



Further Reading on Fractals

- Liberating Structures:
<http://www.liberatingstructures.com/design-elements>
- Fractals: Online Course
<https://www.santafe.edu/engage/learn/courses/fractals-and-scaling>
- Fractal Foundation:
<http://fractalfoundation.org/resources/what-are-fractals/>
- Simple Guide to Chaos & Complexity:
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2465602/>
- Fractal Organization Theory:
<http://www.tandfonline.com/doi/abs/10.1179/1477963313Z.0000000025> (available from GoA library)



Thank you!
See you in 2018!