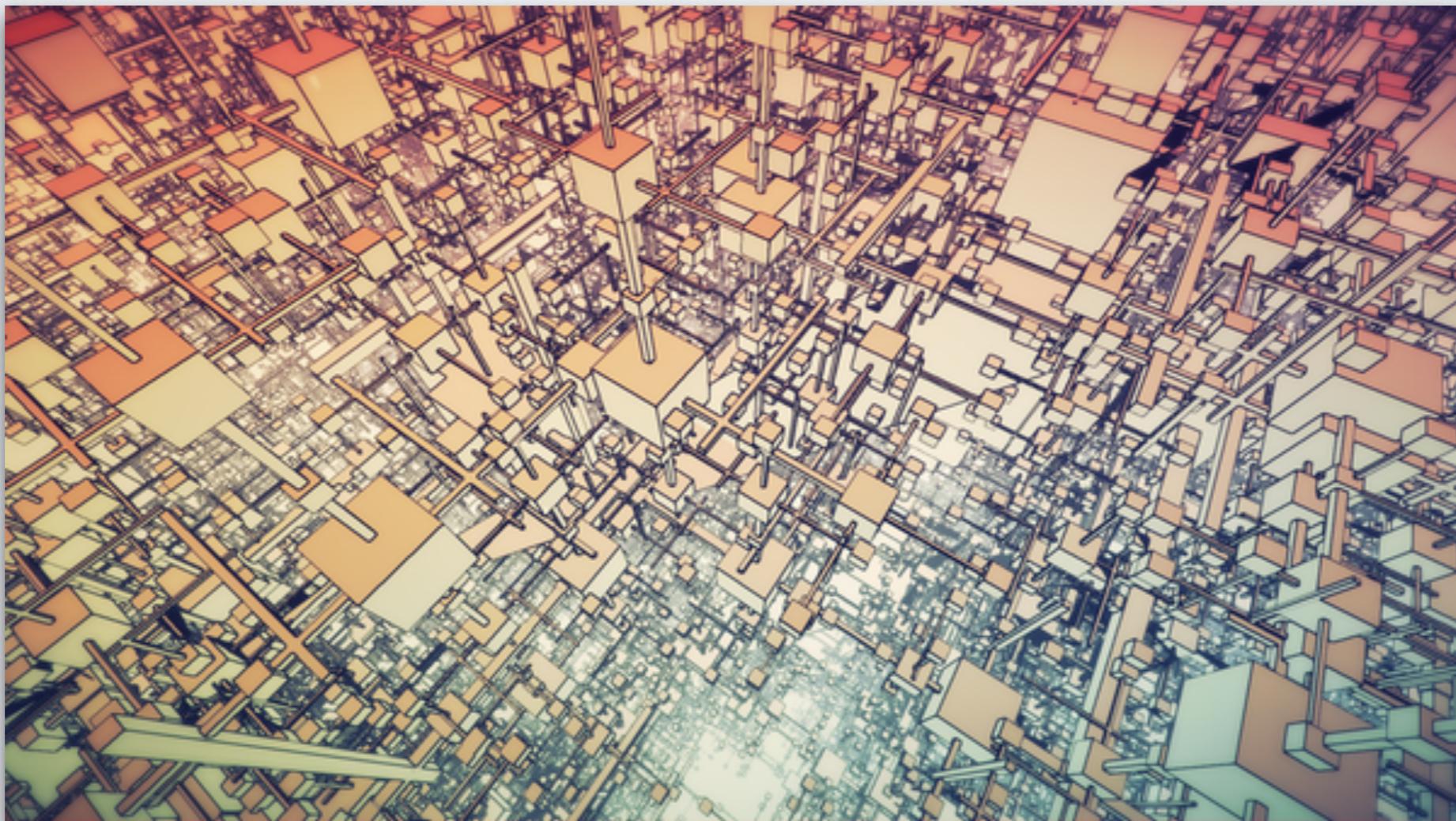


WHAT IS PROCEDURALISM?



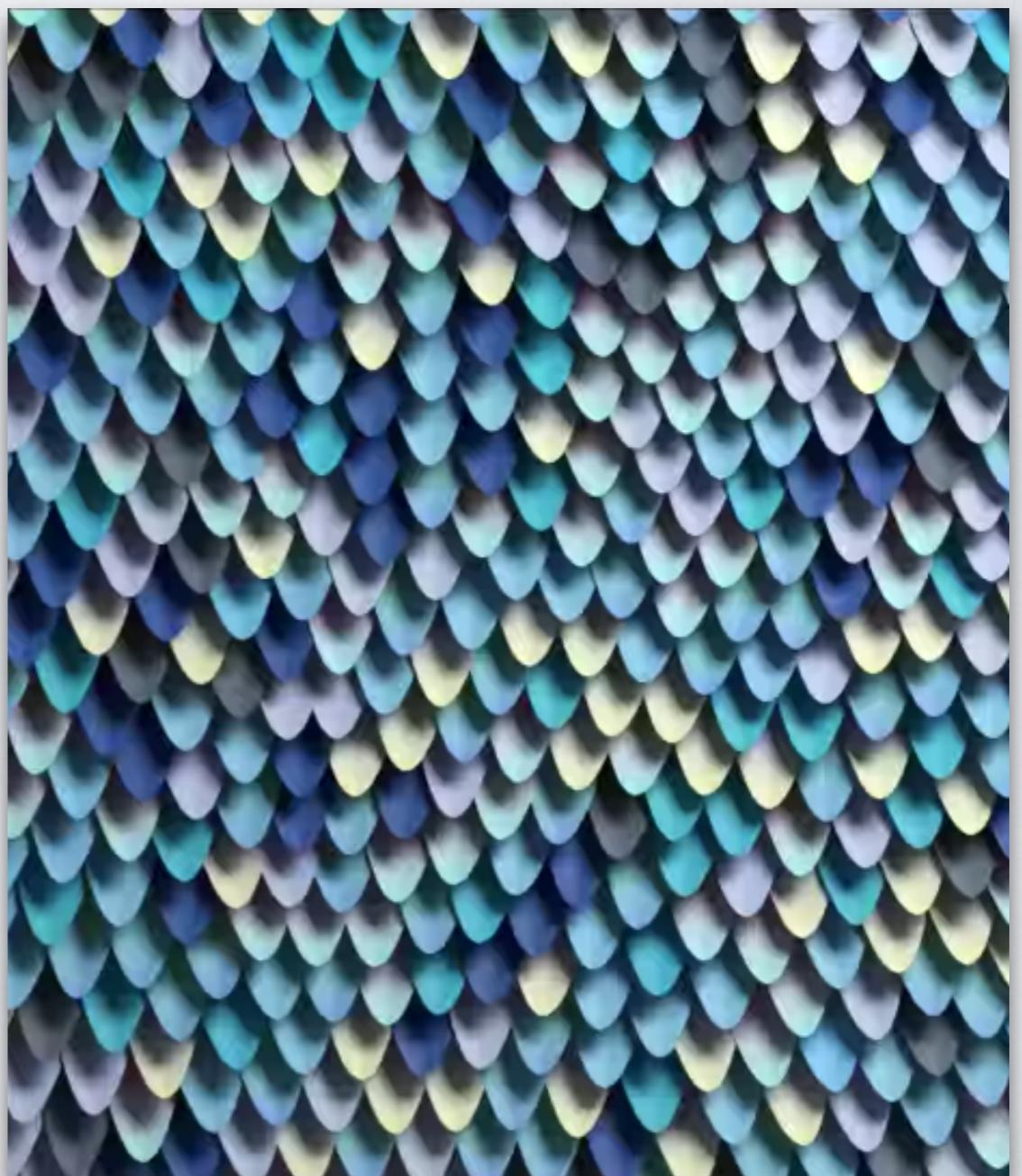
(source)

And why should we care?

WHAT DO YOU THINK?

WHAT IS PROCEDURALISM?

- Finding a “recipe” to describe and synthesize content
- Creation via algorithms, not manual specification
- Slippery definition in computational work
 - Eg. Rendering?!



Light it Up — Method Studios ([source](#))

FOR INSTANCE...



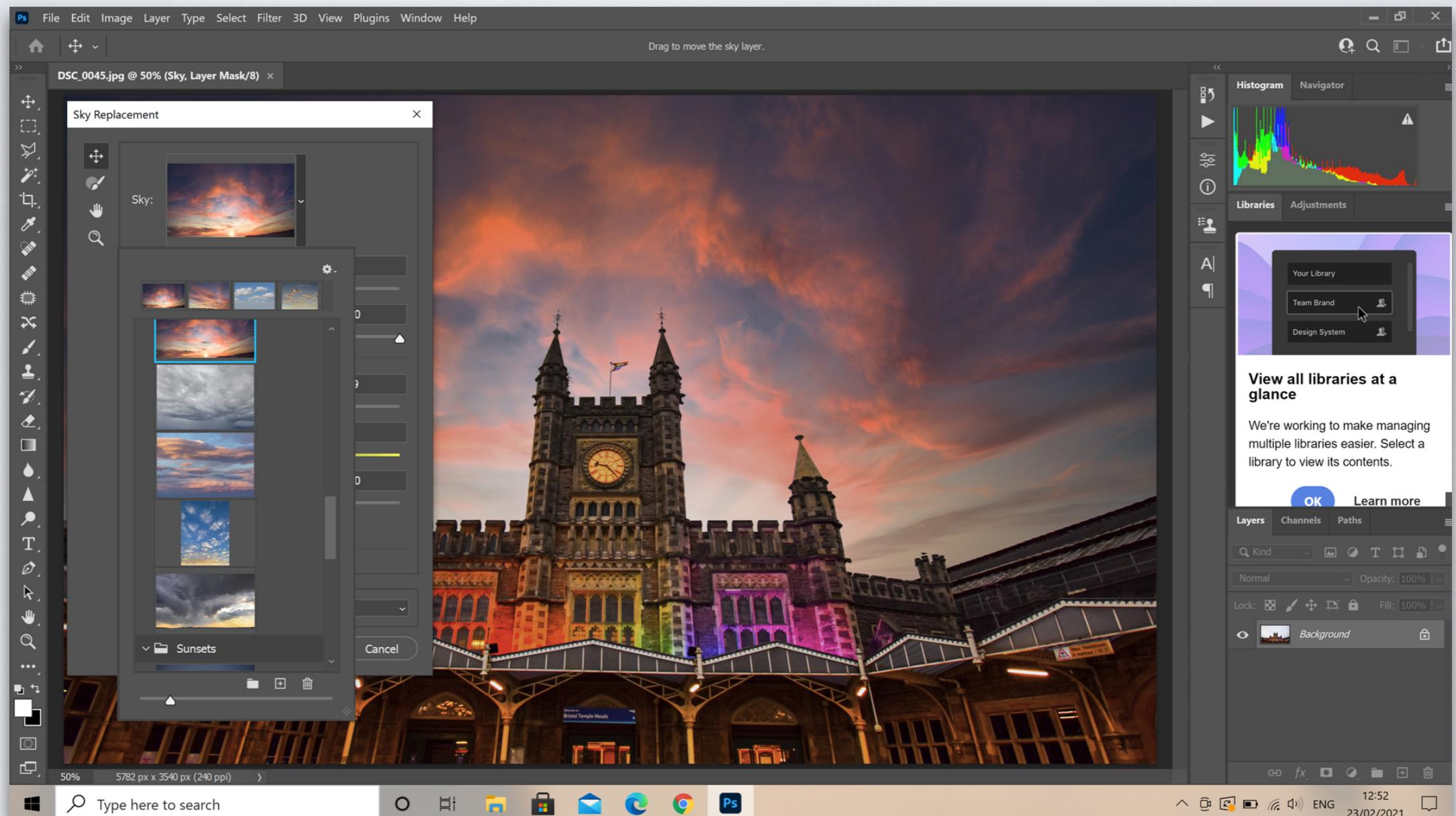
Monolith - ASD | Assembly 2015 ([source](#))

FOR INSTANCE...



Townscaper ([source](#))

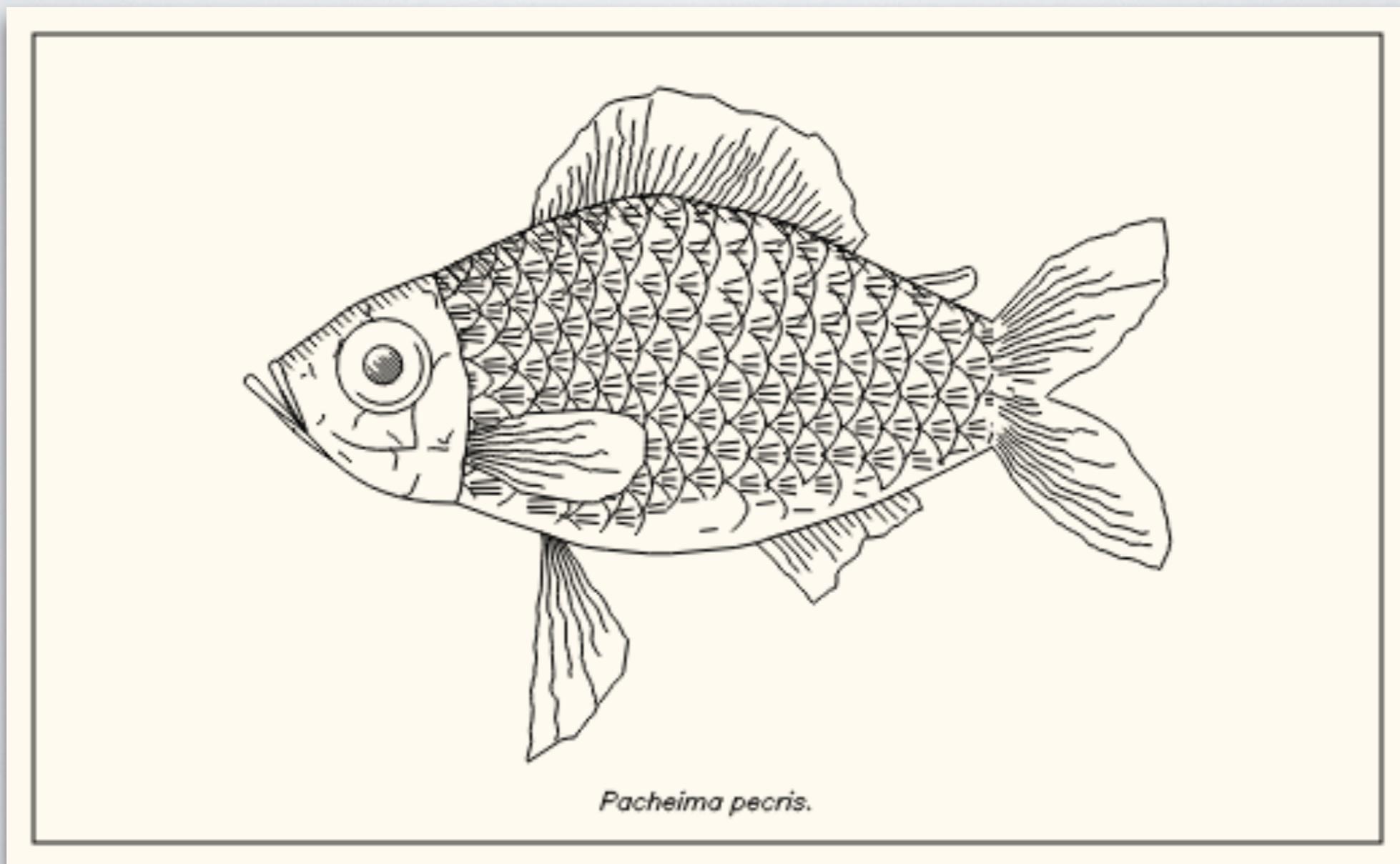
FOR INSTANCE...



Photoshop! ([source](#))

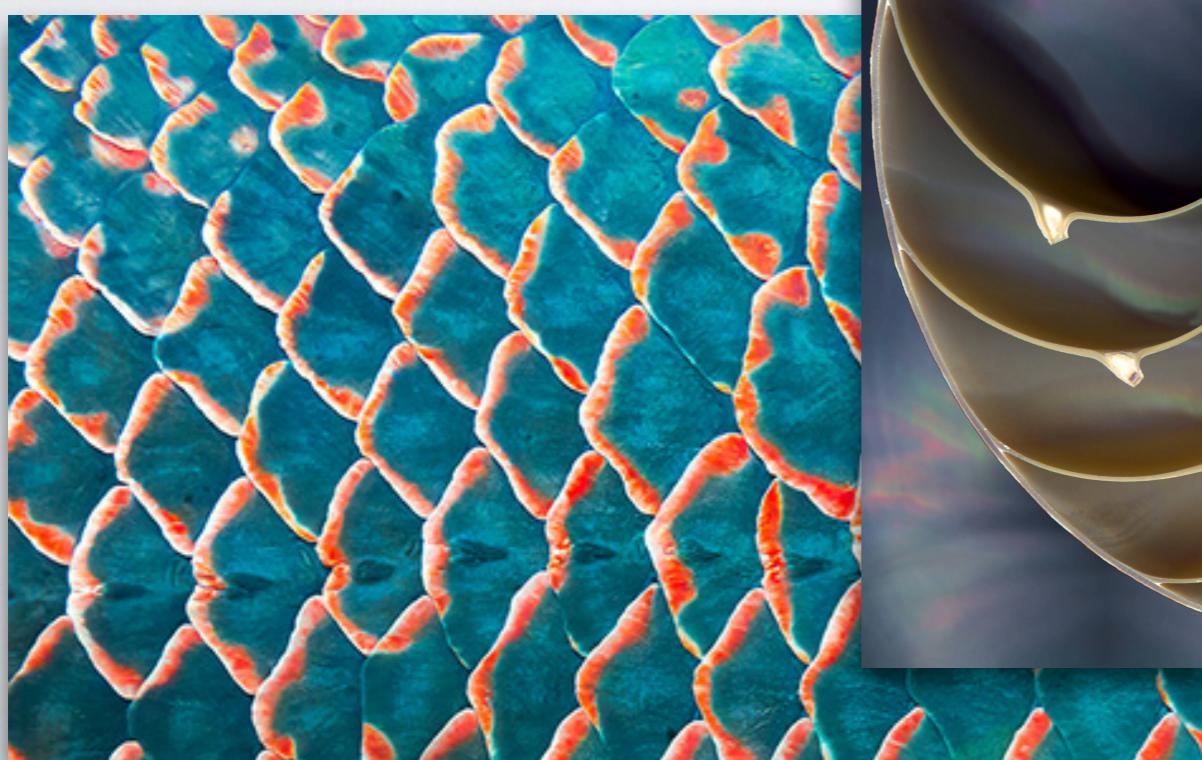
Procedural question of the day!
(PQoftD)

HOW TO GENERATE...?



(source)

STRUCTURE IS EVERYWHERE



WHY PROCEDURALISM?

- **Infinity:** Generation at consumption speed => endless content Eg. Minecraft
- **Design exploration:** computers can invent unintuitive solutions that provide inspiration for further design. Beauty in emergent complexity
- **Customization:** Tailor content for individual players / sessions
- **User empowerment:** amplify player input. Make them feel powerful.
- **Cost:** Duh. Person hours are expensive. Volume is expensive.
- **Automation of tedium:** Outsource the dull parts of the creative process to the computer. Eg. Smart placement
- **Design formalization:** implementing a procedural system really solidifies and clarifies the design problem. Eg. Danesh

WHY PROCEDURALISM?



Novel perception of the familiar

SKY'S THE LIMIT

Many, many examples of interesting procedural content

- Dwarf Fortress: Character / world simulation
- Left4Dead : emotional intensity
- Shadow of Mordor: enemy progression
- Spore: creature generation / animation
- etc etc

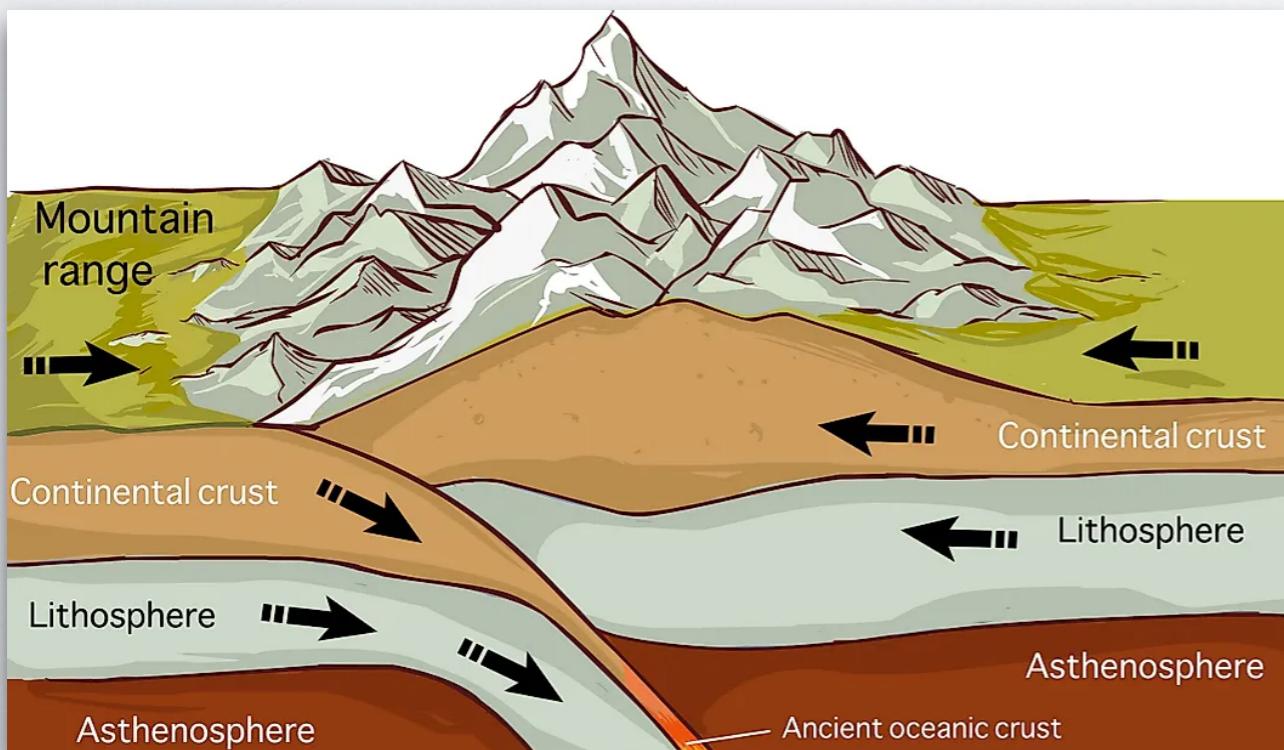
TYPES OF PROCEDURALISM



James Miller ([source](#))

ONTOGENIC

Mimic the output of some process



world atlas ([source](#))

TELEOLOGICAL

Mimic or simulate the process used to create something "naturally"

TYPES OF PROCEDURALISM

- **Offline vs Online [loadtime | runtime]**
- **Necessary vs Optional**
- **Degree / dimensions of Control**
- **Generic vs Adaptive**
- **Stochastic (beware!) vs Deterministic**
- **Constructive vs Generate-and-Test**
- **Automatic vs Mixed-authorship**
- **Teleological vs. ontogenetic**

PRACTICAL CONCERNS

PROS

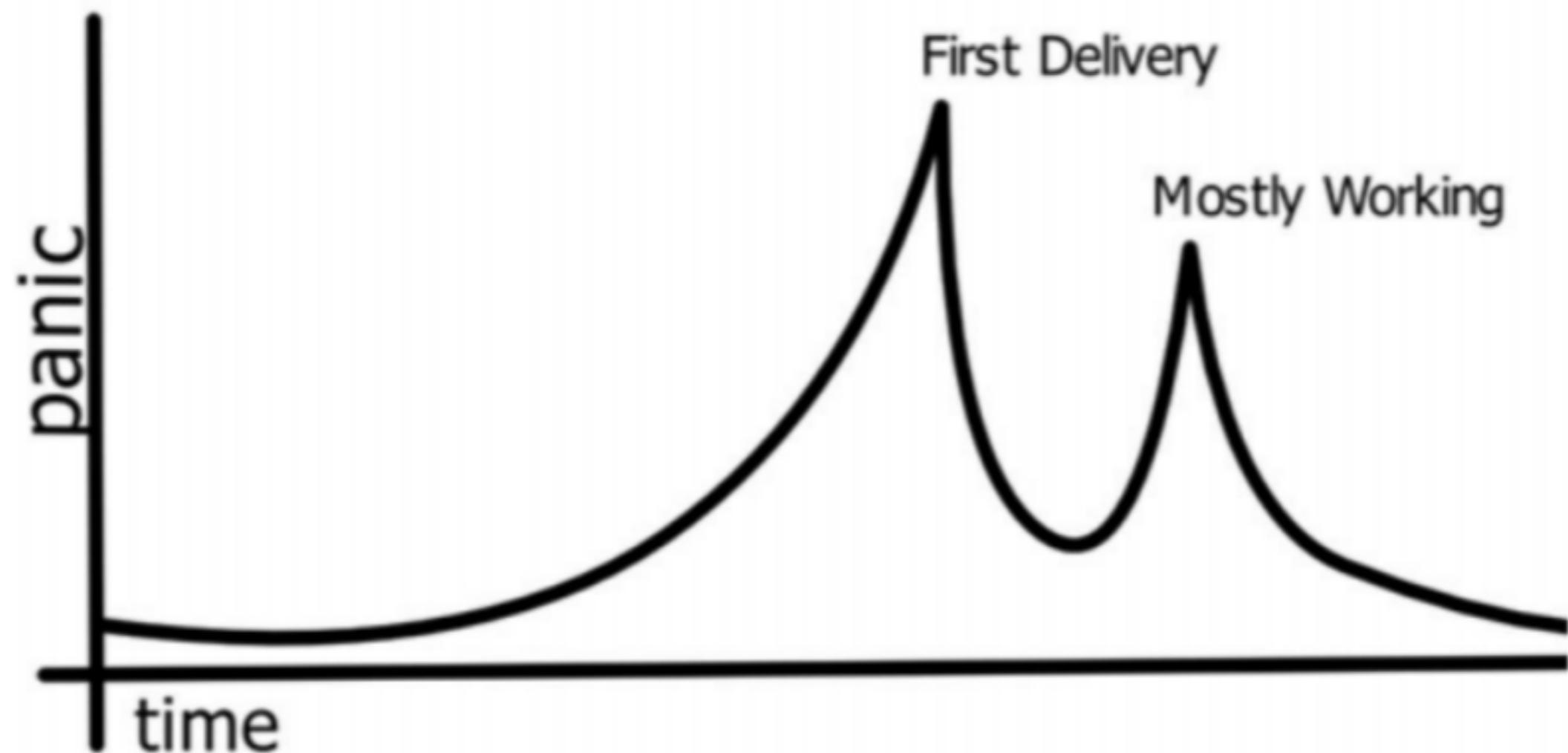
CONS

- Extremely compact
 - Textures: kilobytes vs megabytes
- No fixed resolution/size
 - Continuous functions can be sampled at any frequency, applied to any size domain
- Can be parameterized.
 - Specify a whole class of related models/textures
- Go infinite!

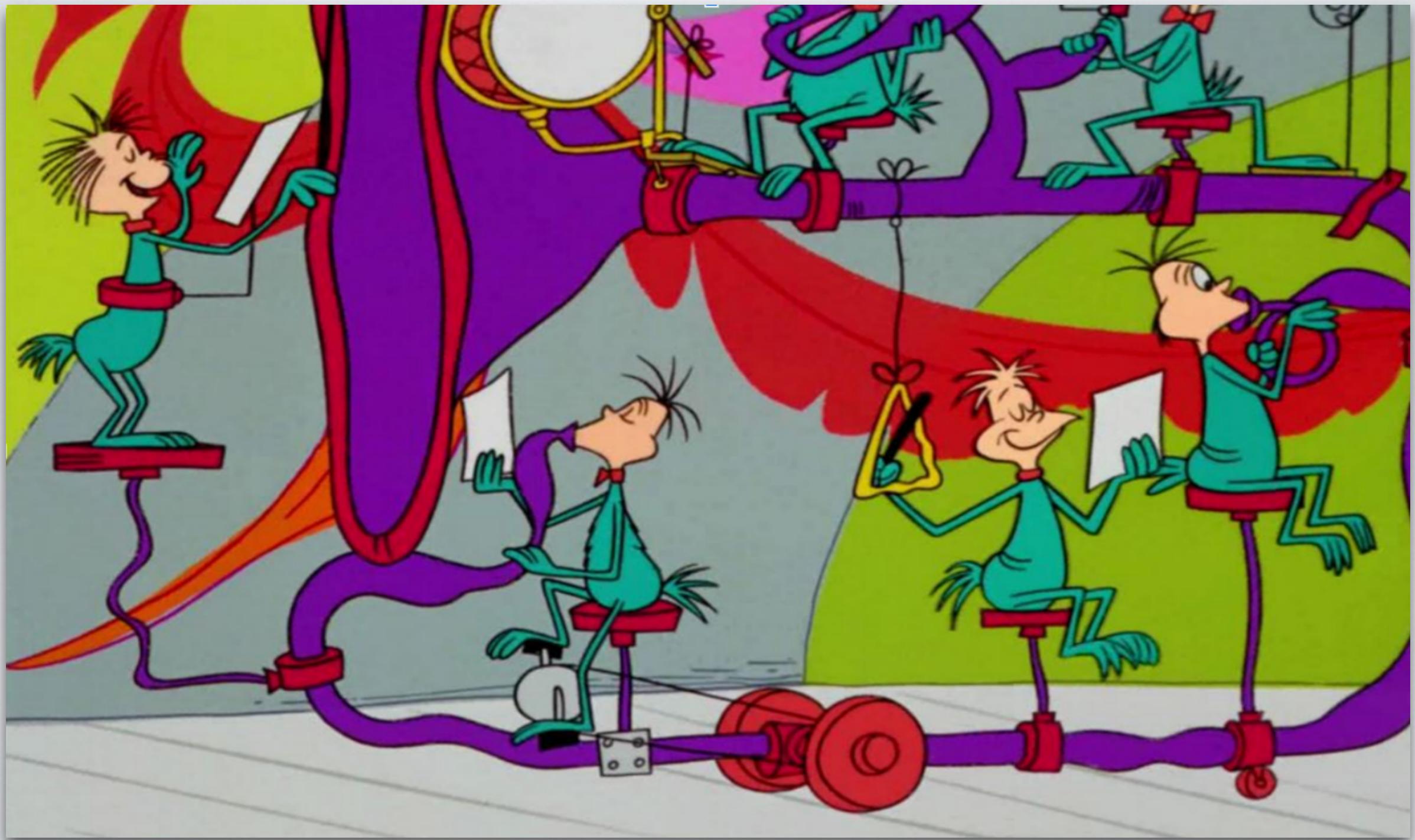
- Implementation Time
 - No bugs in images!
- Difficult to control
 - Surprising results can be a pro or a con
- Evaluation Time
 - Classic time vs. space tradeoff.
- Looks "fake" / not designed

THE JOURNEY

Panic Threshold



WHAT IS GOING ON?



THE KNOBS

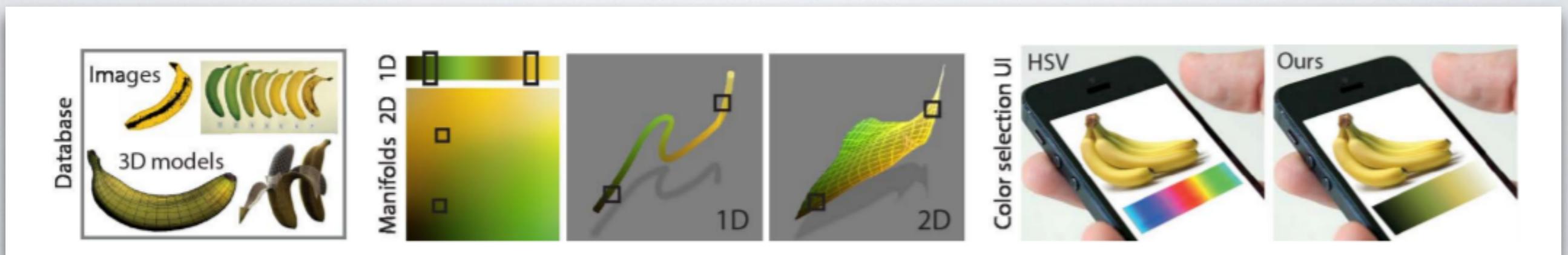
Procedural tool making is designing a musical instrument that you must also learn (or teach) someone to play



Ableton Interface

THE KNOBS

How do you make a tool useful? What are the most useful knobs and their parameters?



MIXED INITIATIVE DESIGN

LEVERAGING COMPUTERS



(a) Computer-aided design: Humans have the idea, the computer supports their creative process

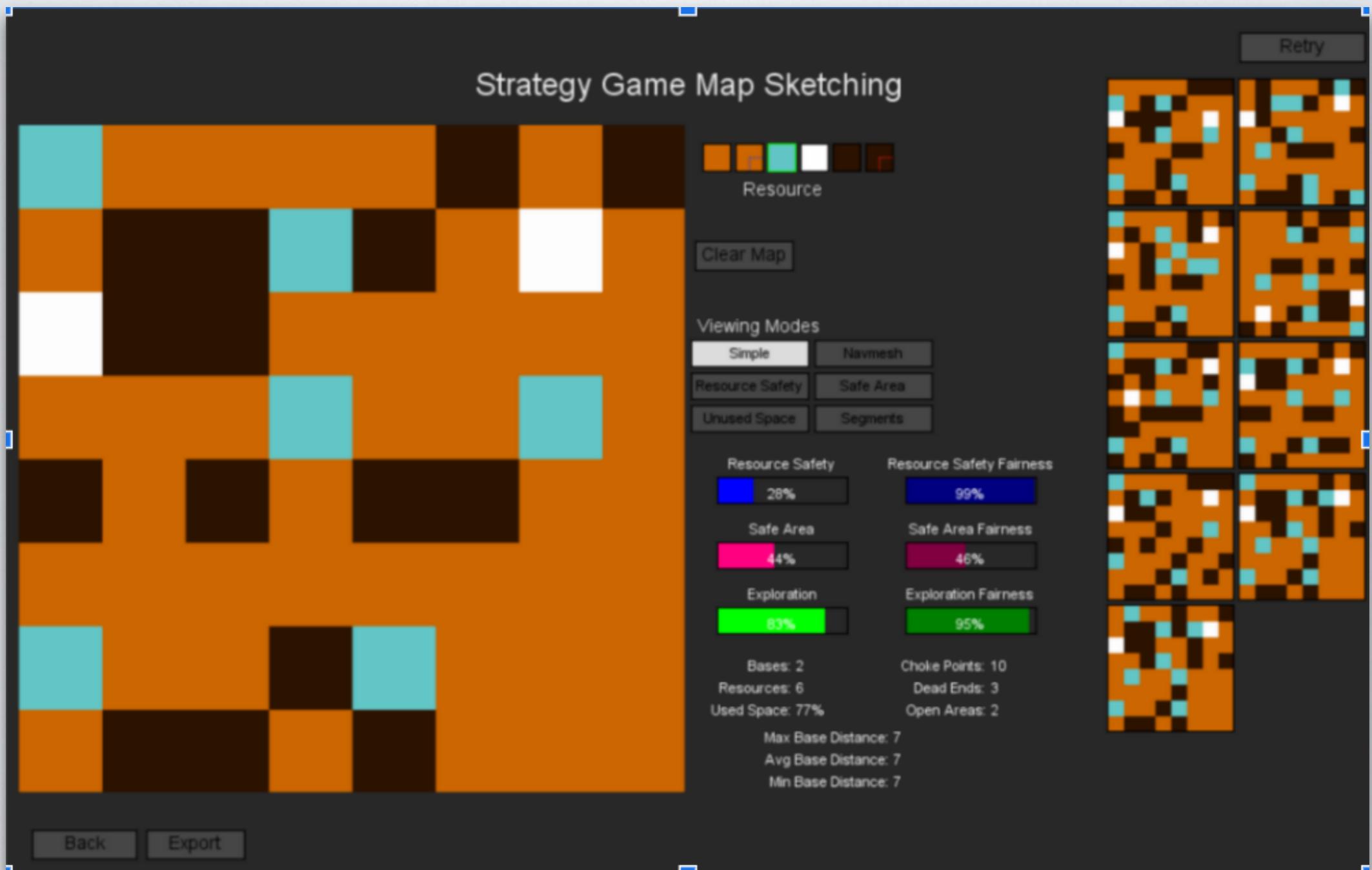
(b) Interactive evolution: The computer creates content, humans guide it to create content they prefer

Fig. 11.1: Two types of mixed-initiative design

- (a) Computer provides quick and easy expression. Eg photoshop
 - Can also test/correct for constraint satisfaction
- (b) Computer has creative initiative but relies on human evaluation

We can be creative about not
just how we implement tools, but
what tools to make

SENTIENT SKETCH BOOK



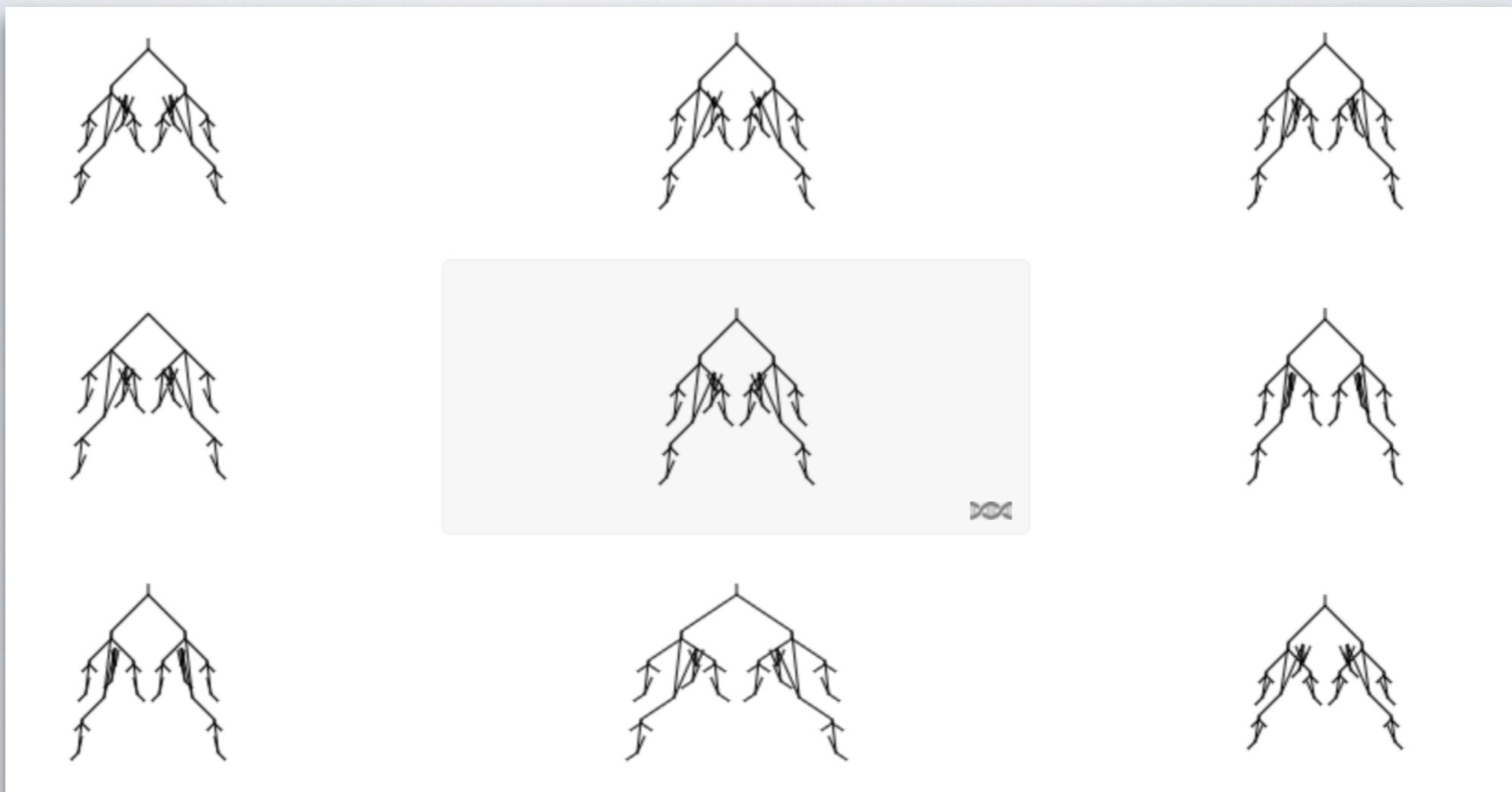
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CUT THE ROPE EDITOR



(source)

BIMORPHS



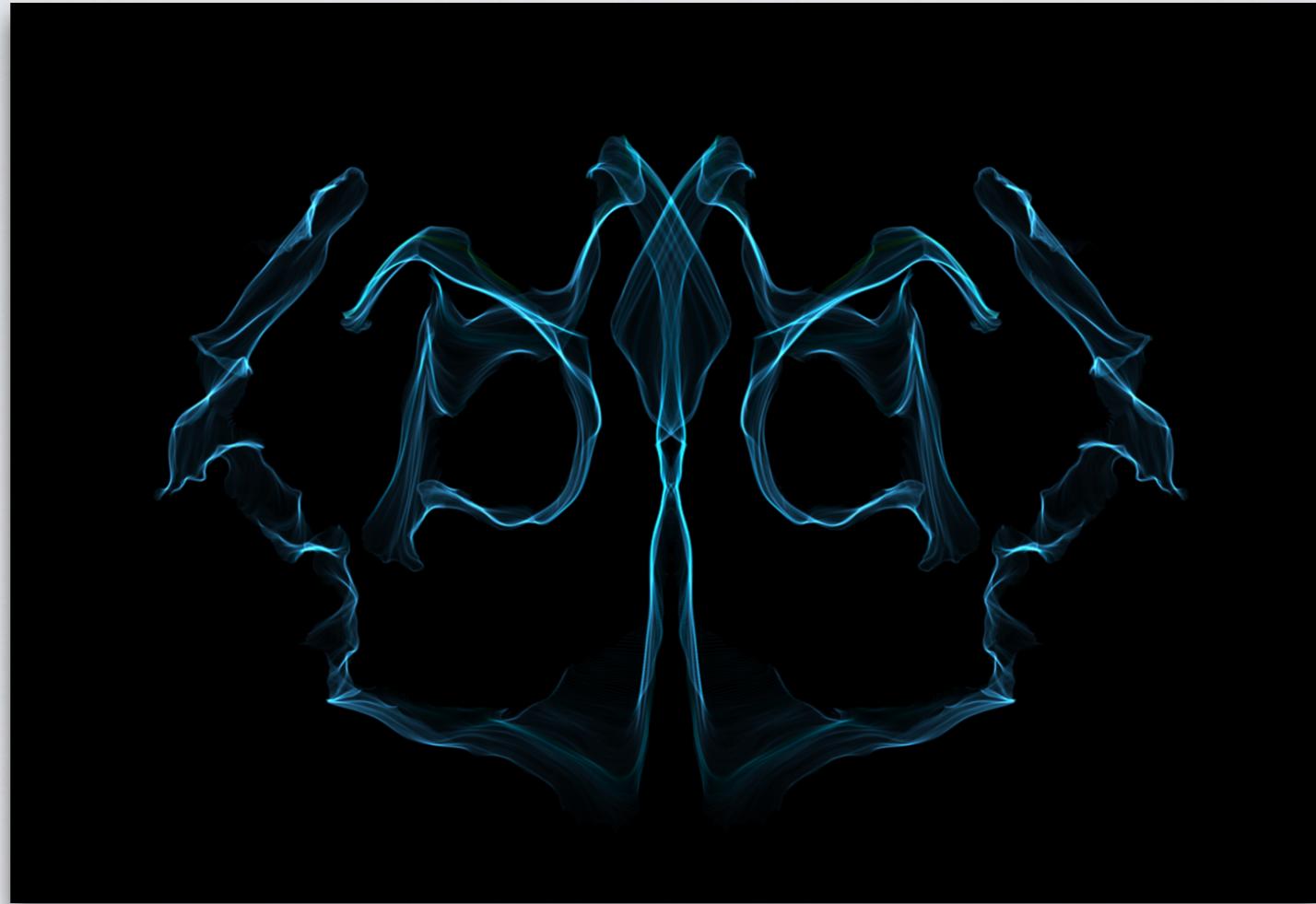
(source)

GALACTIC ARMS RACE



(source)

THE DREAM: MAGIC CRAYON



WeaveSilk ([source](#))

A procedural tool that is simple to use and allows for instant creativity -- the computer's support allows a user to create something better than they would alone, while still echoing their original design intent

QUESTIONS? HOPES?
DREAMS?