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DESIGN IS A !RANDOM EVOLUTIONARY PROCESS

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Q

Who the hell am I?

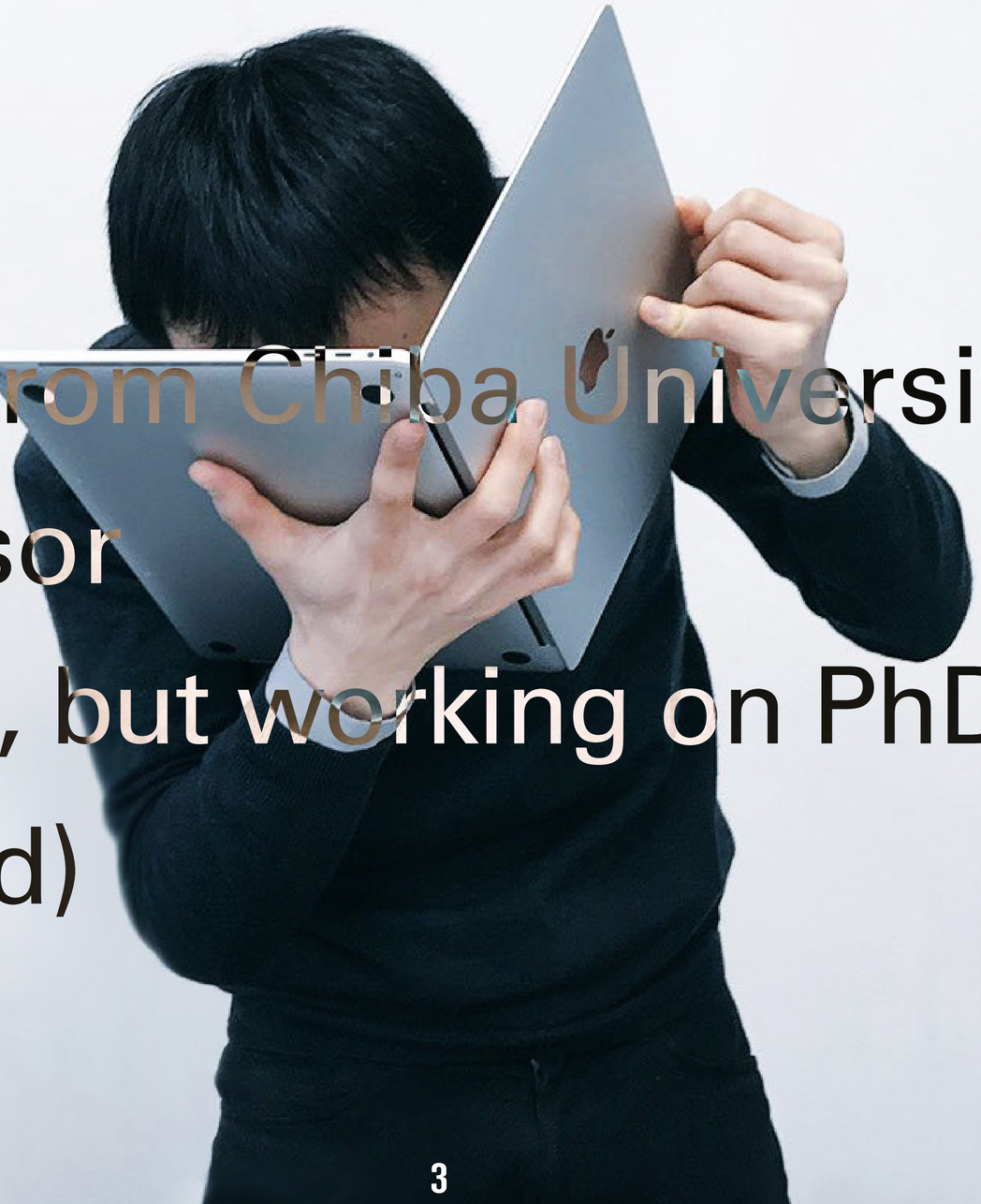
A

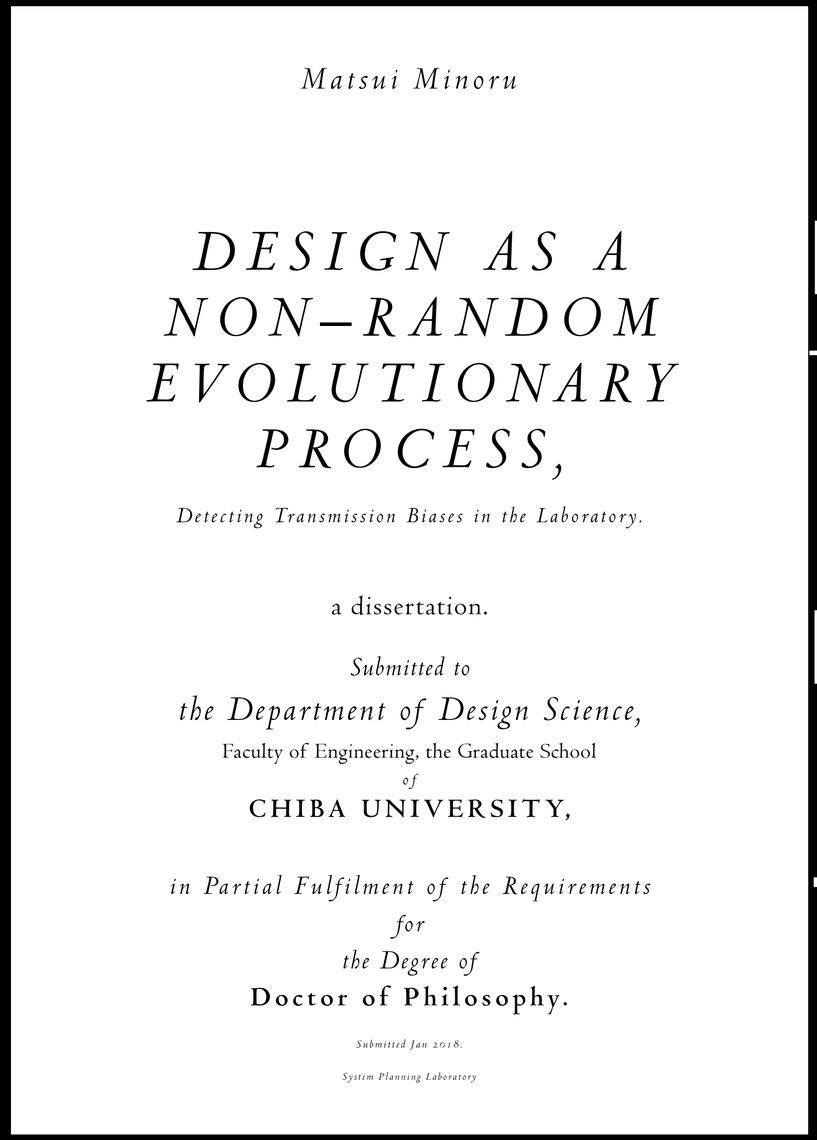
A researcher from Chiba University(

NOT a professor

NOT a student, but working on PhD thesis

(nearly finished)





Design as a Non-random Evolutionary Process: Detecting Transmission Biases in the Laboratory

In Japanese:

ノンランダムな進化過程としての設計：実験による伝達バイアスの検出

Q

Are you creative?

A

You are not that creative.

What I am going to argue:

The selection and the creation of design is *dominated* by random process.

I show this through 3 experiments.
Amongst various experimental conditions, little showed the evidence of selection: but a couple of them did.

What is Evolution?

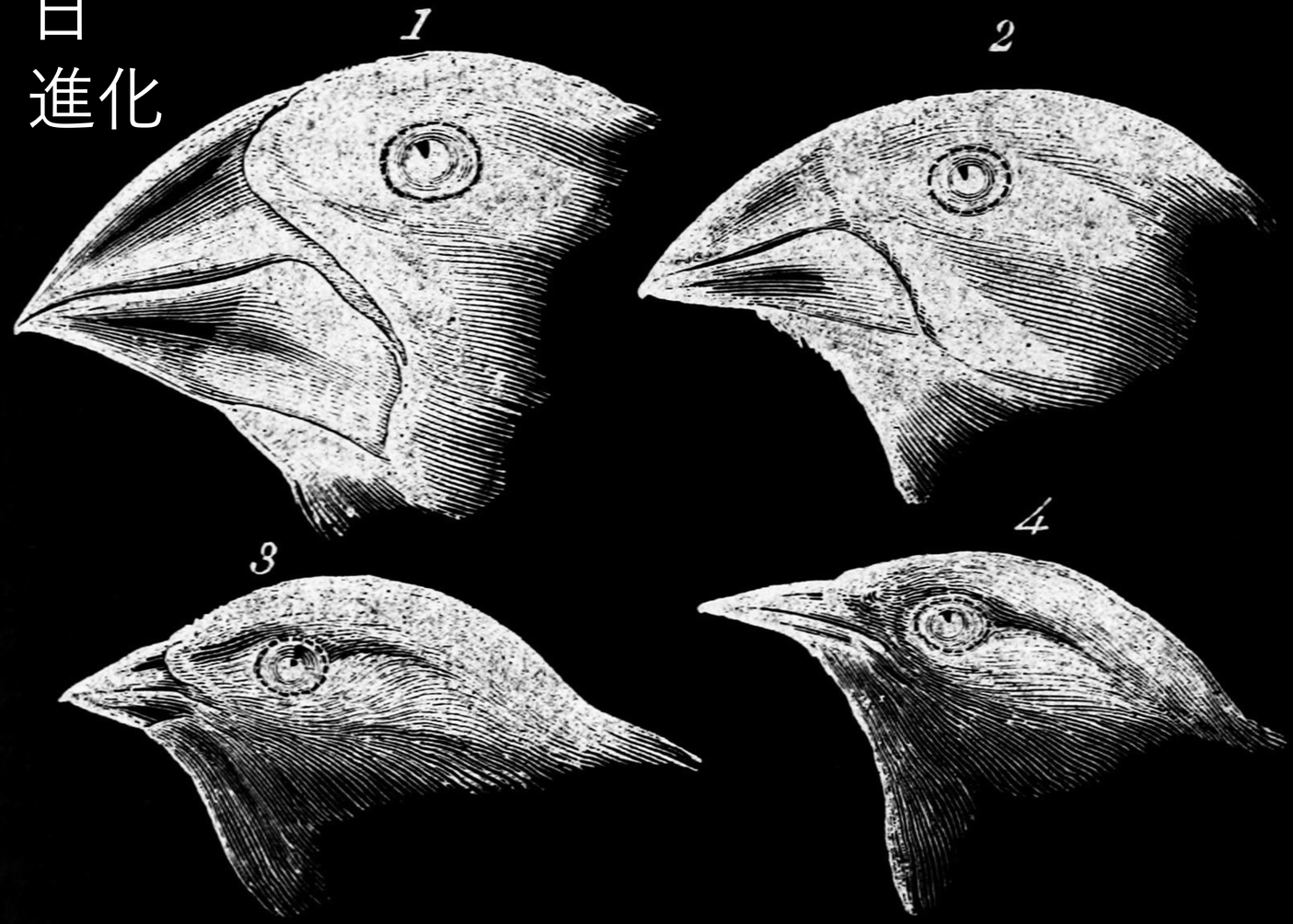
韓
진화

中
演化

日
進化

We know the term
not the details

(But I believe we should)



1. Geospiza magnirostris.
2. Geospiza fortis.
3. Geospiza parvula
4. Certhidea olivacea.

What is Evolution?

Biological evolution: Change in the number of alleles (genes) in a population over time

What is Evolution?

Biological evolution: Change in the number of alleles (genes) in a population over time

=

Evolution does not imply progress. It just means changes over time

Hey, that definition is quite difficult to comprehend

Evolution MUST occur when there is...

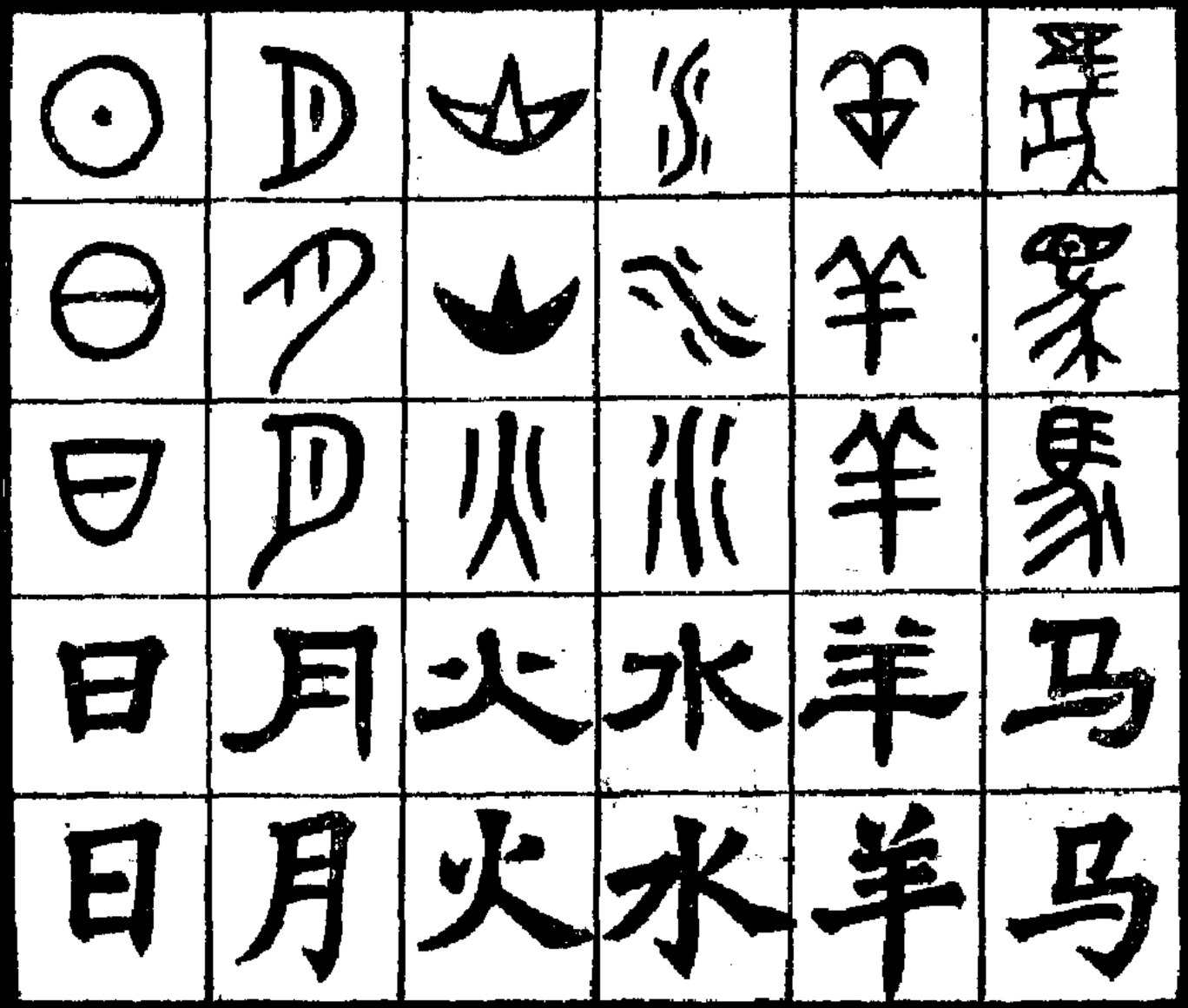
Variation 돌연변이突变

Selection 자연선택自然选择

Inheritance 유전遺傳

in a population, whether it is biological, cultural, language, etc...

Changes
over time



Evolutionary processes

Two types of evolutions

Neutral Evolution & Adaptive Evolution

중립 진화 이론 & 적응

中性演化理論 & 適應

Neutral ランダム Evolution (Not very interesting evolution)

+

Adaptive Evolution

=

Interesting Evolution

Random drift 유전자 부동遺伝漂変 : Variations do not affect the fitness
Examples: ABO blood type; your name

Your name is randomly chosen,

although baby names
clearly seems non-randomly
decided. Parents think deeply about their
offspring's name...
But if you count them, the frequencies of
names obey random-copying model

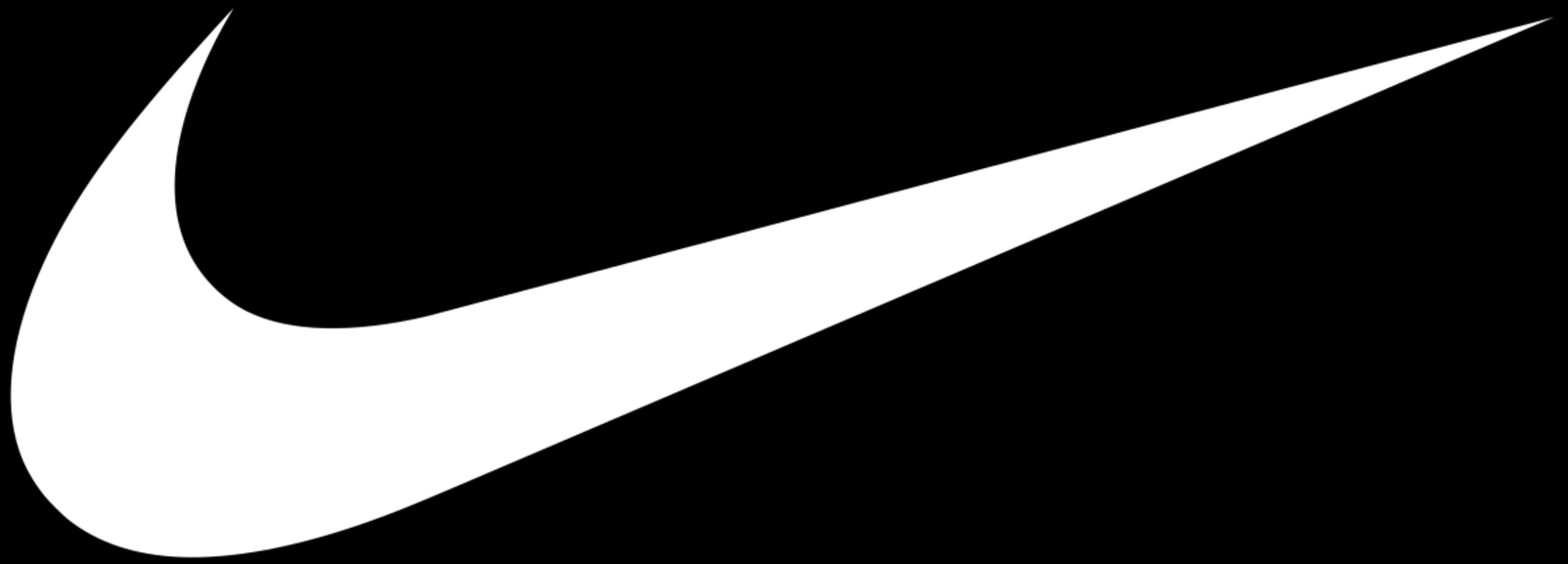
thinking deeply does not affect randomness

How about design?

Would deeply designing really affect your design's success? — maaaaaybe not

in other words, your success as a designer depends on sheer luck (so don't sweat it)
examples: music / movie chart, scientific paper citations, pet dog breeds, retweets, ... all are shown to be random

$35



http://www.huhmagazine.co.uk/4140/the-cost-of-a-logo

$100,000,000

http://www.huhmagazine.co.uk/4140/the-cost-of-a-logo

Research Purpose / Research Hypothesis

To show that **modern design is better understood as random evolutionary process**, rather than goal-seeking purposeful intelligent work.

ESPECIALLY when the designs are grasped as a population

To test my hypothesis, I experimented

1. Create an experimental condition in the laboratory that resembles an actual design process as close as possible

close-to-designer experiment participants (e.g., design students), generational turnover of designers, votes on design based on preferences, realistic design tasks, multiple design candidates to choose from

To test my hypothesis, I experimented

2. Try various designing conditions that would FORCE the design process to be NON-random

Because of my hypothesis insist that design is random, it is necessary for me to prepare conditions that would work *against* my hypothesis

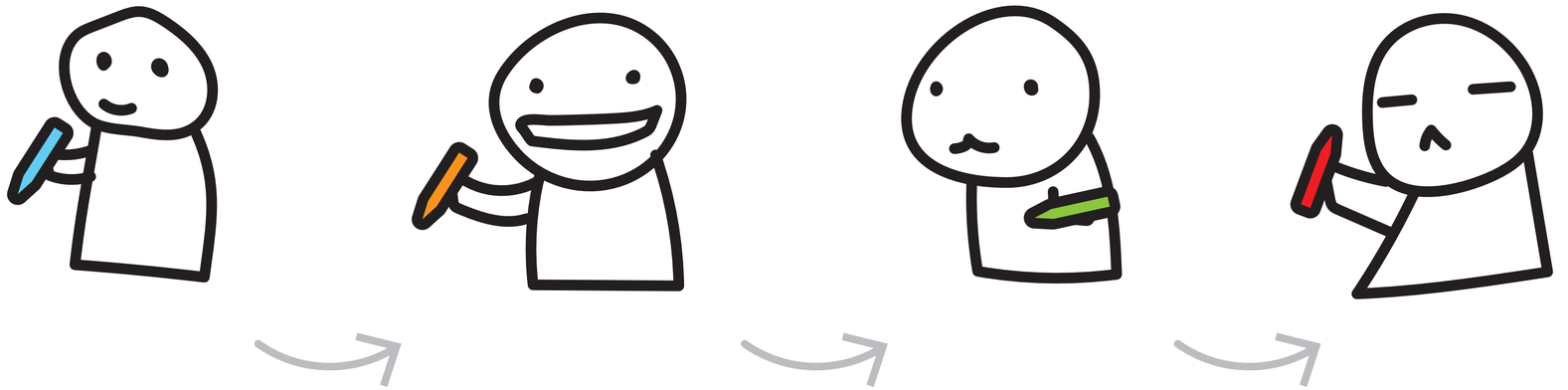
I tried everything I can think of imitating realistic design processes that may produce non-random patterns

Cultural Transmission **Network**

Generation

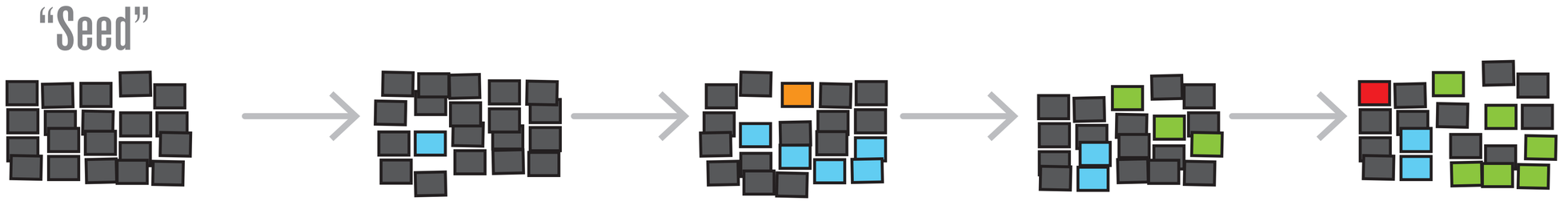
$t =$ 0 1 2 3 4 ...

Designer-selector



Chain of single participants
vote, select and create

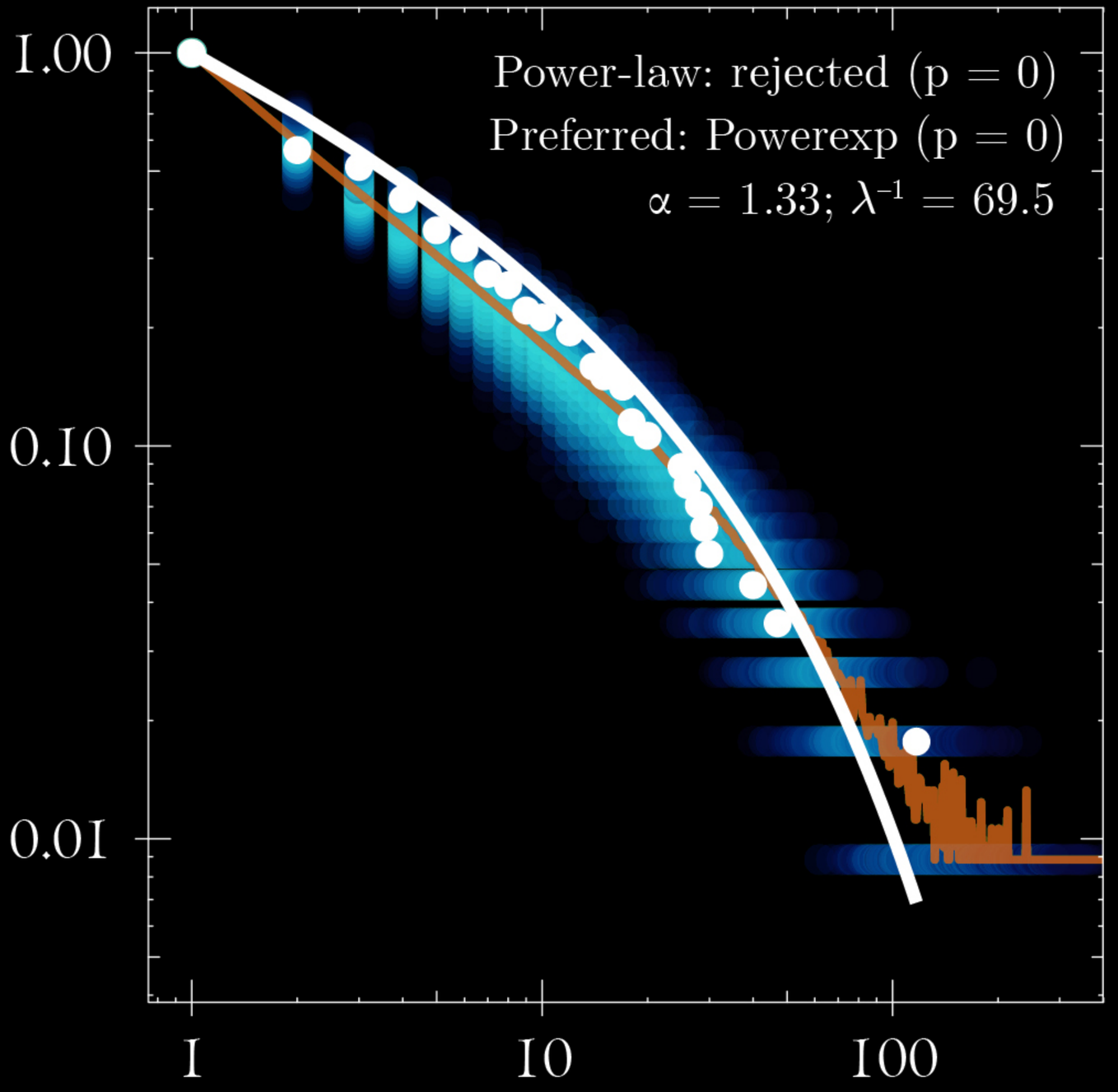
Trait

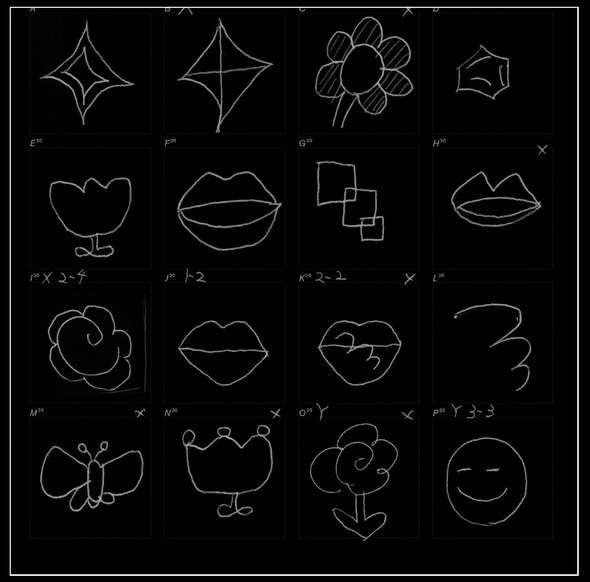


A population of cultural traits

In what situation you can safely say that the process is random?

If the experimental data fit the data from Random-copying simulation (run 1000 times) *then* under the experimental condition the design process may be random

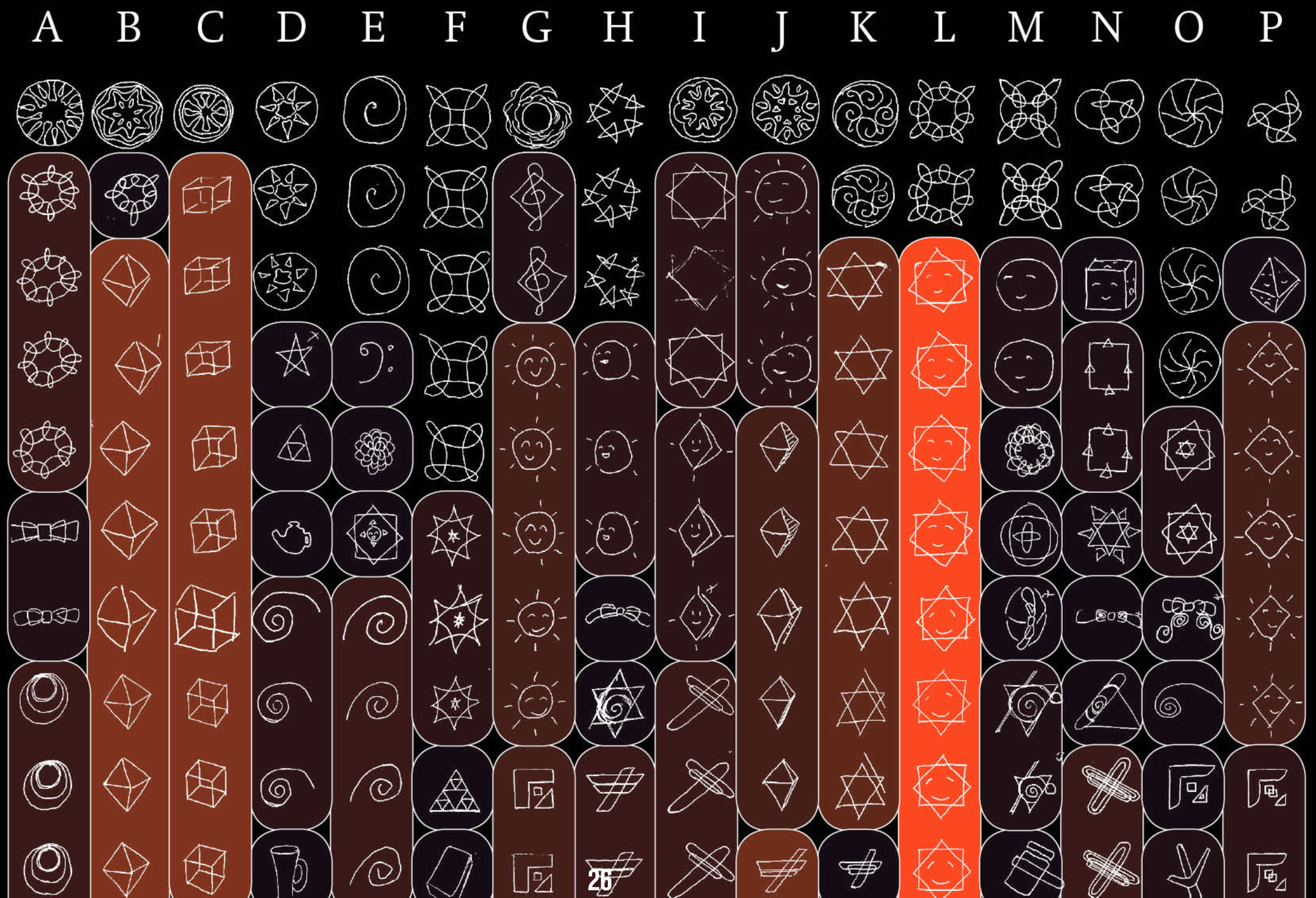

1.00
0.10
0.01
1
10
100
Power-law: rejected (p = 0)
Preferred: Powerexp (p = 0)
α = 1.33; λ⁻¹ = 69.5



task1: "design&select drawings that you like; stand out; easy to remember; easy to copy".

subjective design, w/o specific functional goal

INDIVIDUALS



INDIVIDUALS

task2: "design&select appropriate logo for our lab"

Clear functional goal, more realistic task

tried 5 conditions, 2 were control experiments

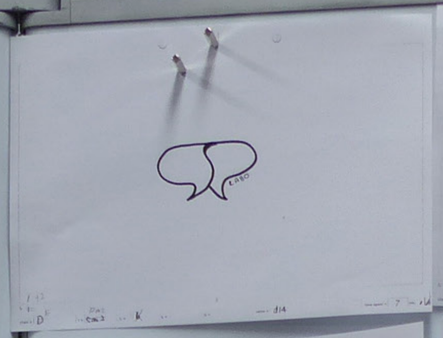
チェンジ

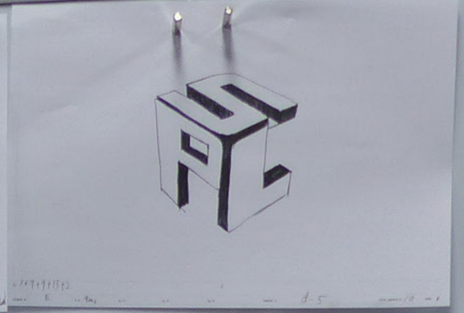
投票するだけ!!

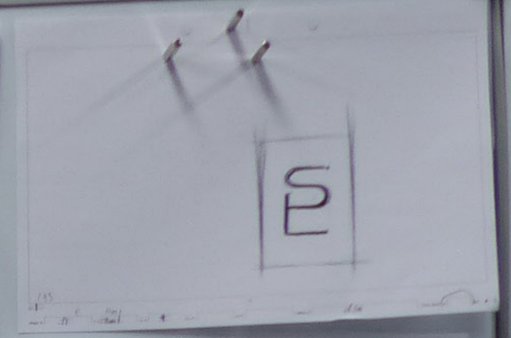
けさないで!!

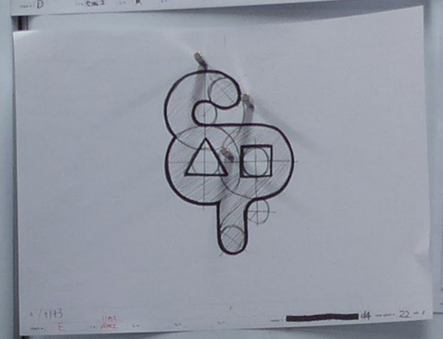
二度お前にシャッフル

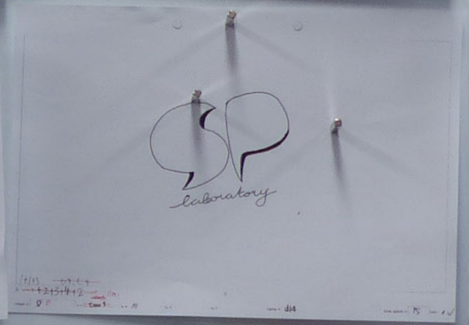
t	d
1	$t_1 = d25$
2	$t_2 = d10$
3	$t_3 = d27$
4	$t_4 = d28$
5	$t_5 = d30$
6	$t_6 = d19$
7	$t_7 = d31$
8	$t_8 = d32$
9	$t_9 = d33$
10	$t_{10} = d34$
11	$t_{11} = d35$
12	$t_{12} = d36$
13	$t_{13} = d37$

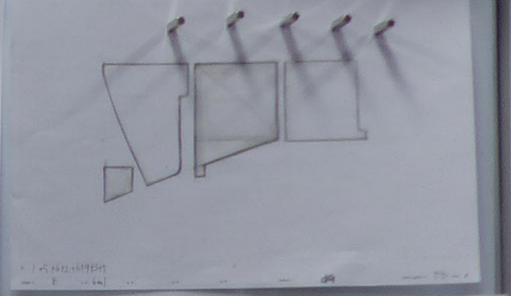


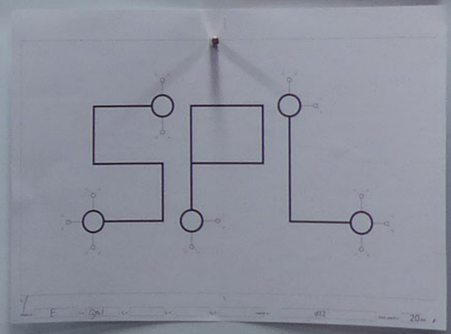


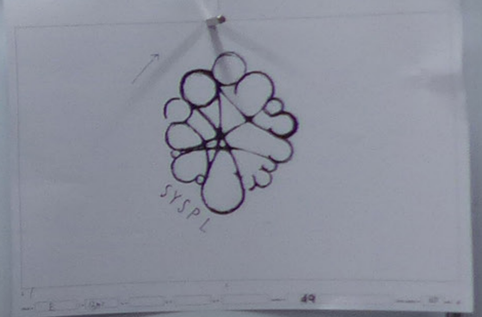












Result

Net	Frequency Distribution		Turnover	Unique Variants	Judge
	Support for Power-law	$Pr(X \geq 2)$			
1.1	with cut-off	–0.085	*Neutral*	1.8	*Neutral*
1.2	with cut-off	0.039	*Neutral*	1.7	*Neutral*
2	with cut-off	–0.070	*Neutral*	0.087	*Neutral*
3	with cut-off	–0.035	*Neutral*	–1.2	*Neutral*
4	**with cut-off***	**–0.293**	**(+)1.31**	0.9	**Anti-novelty**
5	with cut-off	0.023	*Neutral*	–0.51	*Neutral*

RANDOM

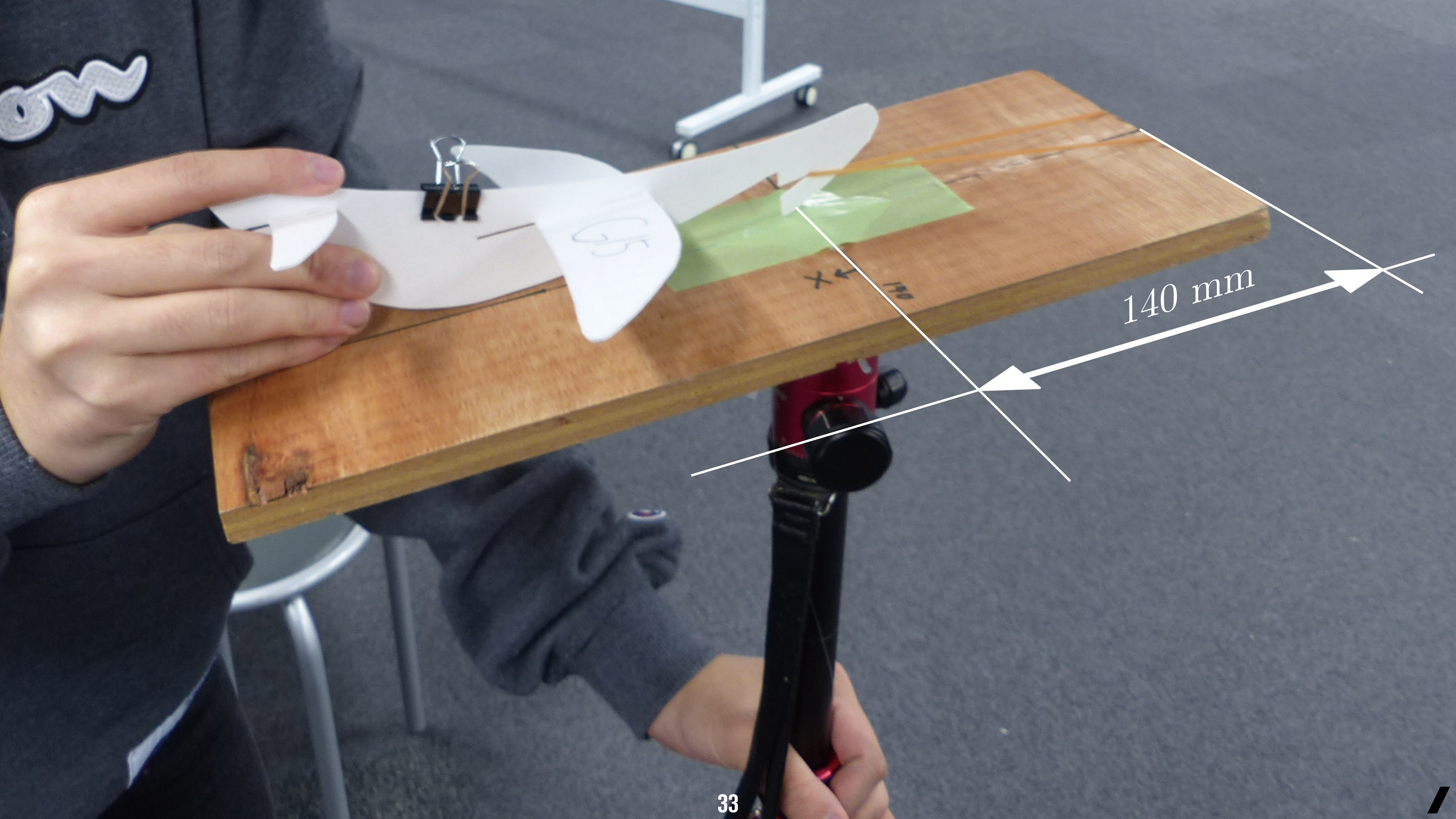
*: $x_{\min} = 2$

Bias detected | Evidence for judge | Evidence against judge

All random, except a control experiment

task3: "design&select hand-launched paper glider that fly as far as possible"

Clear design goal, quantifiable performance


140 mm

Experiments on 6 conditions, with different goals

Table 4. *Exhaustive list of conditions for six transmission networks for aircraft experiment.* "•" means the procedure indicated in the column is available in the transmission condition. The priority order is explained in 8.5.5.

Net	Inspectable attributes		Voting	Mutation			Priority order
	Visual	Performance		Invention	Borrowing	Freedom	
Aes	•		•		(↼)		2
AesBlind	•		•		•	•	3
PerfNoVote	•	•			•	•	5
PerfMech	•	•			•		6
Uniq	•	•	•	•		•	4
UniqBlind			•*	•		•	1

↼ mutations are imported from the other networks.

* voting was done after mutation process. In the other conditions, voting was done before mutation process.

Anti-conformist / Pro-novelty bias confirmed

Net	Frequency Distribution		Turnover	Unique Variants	Judge
	Support for Power-law	$Pr(X \geq 2)$			
Aes	**with cut-off**	**0.086**	**(–)0.29**	2.6	**Pro-Novelty/Anti-conformist**
AesBlind	**with cut-off**	**0.103**	**(–)0.27**	1.3	**Pro-Novelty/Anti-conformist**
PerfBlind	yes	–0.055	*Neutral*	–2.1	[Intrinsically Content-biased]
PerfMech	yes	–0.011	*Neutral*	–2.2	
Uniq	**with cut-off**	**0.169**	**(–)0.21**	**5.3**	**Pro-Novelty/Anti-conformist**
UniqBlind	**with cut-off**	**0.203**	**(–)0.04**	**4.4**	**Pro-Novelty/Anti-conformist**

Bias detected	Evidence for judge	Evidence against judge

in a sense, not random, but not in the way we expect it to be. Participants favoured design with less popularity, and disliked designs with more popularity. = decisions based not on the performance, but on their popularity

Any sufficiently advanced design is indistinguishable from random