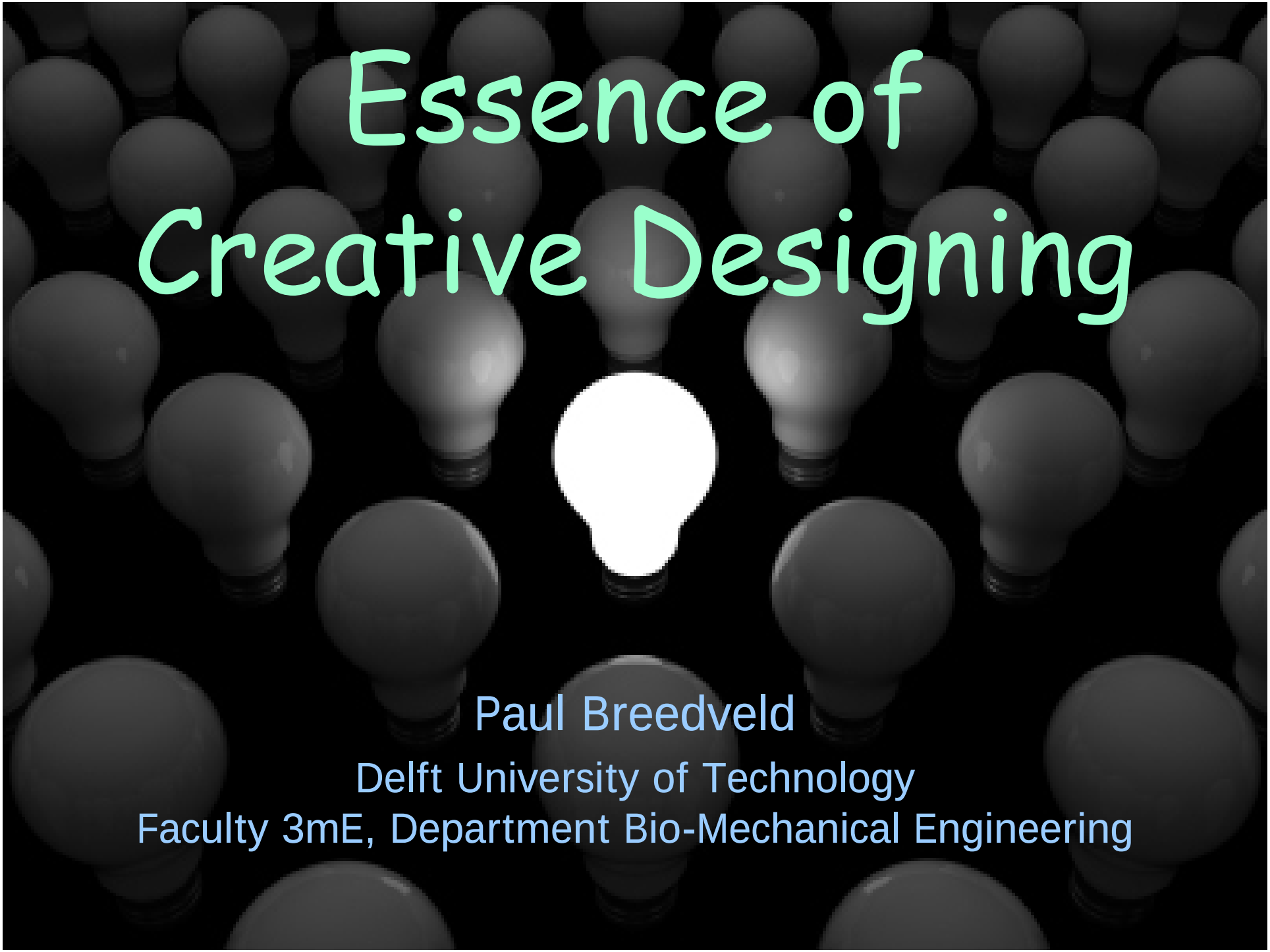
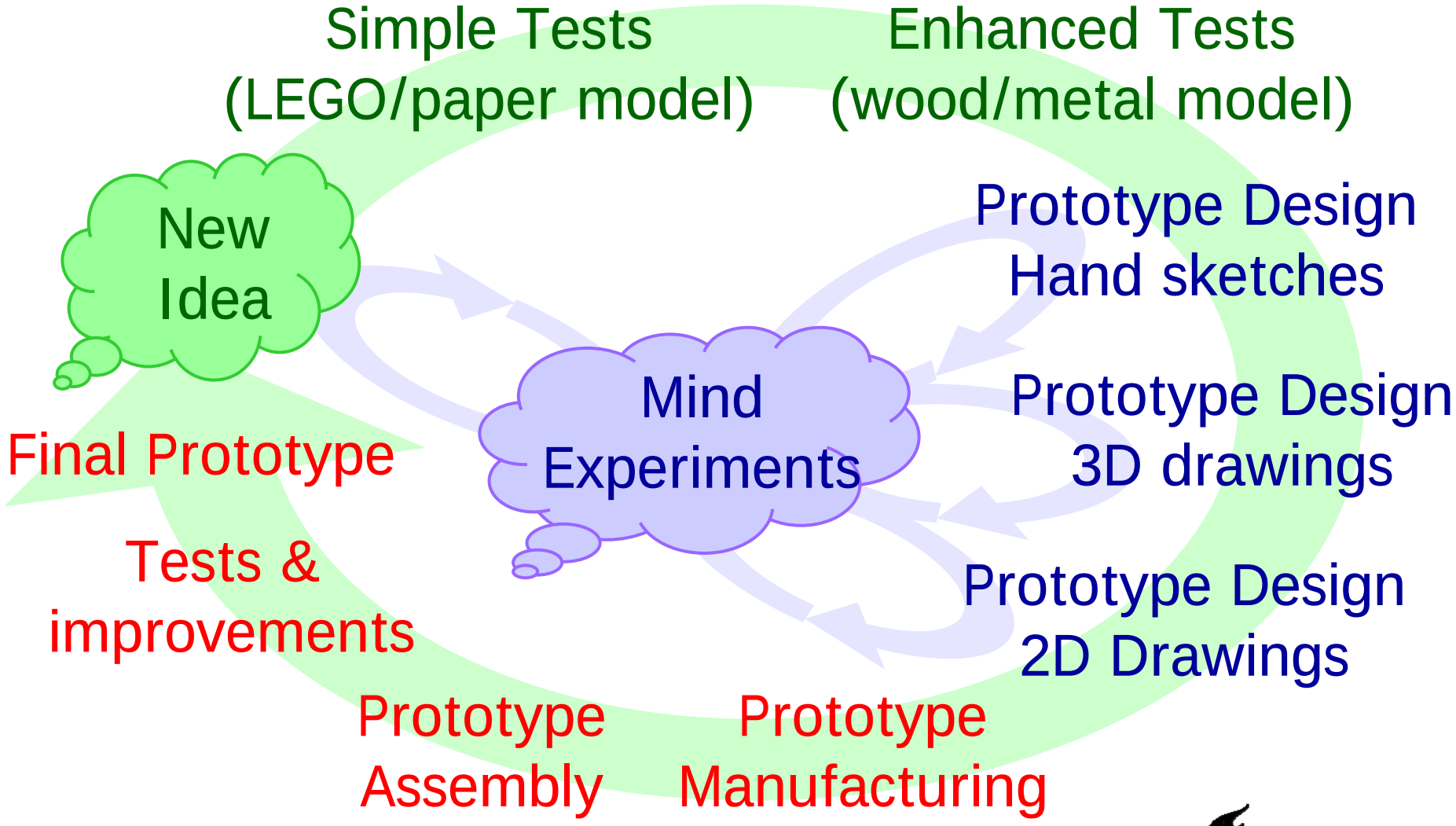


Essence of Creative Designing

Paul Breedveld
Delft University of Technology
Faculty 3mE, Department Bio-Mechanical Engineering

Design Loop



TU Delft

Design Loop

Enhanced Tests
(wood/metal model)

Prototype Design
Hand sketches

Prototype Design
3D drawings

Prototype Design
2D Drawings

Prototype
Manufacturing

Prototype
Assembly

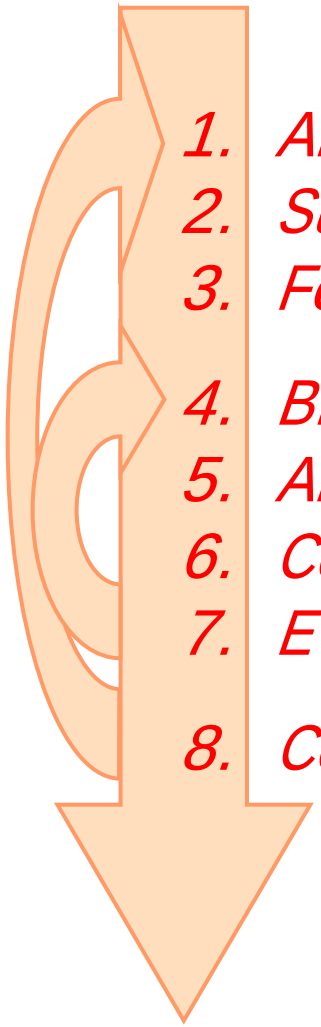
Tests &
improvemen

Final Prototyp

New
Idea

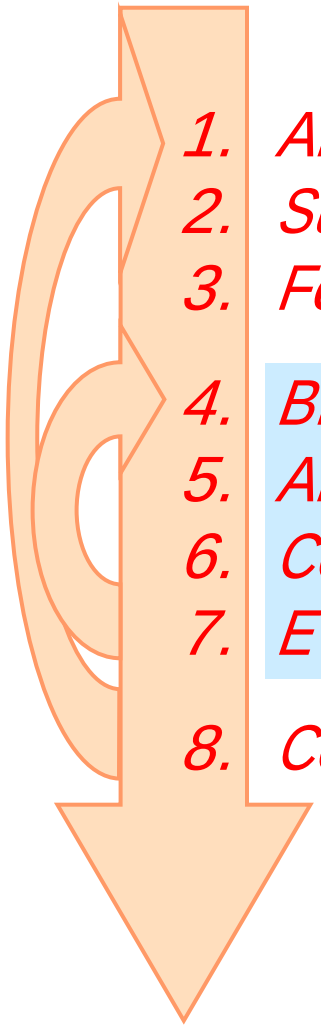
Mind
Experiments

Creative Designing in 8 steps



1. *Analyse* - find essence of problem
2. *Subdivide* - split up problem in sub-problems
3. *Focus* - focus steps 4-7 on one sub-problem
4. *Brainstorm* - use database to find possible solutions
5. *Abstract* - find essence of these solutions
6. *Complete* - use logic to find gaps for other solutions
7. *Evaluate* - evaluate the solutions
8. *Combine* - go back to entire problem

Creative Designing in 8 steps



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Example

Design a wheeled vehicle that is
fast, stable and simple of construction

Fast: ++
Stable: ++
Simple: −−

Total: 20 points

Fast: −
Stable: +−
Simple: ++

Total: 10 points

4. Brainstorm

Conventional way: two ideas, which one is best?

Fast: ++	Fast: −
Stable: ++	Stable: +−
Simple: −−	Simple: ++
Total: 20 points	⇐ Maybe take this one?..

4. Brainstorm

Conventional way: two ideas, which one is best?

Fast: ++
Stable: ++
Simple: −−

Total: 20 points ⇐ Maybe take this one?..

There are better solutions!

4 wheels 2 wheels

Motorized Manual

?

?

5. Abstract

Essential differences between bike & car?

	4 wheels	2 wheels
Manual	 kart	
Motorized		 motorbike

6. Complete

Use logic to find gaps for other solutions

	4 wheels	2 wheels
Manual		
Motorized		

6. Complete

More possibilities than 2 or 4 wheels?

	4 wheels	3 wheels	2 wheels	1 wheel
Manual		 trike		 unicycle
Motorized		 motorized trike		 motorized unicycle

6. Complete

More possibilities than 2 or 4 wheels?

	4 wheels	3 wheels	2 wheels	1 wheel
Manual				
Motorized				

7. Evaluate

Which one is best?

	4 wheels	3 wheels	2 wheels	1 wheel
Manual				
Motorized				

Fast: ++

Stable: +

Simple: +

Total: 40 points!

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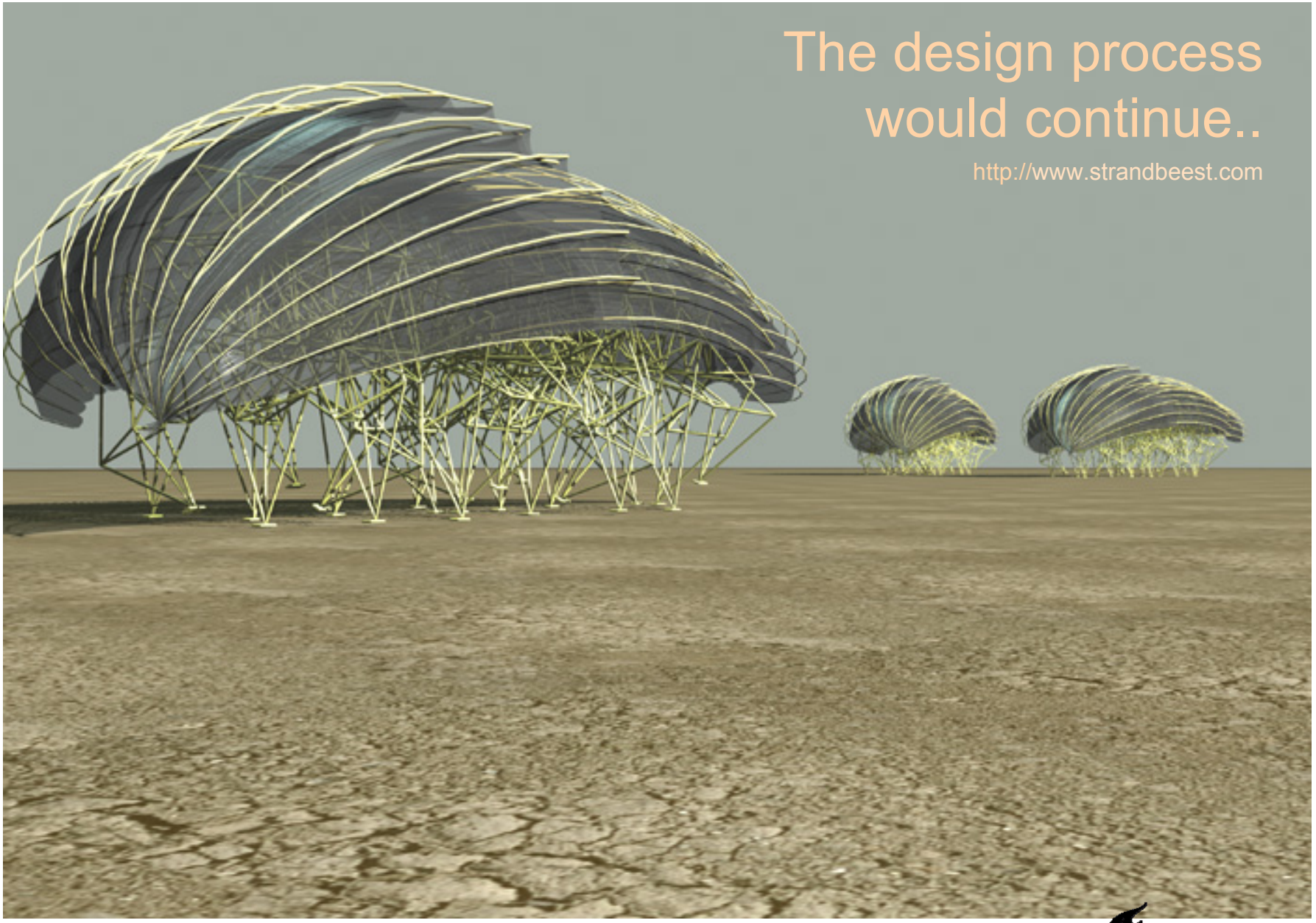
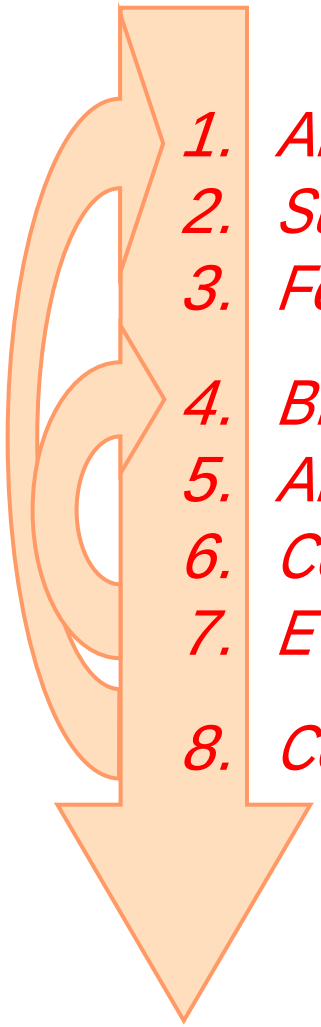
The design process would continue..

http://en.wikipedia.org/wiki/Mark_I_tank


The design process
would continue..
http://www.strandbeest.com

Stimulating Creative Designing



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Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

1. *Resetting yourself*
   (sports, hobbies, pubs, turbulent environment..)


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Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

2. *Using alternative approaches to initiate out-of-box thinking*
   (not straight but curved, no motions but forces, etc)

http://carpentersworkshopgallery.com/

Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

2. Using alternative approaches to initiate out-of-box thinking

Example: 0, 1, 2, 3-dimensional

Wheel with road = 1-dimensional contact surface (line)
Is there anything with 0, 2 or 3-dimensional contact surface?

- 0-dimensional (one or more points)? Foot!
- 2-dimensional (one or more planes)? Caterpillar!
- 3-dimensional: ?

Look at problem from a dimensions perspective!

Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

2. Using alternative approaches to initiate out-of-box thinking

Example: no motions but forces

A car brakes by applying friction on the wheels
This generates a force opposite to the driving motion
What other ways are there to generate such a force?

- A fan, a spring, a magnet, a sail, an anchor, ...

Look at problem from a force perspective!

Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

2. Using alternative approaches to initiate out-of-box thinking

Example: degrees of freedom (DOF)

A car can move forward and turn (2 DOF)
How much DOF can I maximally use for planar motion?

- Is there a car that can also move aside (3 DOF)?

Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

2. Using alternative approaches to initiate out-of-box thinking

Example: degrees of freedom (DOF)

A plane can translate forward and
rotate up/down, left/right and twist (4 DOF)
How much DOF can I maximally use for spatial motion?

- Is there a plane that can also
  translate up/down and left/right (6 DOF)? Helicopter!

Look at problem from a DOF perspective!

Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

2. Using alternative approaches to initiate out-of-box thinking

Example: position, speed & acceleration

A mouse controls the position of the cursor
What is the relationship between mouse and cursor motion?

- Does a “speed mouse” exist? Joystick!
- Does an “acceleration mouse” exist? Gas pedal! (1 DOF)

Look at problem from a position/speed/acceleration perspective!

Stimulating Creative Designing

Step 4, Brainstorm, is strongly stimulated by:

3. Extending your database!

- ✓ Technical hobbies
- ✓ Evolving Design (WB3110)
- ✓ Bio-Inspired Design (WB2436-05)

http://insectlabstudio.com/

Stimulating Creative Designing

All steps are strongly stimulated by:

1. *Doing them with 2 or 3 persons (not more!)*
2. *Very fast idea transfer between these persons*
   (hand sketching, no laptops)


“an idea is like a butterfly:
it pop-ups and disappears in an instant..”