AUTODESK UNIVERSITY

Adventures in Convergence: Sustainable Design & Procedural Modelling

Tyson Fogel & Matthew Spremulli

Autodesk Technology Centers

IS POLLUTION A BYPRODUCT OF POOR DESIGN?

VIDEO: Deskriptiv (MIT - Mediated Matter Lab)

The Problem

What is poor design costing us?

Dollars Wasted

From not being able to repair electronics

- US PIRG

Of Economy

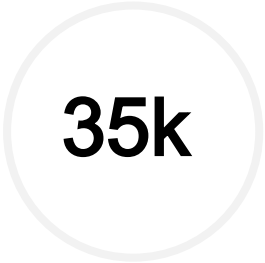
Is currently ‘circular’

- CGRi

Cents per dollar

Are wasted in MFG due to inefficiencies

- Forbes



Decisions Made

Consciously by the average adult per day

- UNC TV

A New Design Mindset

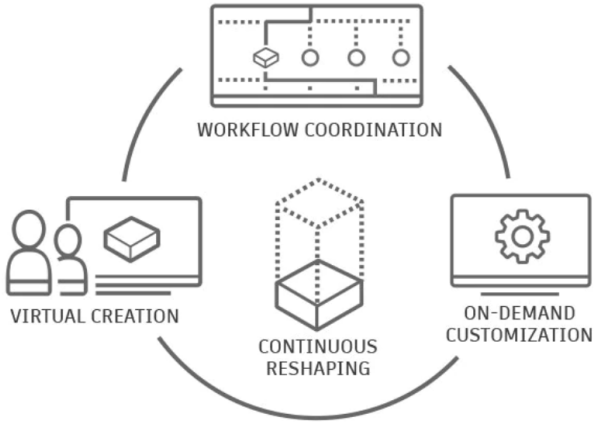
The Mindset of Convergence

What is it?

Convergence is a mindset to encourage others to gain a new perspective on how to solve problems

Convergence means leveraging best practices from other industries and domains.

Learn more at:
www.Autodesk.com/industry/convergence

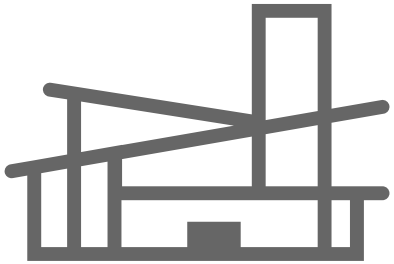


Can Procedural Modelling (from M&E) be used to make Industrial Design more sustainable?

VIDEO: Deskriptiv (MIT - Mediated Matter Lab)

Our Research Collaborators

Converging Personas & Processes

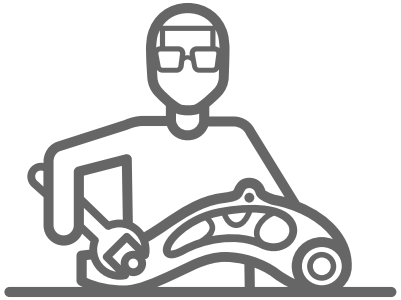


AEC

Architecture academics / professionals …

M&E

… using Media & Entertainment Tools …



PDM

… to make Product Design objects.

Our Approach

How to explore the intersection between Procedural Modelling and Industrial Design – As it pertains to Sustainable Design?

Brainstorm - Contrast, compare and distill potential intersections

A

Conduct a survey and follow up interviews with a series of industry experts

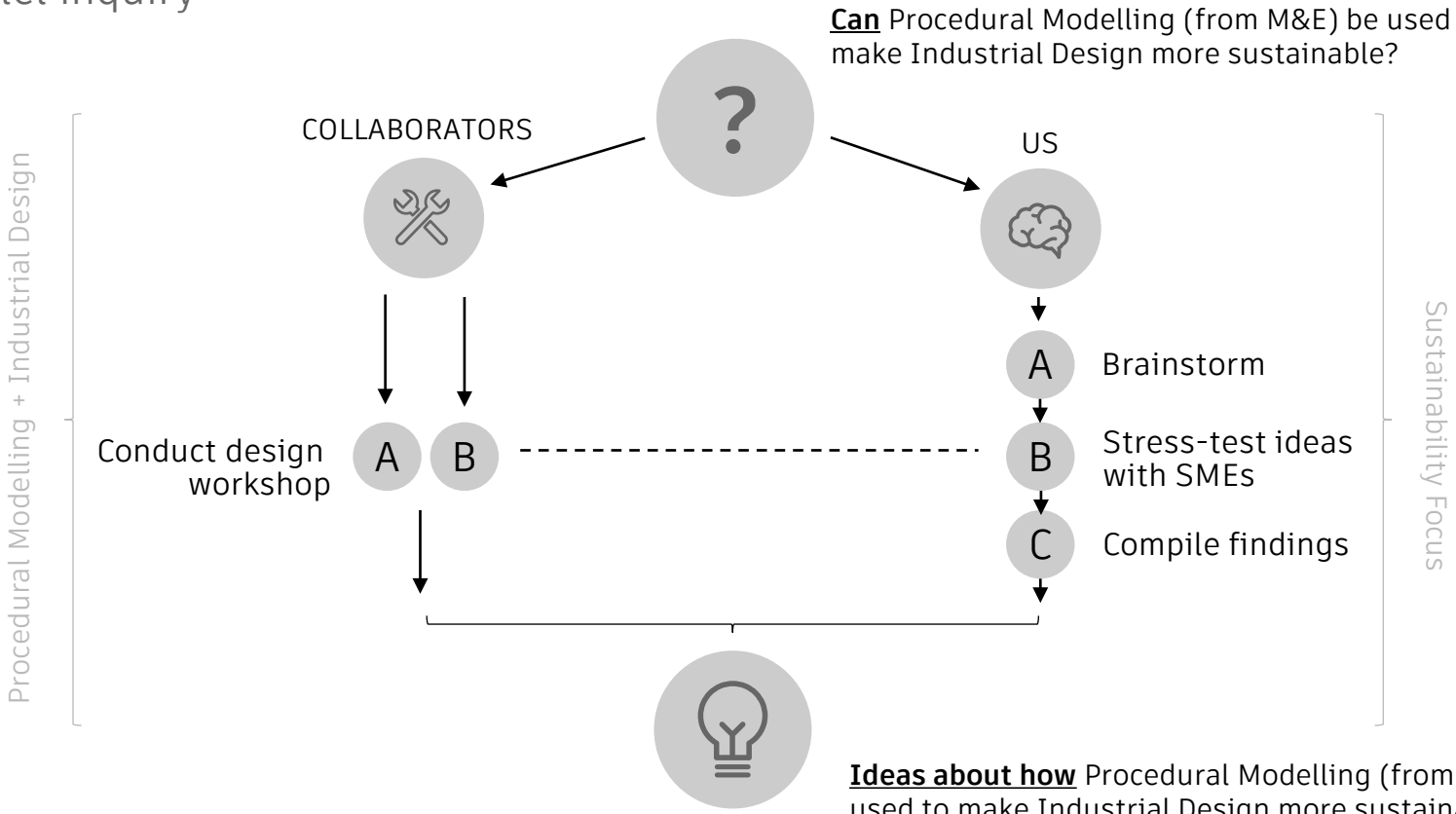
B

Aggregate, cross reference and evaluate all results

C

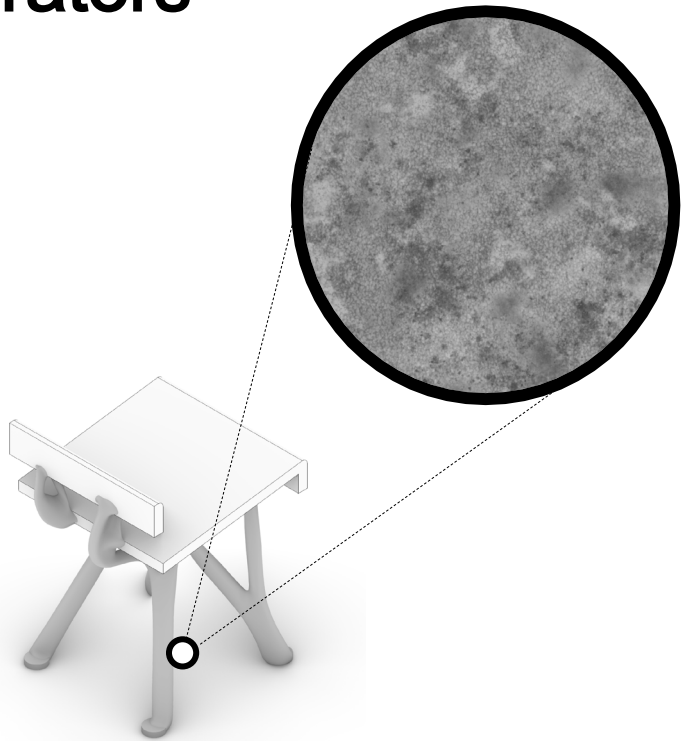
Our Approach with Our Collaborators

A parallel inquiry



Our Approach with Our Collaborators

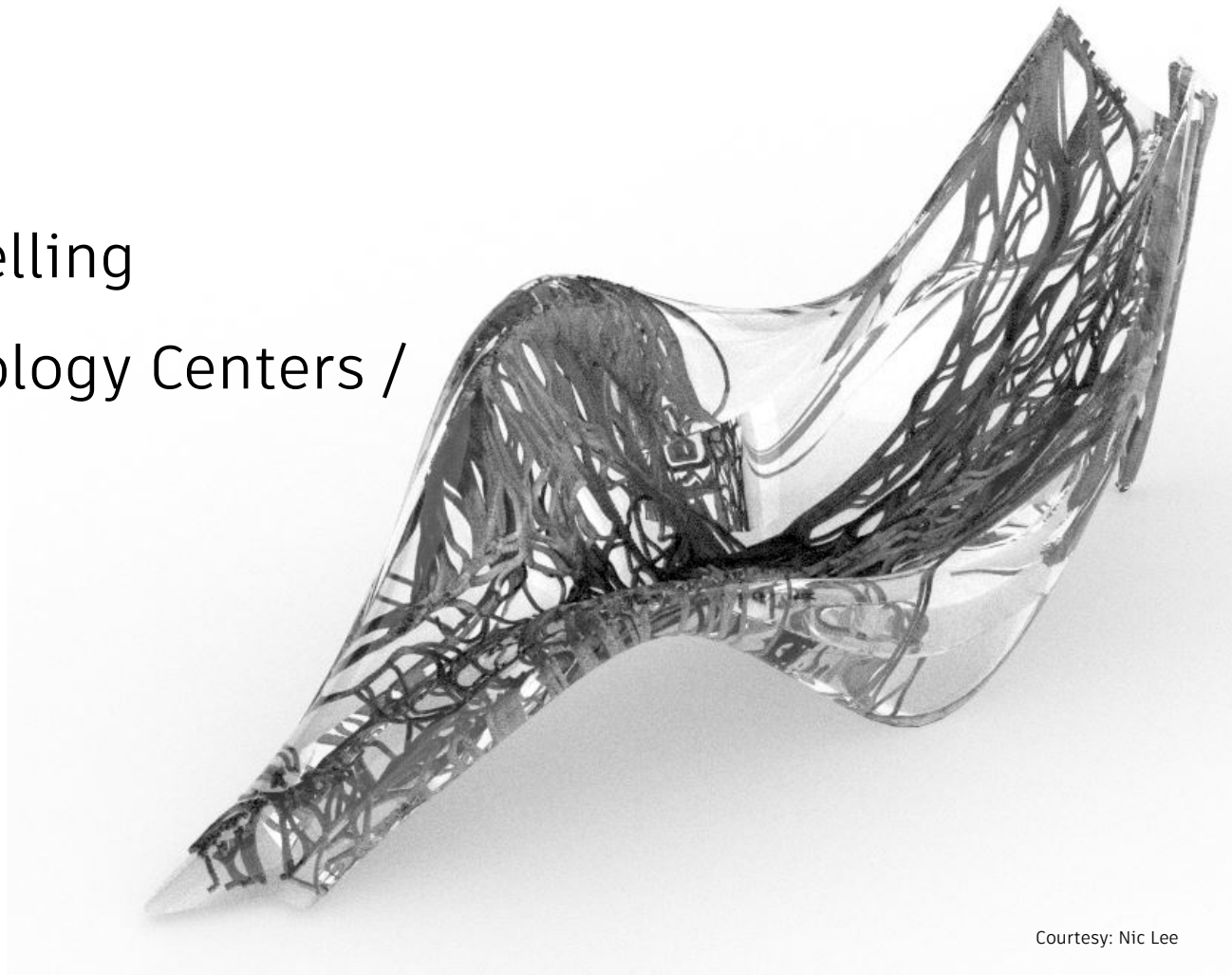
A Industrial Design Case Study: Chair



Talk Unpacked

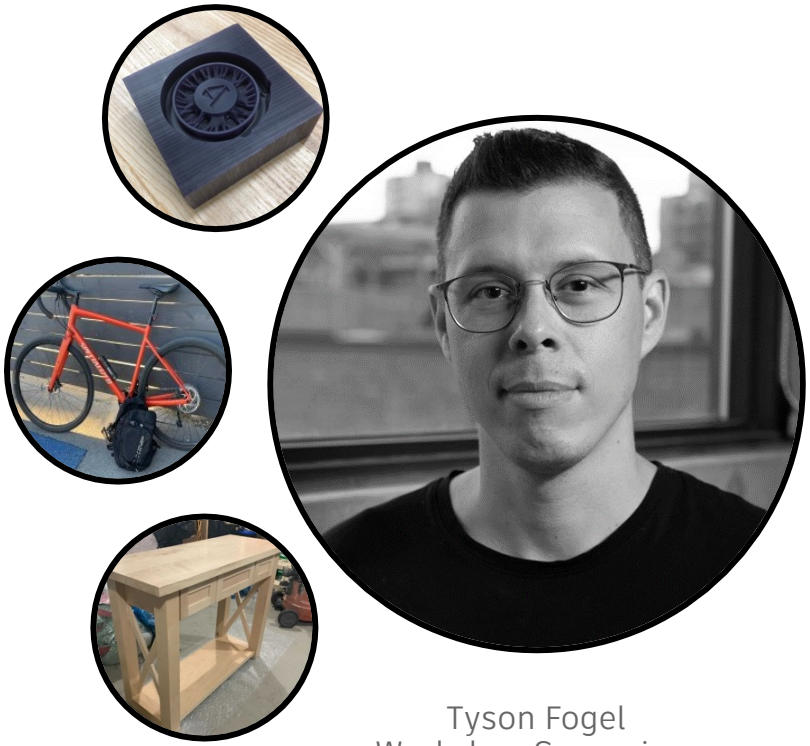
Quick Overview

- Procedural Modelling
- Autodesk Technology Centers / Resident
- Our Approach
- Lessons Learned

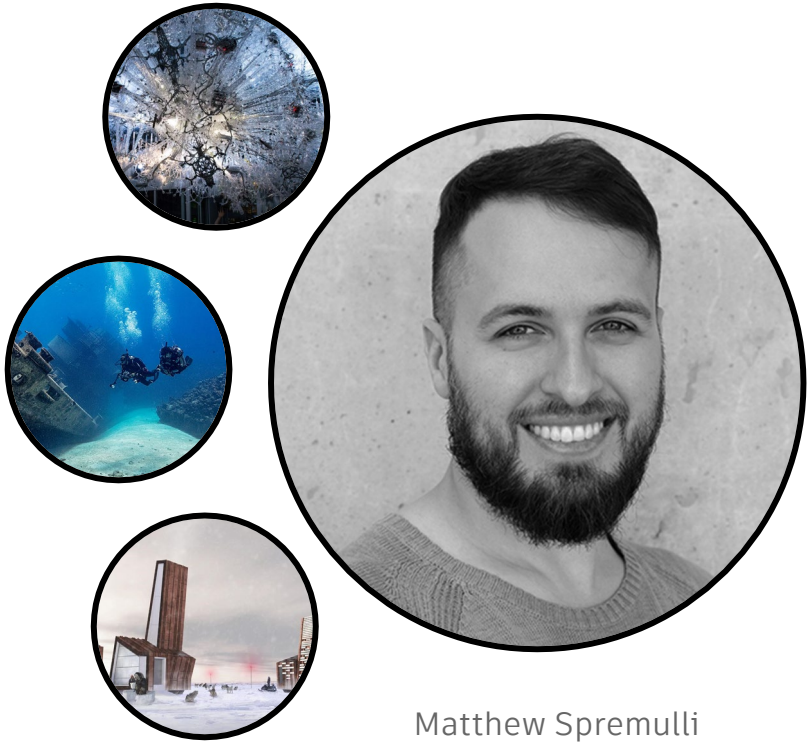


Courtesy: Nic Lee

Intro’s



Tyson Fogel
Workshop Supervisor



Matthew Spremulli
Development Manager

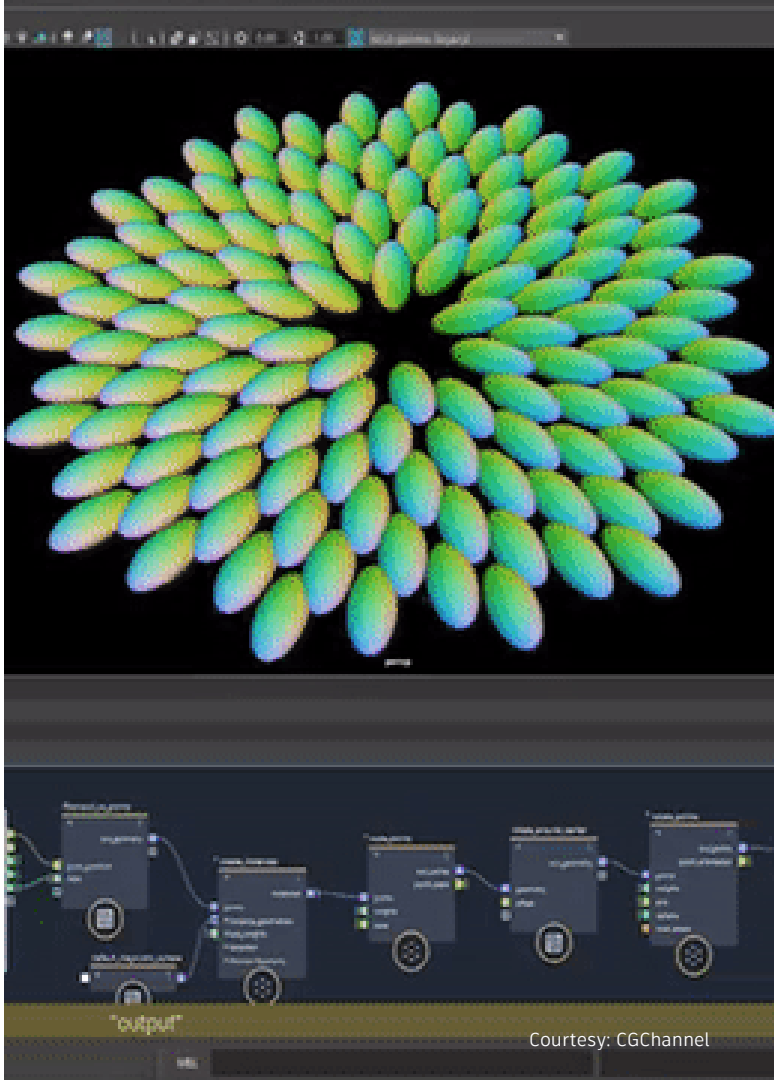
PART 1
Procedural Modelling(?)

Procedural Modelling

What is it?

Procedural Modelling helps designers create 3D models, textures, effects, graphics, and/or animation from sets of rules – or procedures.

The advantage to using “Procedural Modelling” is that it can create large/complex “scenes” from a much smaller digital footprint –and allow the user to modify the procedures to tweak the output.



Courtesy: CGChannel

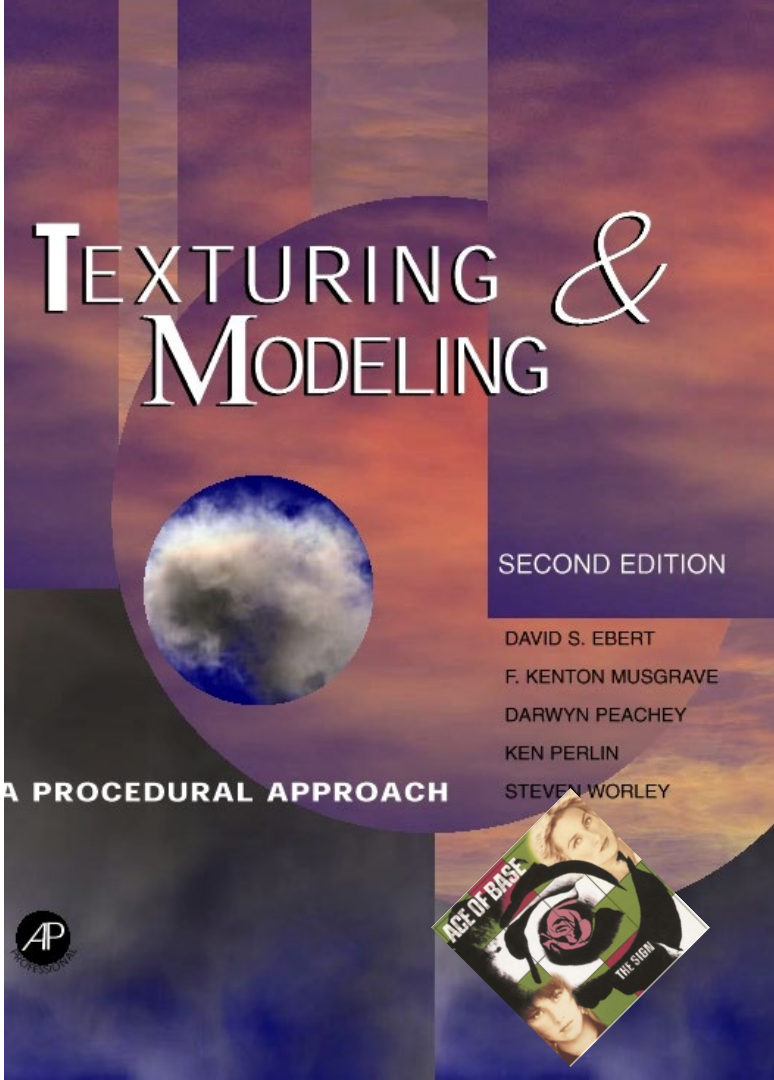
Procedural Modelling

What is it?

Procedural Modelling is NOT new. The first comprehensive book on the emerging technology was published in 1994!

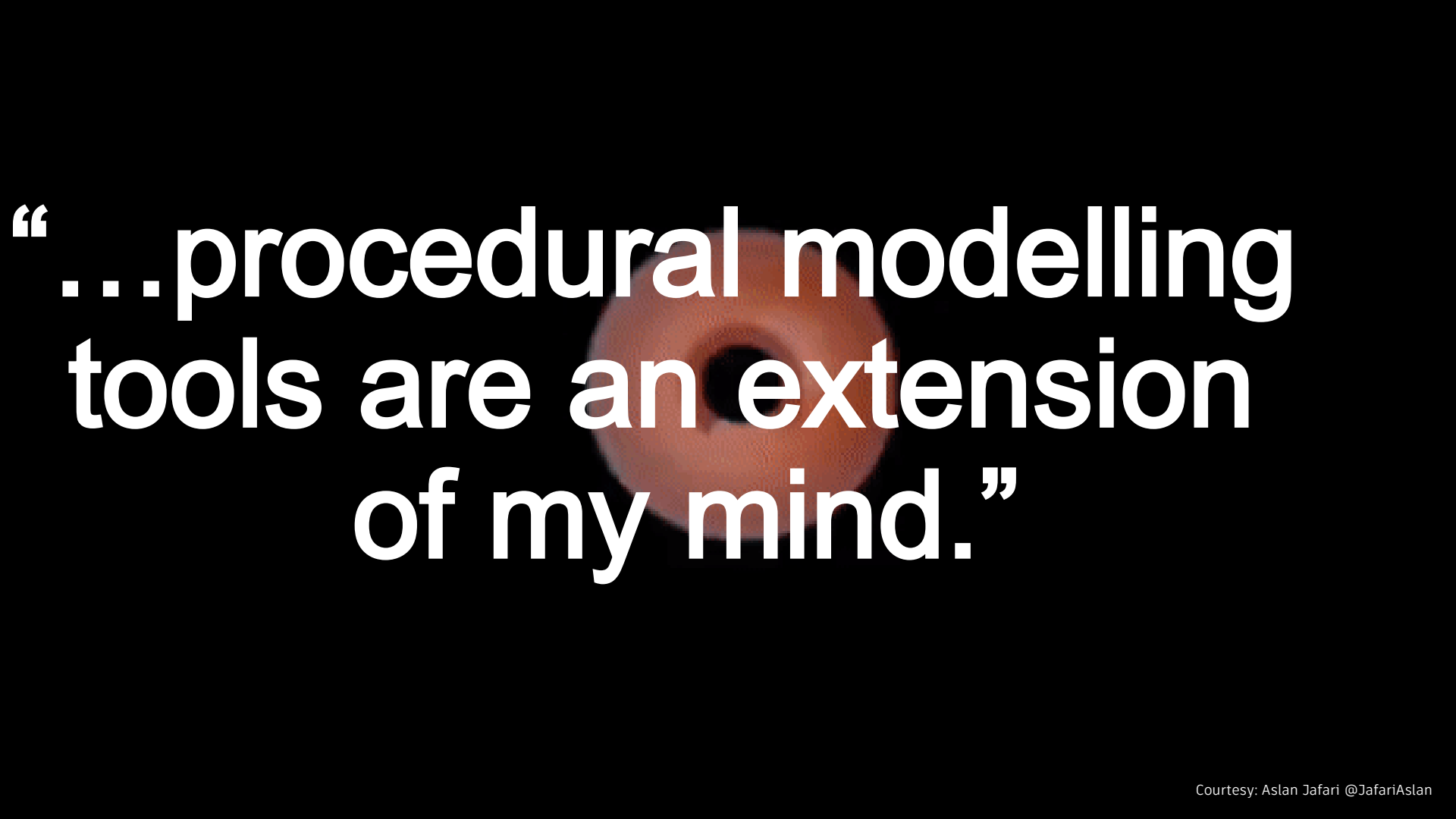
Procedural modeling has traditionally been employed in the Media and Entertainment Industry to help designers and creators automate asset creation for output like games or movies.

Since 1994, there have been many tools that have been leveraging this tech., exposing different ways for designers to interact with procedures.



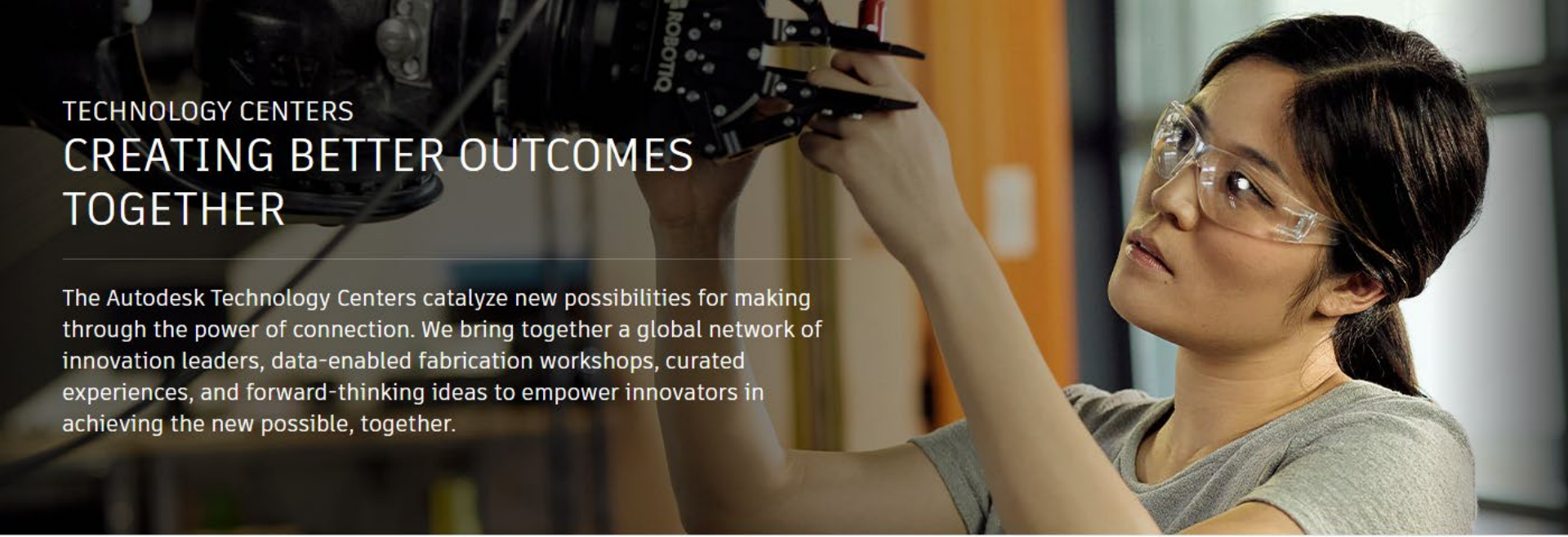
What can the technology ‘do’?

Courtesy: Aslan Jafari @JafariAslan



Courtesy: Aslan Jafari @JafariAslan

PART 2
Autodesk Technology Centers & Resident



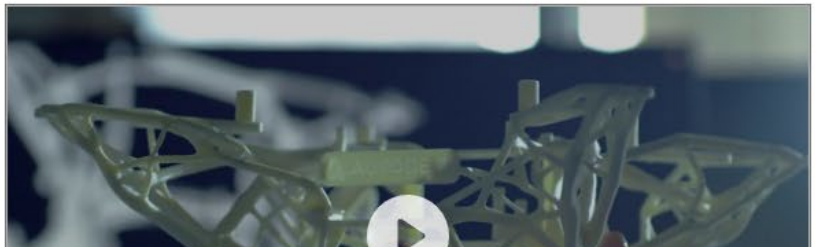
TECHNOLOGY CENTERS

CREATING BETTER OUTCOMES TOGETHER

The Autodesk Technology Centers catalyze new possibilities for making through the power of connection. We bring together a global network of innovation leaders, data-enabled fabrication workshops, curated experiences, and forward-thinking ideas to empower innovators in achieving the new possible, together.

https://www.autodesk.com/technology-centers

About the Technology Centers

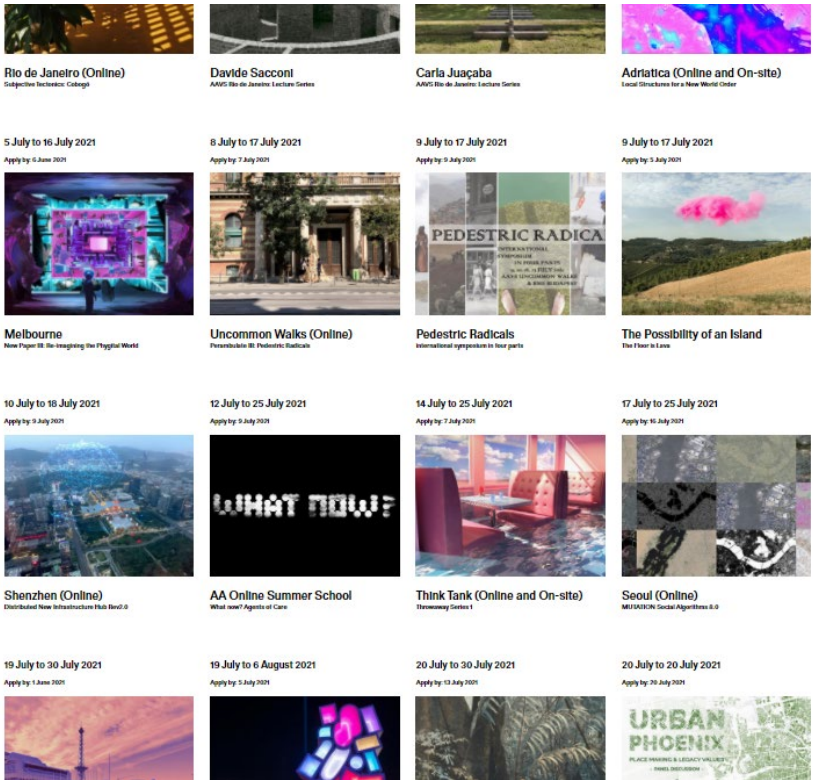


Building a shared vision of the future

The organizations and teams who engage with the Autodesk Technology Centers conduct speculative and industry-applied work pertaining to design and make. From start-ups and customers, to academics, industry teams and groups within Autodesk, our residents are leaders with a passion for accelerating and researching design and make processes in a myriad of industries.

What is the AAVS?

An Outsight Network Resident

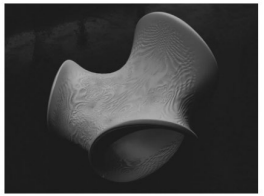


AAVS - Team

"Collaborative" Researchers

16 August to 29 August 2021

Apply by: 17 August 2021



Toronto (F^2) (Online)

Morphological Experiments between Force and Form







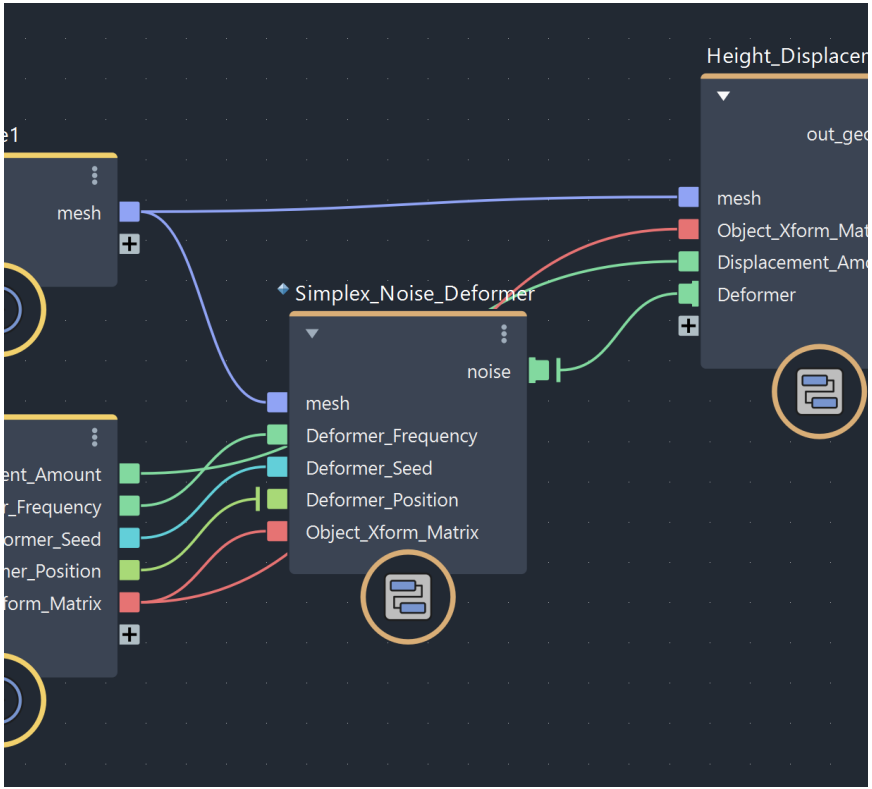
Vahid Eshragi Ali Farzaneh James D'Alessandro David Correa Isabel Ochoa James Clark-Hicks Nic Lee

24 students (16 different countries)

PART 3
Our Approach

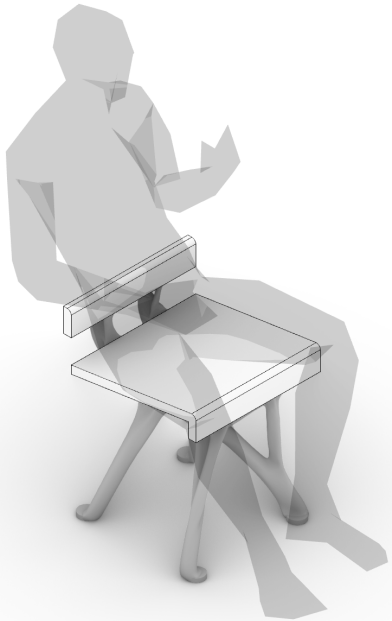
Brainstorming + Experimentation

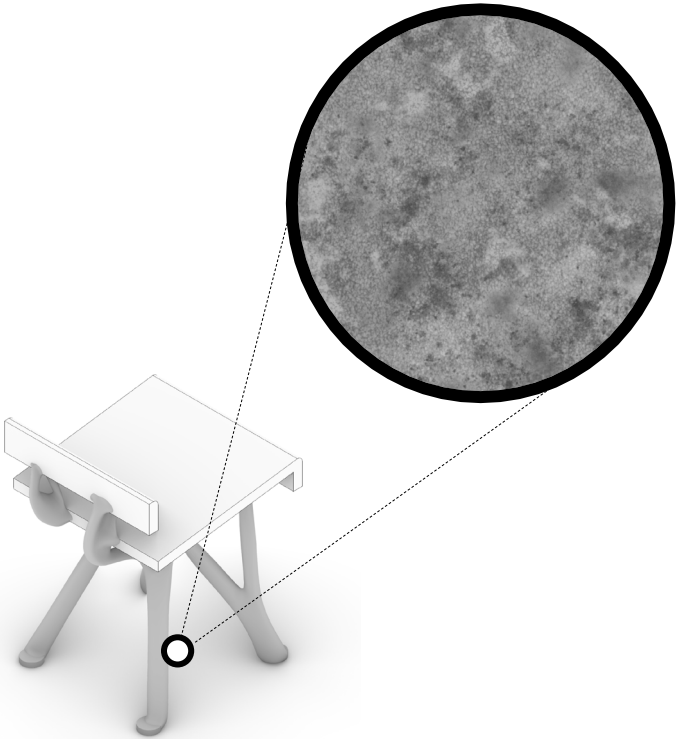
Step A



Ind. Design Case Study: Chair

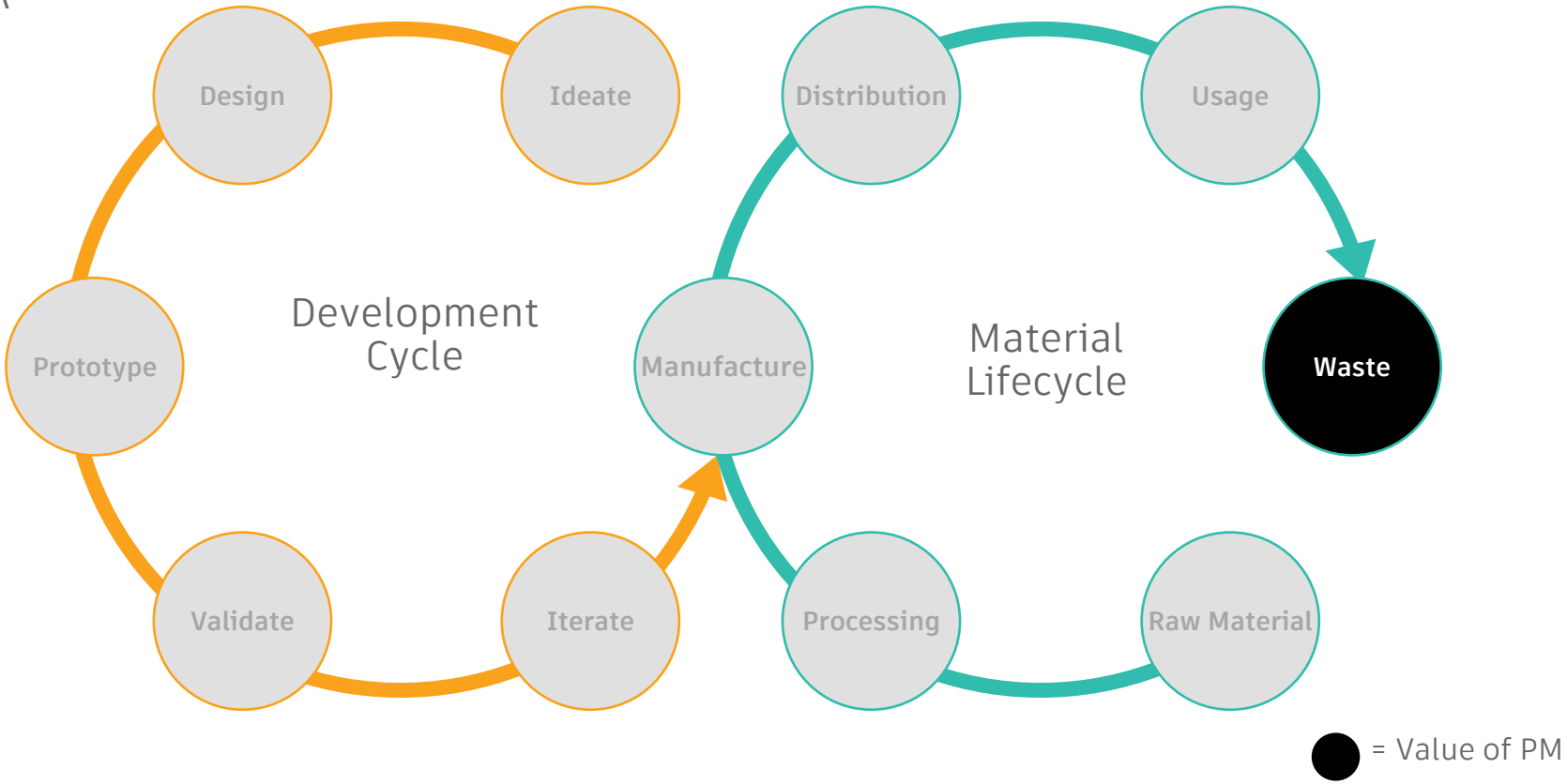
Step A





Ind. Design Case Study: Chair

Step A



Ind. Design Case Study: Chair

Step A

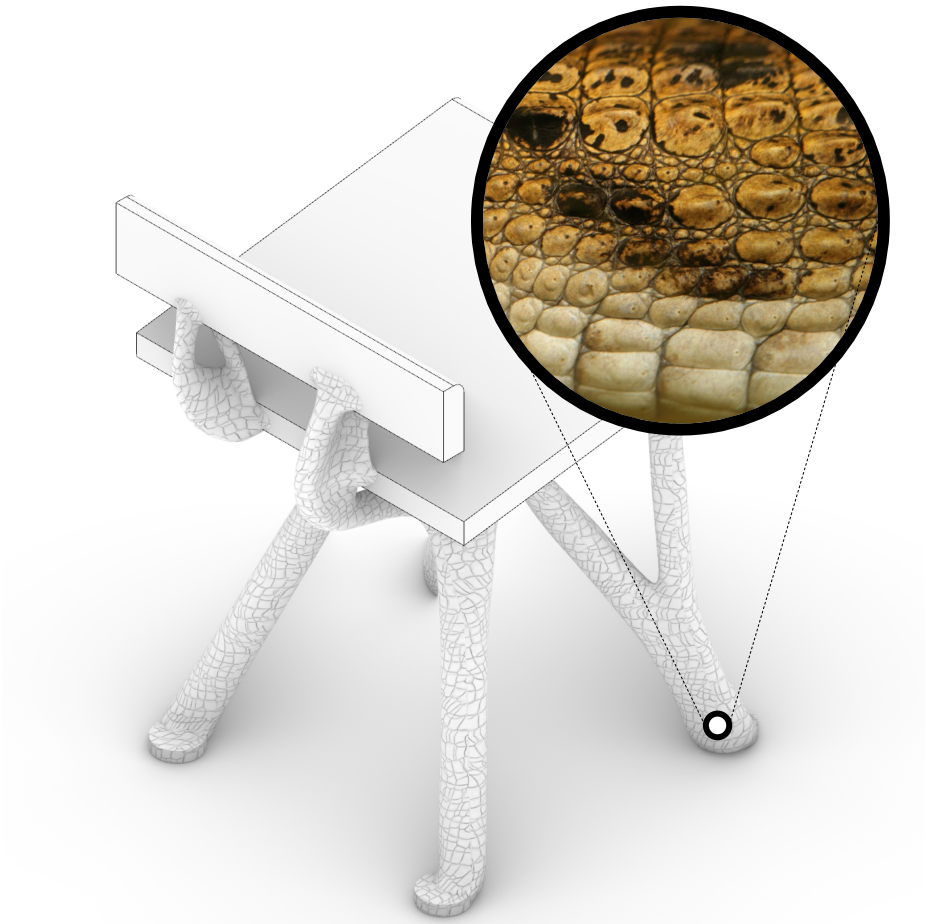
1. Biomimicry 
2. Design for “Afterlife” 
3. Design for “Repair” 
4. Manufacturing Modifications 
5. Design for “Awareness” 

1 Biomimicry

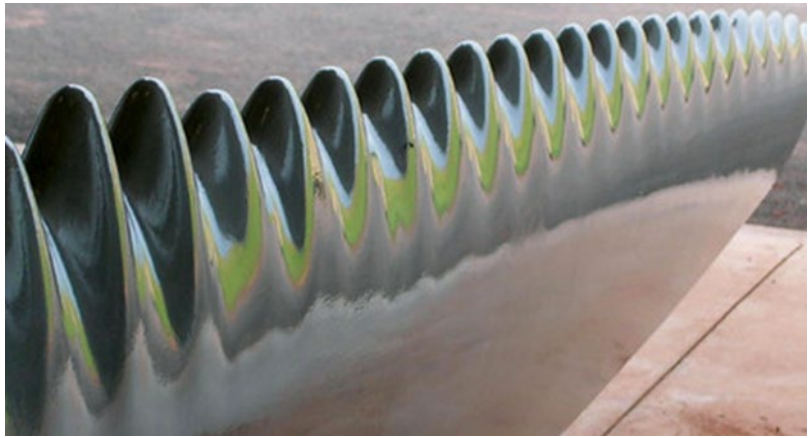
Step A

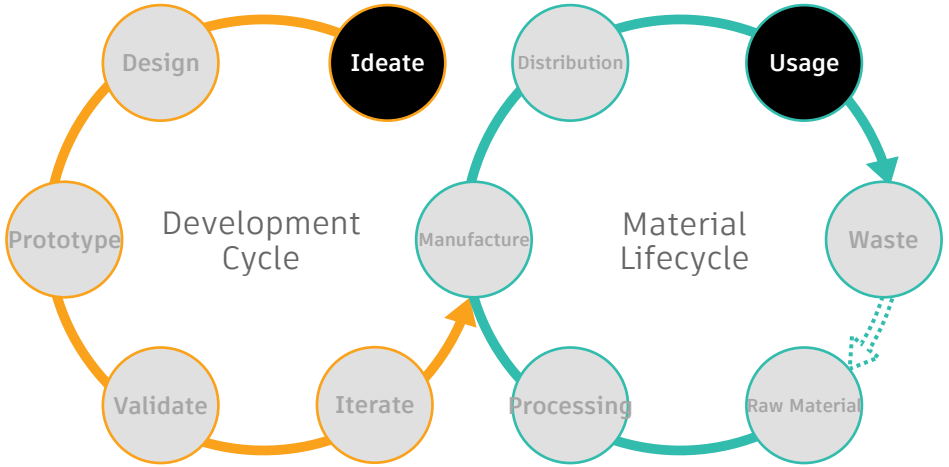
Use procedural modelling to emulate a form or process observed in ‘nature’

Why Biomimicry?
Our largest circular and self-sustaining system (Earth), has proven the value of its functions by lasting thousands of years



1 Biomimicry





Industry Example:
Whale Power Tubercle Turbine Blade

● = Value of PM

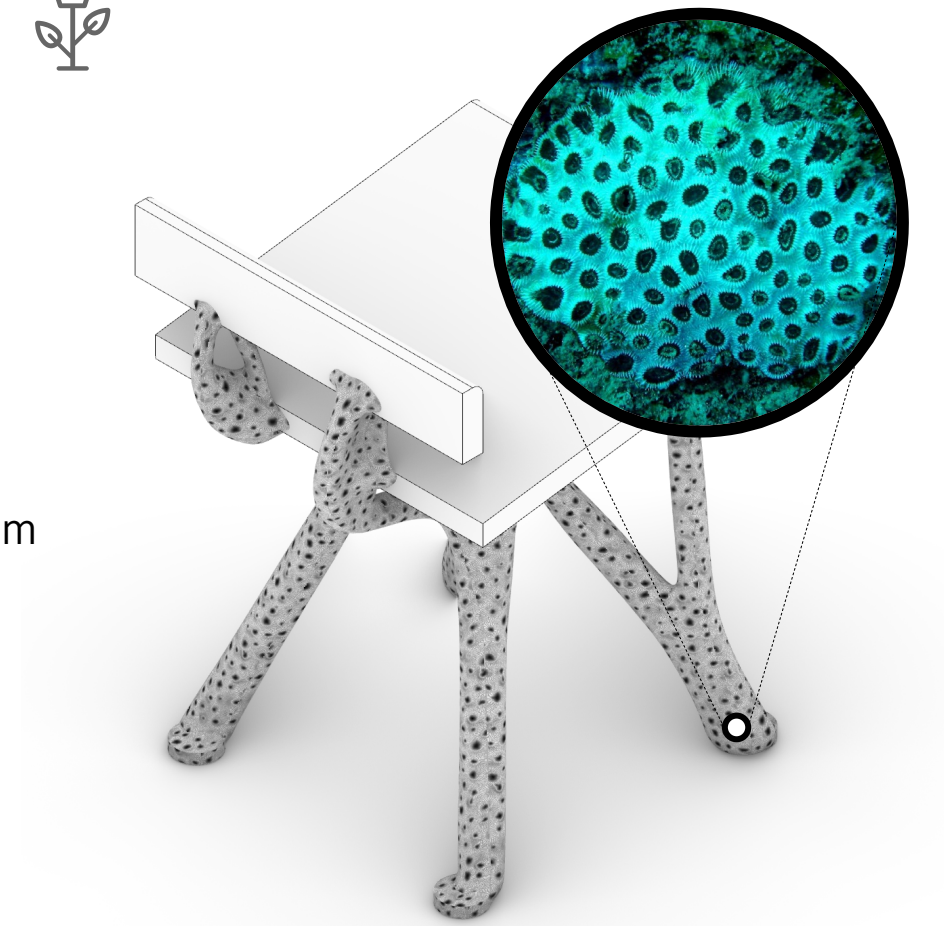
❷ Design for “Afterlife”

Step A

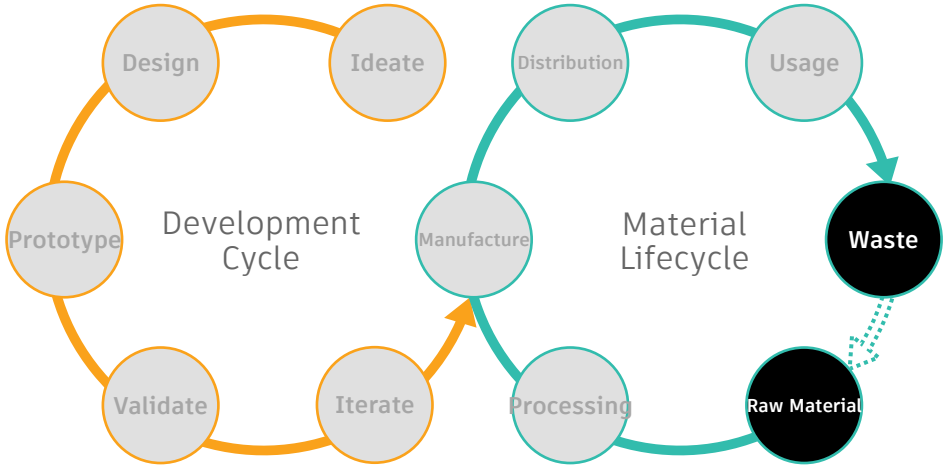
Use procedural modelling to enhance functions like biodegradability, recyclability, decomposition, transformation, etc.

Why Afterlife?

Waste does not exist. Provide an ecosystem with the nutrients it needs to flourish



2 Design for “Afterlife”



“P-Wall” Matsys 2009

● = Value of PM

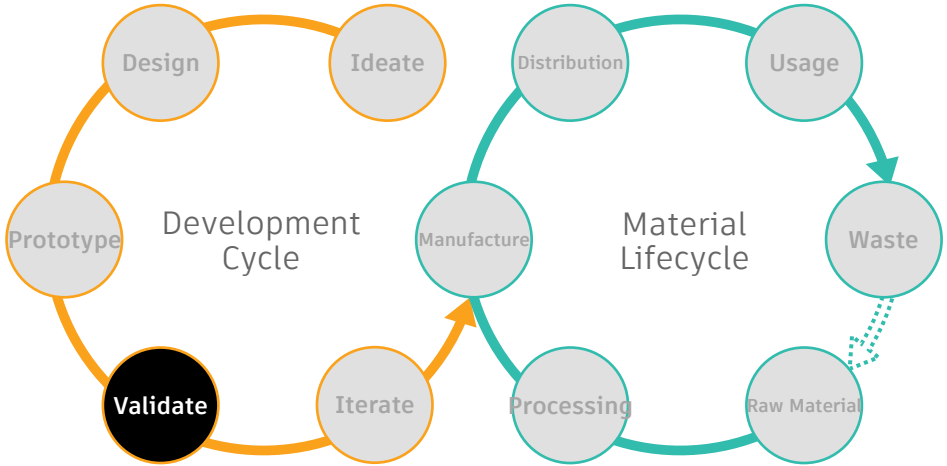
3 Design for “Repair”

Step A

Use procedural modelling to keep the product in the lifecycle as long as possible and allow for a degree of repairability, recyclability, modularity, or disassembly.

Why Repair?
Smarter design comes from understanding product usage, wear/tear, usage patterns and ergonomics.

3 Design for “Repair”



Industry Example:
Discolor Tyre.

● = Value of PM

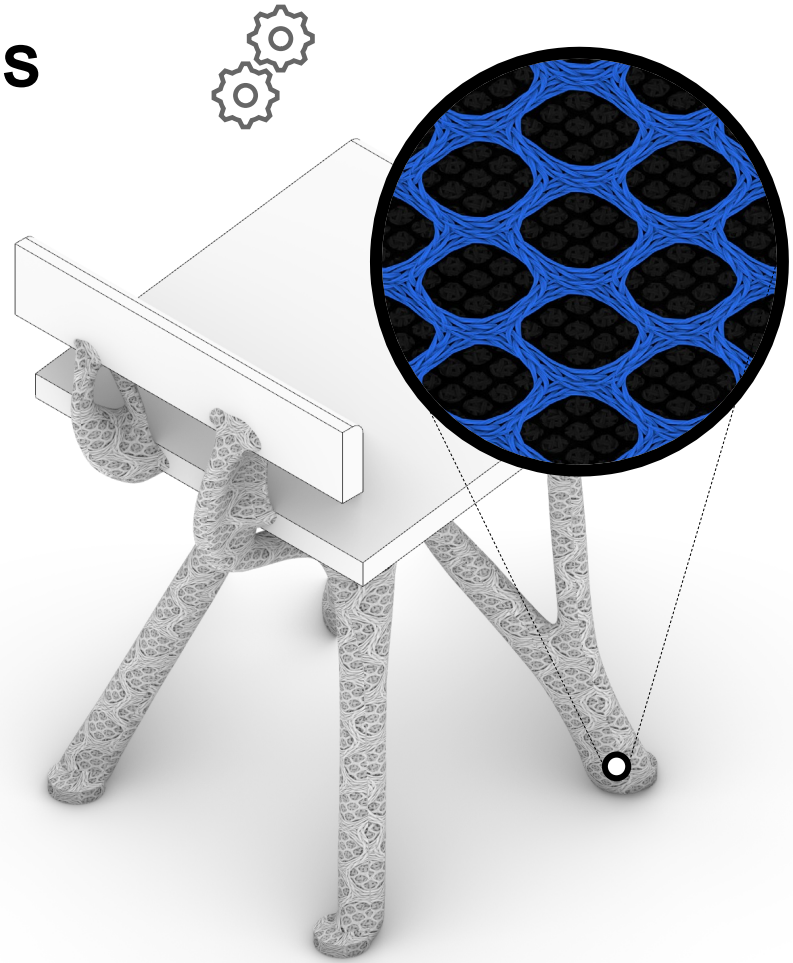
4 Manufacturing Modifications

Step A

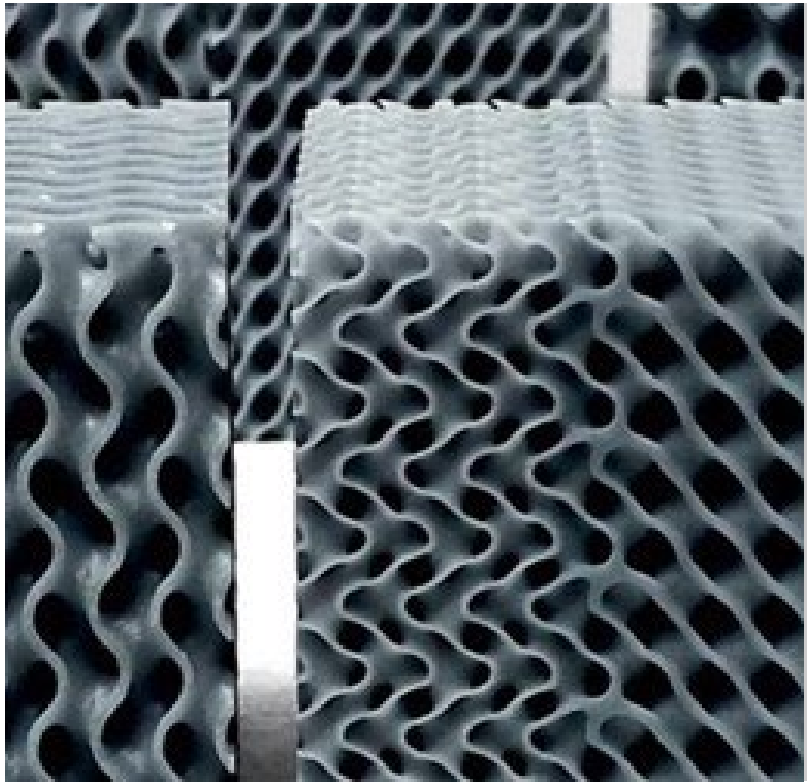
Use procedural modelling to intentionally reduce energy or material in manufacturing processes?

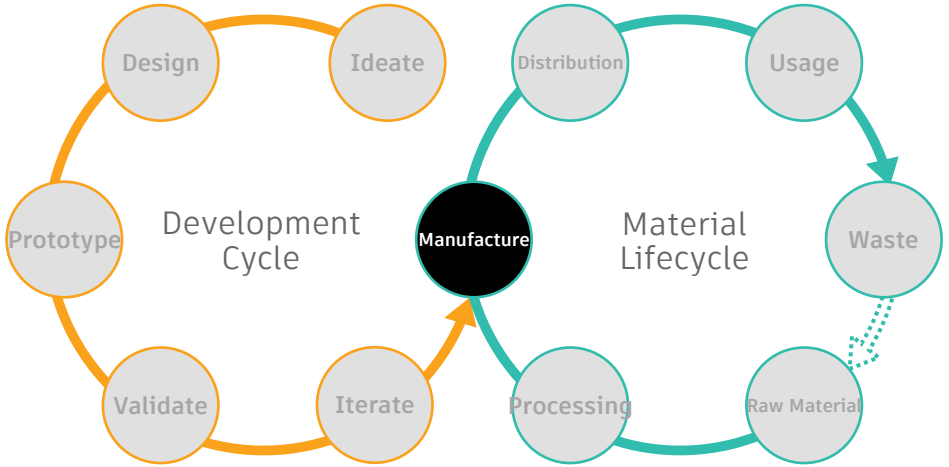
Why optimize for MFG?

Eliminating or ‘designing’ out waste, time intensive or energy intensive phases within a manufacturing operation can contribute to sustainable design.



4 Manufacturing Modifications





Industry Example:
Metafold

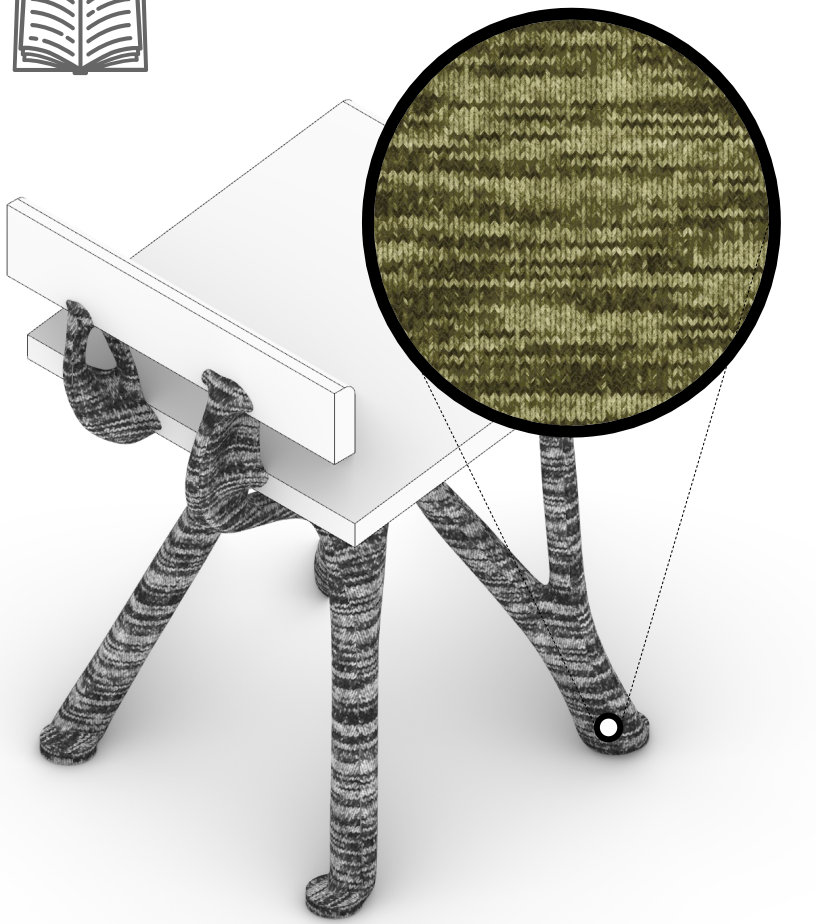
● = Value of PM

5 Design for “Awareness”

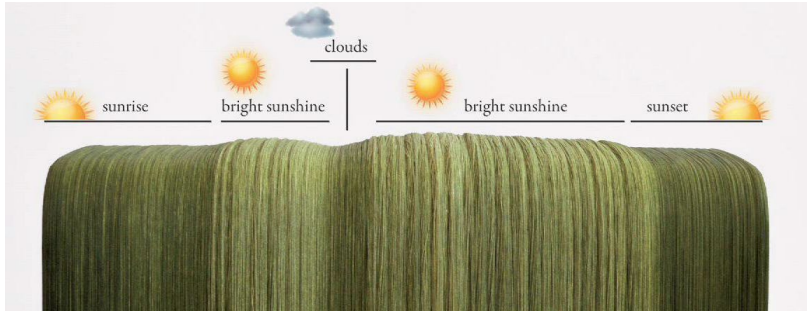
Step A

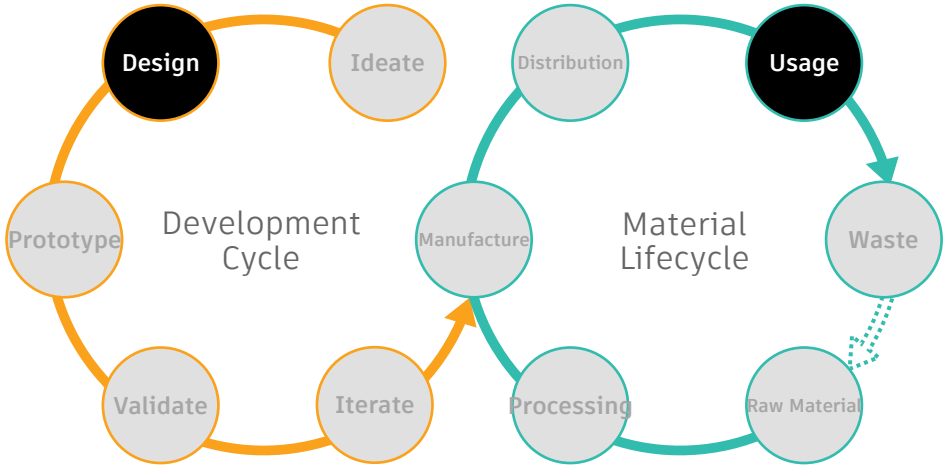
Use procedural modelling to communicate the creation/use of an object to alter consumer perception and consumption awareness

Why awareness?
Encoding a story about ‘how much material or energy’ was used in the making of the object can provide ongoing context and awareness to those that use it.



5 Design for “Awareness”





“The Idea of a Tree”
Mischer Traxler 2008

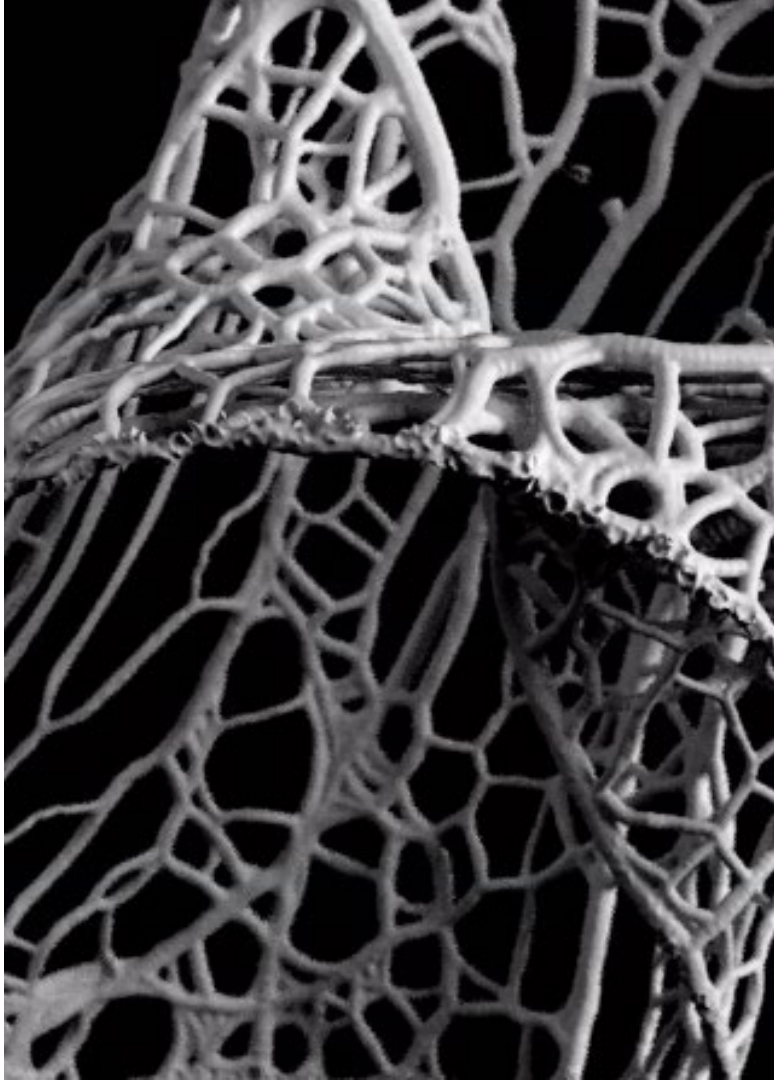
= Value of PM

Surveys & Interviews

Step B

1. Why Procedural Modelling?
2. Procedural Modelling VS Other Computational Design Tools
3. Procedural Modelling for Functional Design
4. Procedural Modelling for Sustainable Design?

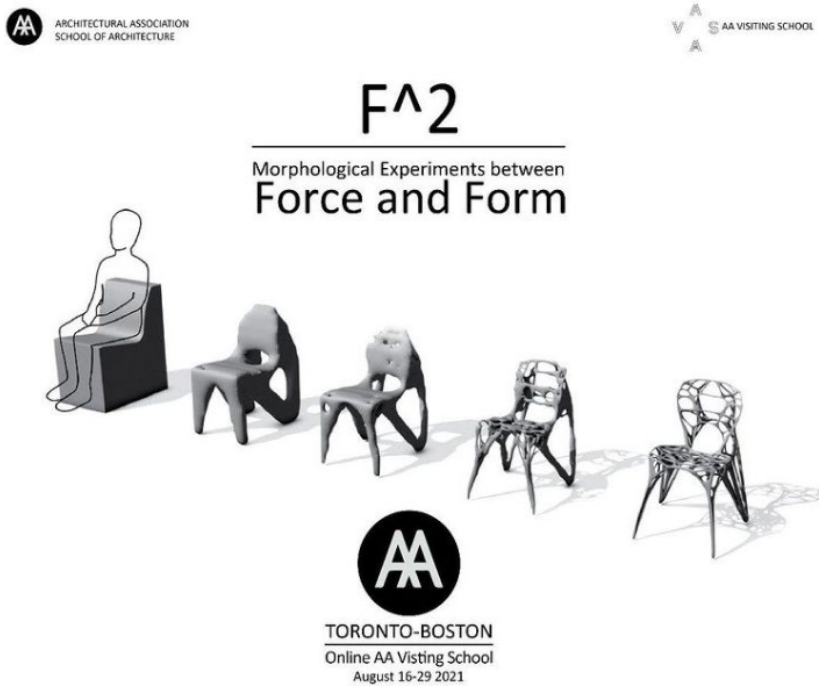
Each question contained a cluster of sub-questions to better understand the ‘how’, ‘what’, & ‘why’ of procedural modelling across industries.



PART 4
Our Observations

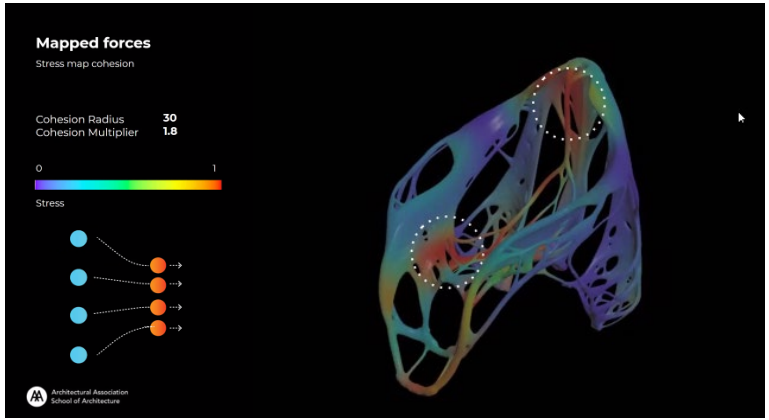
Observations & Lessons Learned

Step C



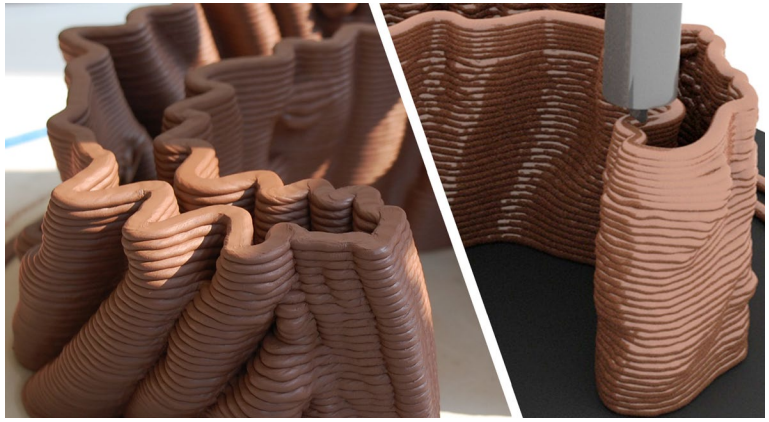
Observations & Lessons Learned

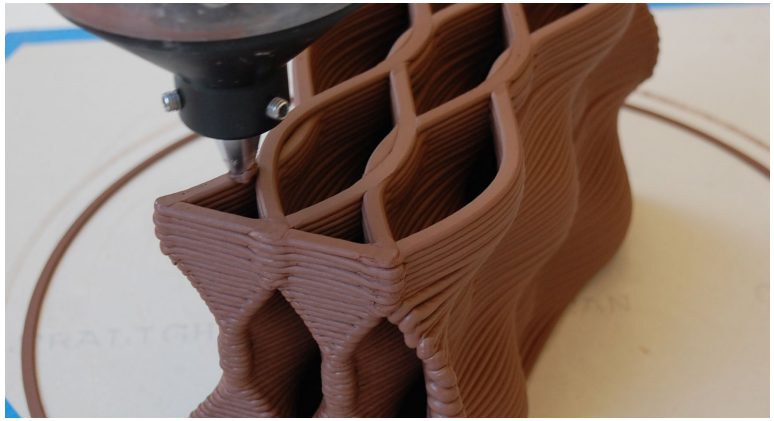
Step C

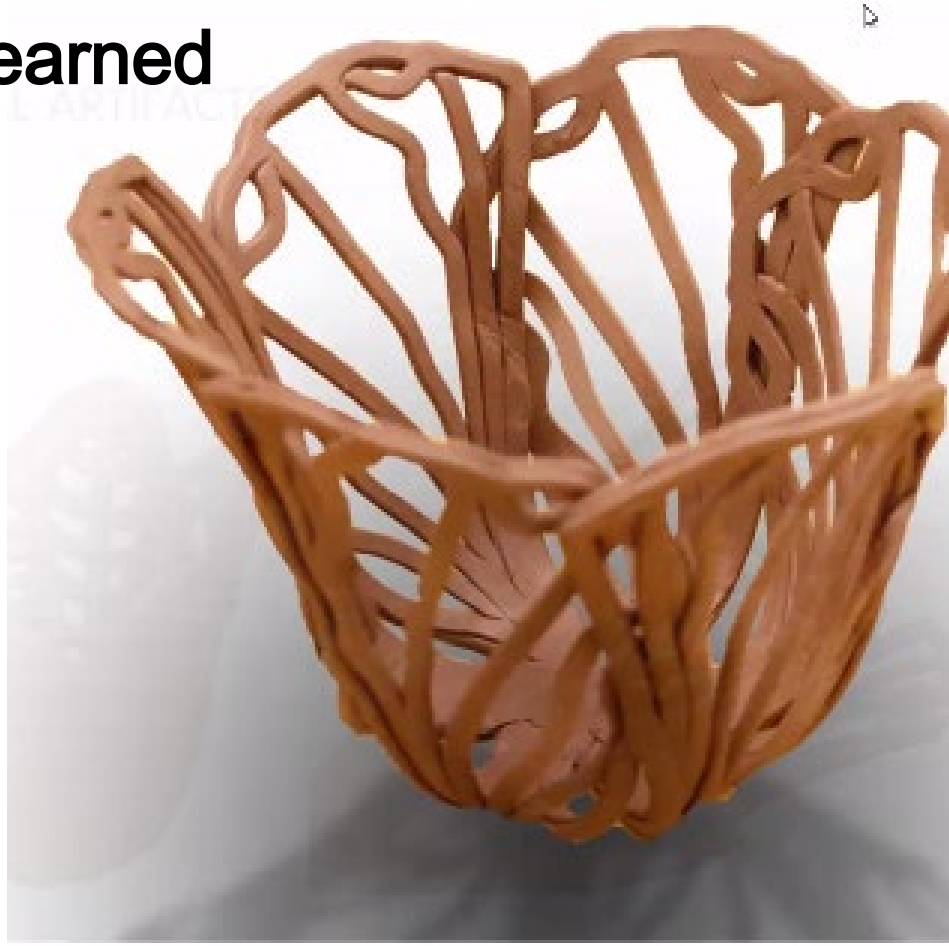


Observations & Lessons Learned

Step C







PORIFEROUS VASE

Nomenclature vs. Syntax

Courtesy: Aslan Jafari @JafariAslan

Behaviour - The 4th Dimension

Courtesy: James Dalessandro @emergent.design

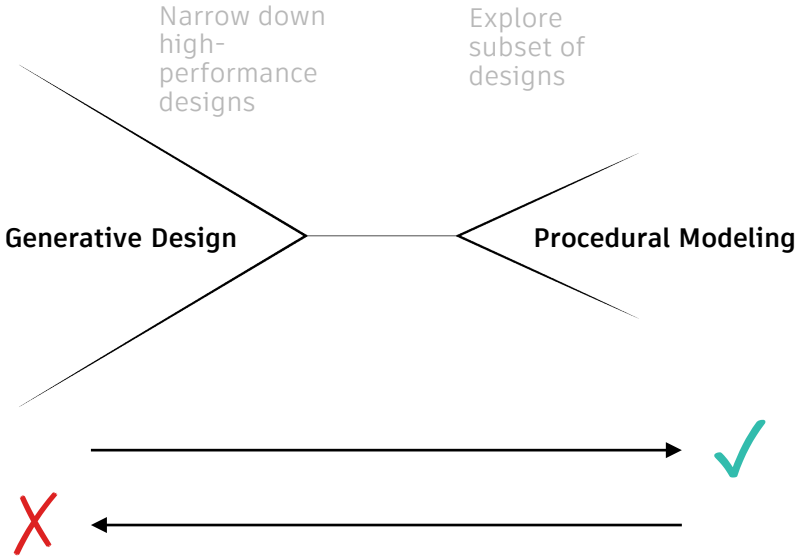

Applications =
Investment
Courtesy: Phil Radford @Stragebox_ltd


Finding Strength in Weakness
Autodesk Bifrost in Maya

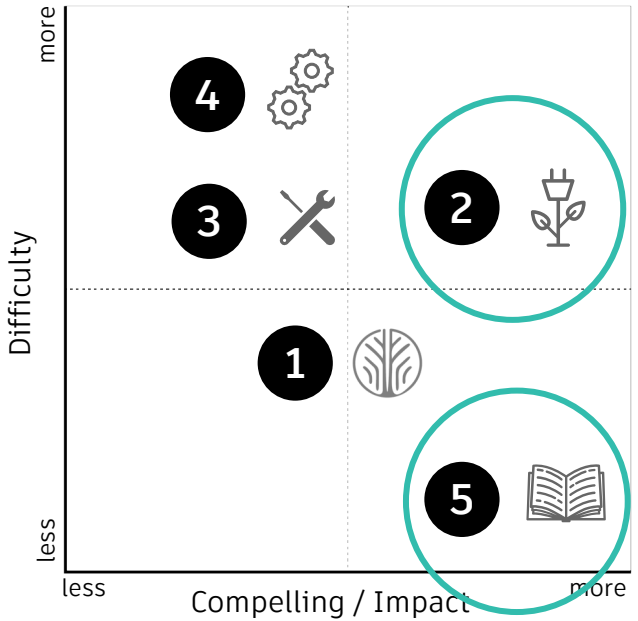
Sustainability + Functionality

Step C - Observations & Lessons Learned

Cross Technology Interaction



Scenario Impact/Difficulty Ranking



Sustainability + Functionality

Step C - Observations & Lessons Learned

Design Strategies

AFTERLIFE for the win. It is our biggest opportunity.

The **MANUFACTURING MODIFICATIONS** 2.0 debate.

Cultural **AWARENESS** is a must. It could change consumer perception.

Can Procedural Modelling be used to design more sustainably?

VIDEO: Deskriptiv (MIT - Mediated Matter Lab)

AUTODESK UNIVERSITY