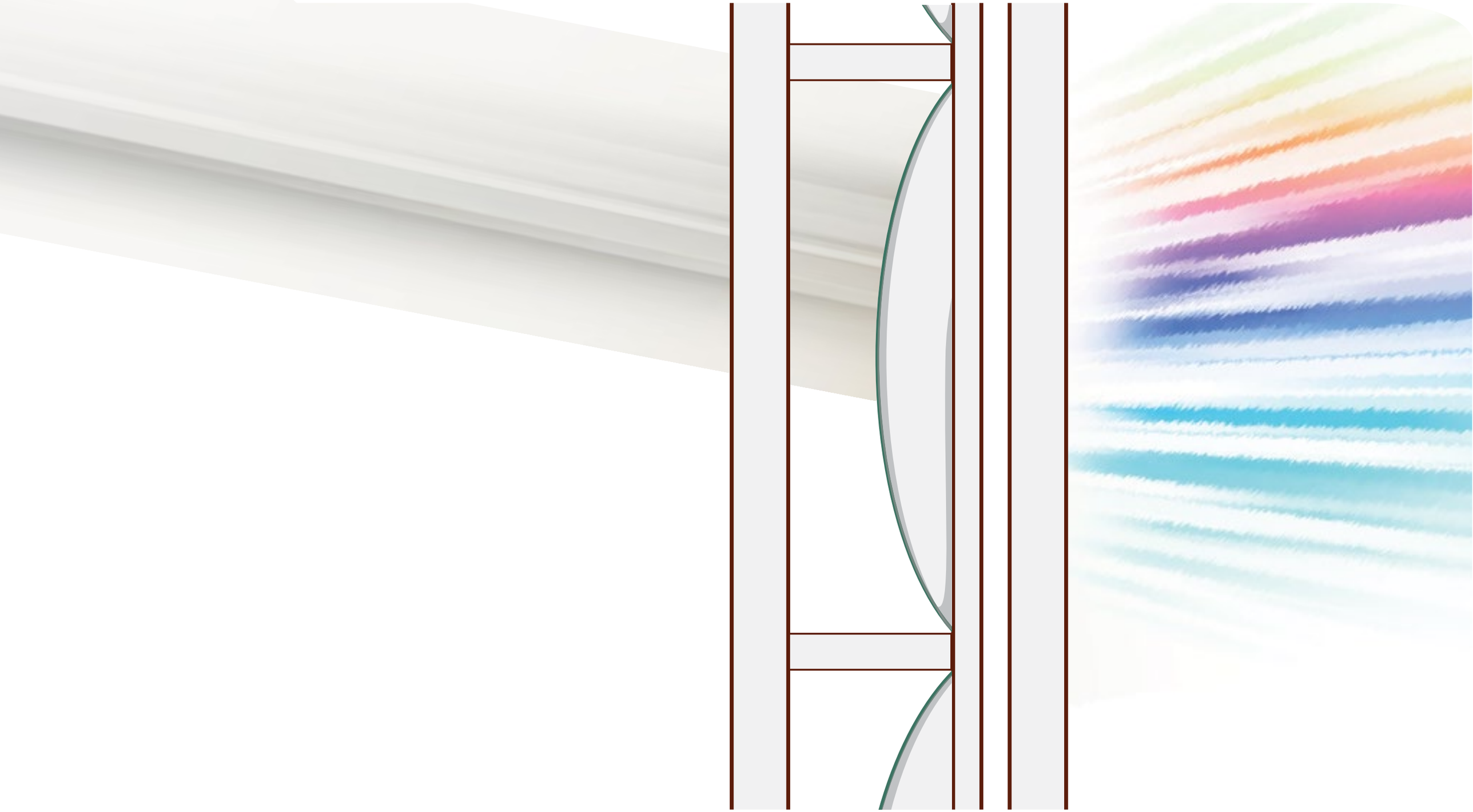
Innovative display technique for the building envelope
A research on electrowetting as new glazing method



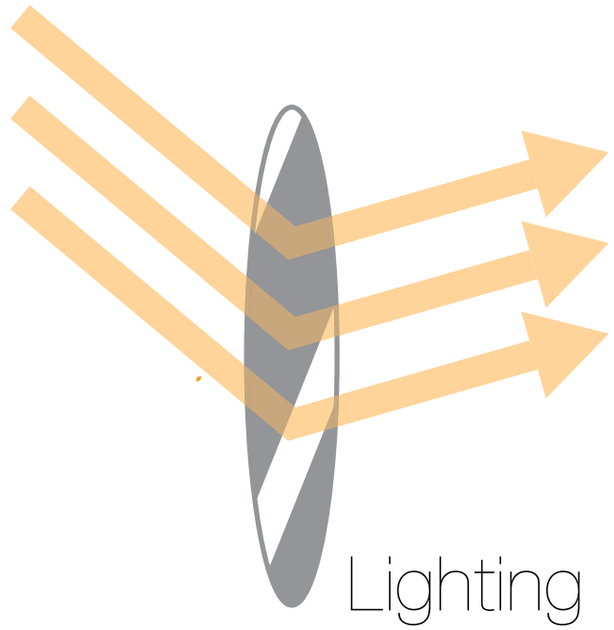
The façade dream

Shading

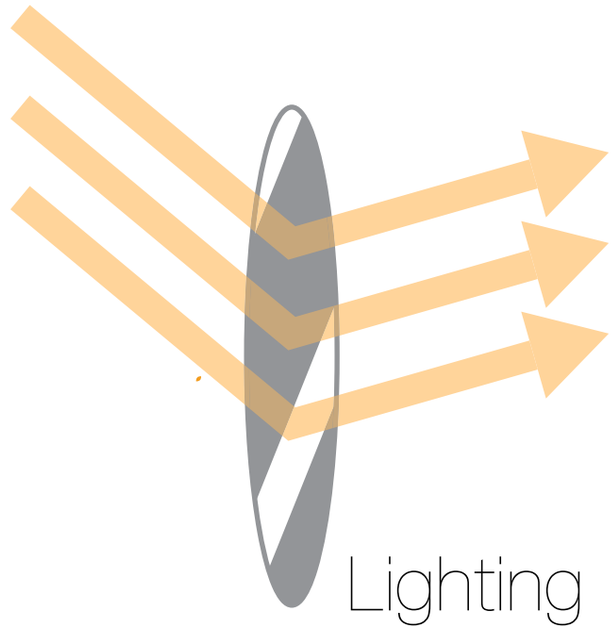
THE FAÇADE DREAM

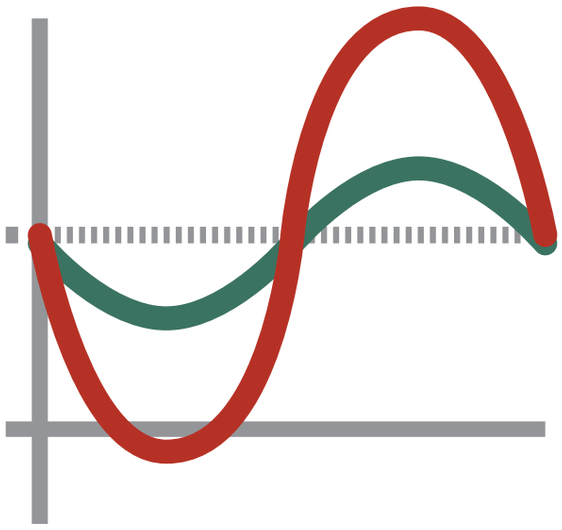
Introduction

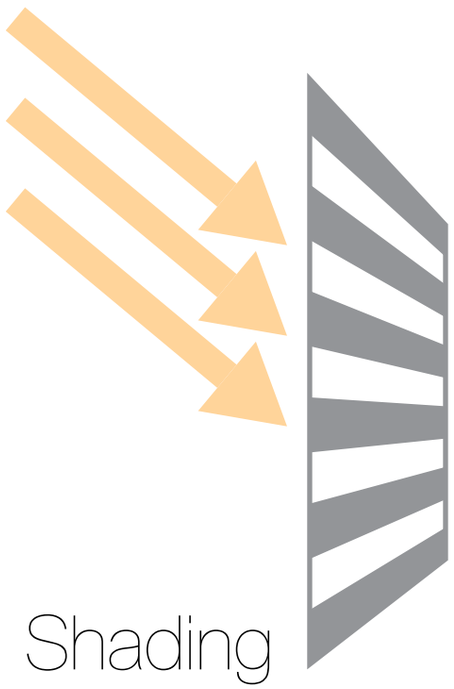
THE FAÇADE DREAM



THE FAÇADE DREAM

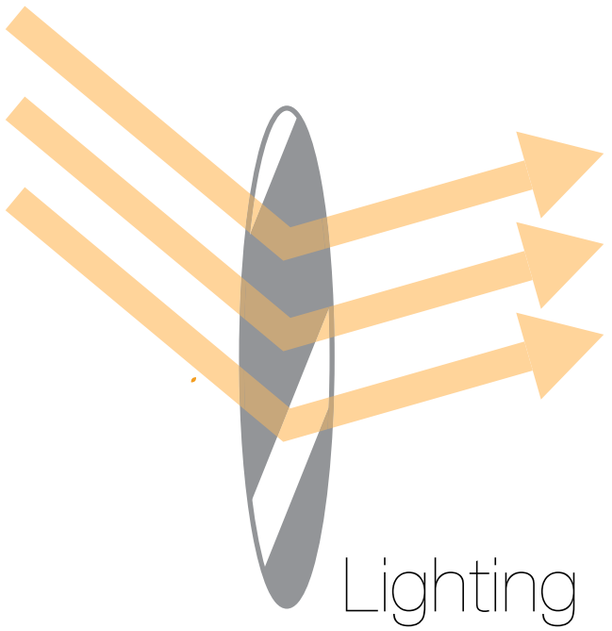




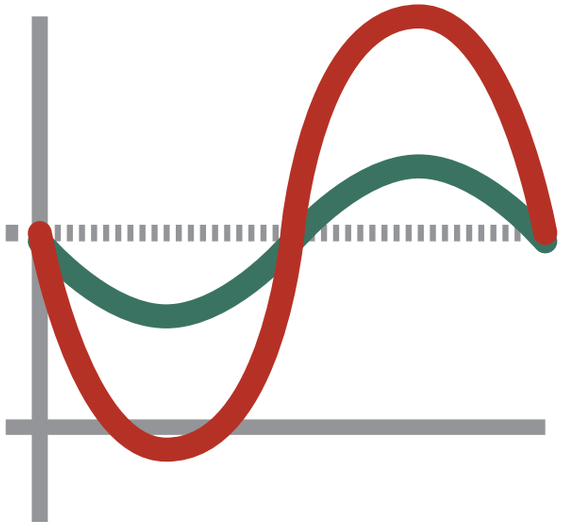


Shading

THE FAÇADE DREAM

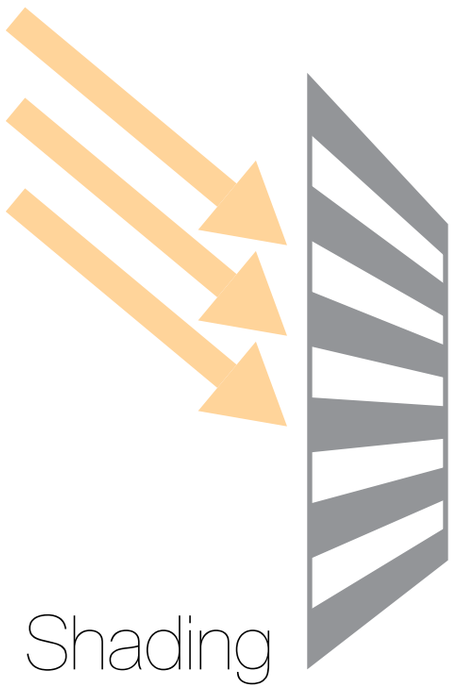


Lighting



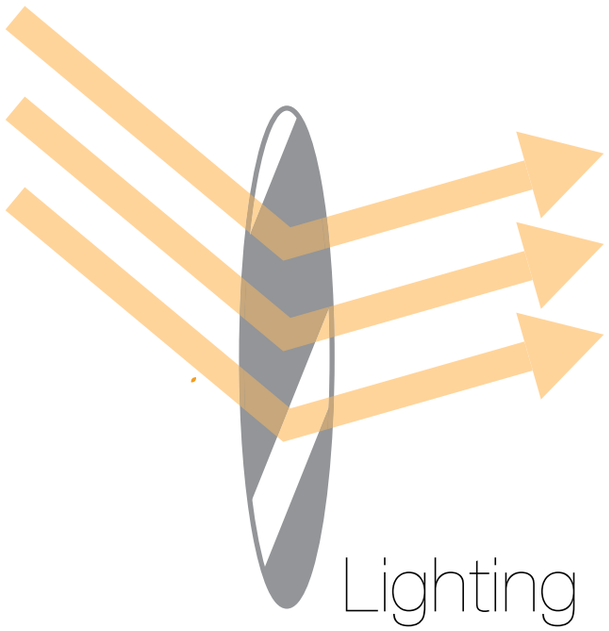
Thermal

Architectural



Shading

THE FAÇADE DREAM



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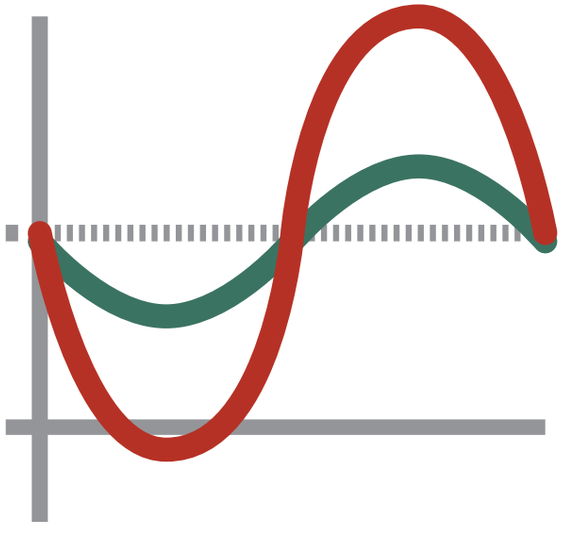
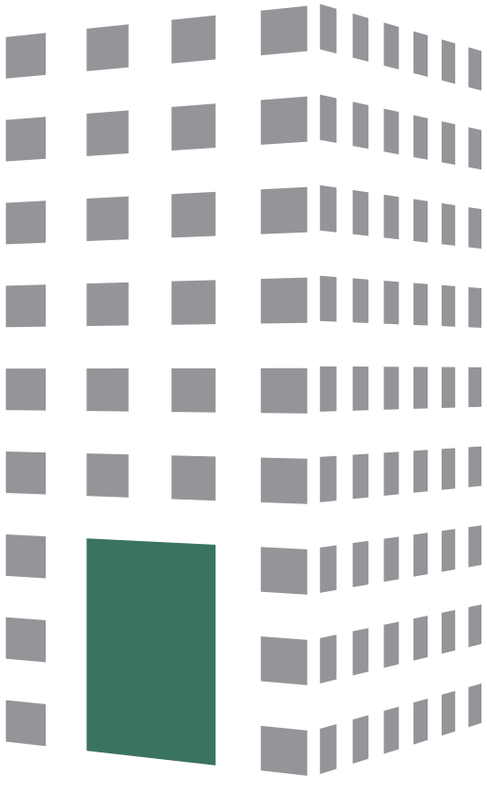


Thermal

Mood & Health



Architectural


Your personality...
...your choice.

Problem statement

Boundary conditions

Research question

Problem statement Basic electrowetting

Boundary conditions Applications

Research question Playing a game

Problem statement Basic electrowetting Conclusions

Boundary conditions Applications Future perspective

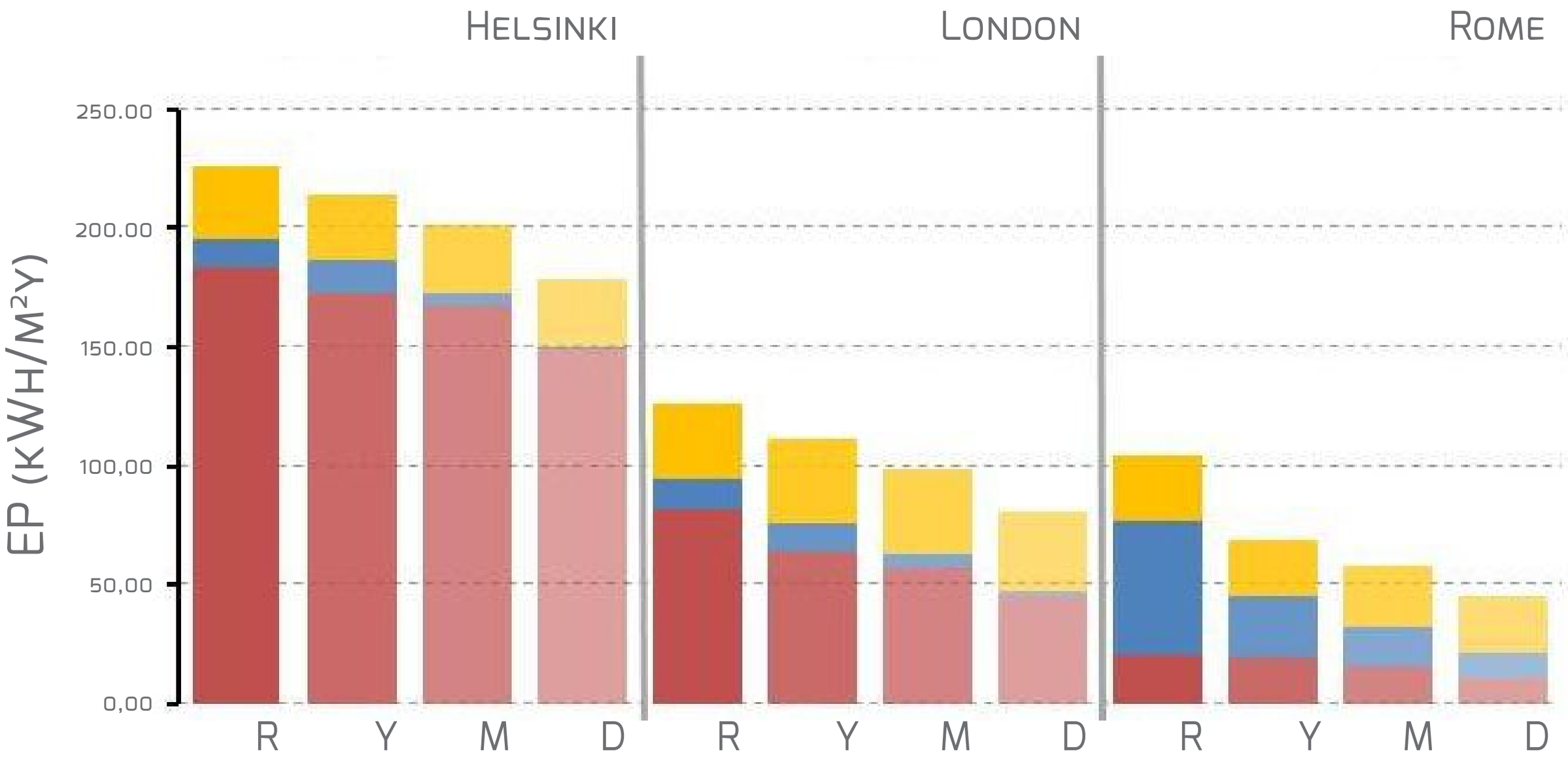
Research question Playing a game

Problem statement

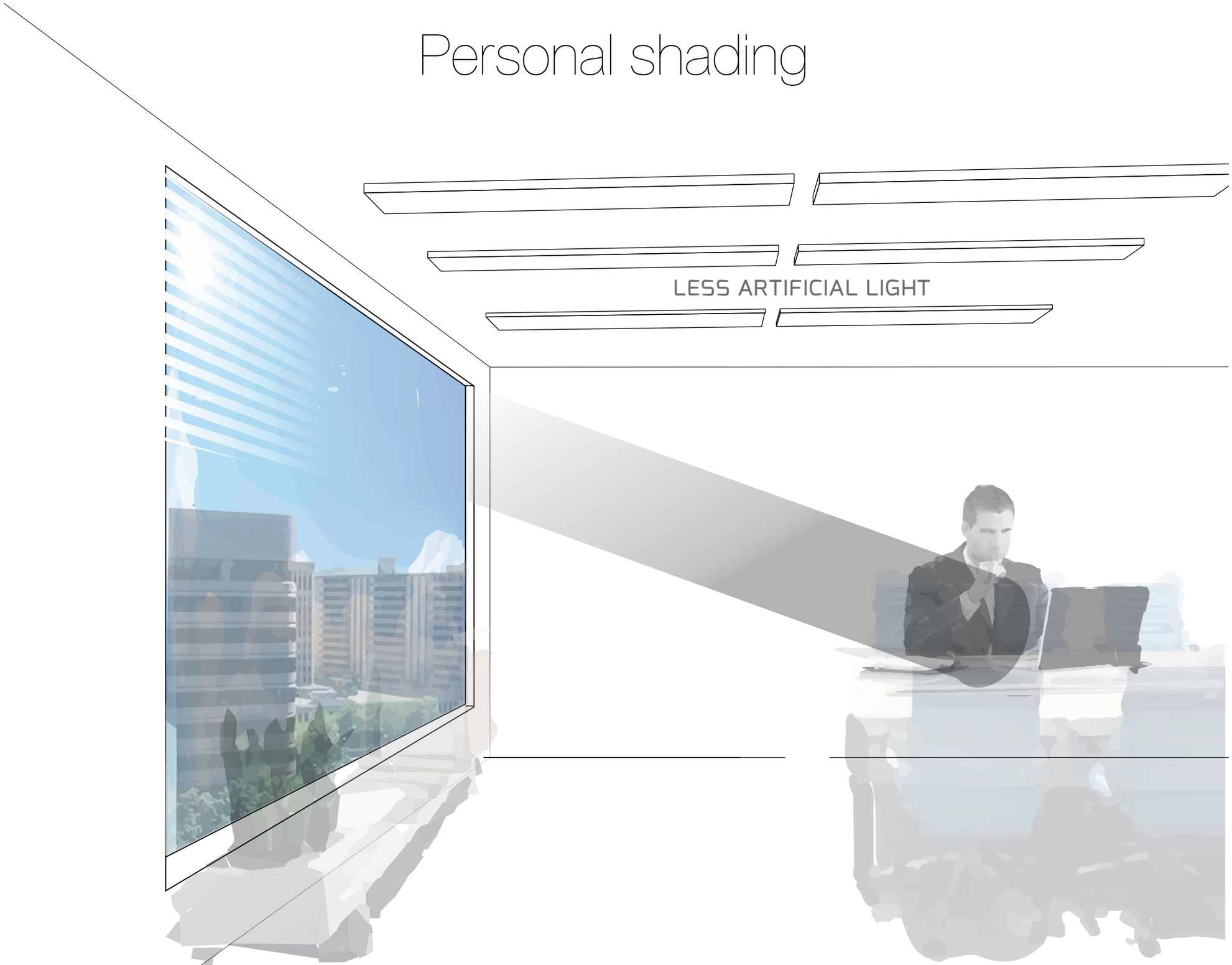
International style

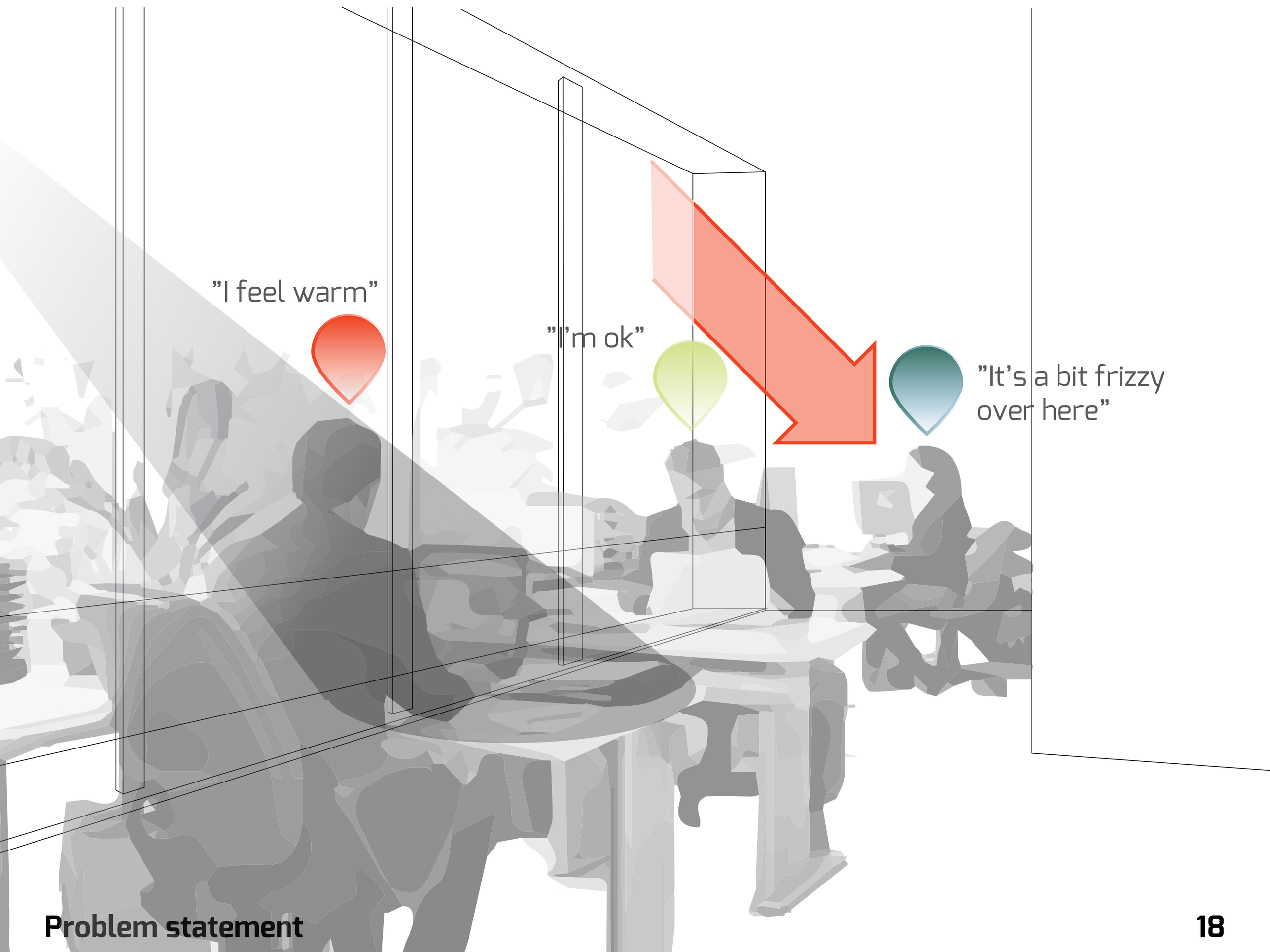
Smart glazings

Energy efficient



Personal shading

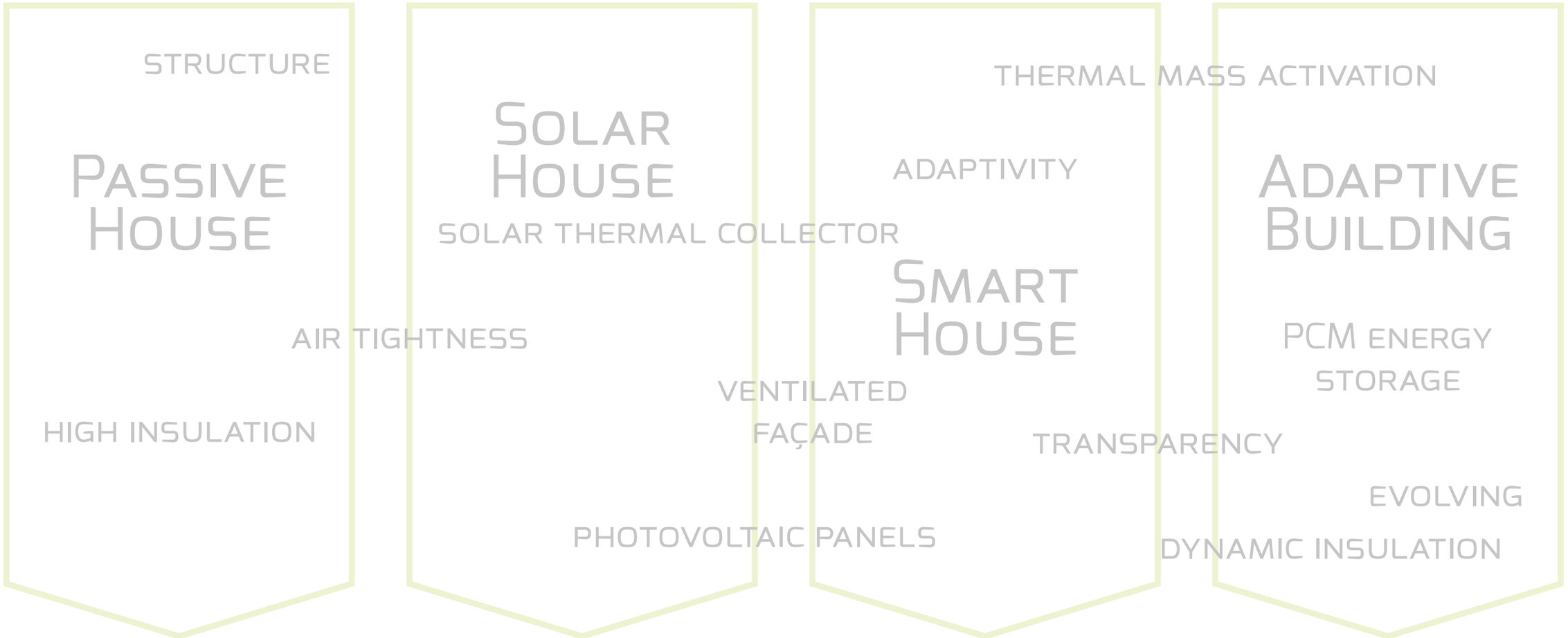



"I feel warm"
"I'm ok"
"It's a bit frizzy over here"

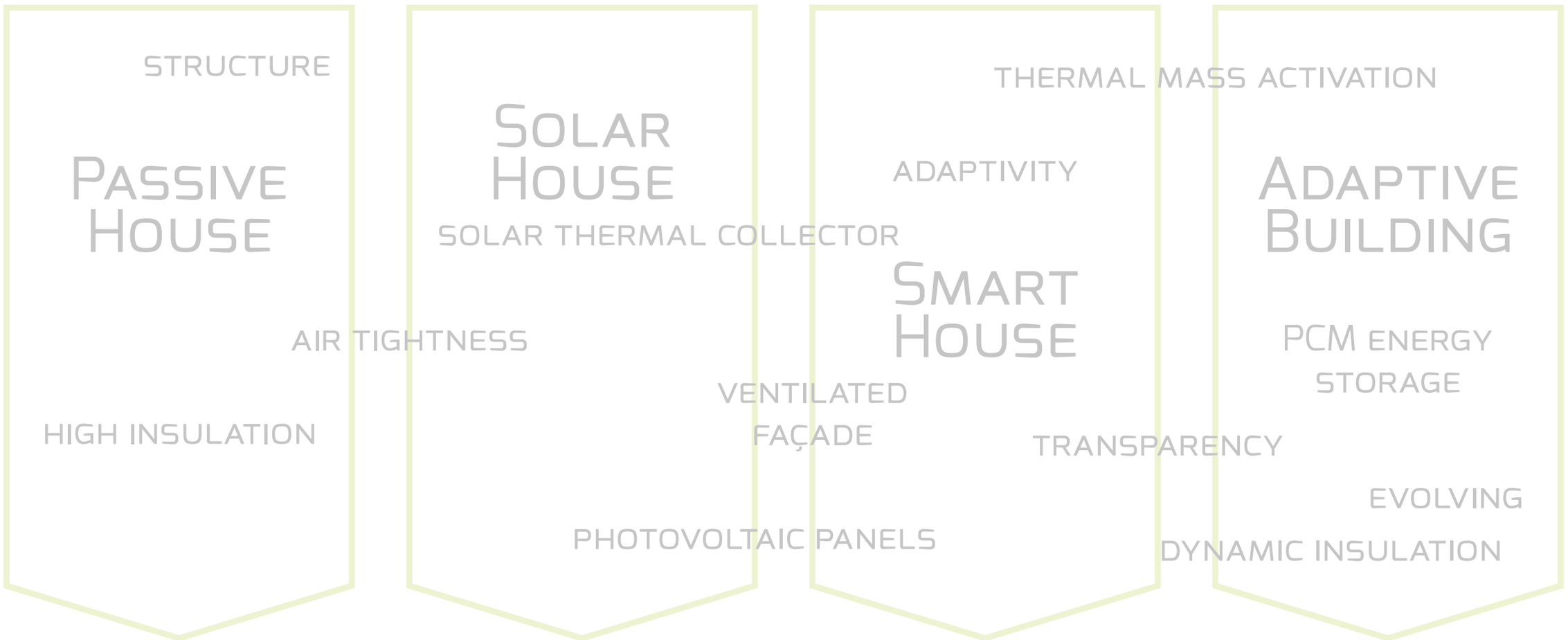
Spectrally selective glazing

Spectrally selective glazing

Boundary conditions

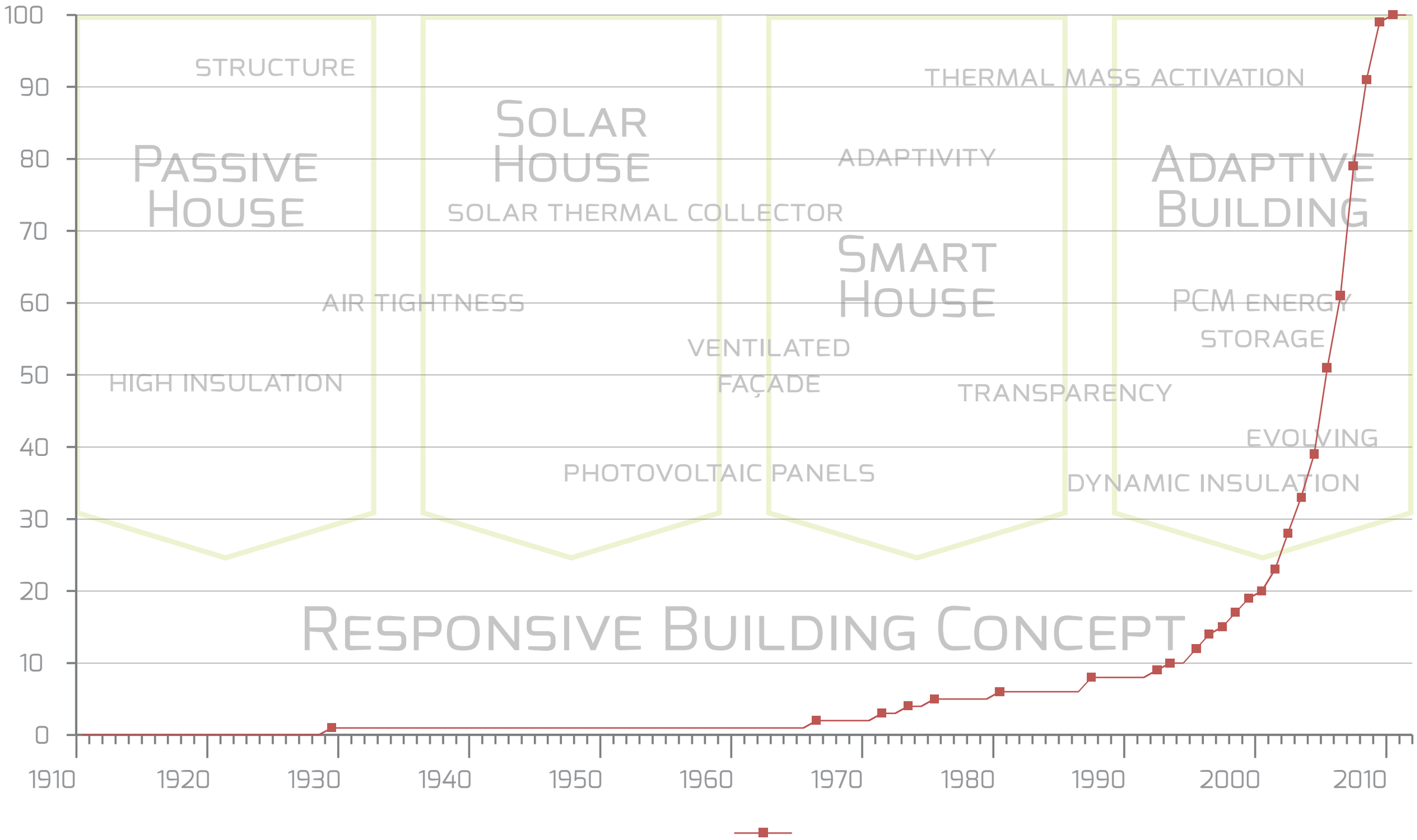


Boundary conditions



Responsive Building Concept

Interest in the topic



Responsive skin

[1] Dynamic

Responsive skin

[1] Dynamic

[2] Adaptive

Responsive skin

[1] Dynamic

[2] Adaptive

[3] Multi functional

Responsive skin

[1] Dynamic

[2] Adaptive

[3] Multi functional

[4] Intelligent

Responsive skin

[1] Dynamic

[2] Adaptive

[3] Multi functional

[4] Intelligent

Responsive skin

Multi functional

Responsive skin

Multi functional


UC
VISA
GENERATIONS
from EXILE TRIBE
1st Album
ON SALE
Hisamitsu
サロンパス
F21
FOREVER 2
Melumo
BIGBANG
Euphoria
ISABEL MARANT
STARBUCKS

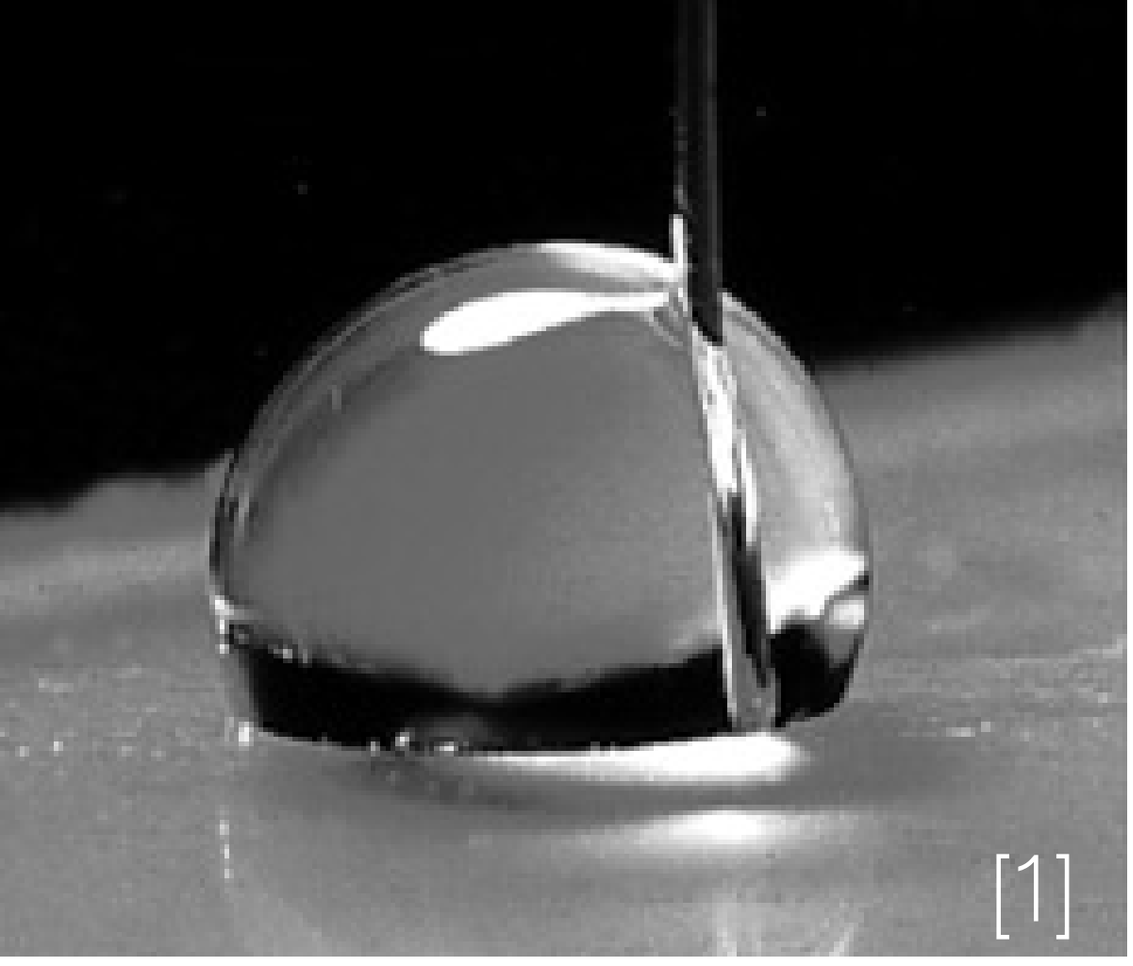
Will electrowetting be different?

Research question

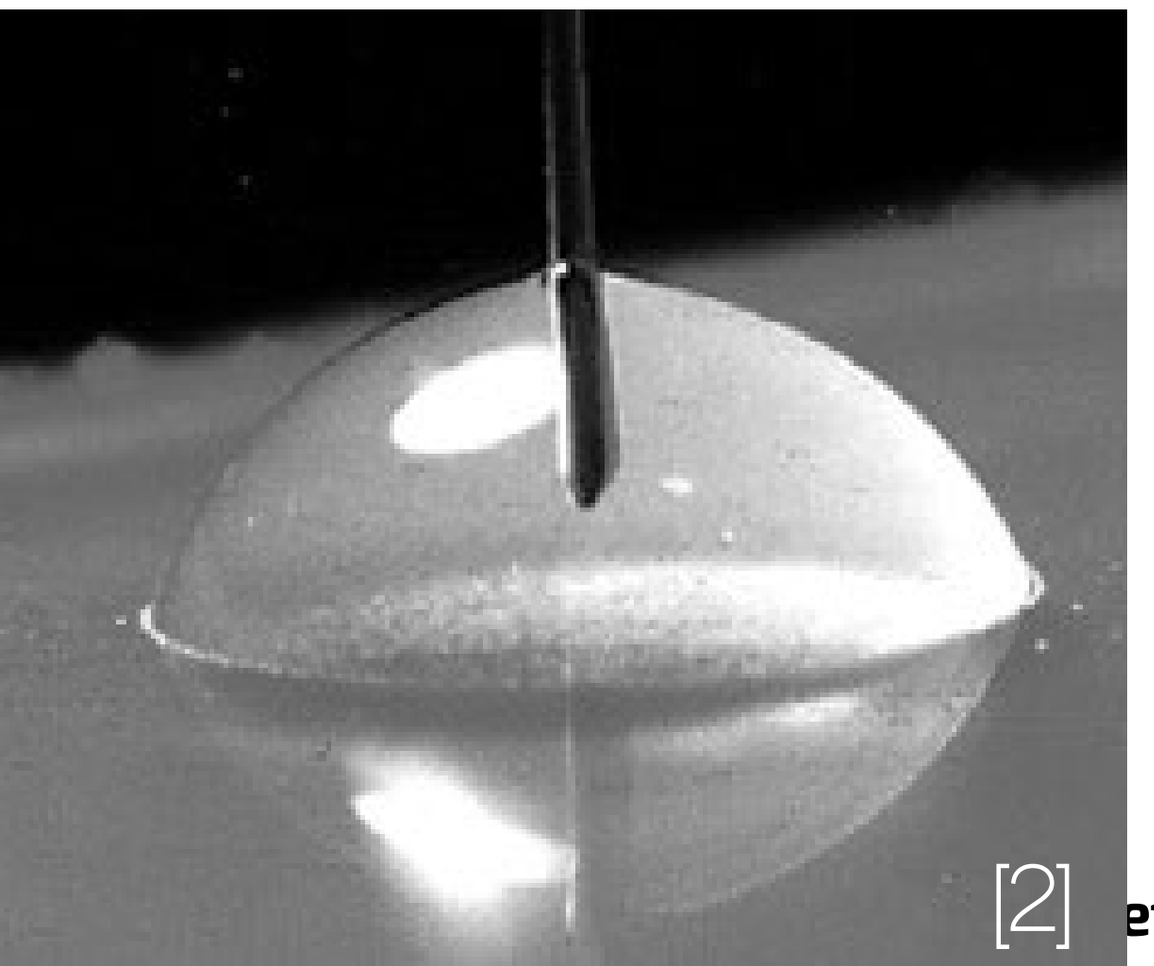
Research question

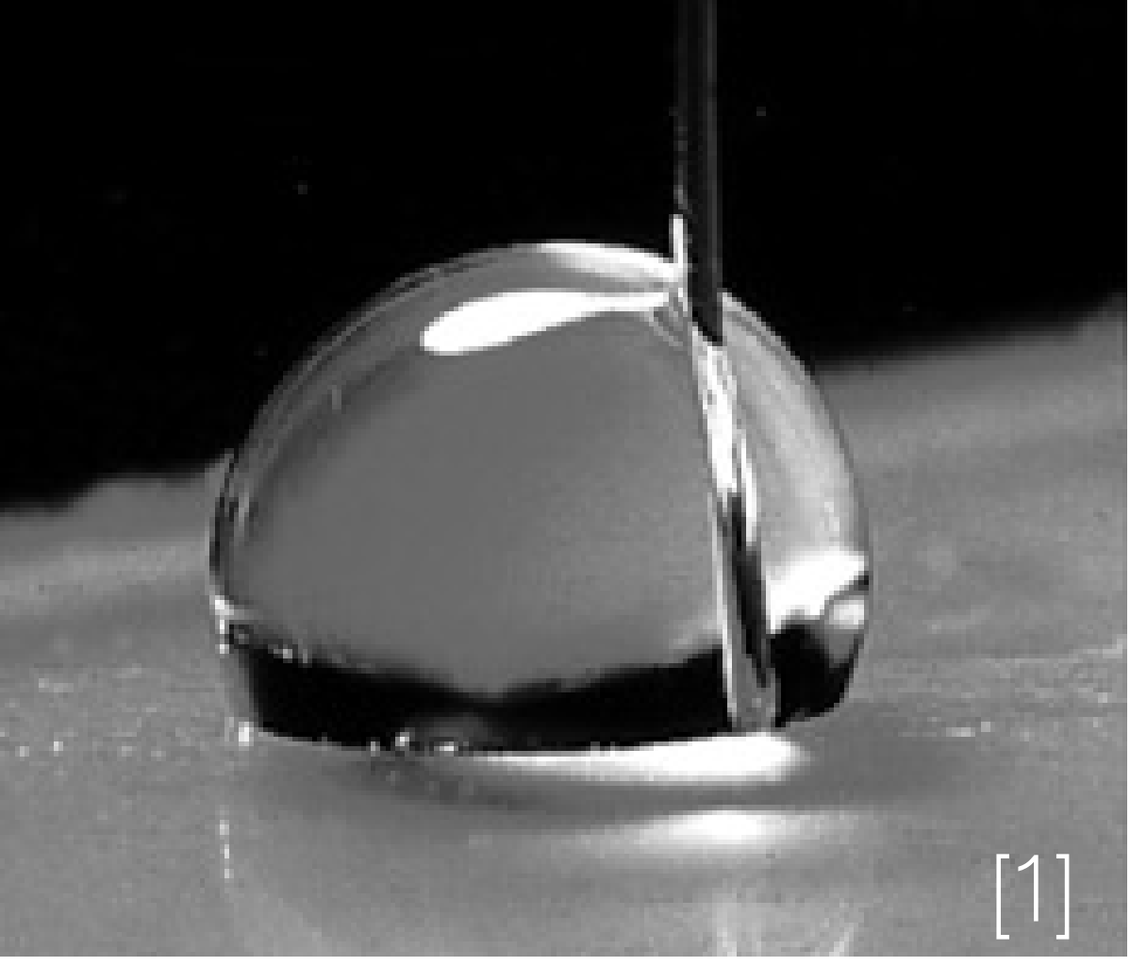
What are possible applications of electrowetting for the building envelope and could those applications be feasible with regard to user comfort, energy performances and architectural interventions?

Electrowetting basics


[1]

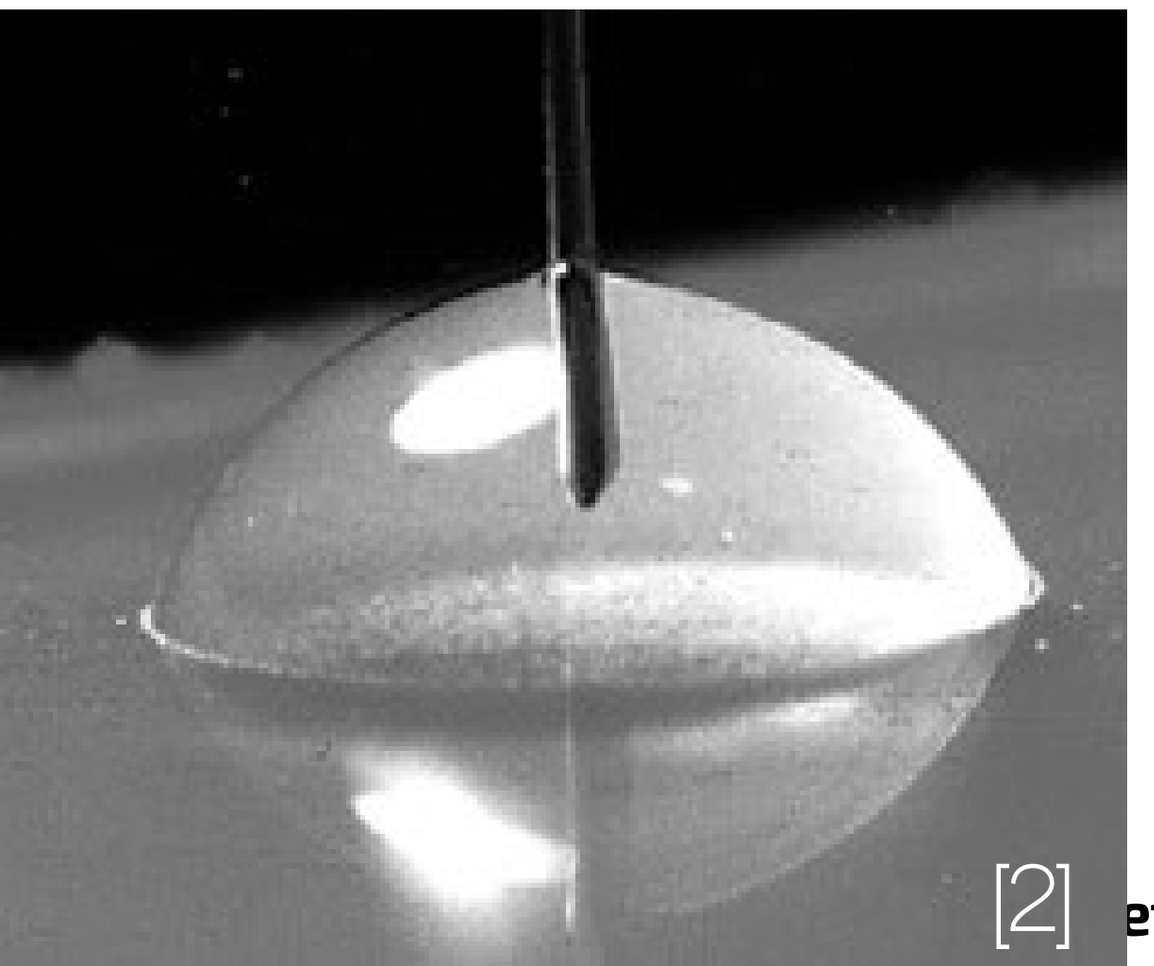
[1] Waterdroplet on a hydrophobic surface


[2]


[1]

[1] Waterdroplet on a hydrophobic surface

[2] Apply voltage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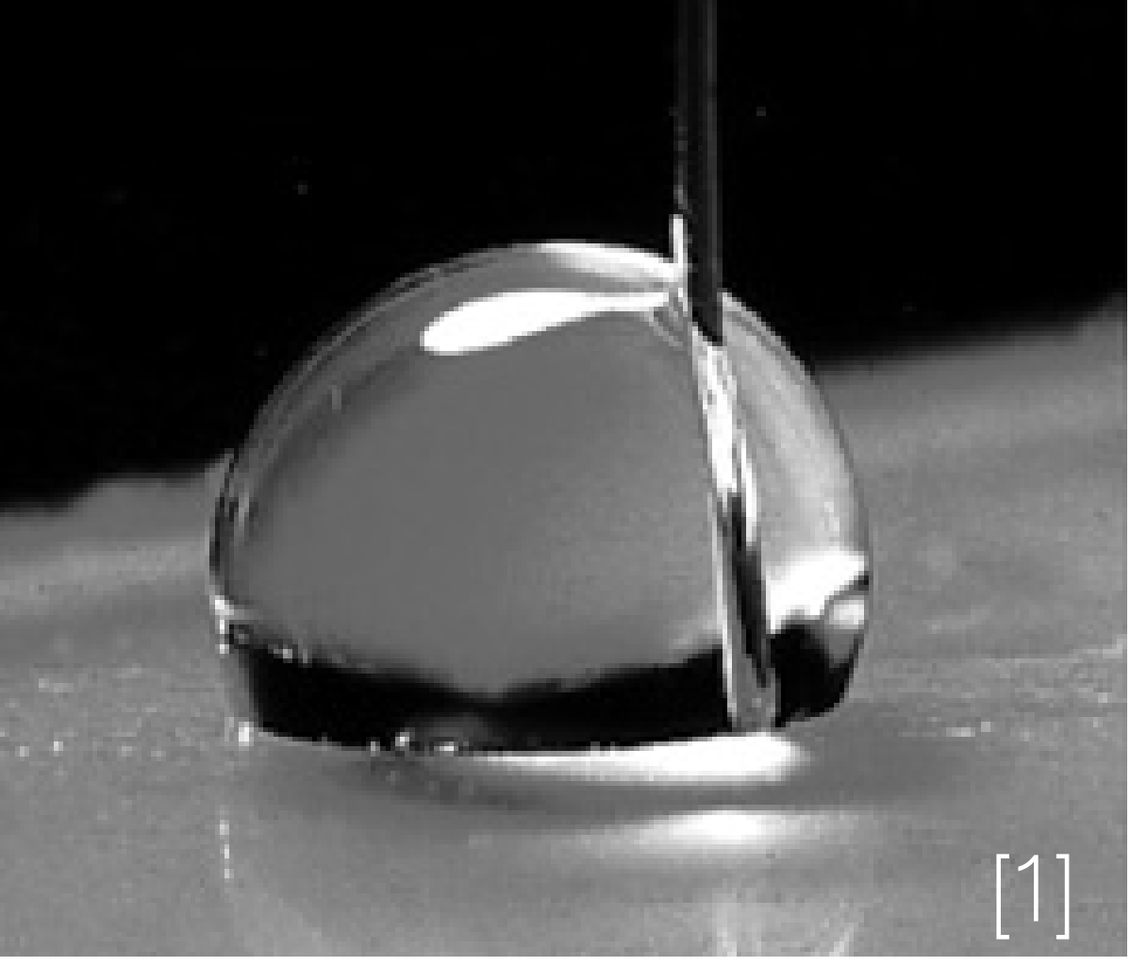
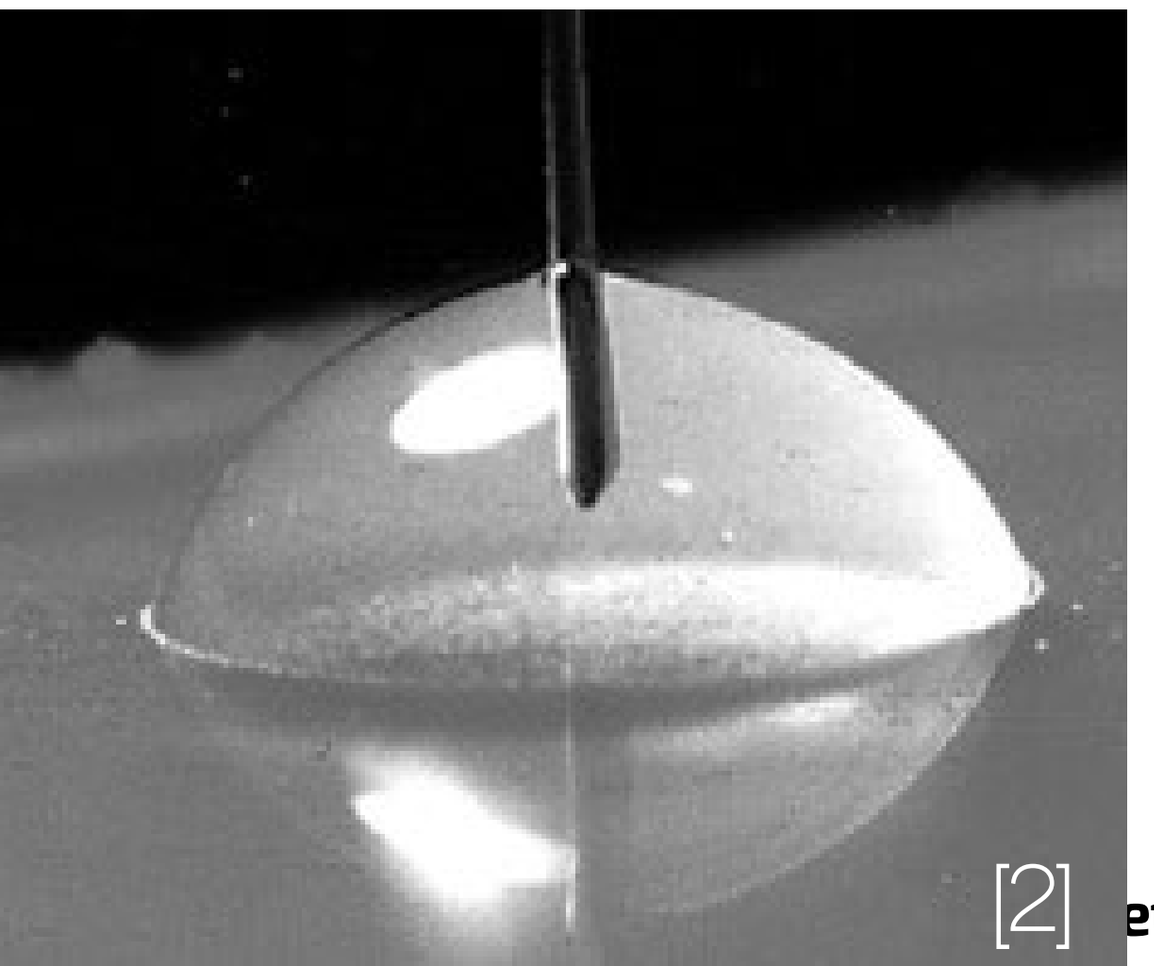
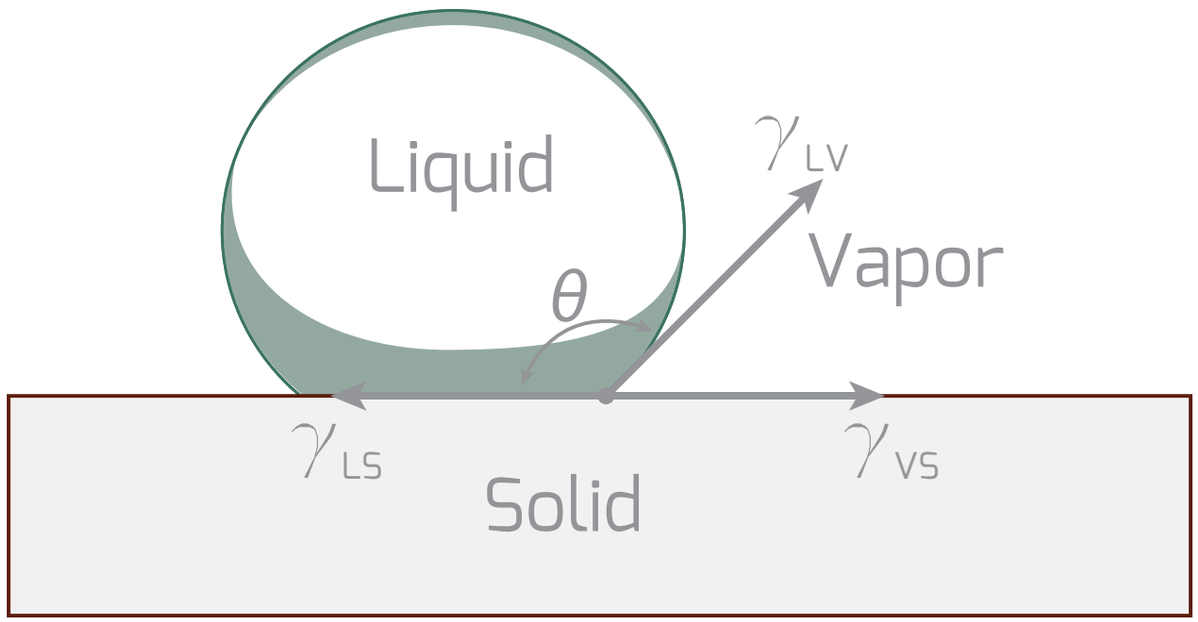


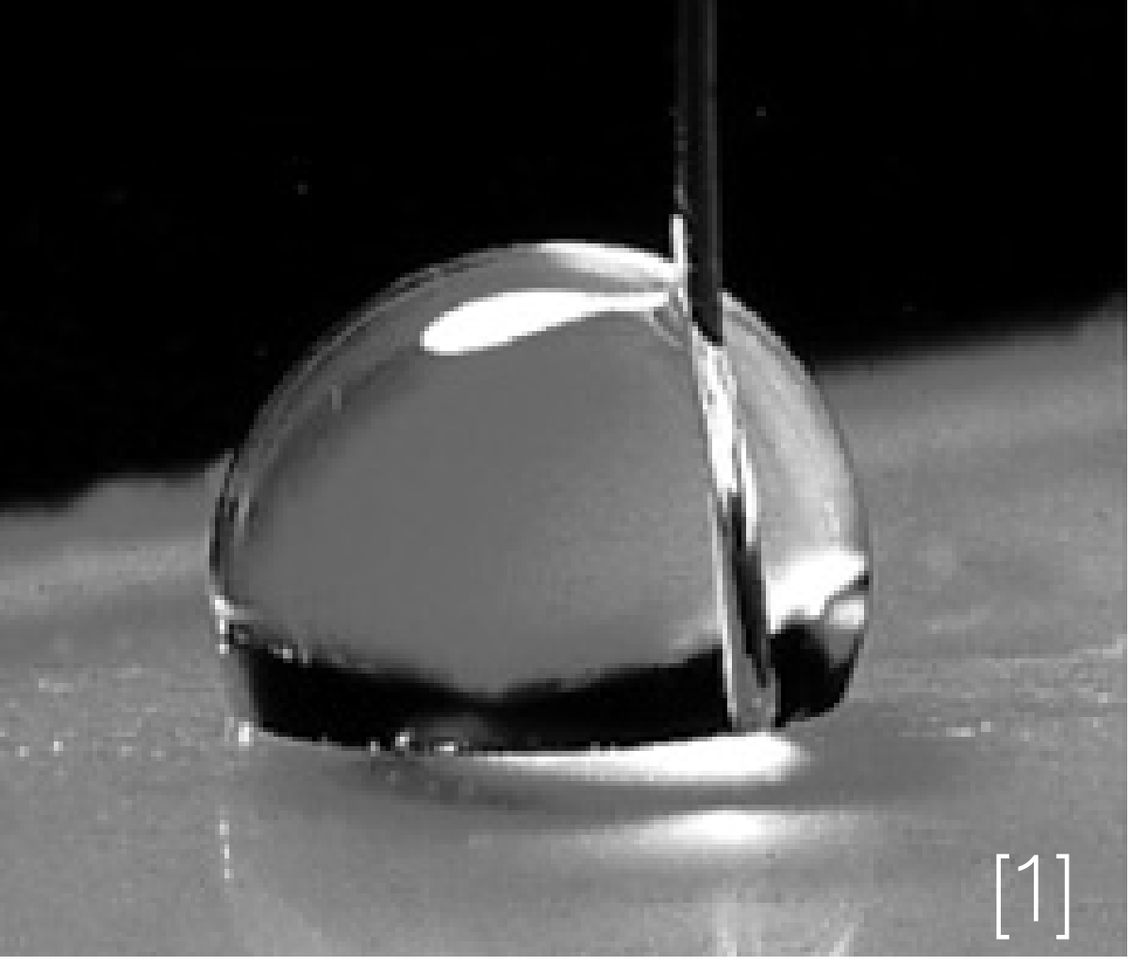
[1] Waterdroplet on a hydrophobic surface

[2] Apply voltage

[3] The interface (between droplet and surface) becomes charged





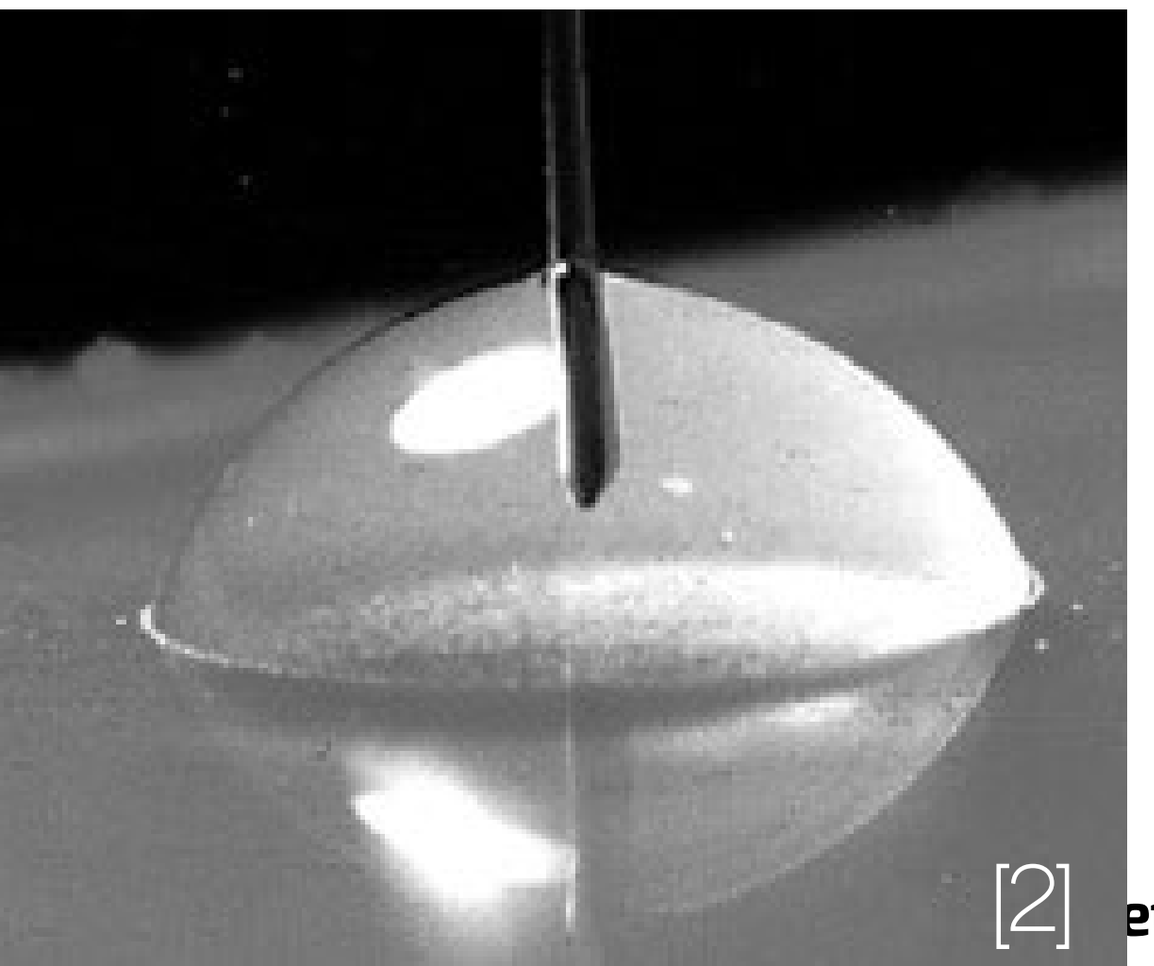


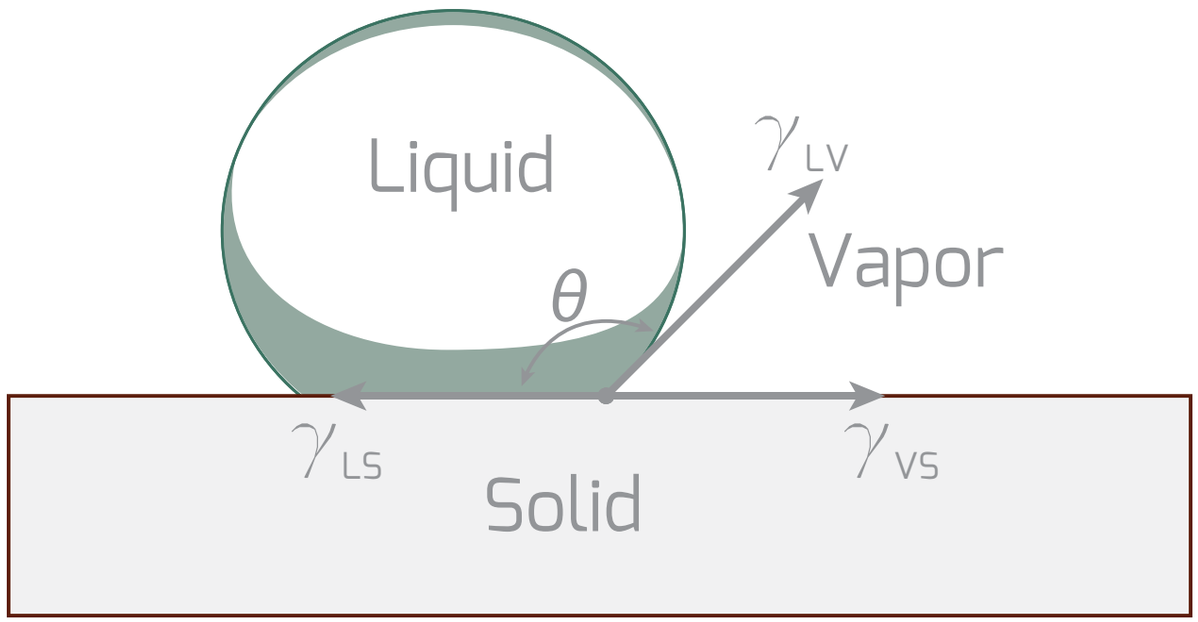
[1] Waterdroplet on a hydrophobic surface

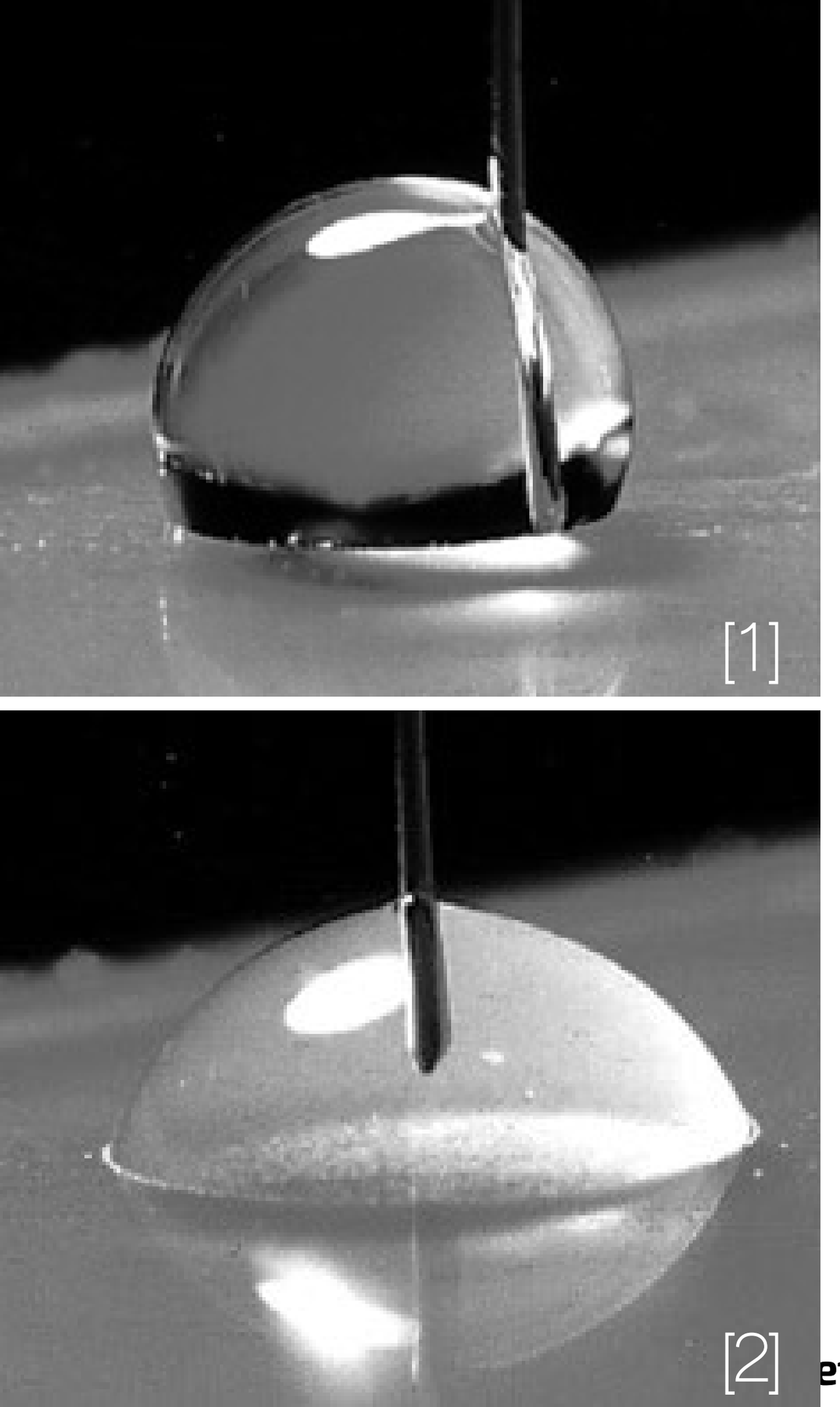
[2] Apply voltage

[3] The interface (between droplet and surface) becomes charged

[4] The droplet spreads







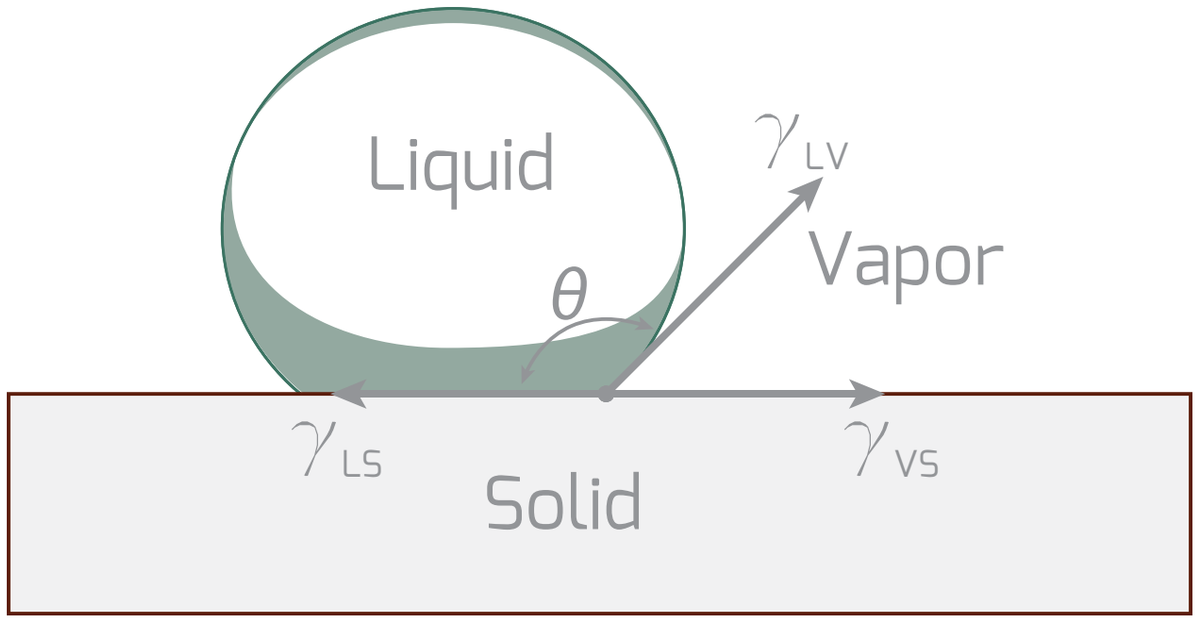
[1] Waterdroplet on a hydrophobic surface

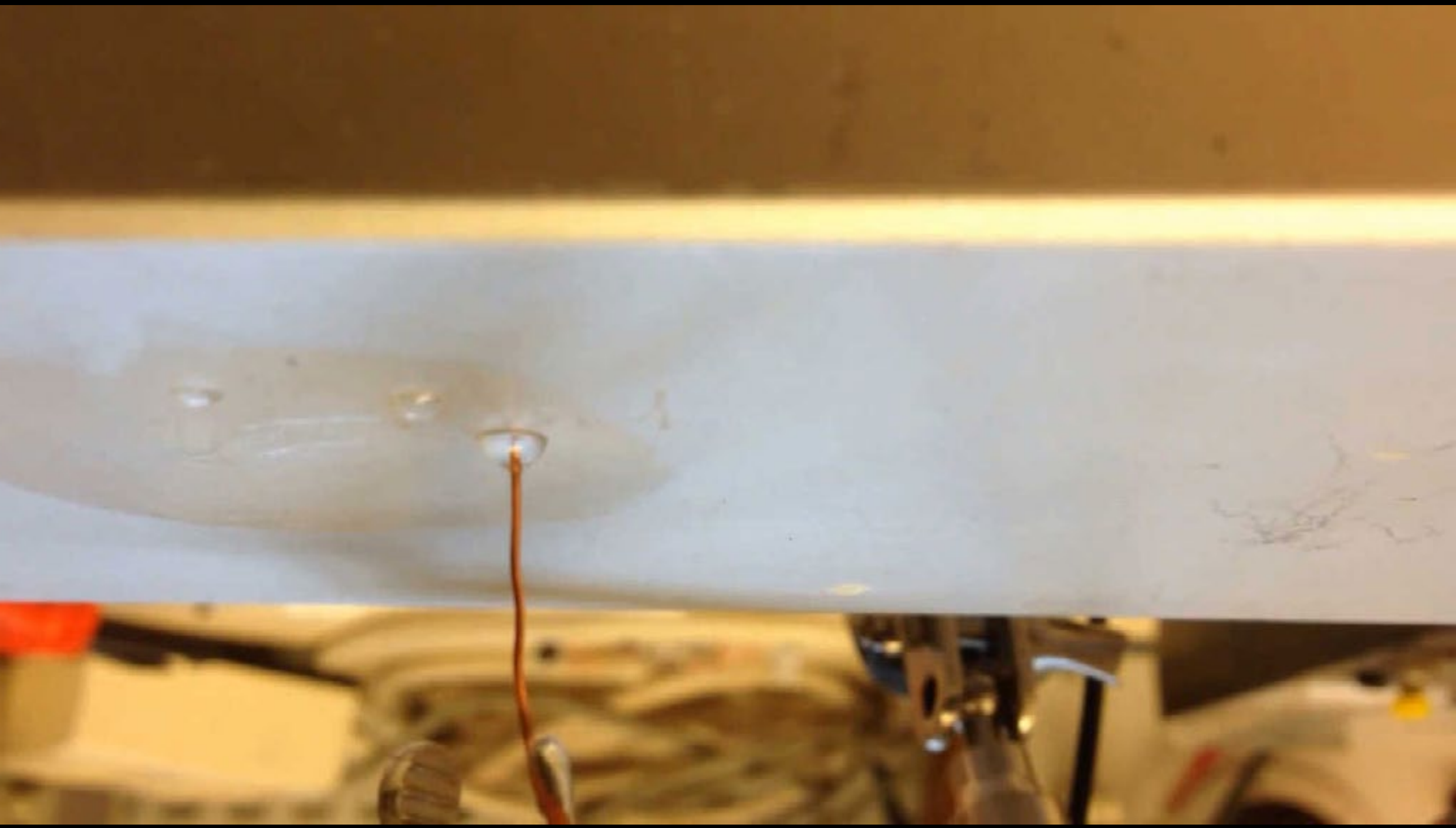
[2] Apply voltage

[3] The interface (between droplet and surface) becomes charged

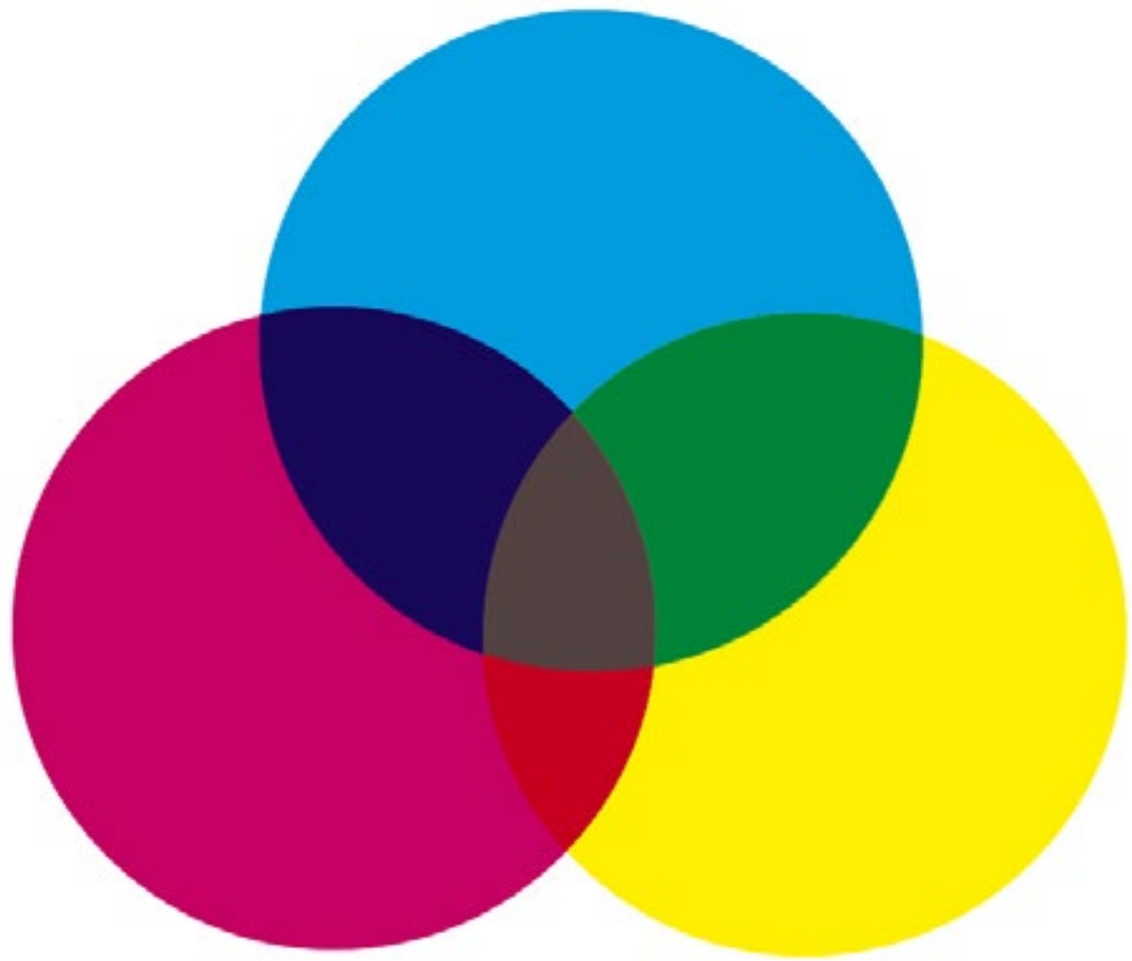
[4] The droplet spreads

[5] Remove voltage, surface tensions return to state 1



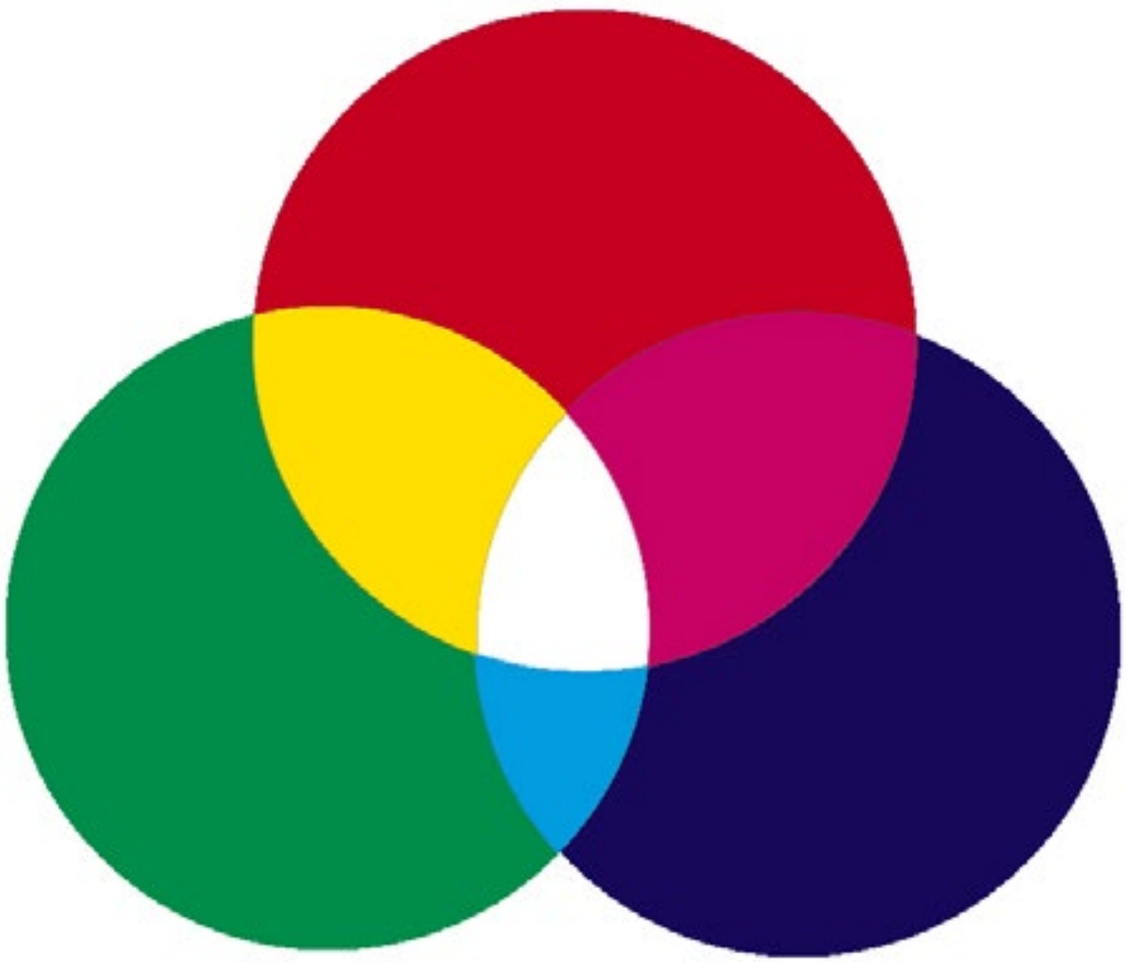


Colour gamut

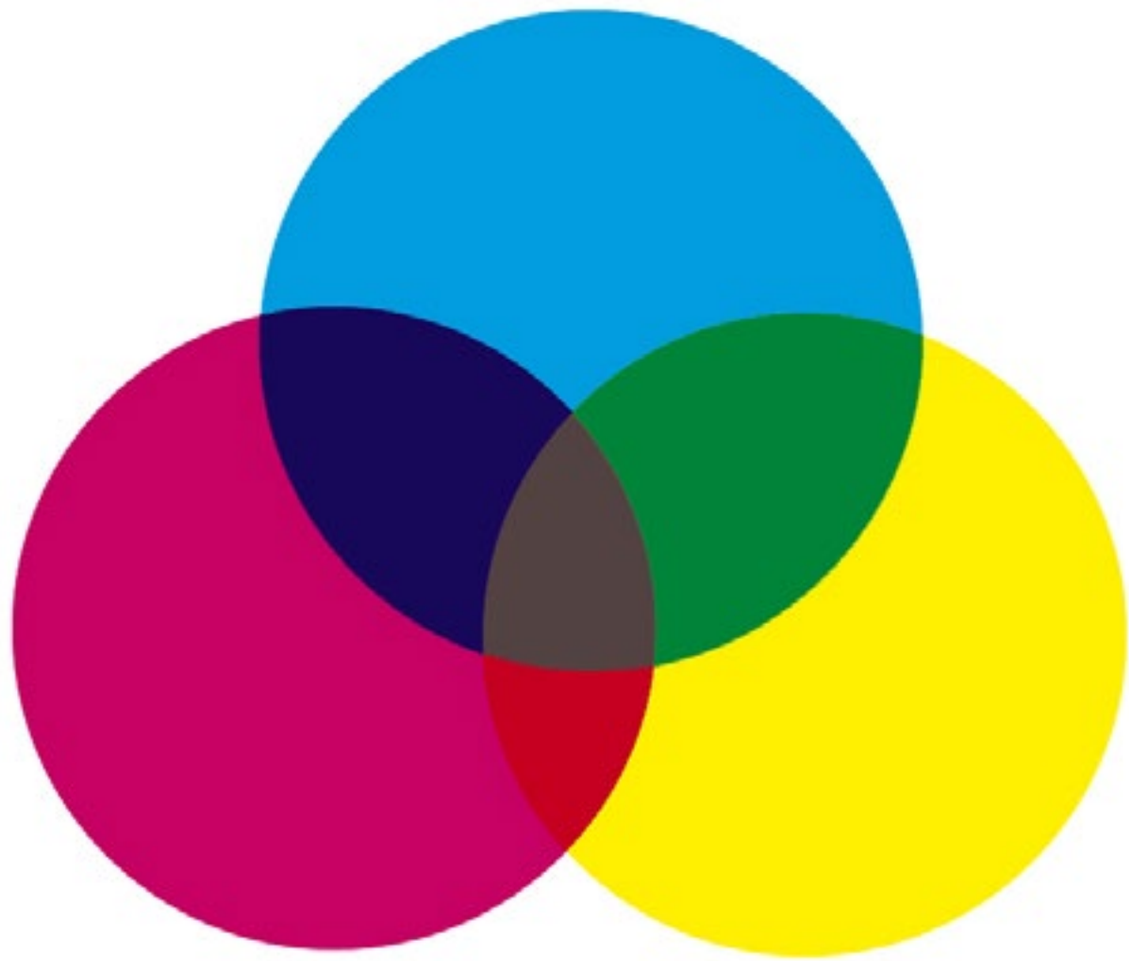


CMY

Colour gamut

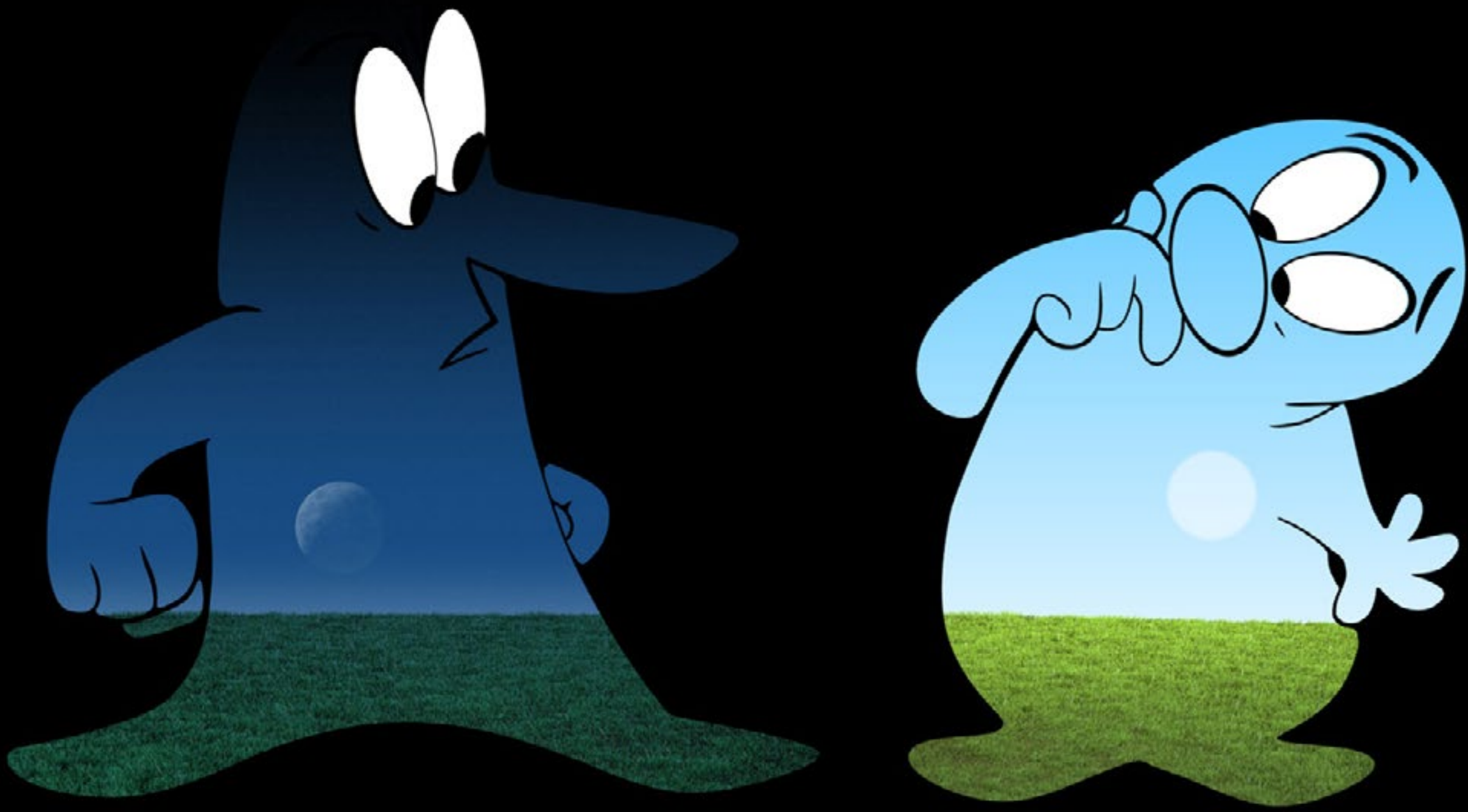


RGB

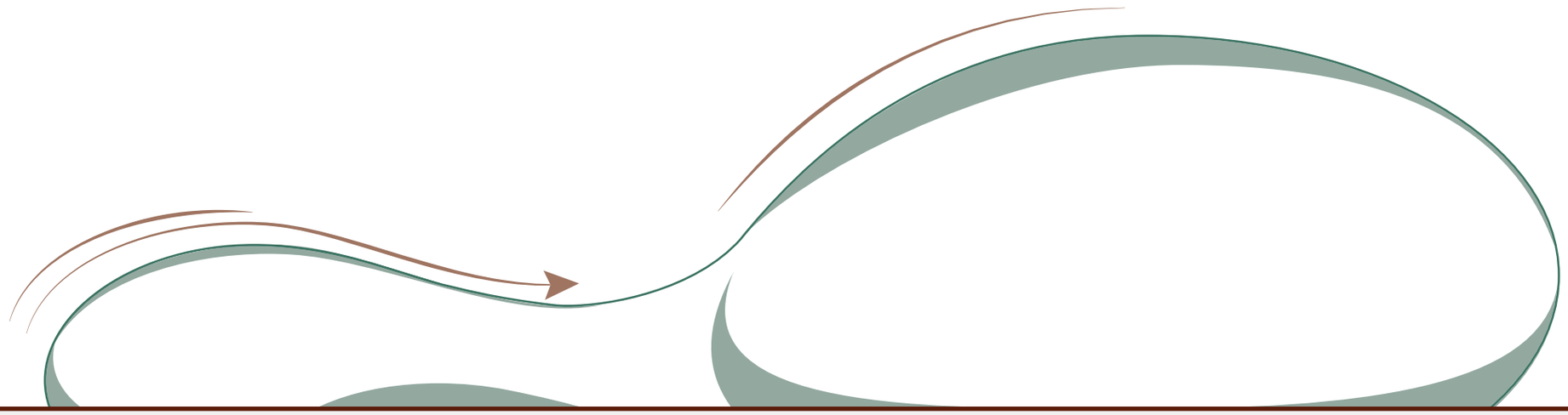


CMY

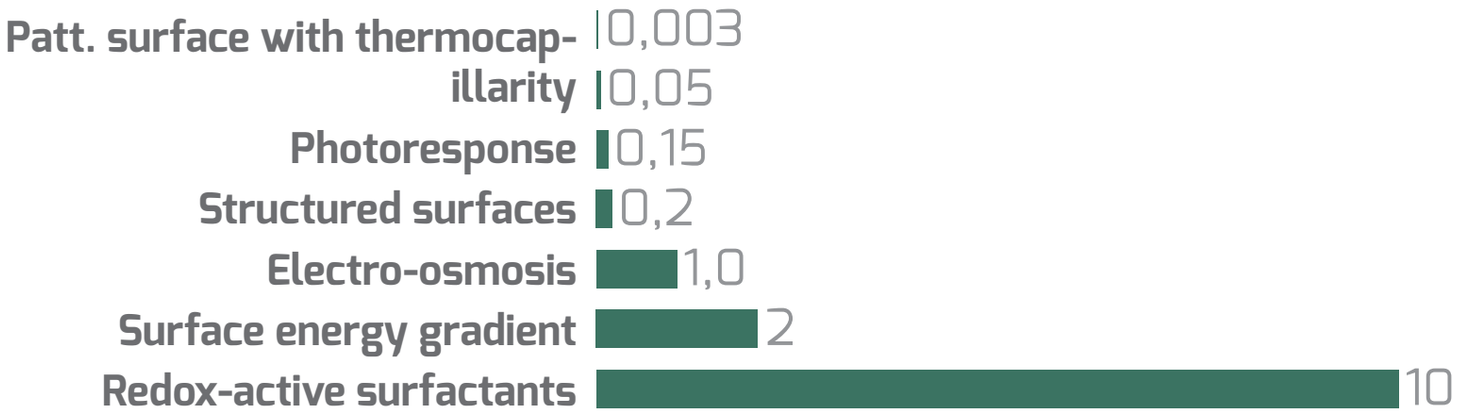
Colour gamut



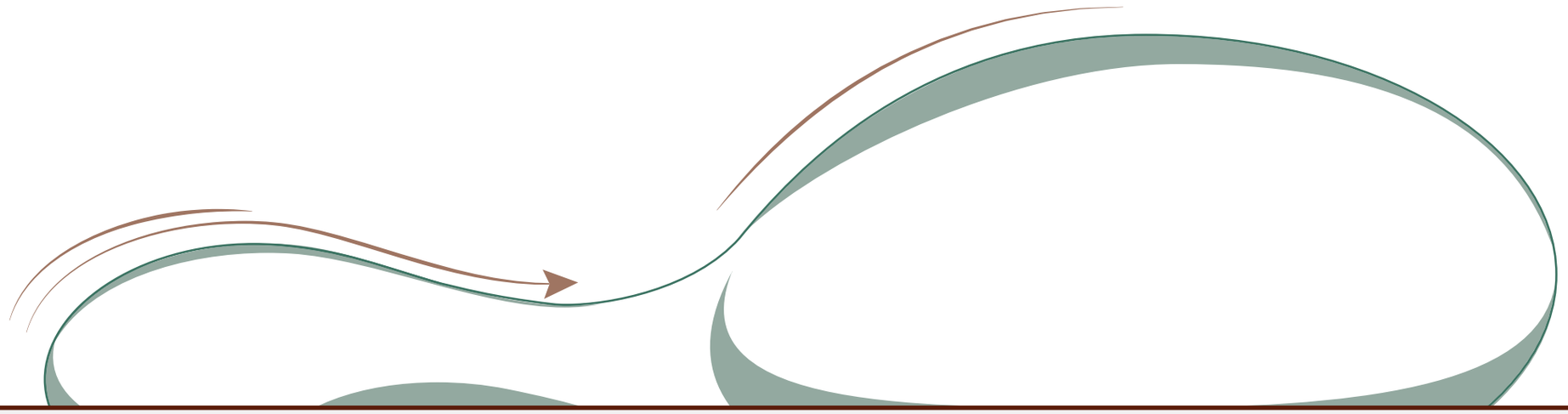
Velocity



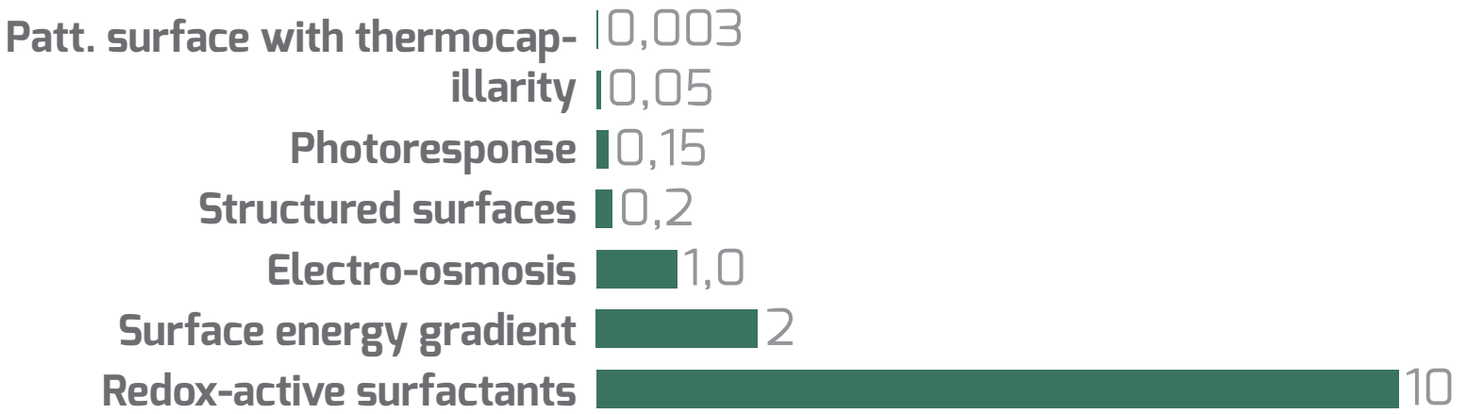
Velocity



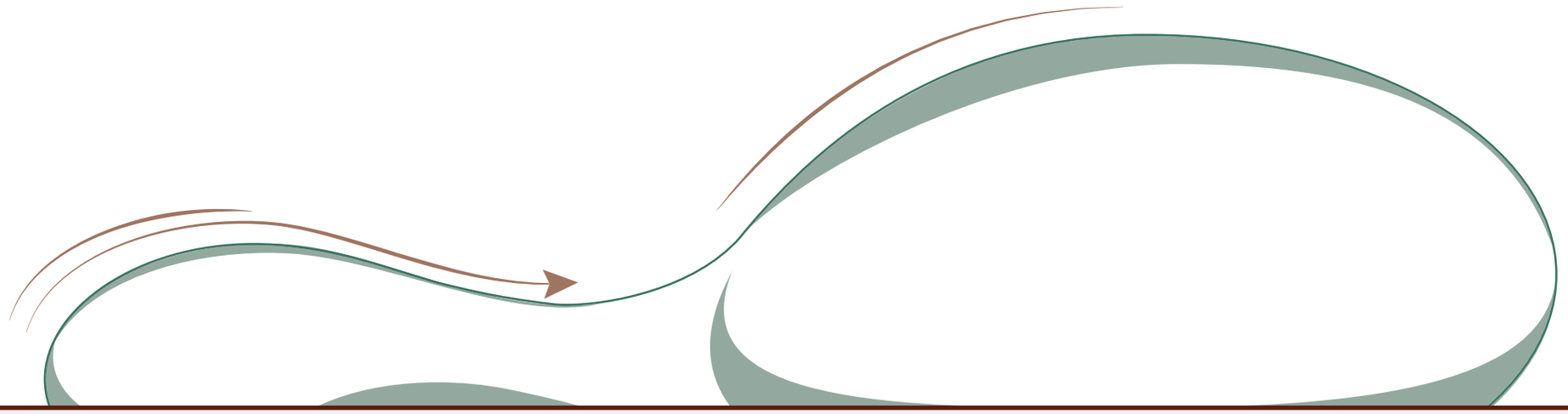
Velocities of technologies for manipulation of liquids in mm/s



Velocity

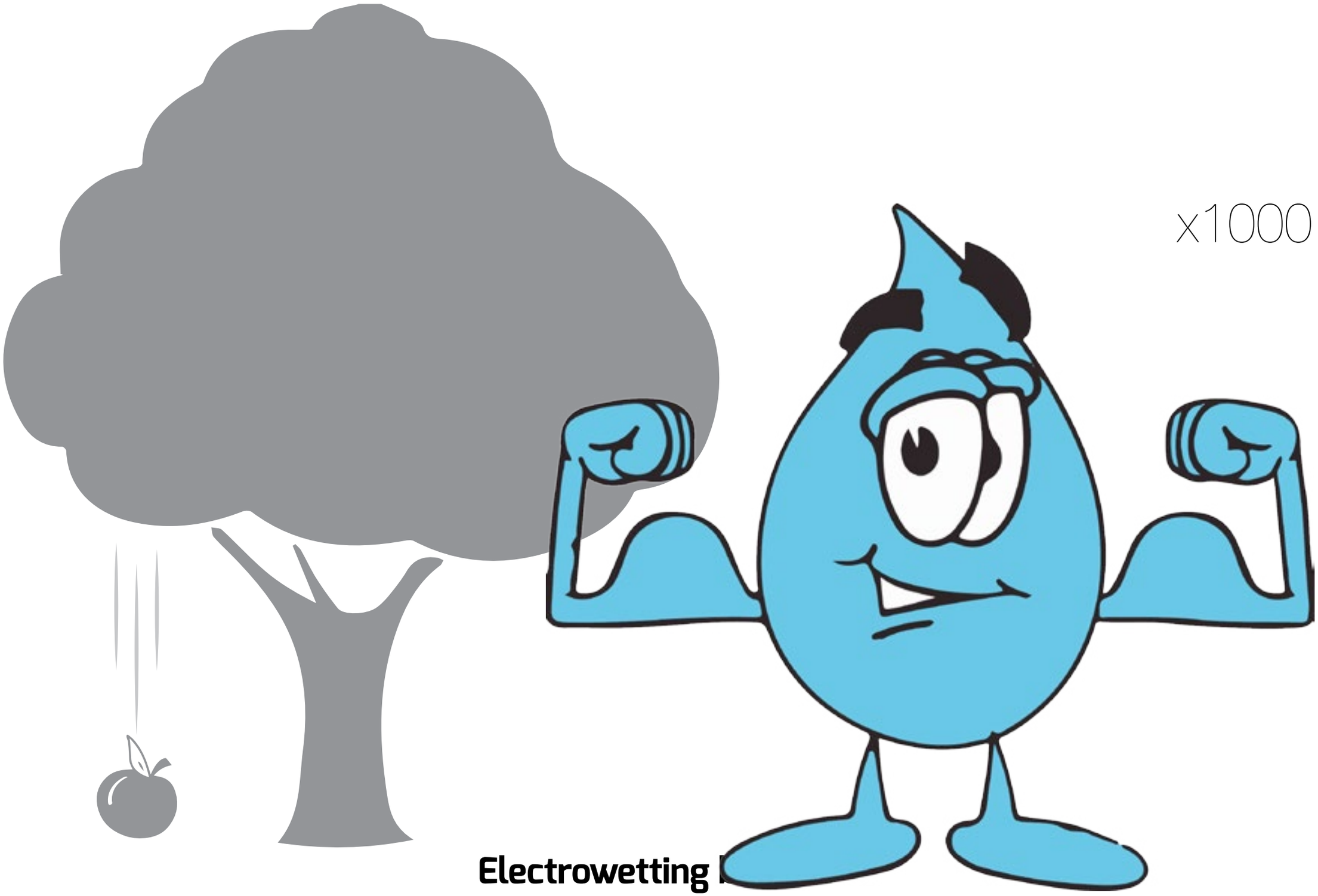


Velocities of technologies for manipulation of liquids in mm/s

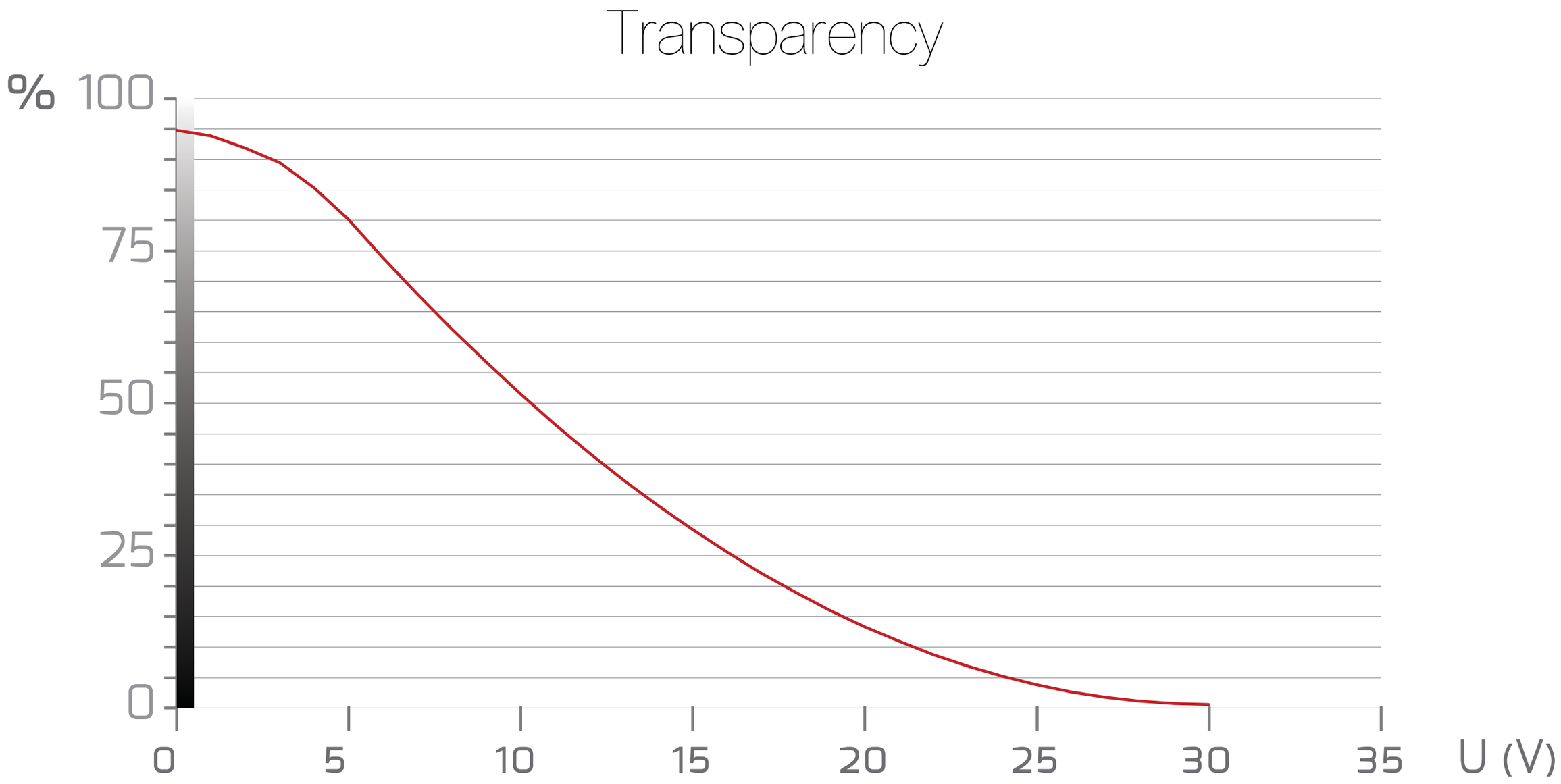


Gravity

Gravity



x1000


Transparency
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50
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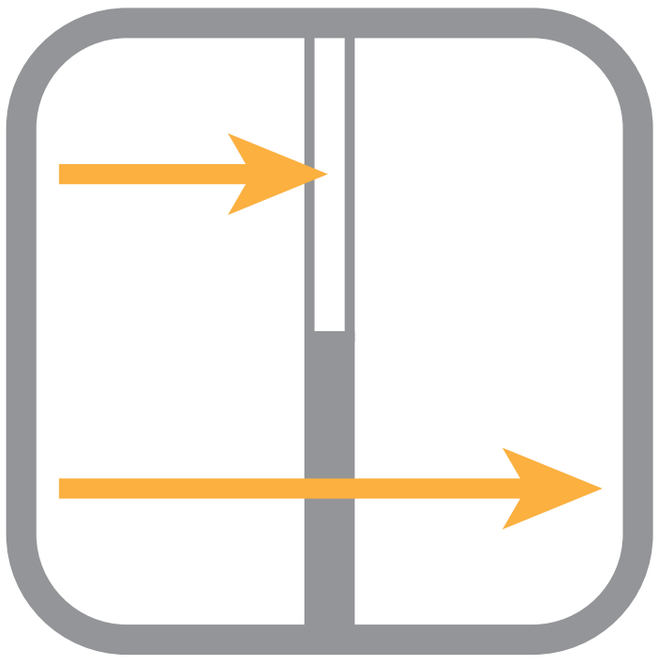
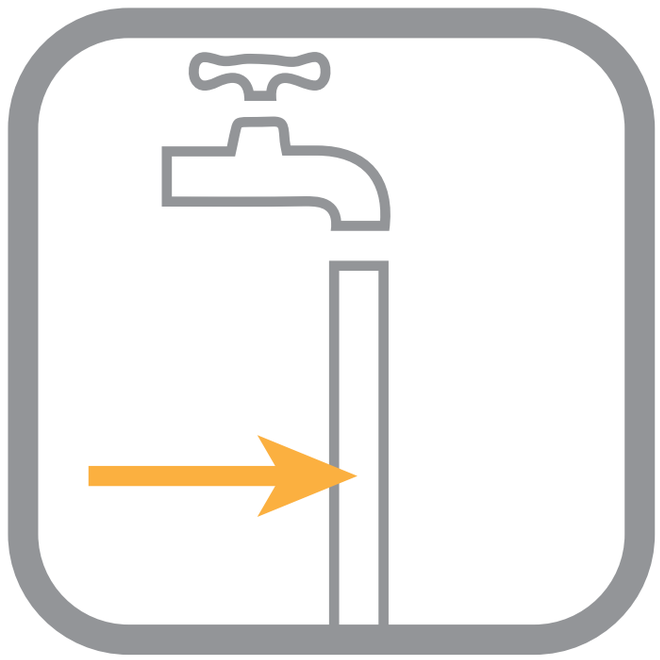
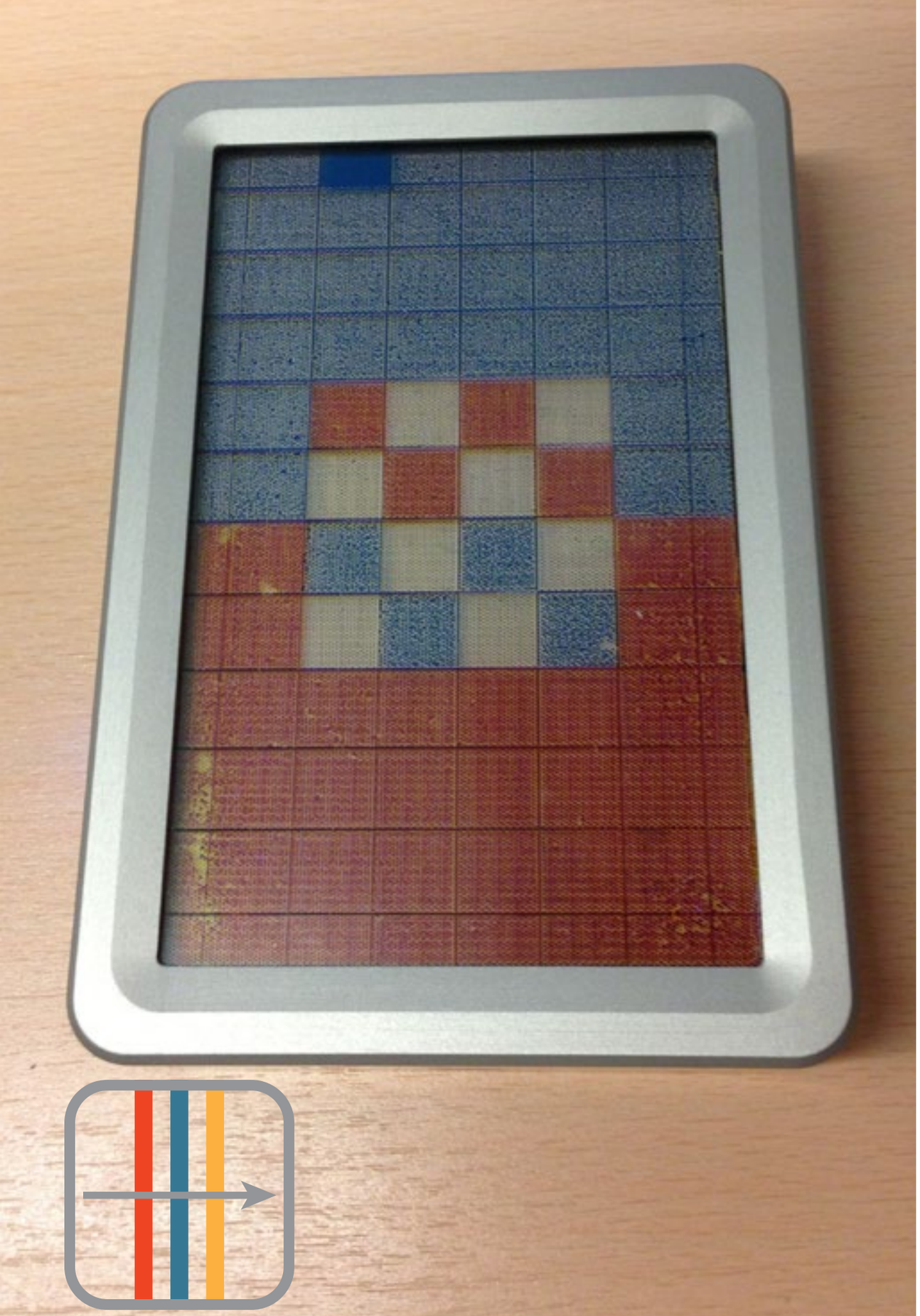
10
15
20
25
30
35
U (V)

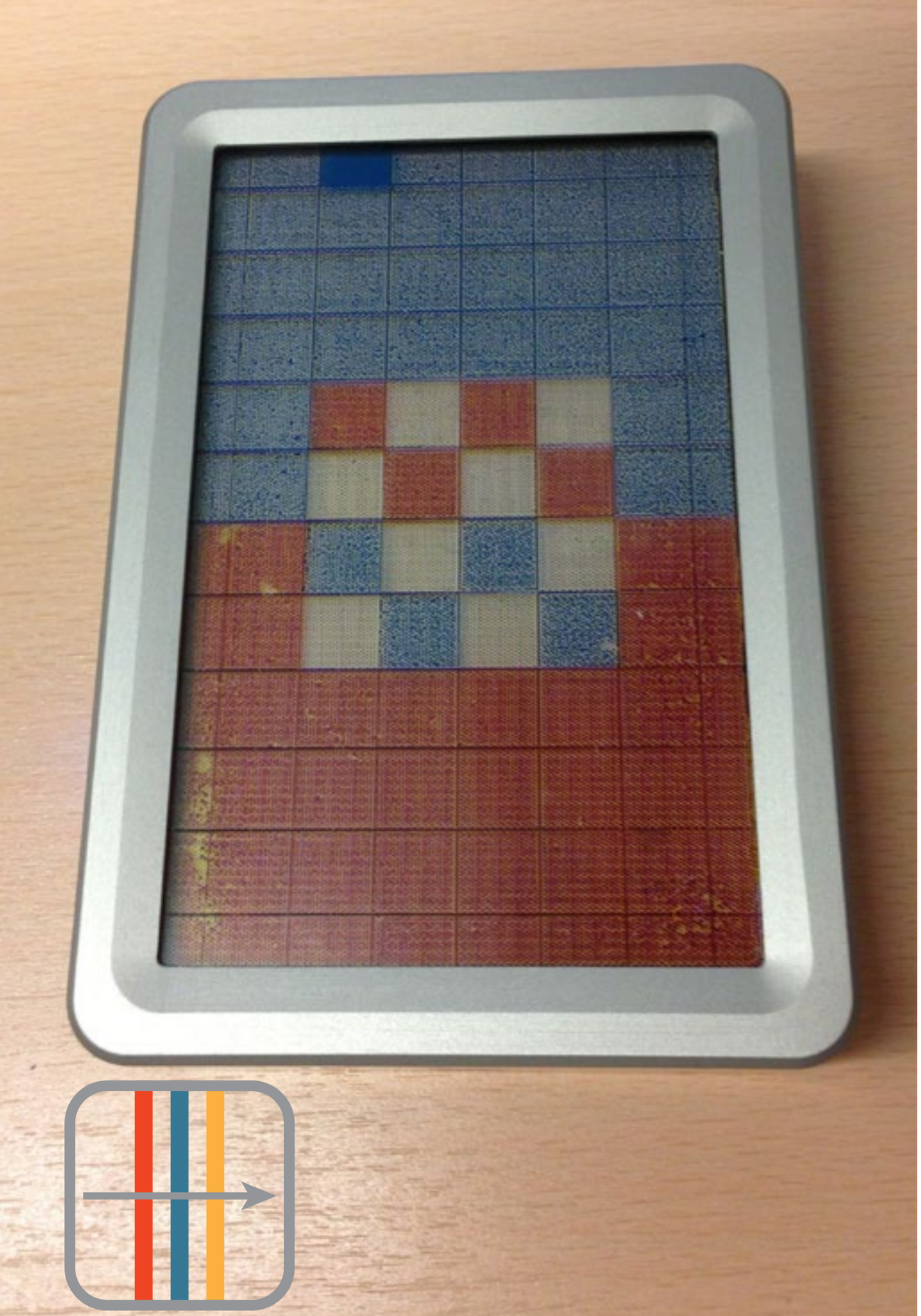
Mechanisms

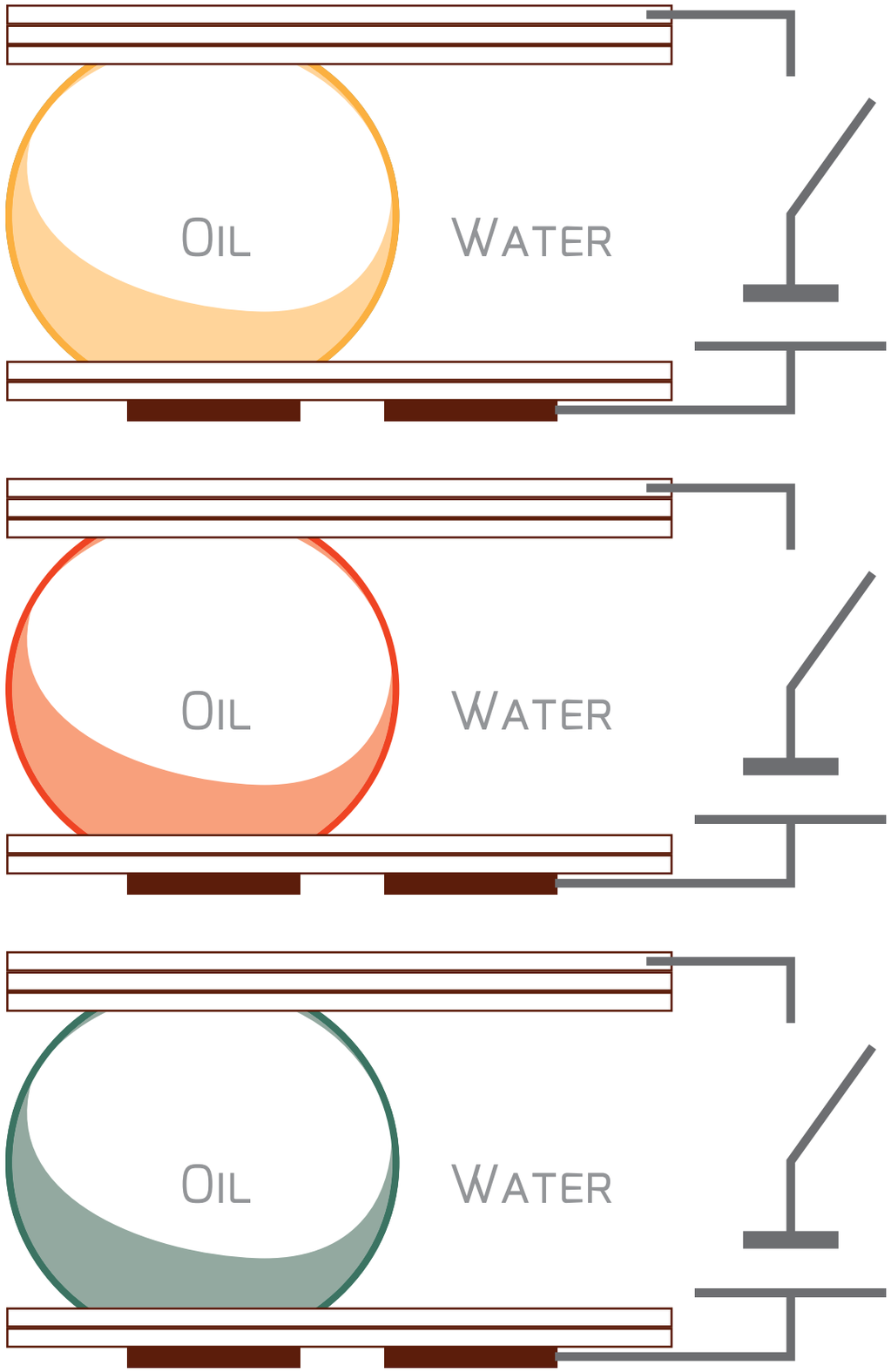




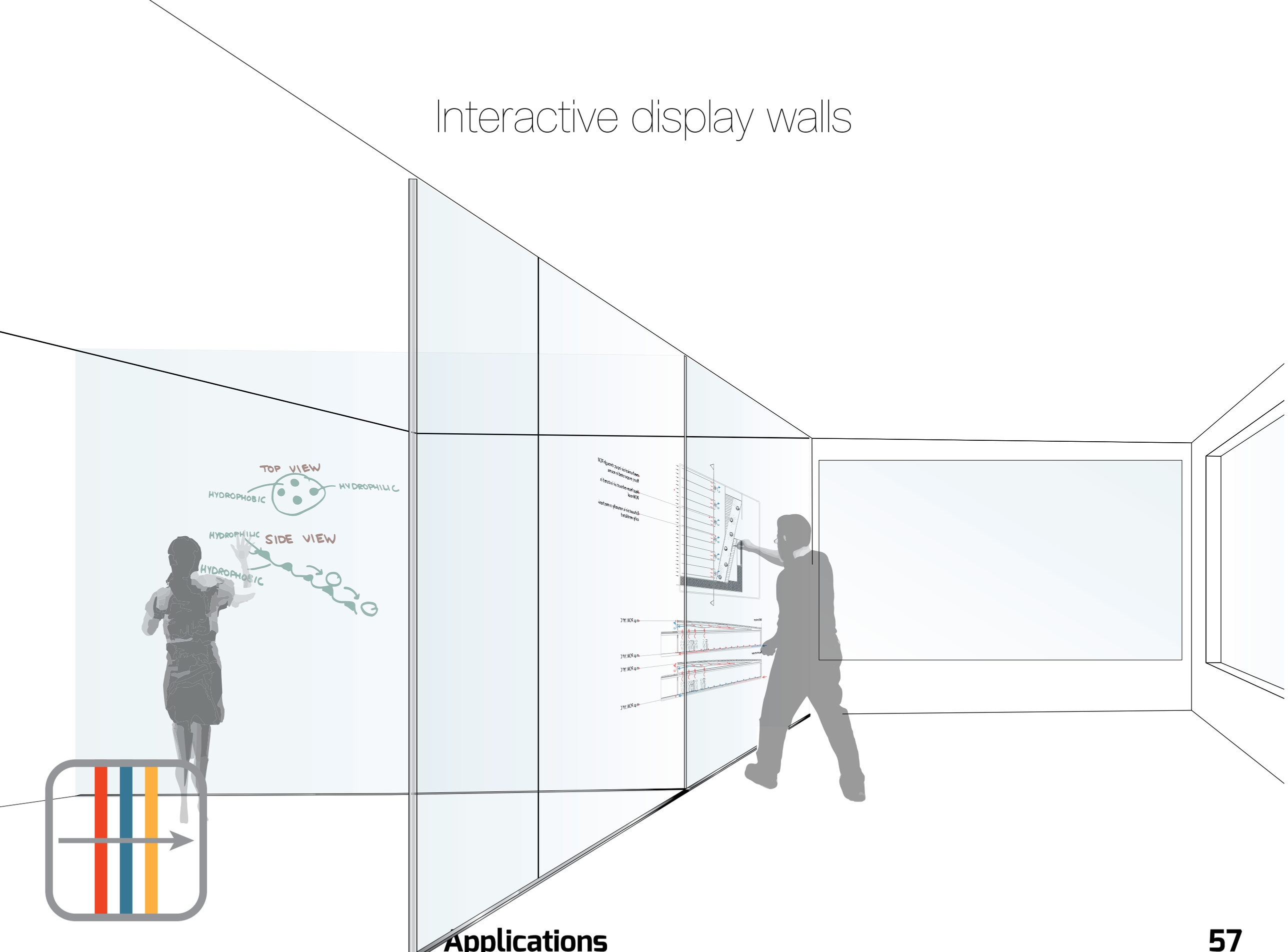
Triple layer method

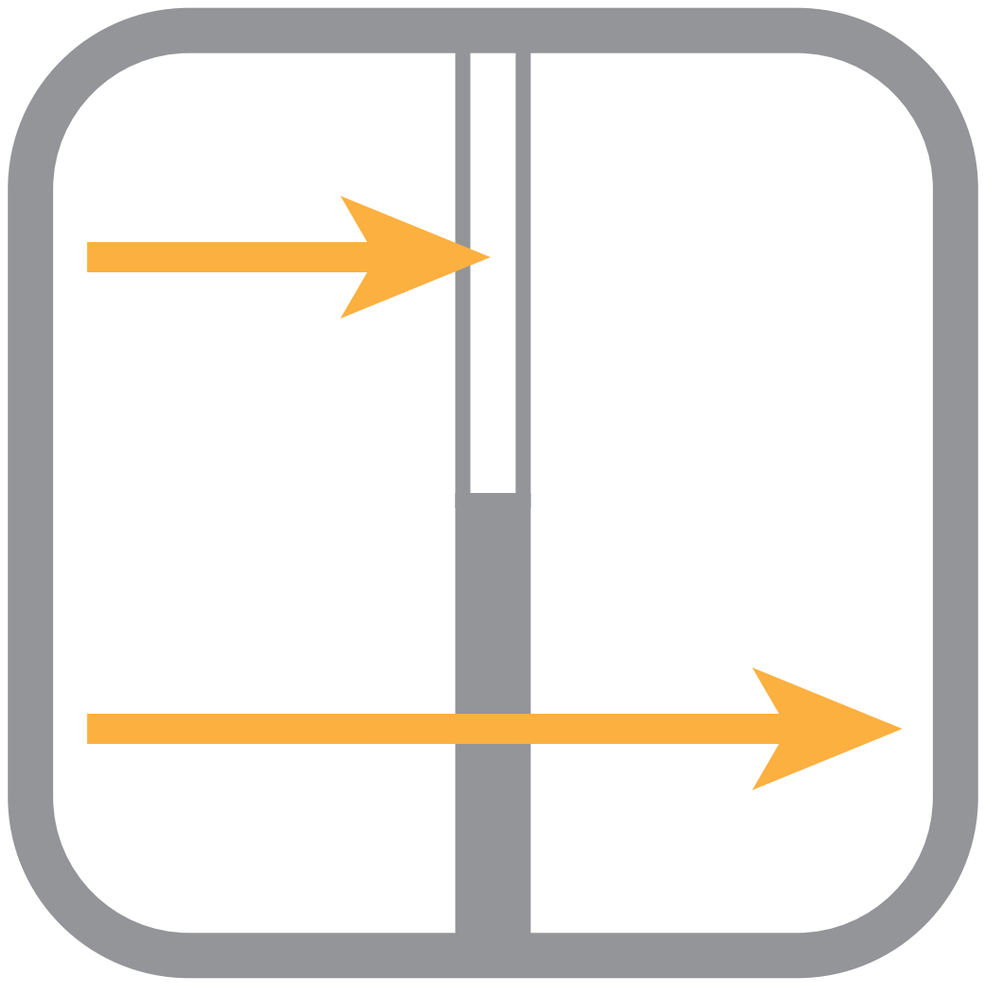




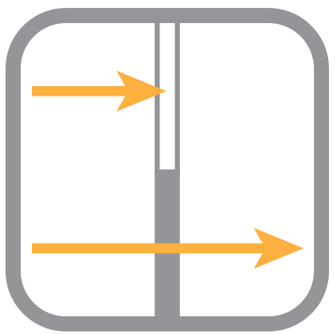

Oil
Water
Oil
Water
Oil
Water

Interactive display walls

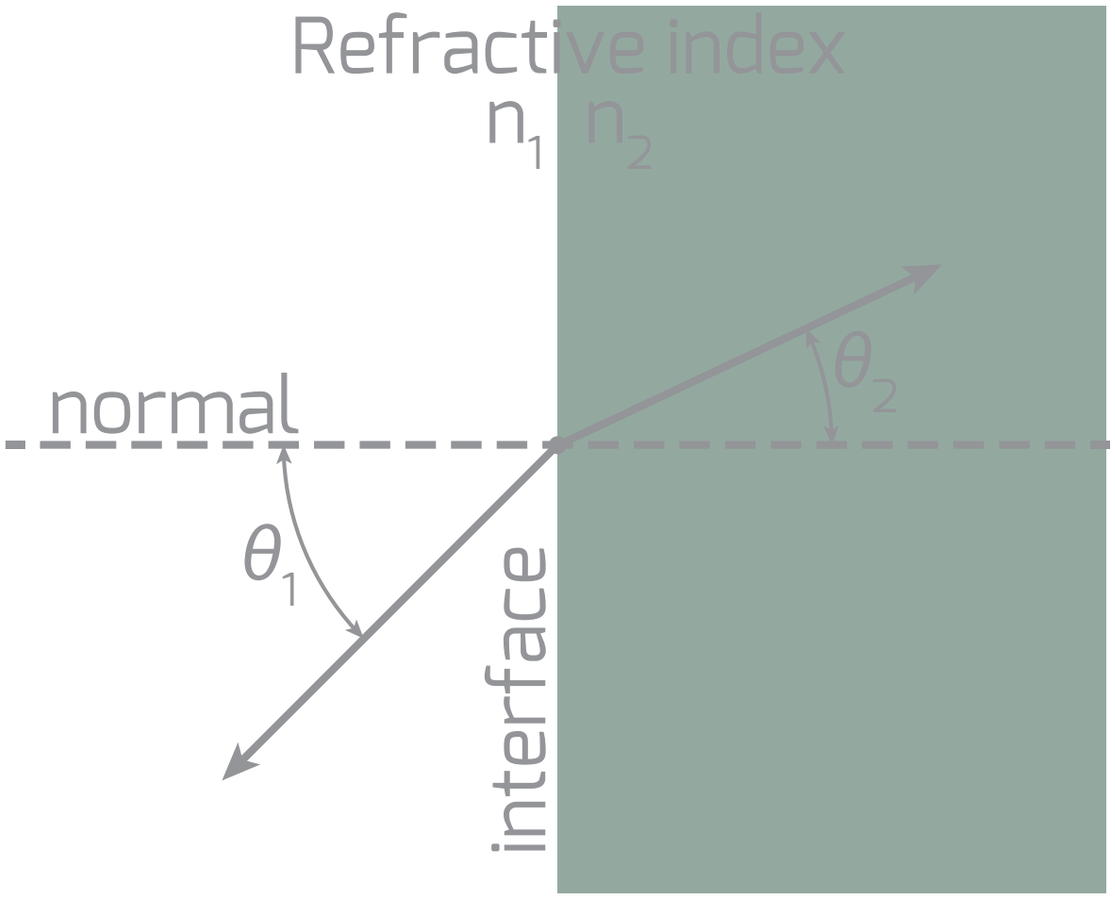


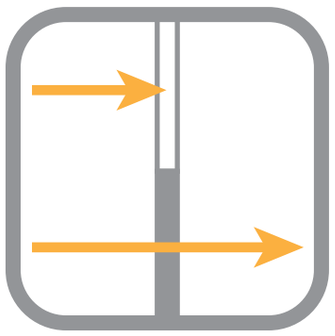


Single layer method



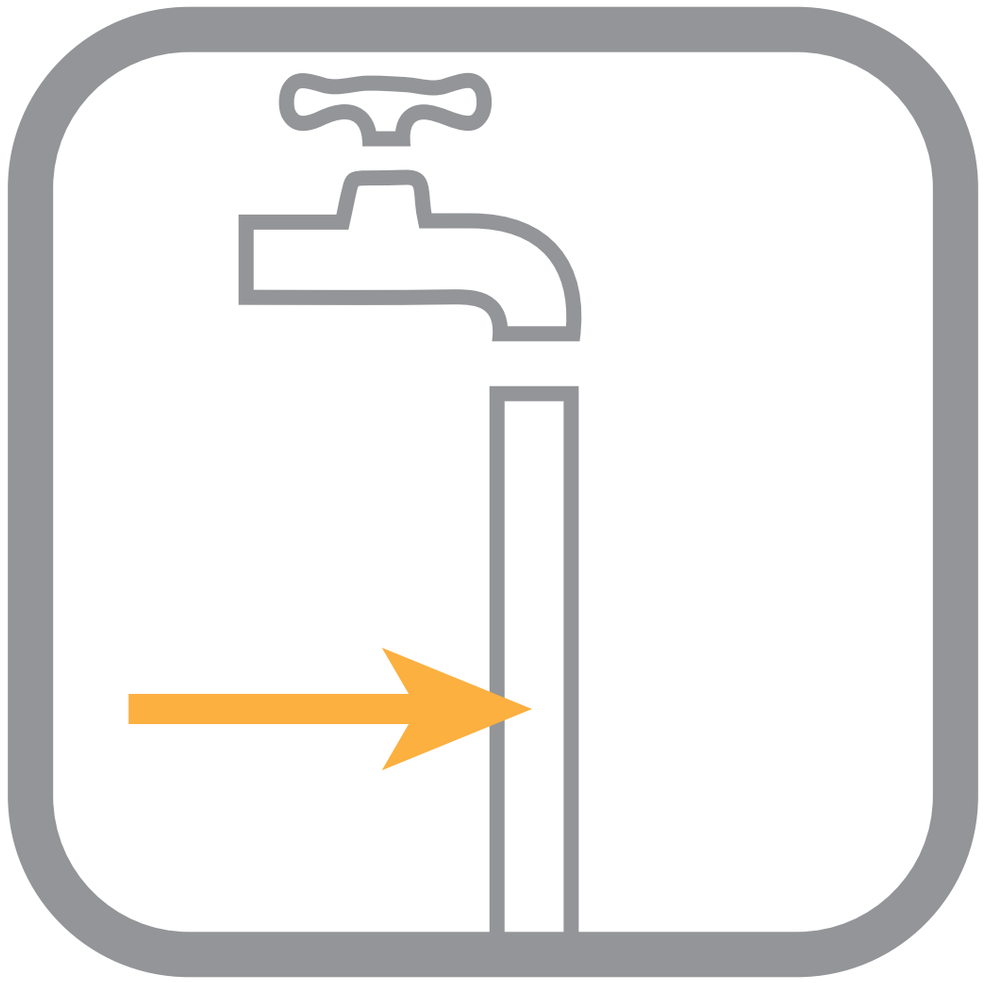
Applications



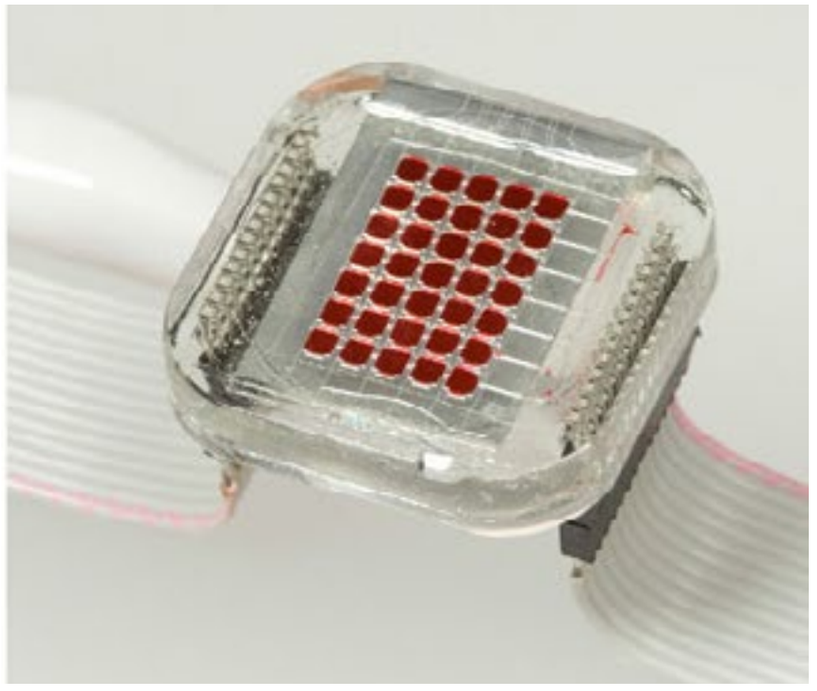


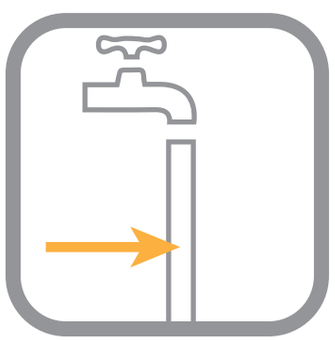
Applications

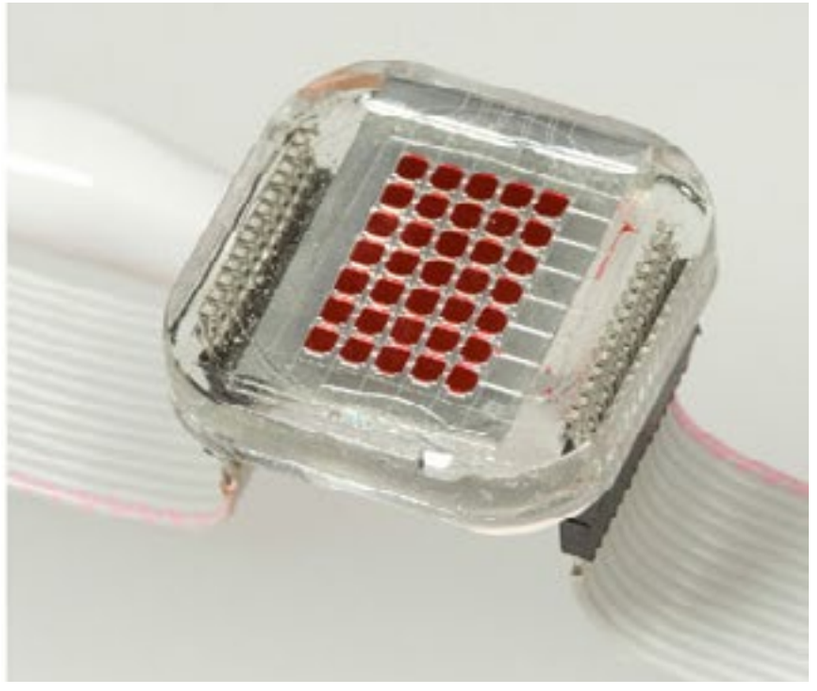
Personal shading

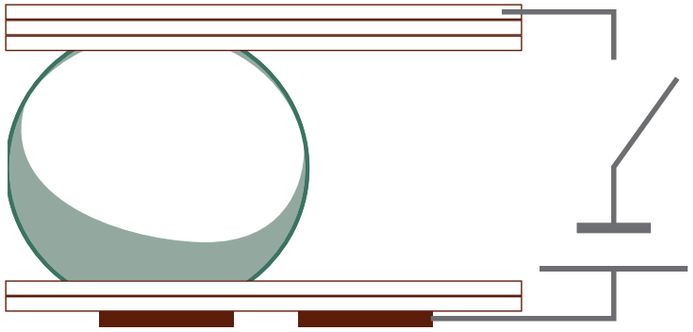


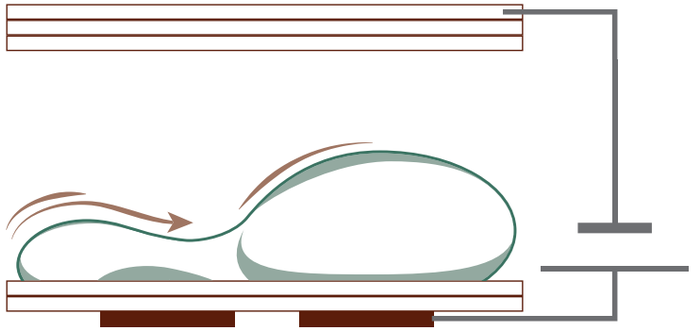
Bistable method

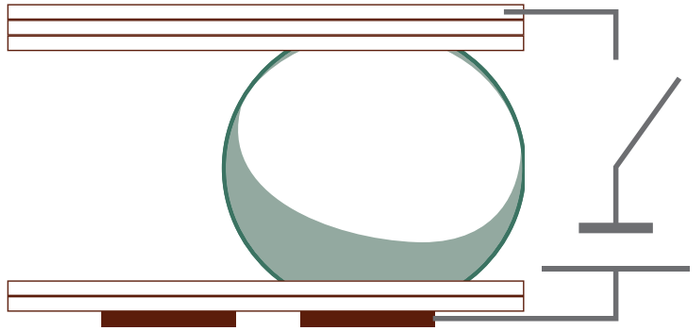






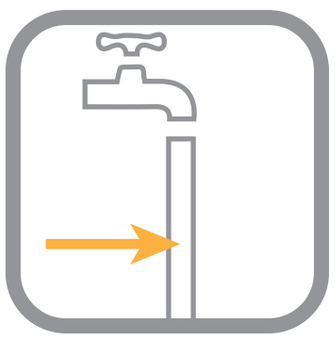


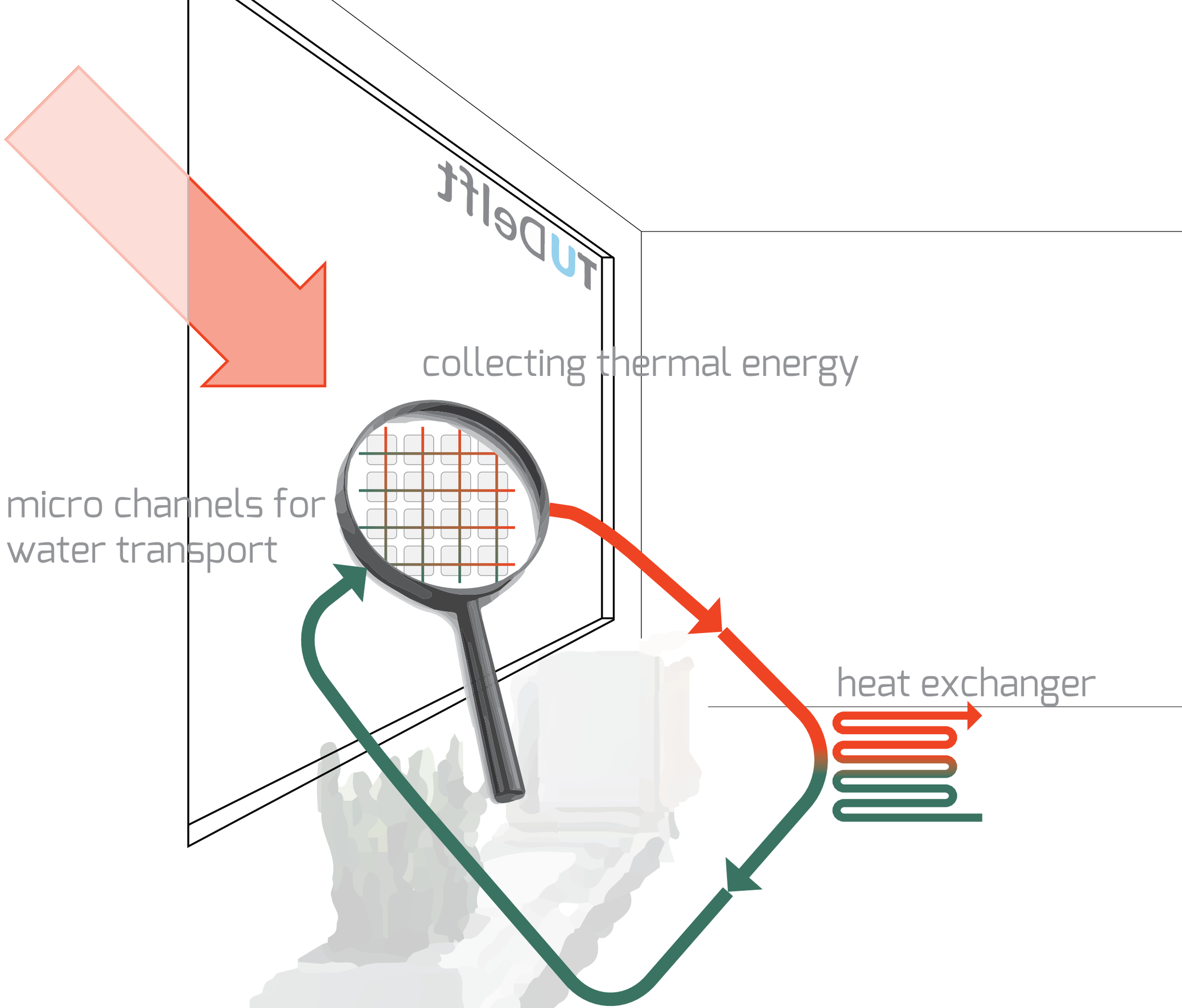




BISTABLE

BISTABLE




collecting thermal energy
micro channels for
water transport
heat exchanger

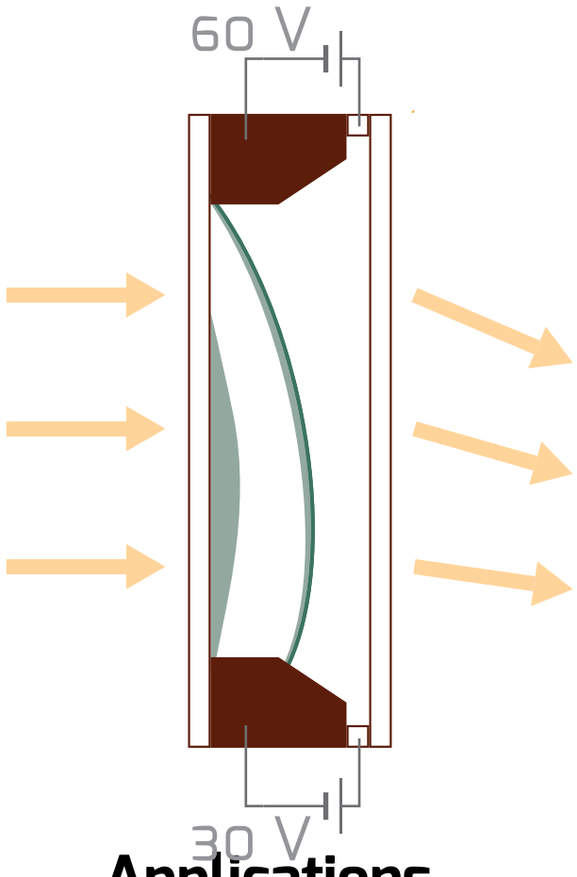
Prisms & lens

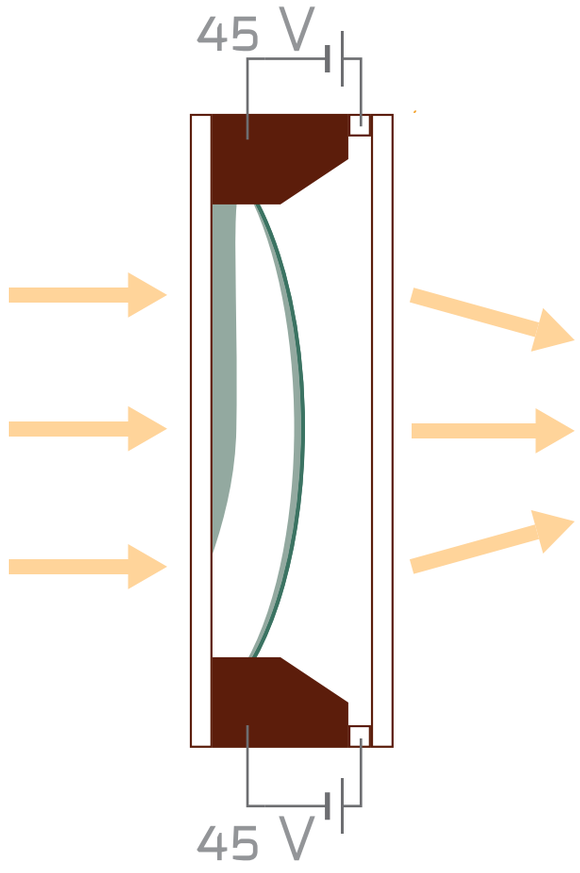
BIOMETRICS

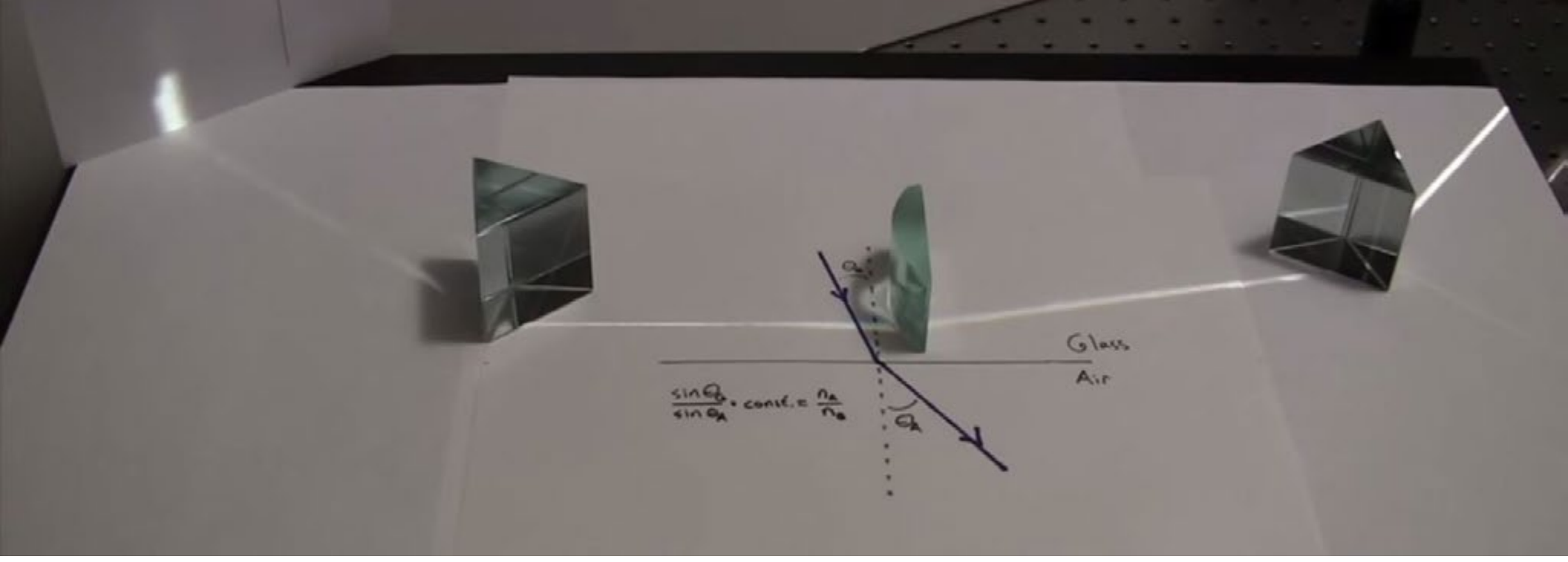
High resolution focus

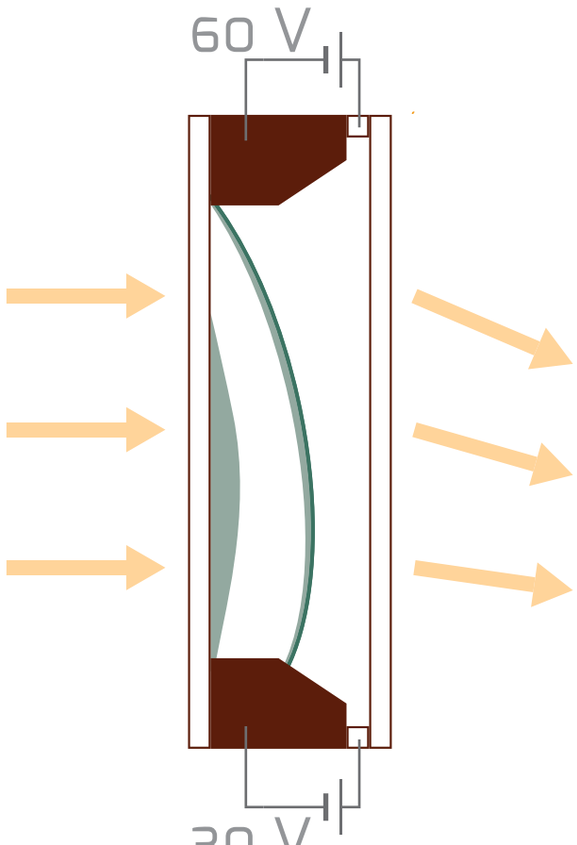
BIOMETRICS

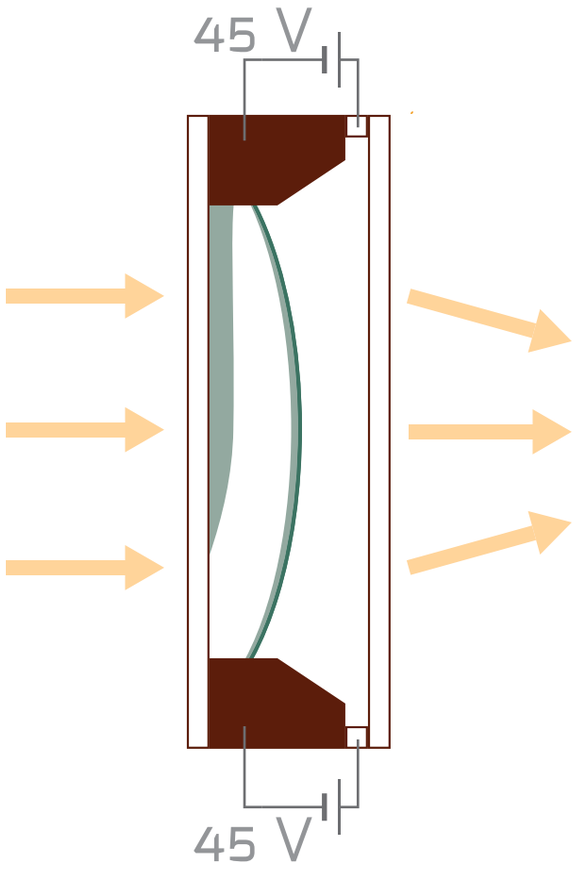
High resolution focus





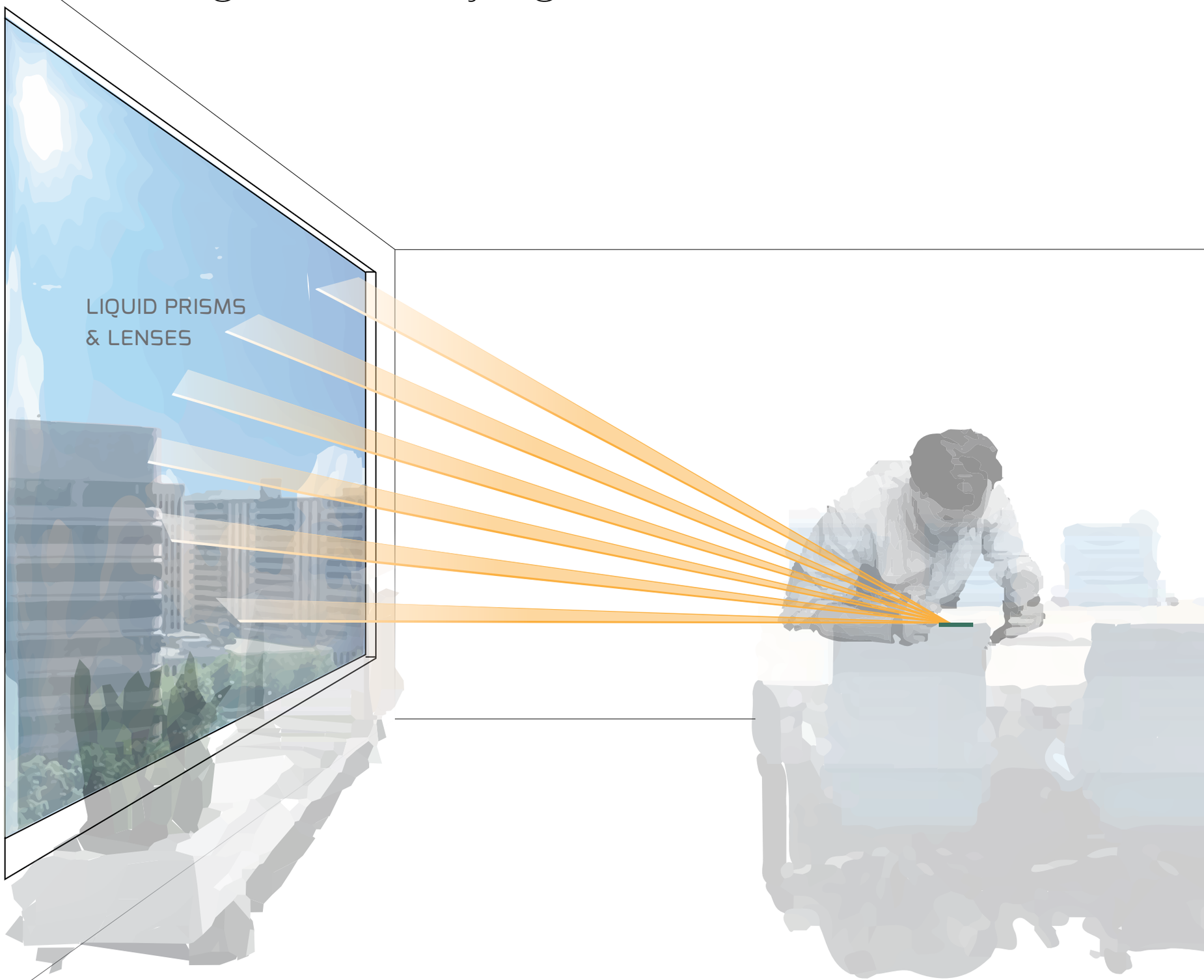




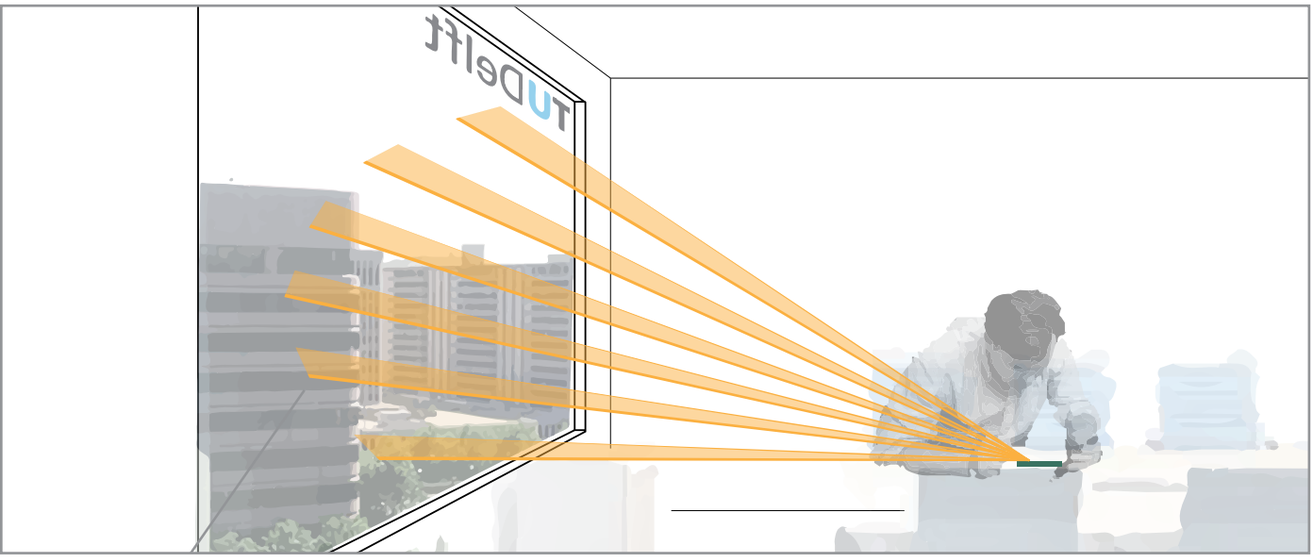


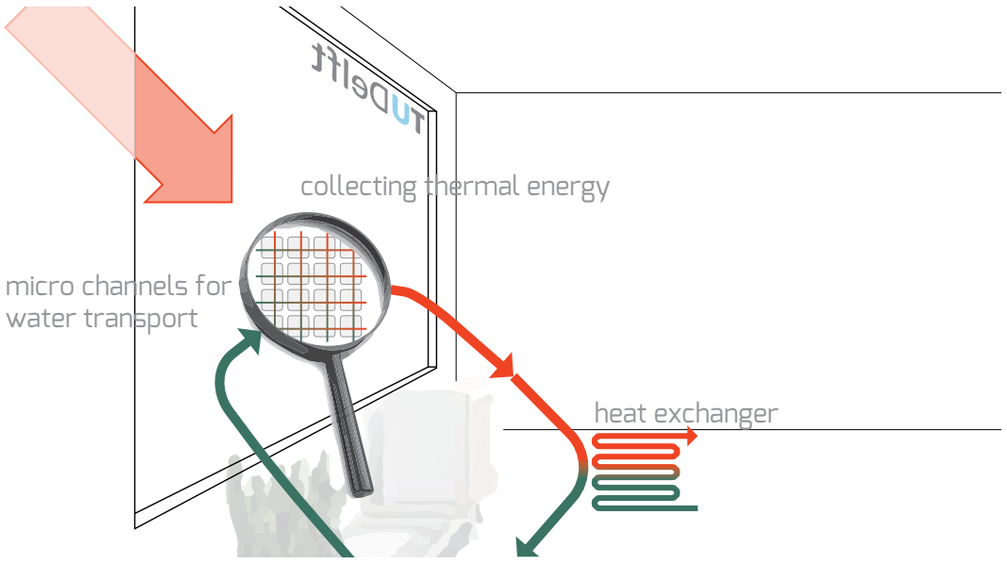
Applications

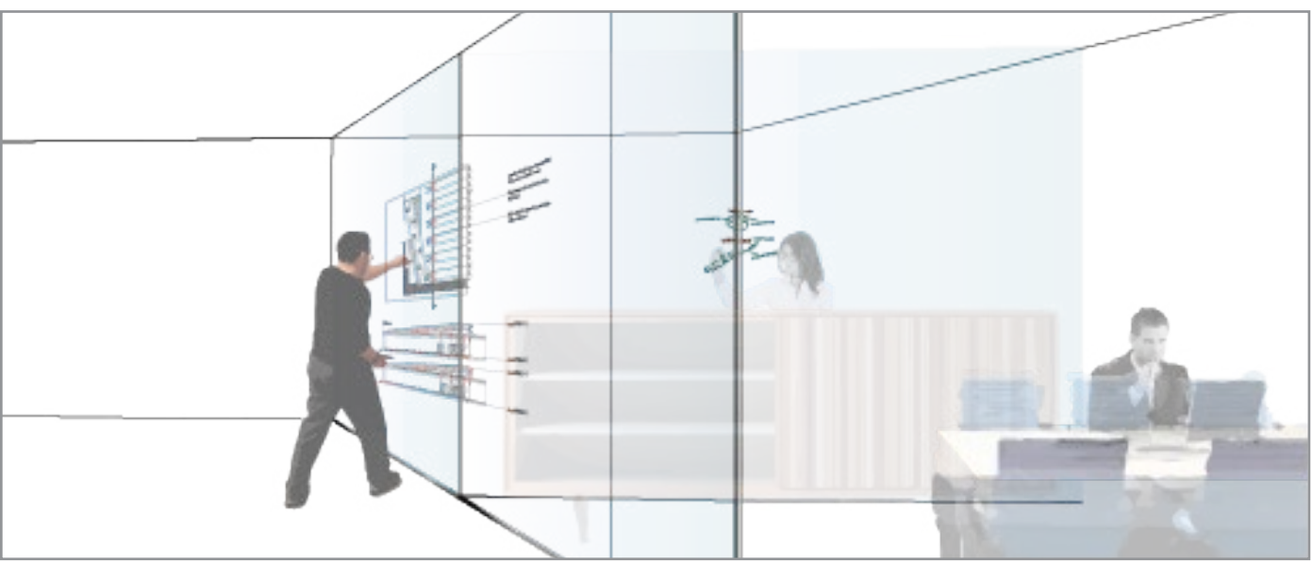
Light intensifying

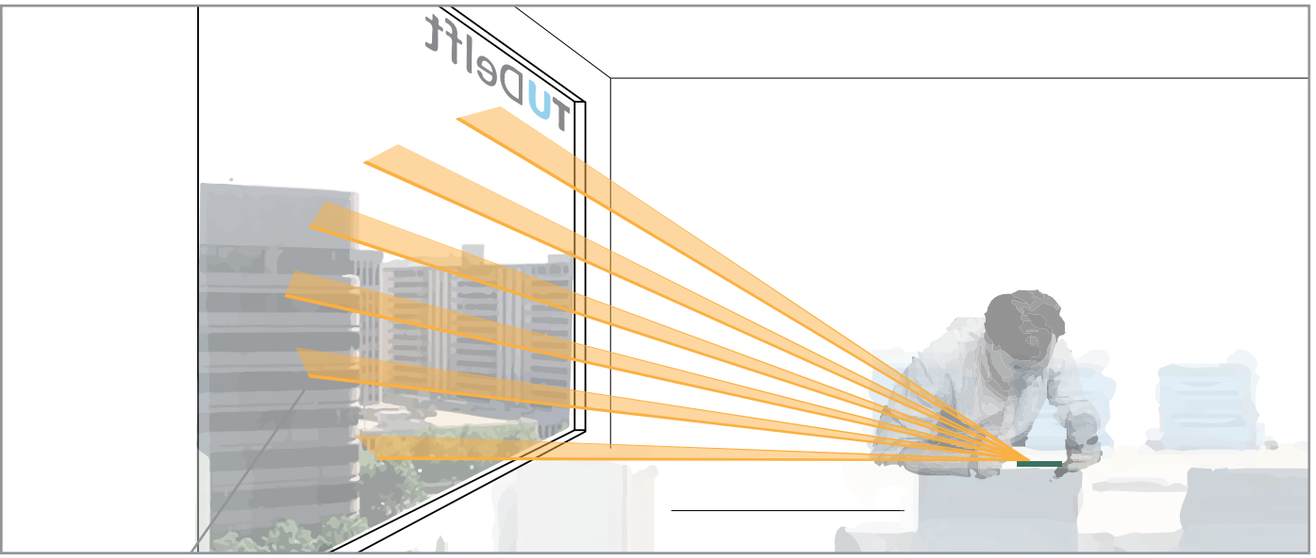


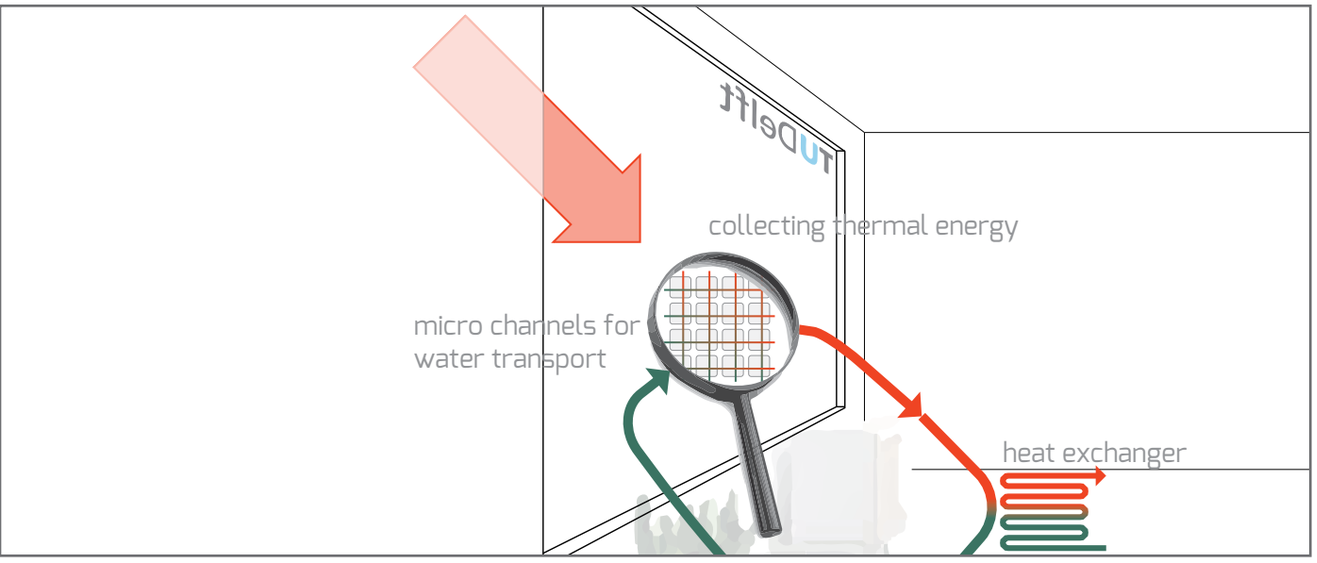
Building functions

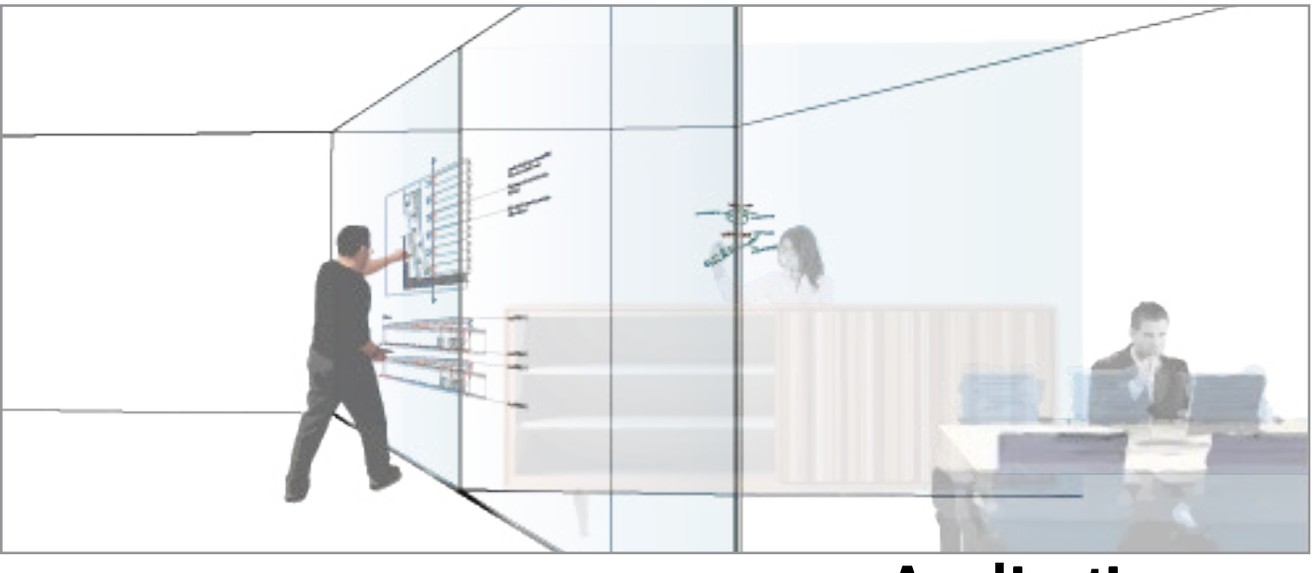




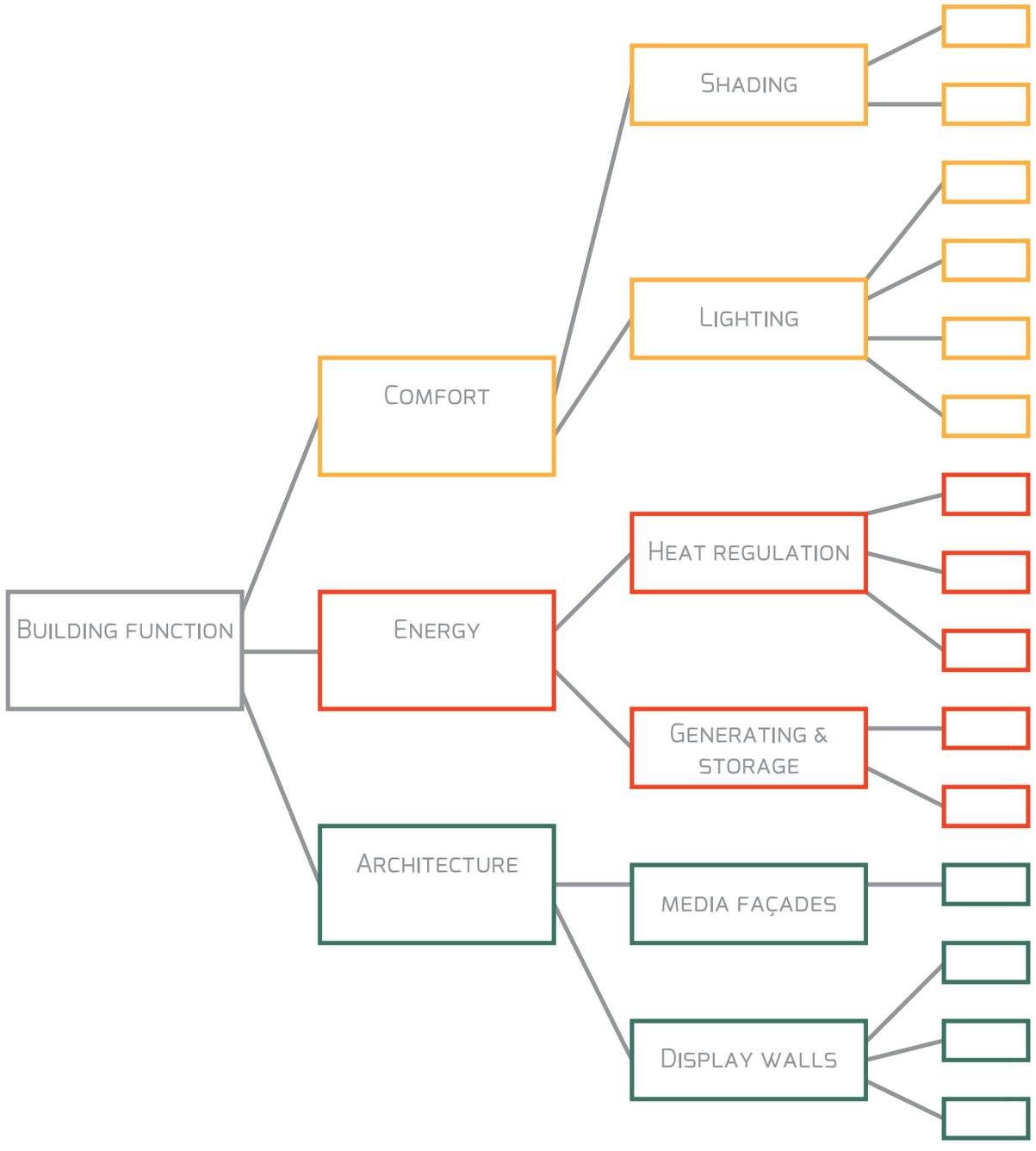


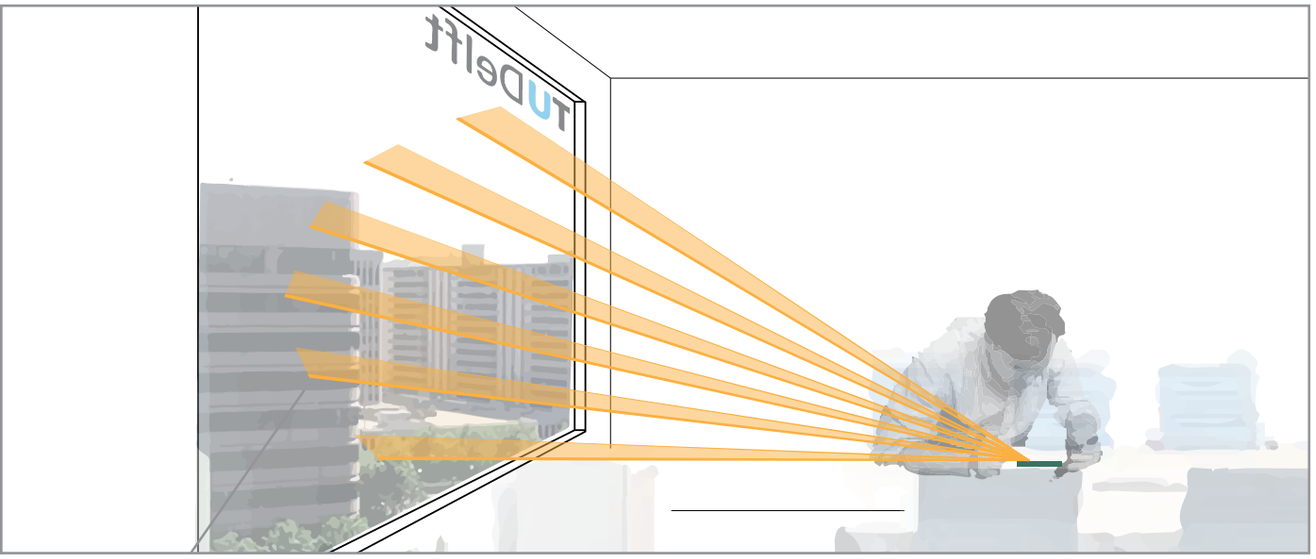




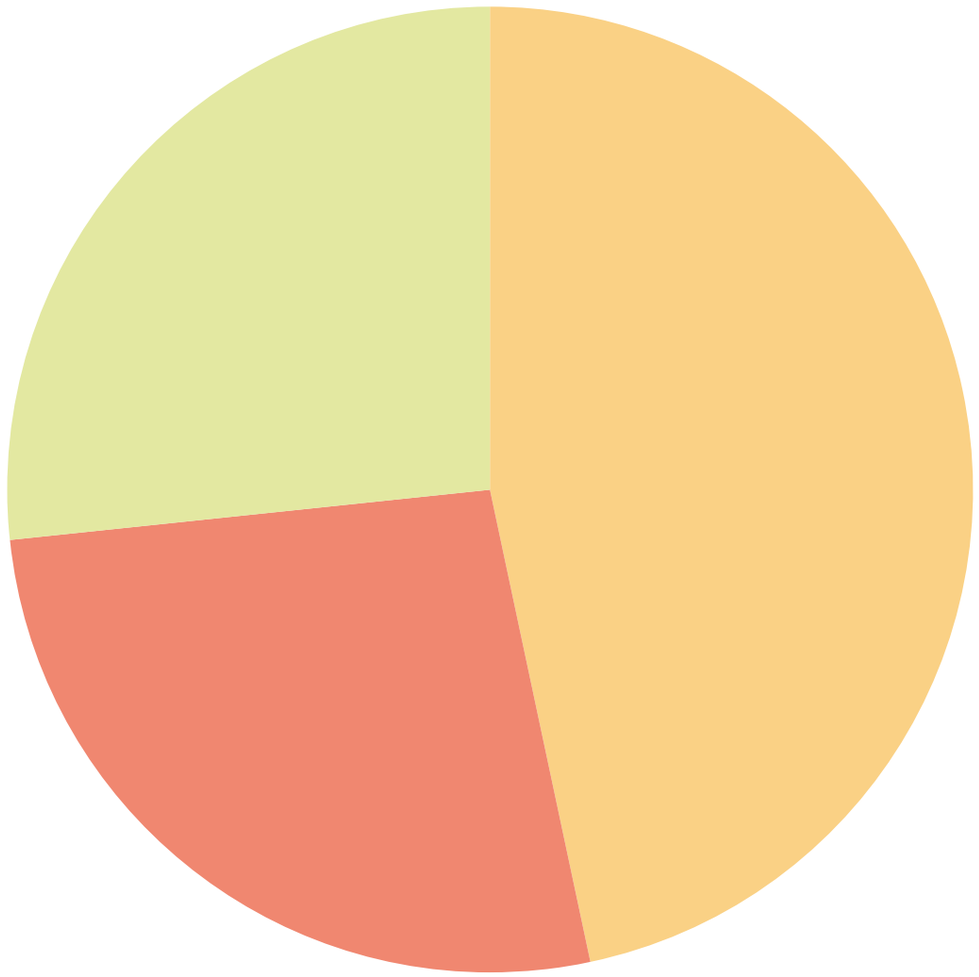


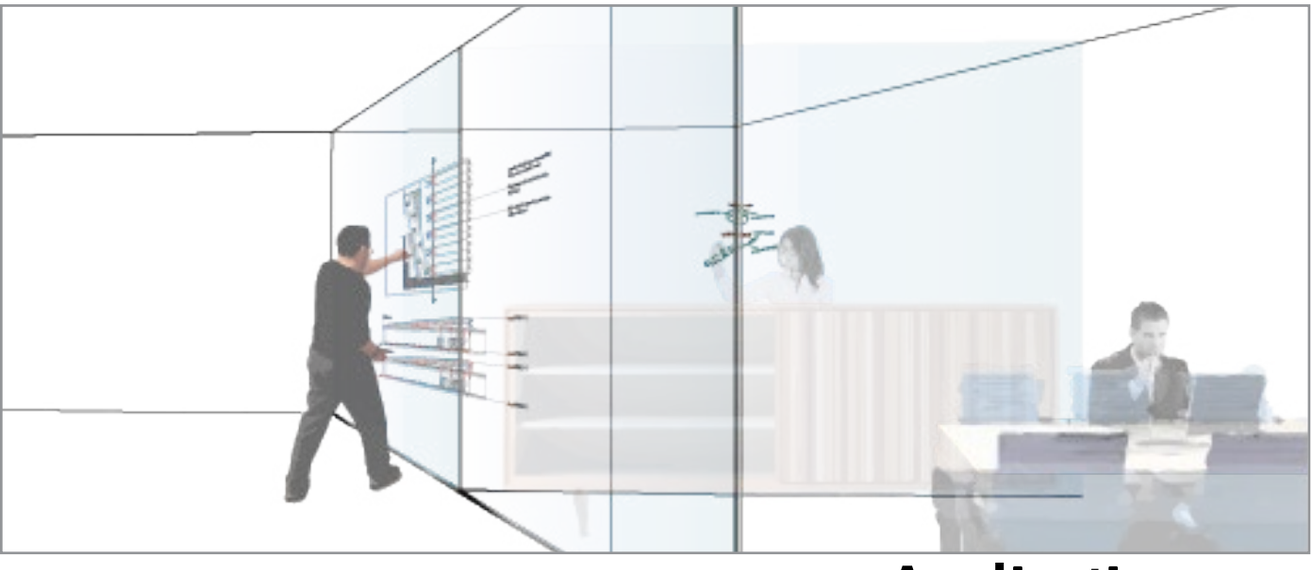
Building functions





Building functions





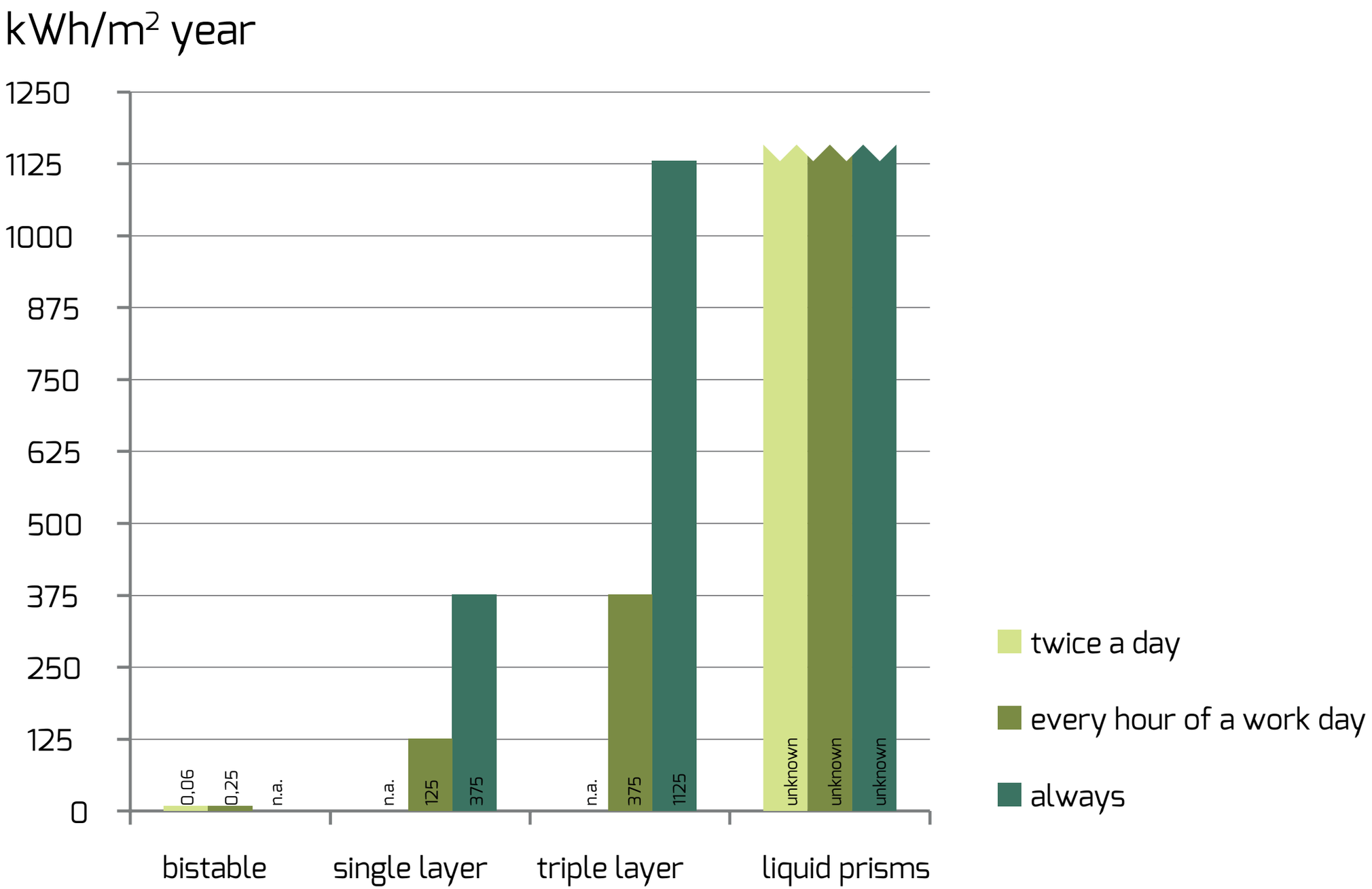
Lighting comfort (47%)
Energy (27%)
Architecture (27%)

Applications

‘Guess who?!’

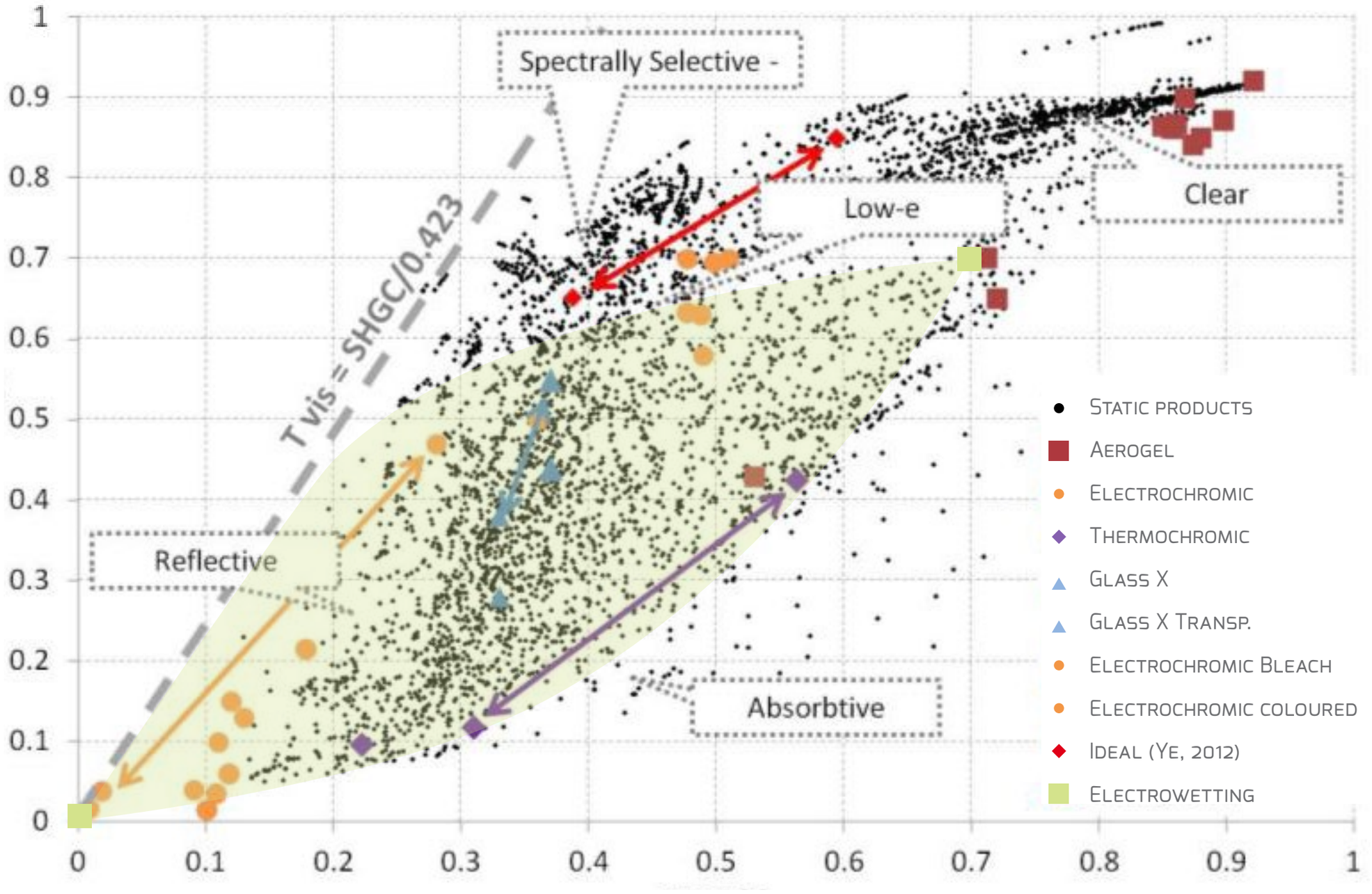
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	-

Energy potential

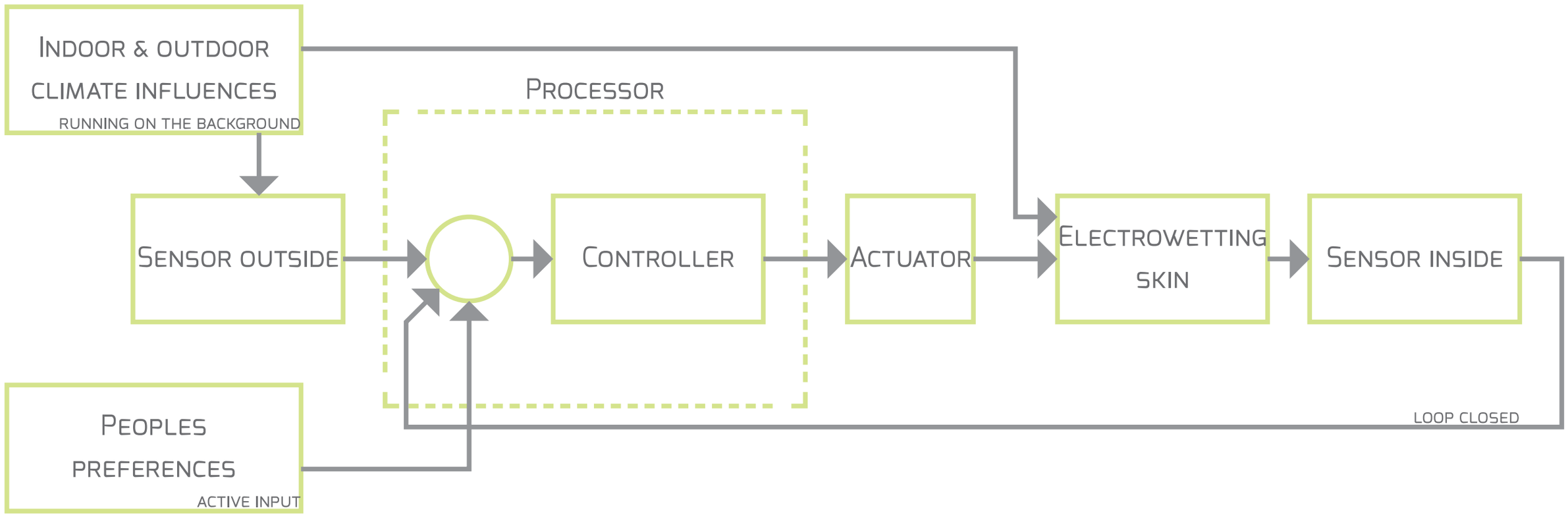


Playing a game

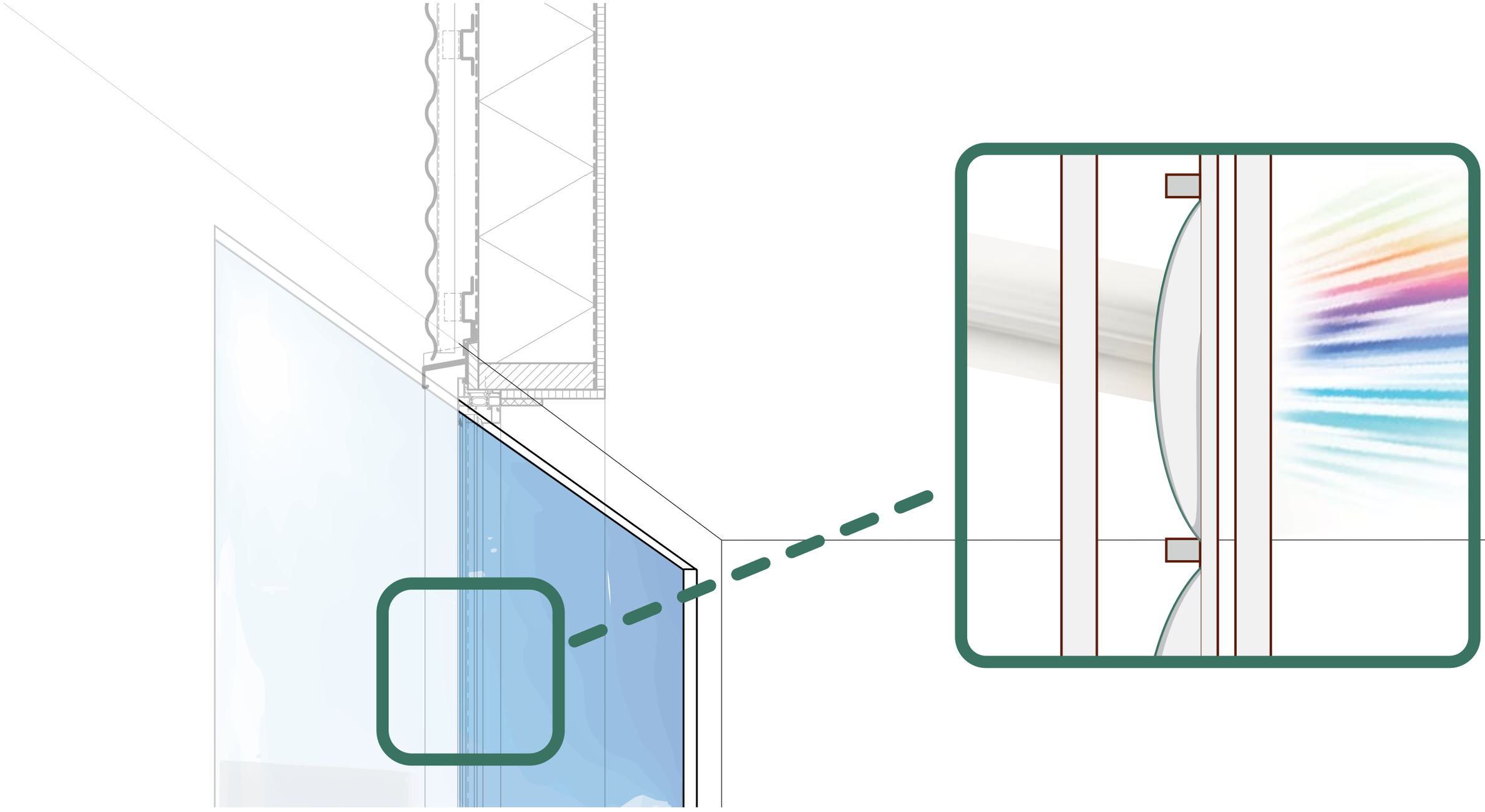
Lighting potential



Control preferences



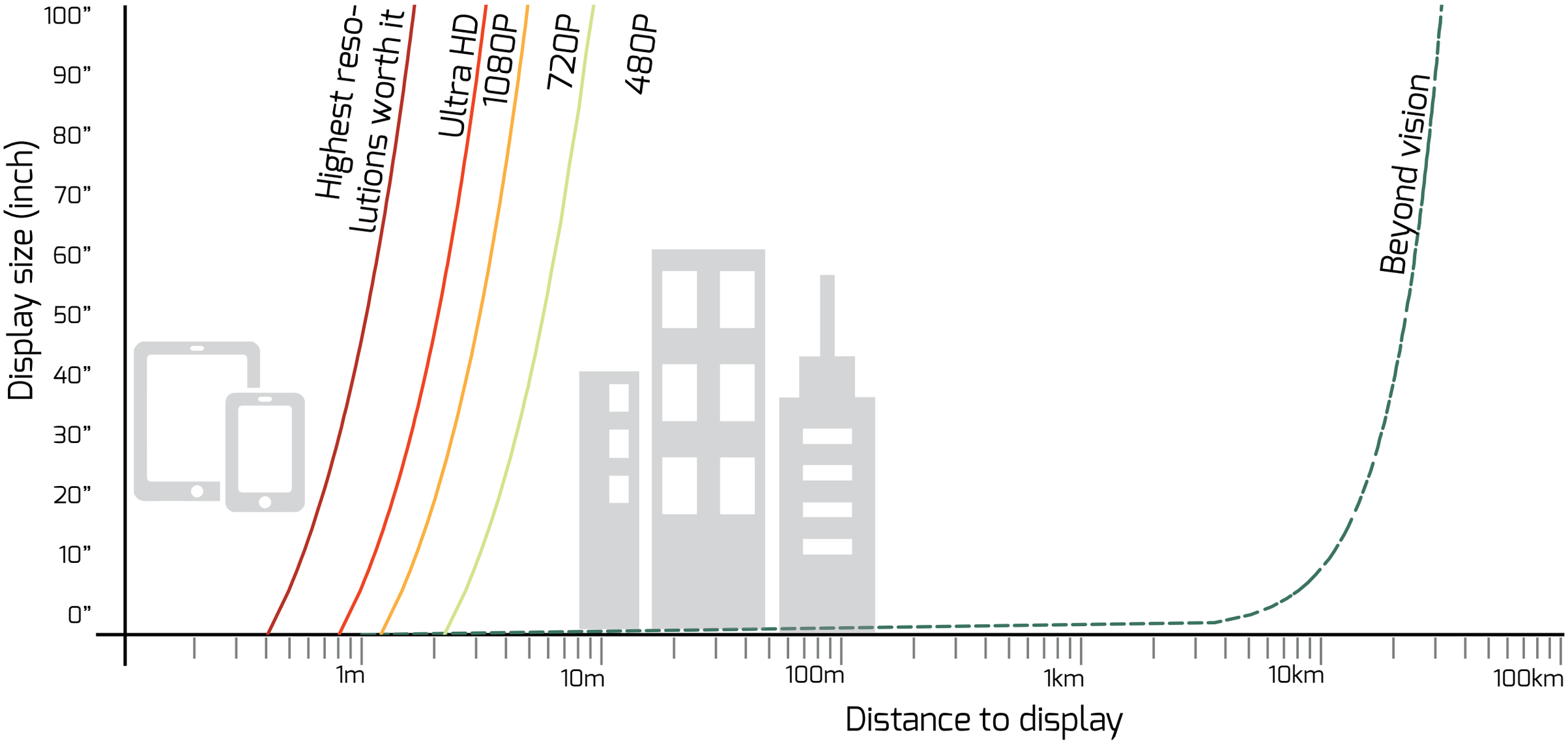
Other aspects



‘Guess who?!’

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	-

Desired display resolution

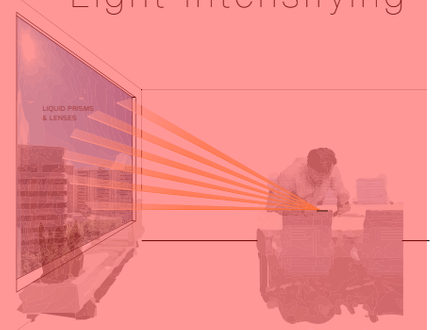


1
Personal shading


Comfort

2
Anti-glare solution

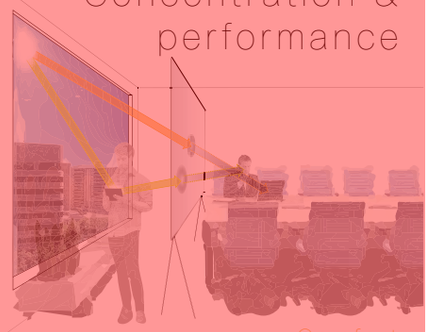
Comfort

3
Light intensifying


Comfort

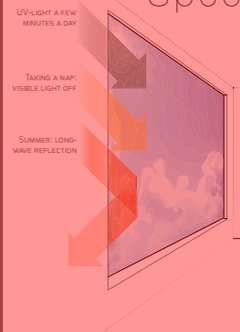
4
Luminance ratios


Comfort

5
Concentration & performance

Comfort

6
Mood, health & light therapies

Energy

7
Spectral selective glazing


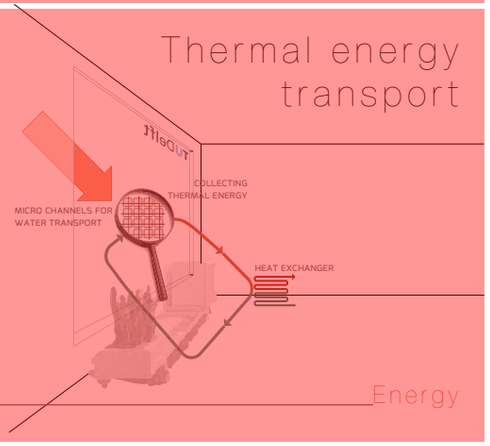
Energy

8
Group shading

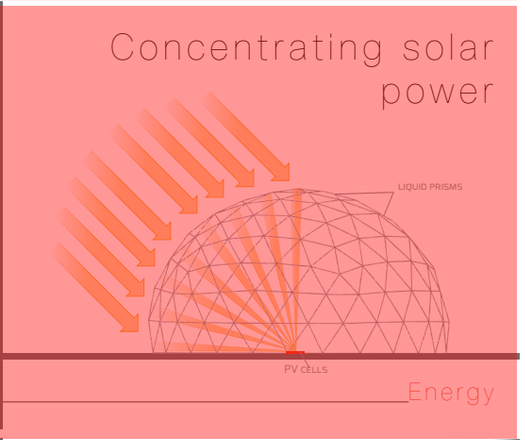
Energy

9
Personal temperature adjustments

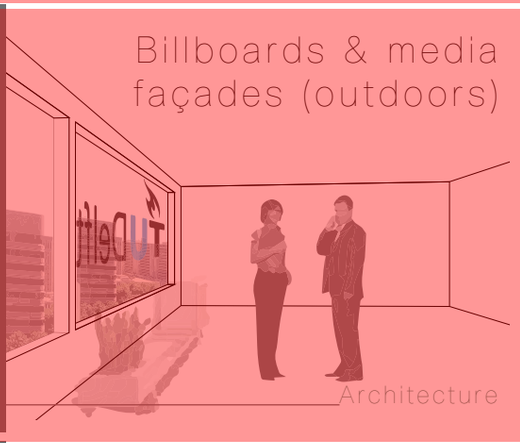

Energy

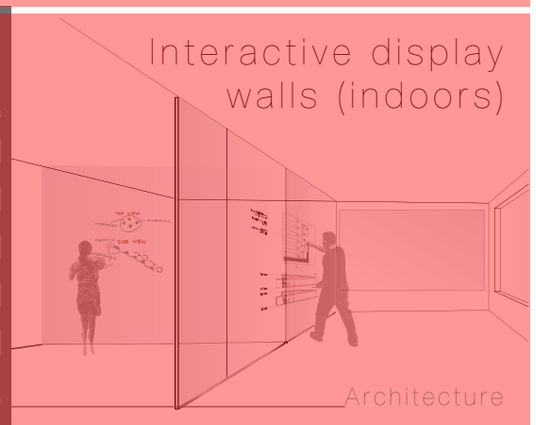
10
Thermal energy transport


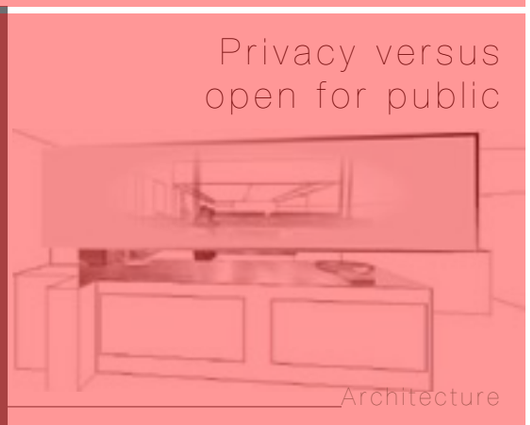
Energy

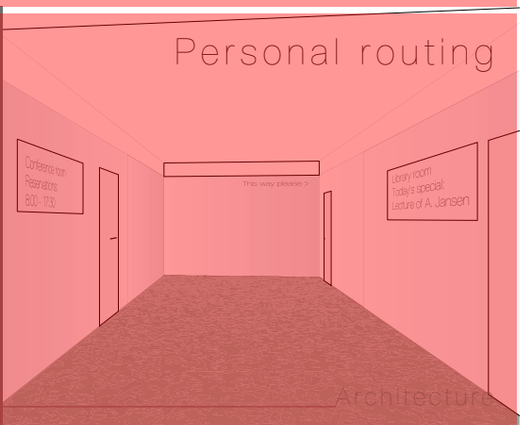
11
Concentrating solar power


Energy

12
Billboards & media façades (outdoors)

Architecture

13
Interactive display walls (indoors)

Architecture

14
Privacy versus open for public

Architecture

15
Personal routing


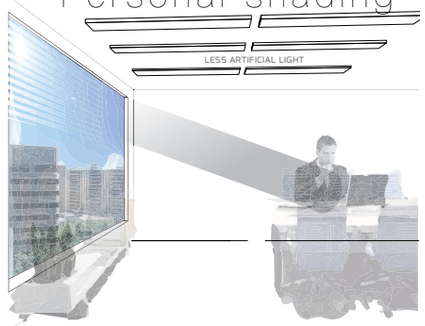
Architecture

16
Requirements
Location
Climate
Control
Mechanism
Display
Since 2012

Go for another smart glazing

1

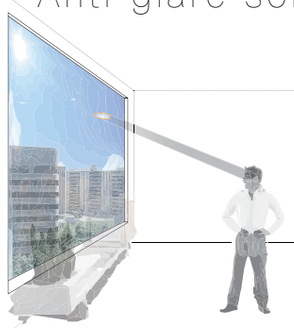
Personal shading



Comfort

2

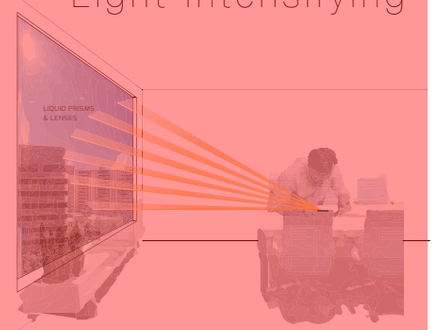
Anti-glare solution



Comfort

3

Light intensifying



Comfort

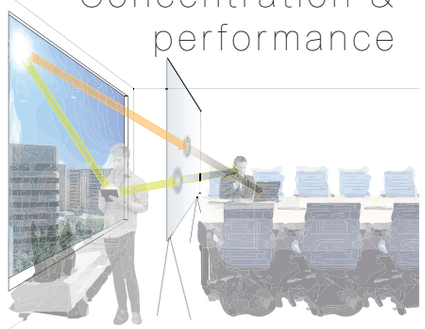
4

Luminance ratios

Comfort

5

Concentration & performance



Comfort

6

Mood, health & light therapies

Energy

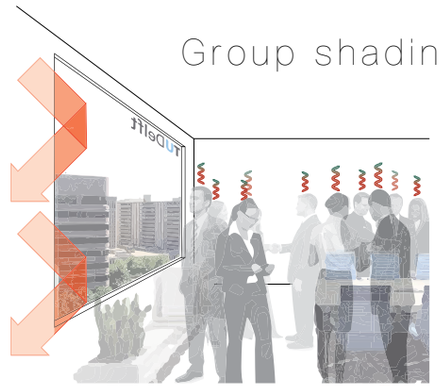
7

Spectral selective glazing

Energy

8

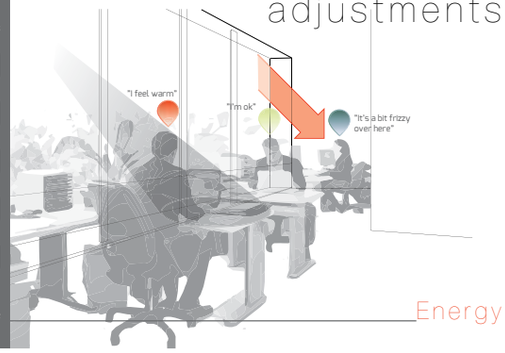
Group shading



Energy

9

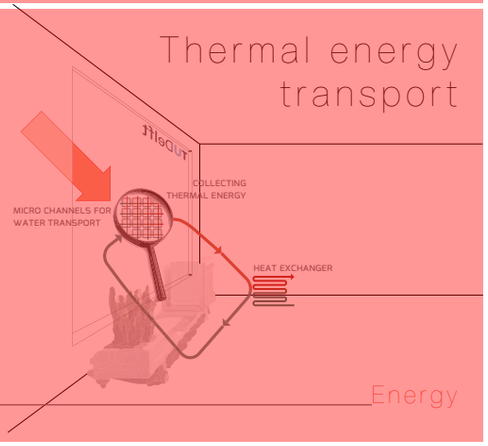
Personal temperature adjustments



Energy

10

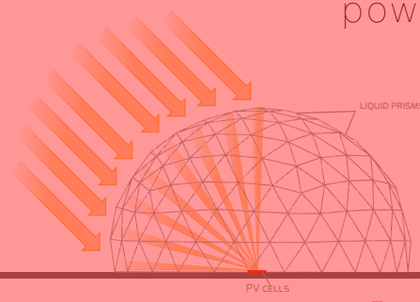
Thermal energy transport



Energy

11

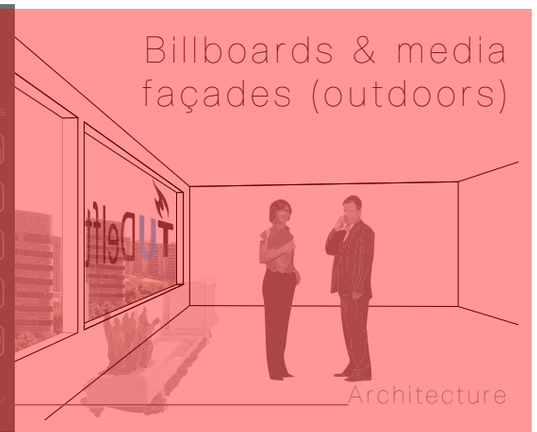
Concentrating solar power



Energy

12

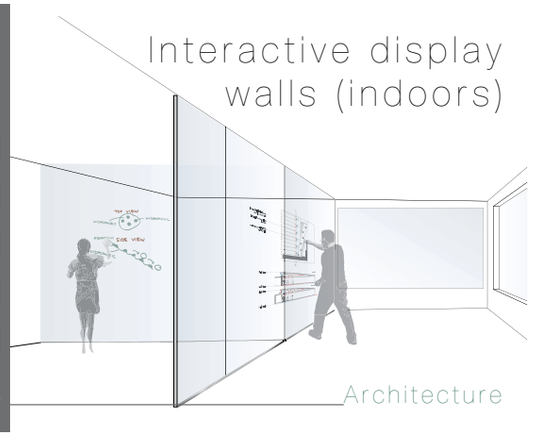
Billboards & media façades (outdoors)



Architecture

13

Interactive display walls (indoors)



Architecture

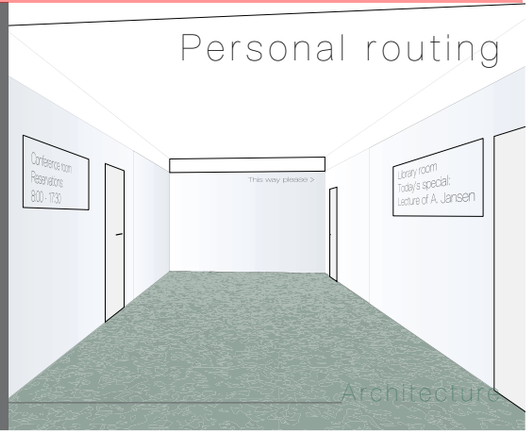
14

Privacy versus open for public

Architecture

15

Personal routing



Architecture

16

Go for another smart glazing

Playing a game

Conclusions

Smart glazing?

Multi functional?

Feasible?

Financial value

Financial value

Energy value

Financial value

User value

Energy value

Marketing value

Financial value

User value

Energy value

Marketing value

FAÇADE VALUE

Financial value

User value

Energy value

Future perspective

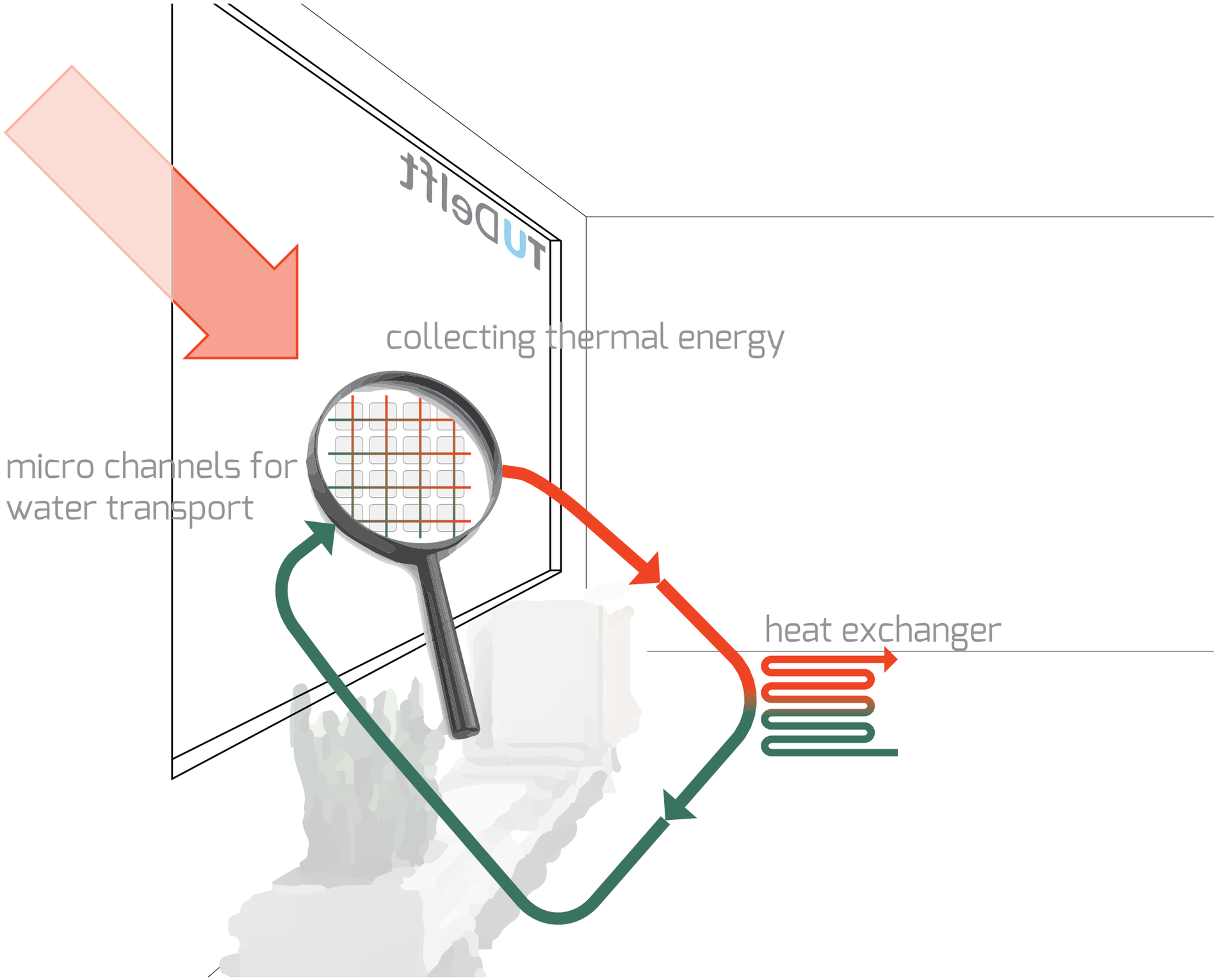
Billboards


etulipa is transforming the world
of outdoor digital advertising
cost
savings
etulipa

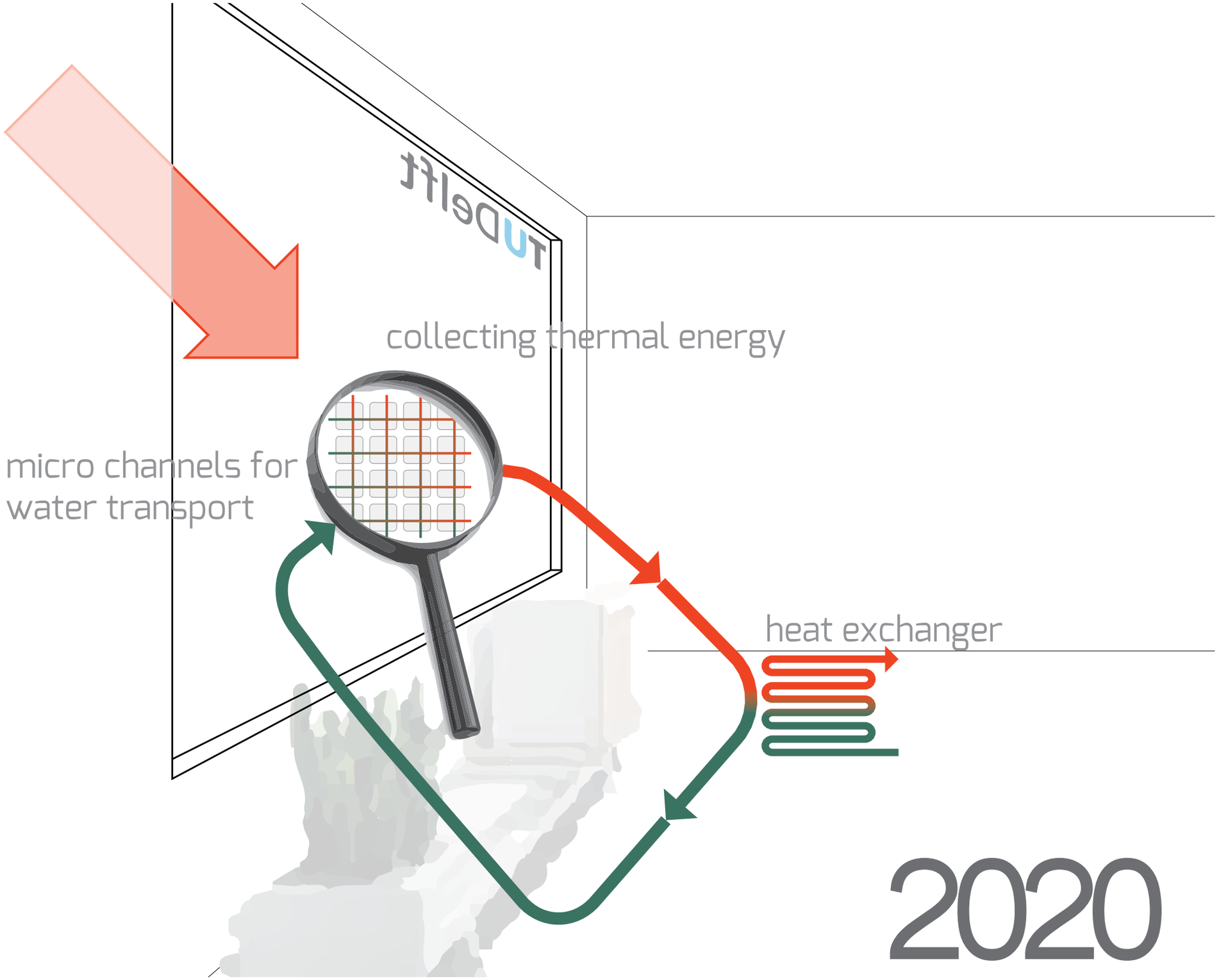
Billboards

2016

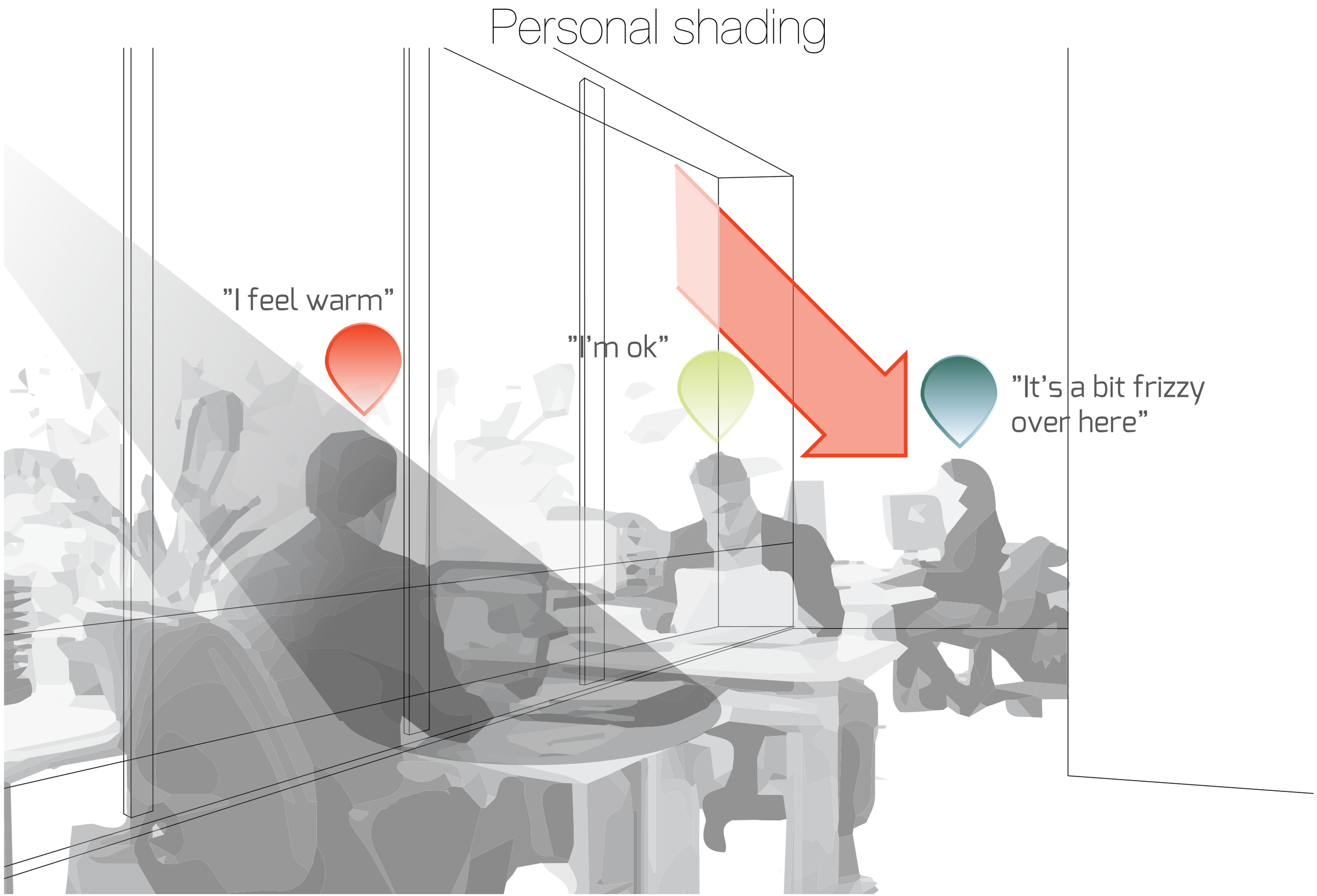
Thermal energy transport



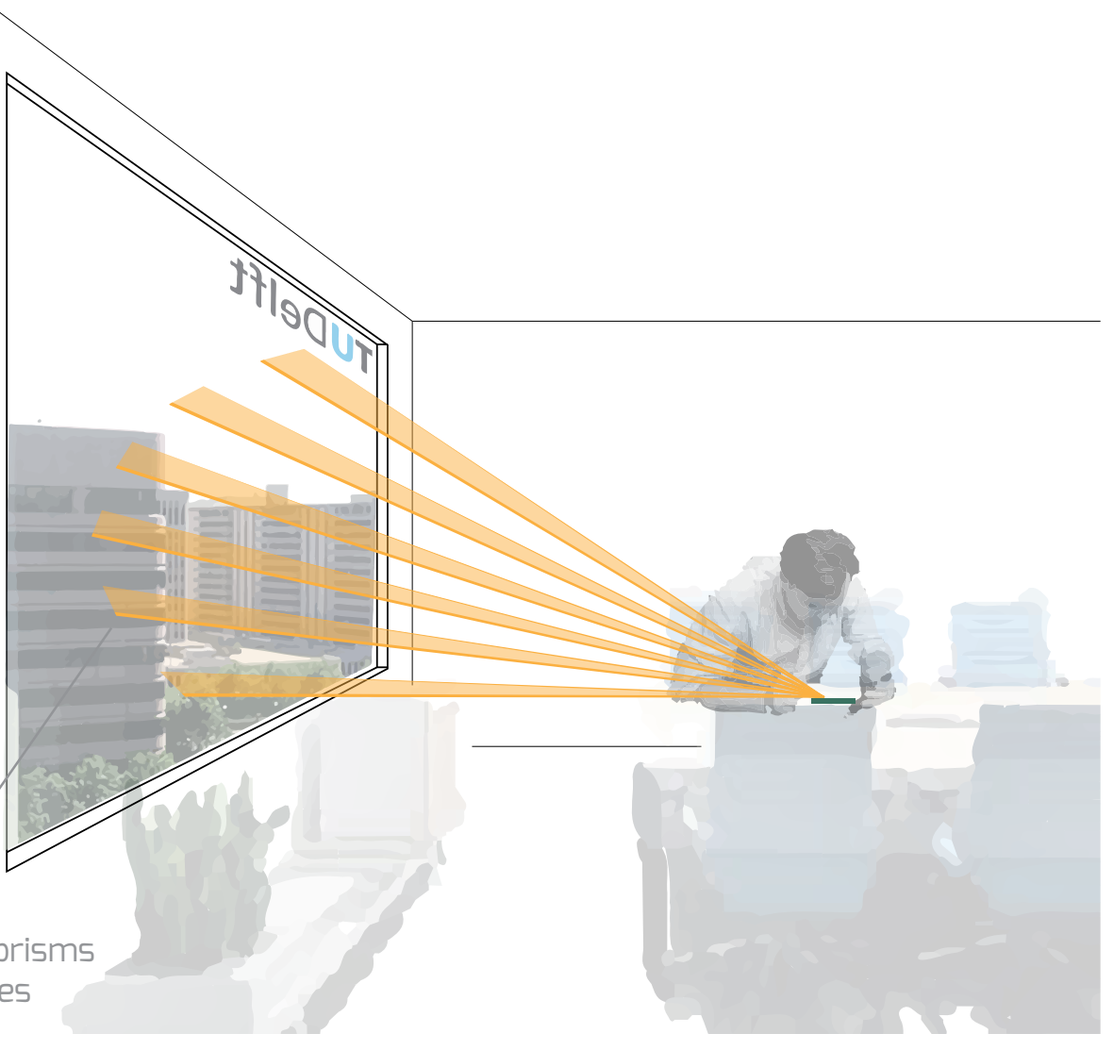
Thermal energy transport

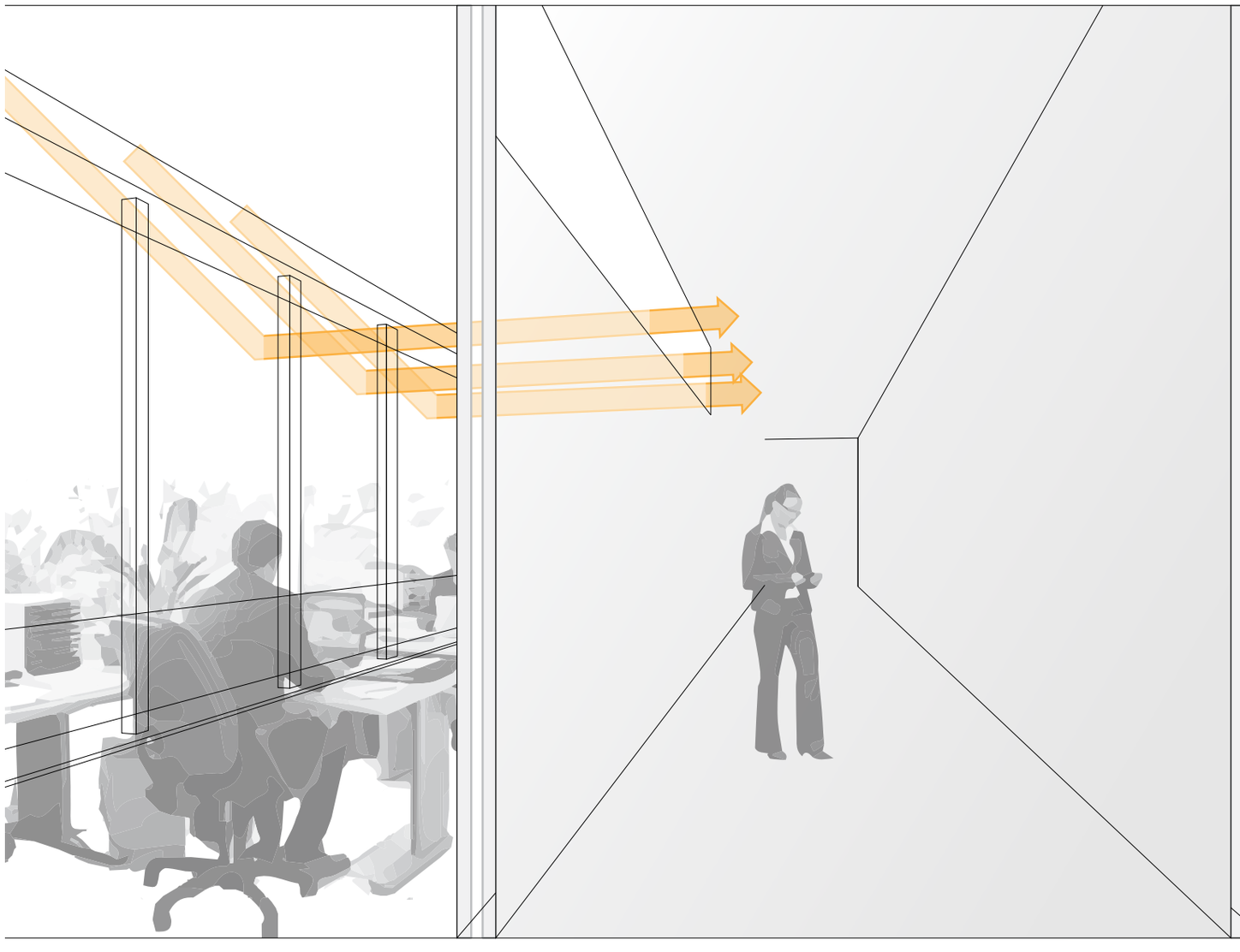


2020


Personal shading
”I feel warm”
”I’m ok”
”It’s a bit frizzy over here”

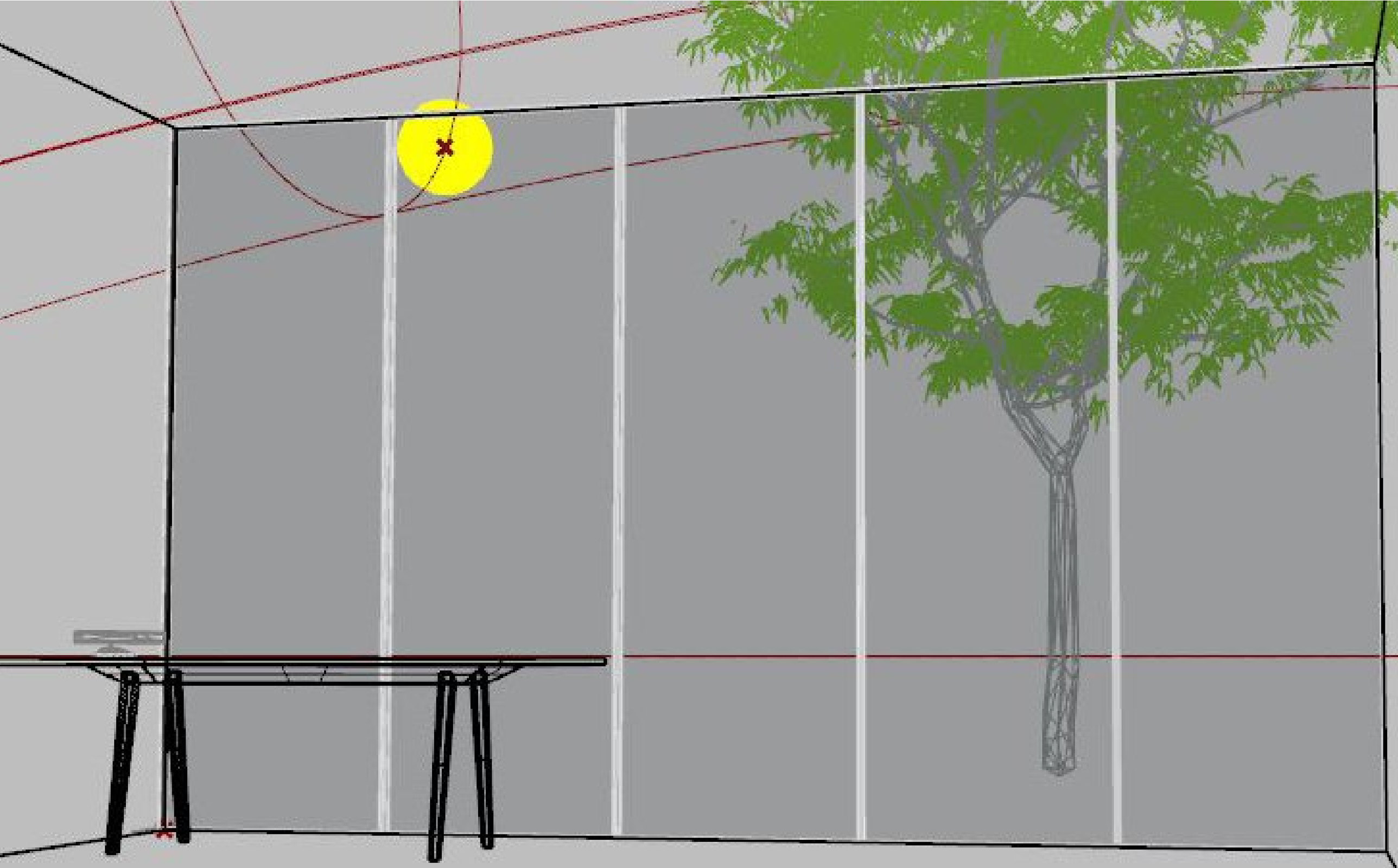
Within 5 years





Time being

Future perspective



Thank you!