

The screenshot shows a web browser window with the following elements:

- Top Bar:** Includes standard OS X-style controls (red, yellow, green buttons) and a search bar with placeholder text "Search or enter website name".
- Header:** The title "BRICKS AS SPATIAL SOUND MODULATORS" is displayed vertically on the left.
- Navigation:** Links for "ABOUT" and "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE" are located at the top center.
- Content:** Three large, overlapping images illustrating the concept. The top-left image shows a circular arrangement of blue hexagonal tiles. The middle-right image shows a larger, more complex arrangement of the same tiles. The bottom-right image shows a close-up view of the hexagonal tiles.
- Bottom Right:** A footer text "@ ANTIGONI KARAIKOU | 4621492" is visible.

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

PROBLEM STATEMENT ▾

speech-in-noise perception
transdisciplinary approach

RESEARCH QUESTION ▾

How can different periodicity patterns applied on fibreless surfaces provide a toolbox for designers that aim for a balanced ratio of speech intelligibility and speech privacy in an ILE school by allowing low-frequency absorption and high-frequency diffusion?

RESEARCH OBJECTIVE ▾

convert traditional materials into sound controlling devices
▼ hybrid
absorption + diffusion
▼ periodicity
low-level rules
high-level of self-organization

WORKFLOW

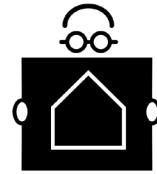
macro-scale (where)
optimum proportions of absorption and diffusion
micro-scale (how)
non-repetitive sequence for uniform dispersion

PARAMETERS

pattern
depth-to-length ratio
well width
period
elements
finite set

EVALUATION

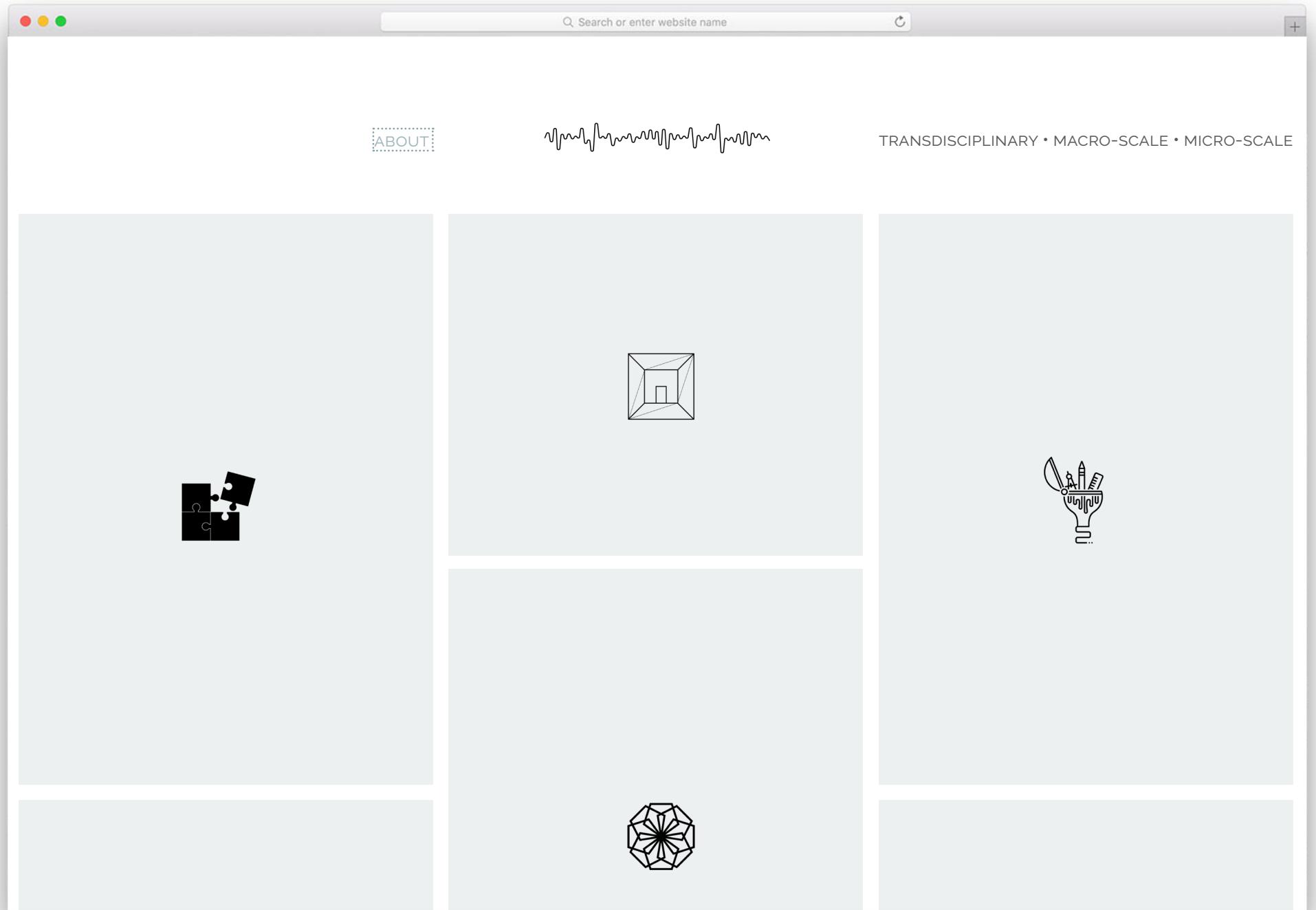
selected pattern
increase complexity of the reflected sound field
properties
overall simplicity (preserve the economy of the means for the end user)

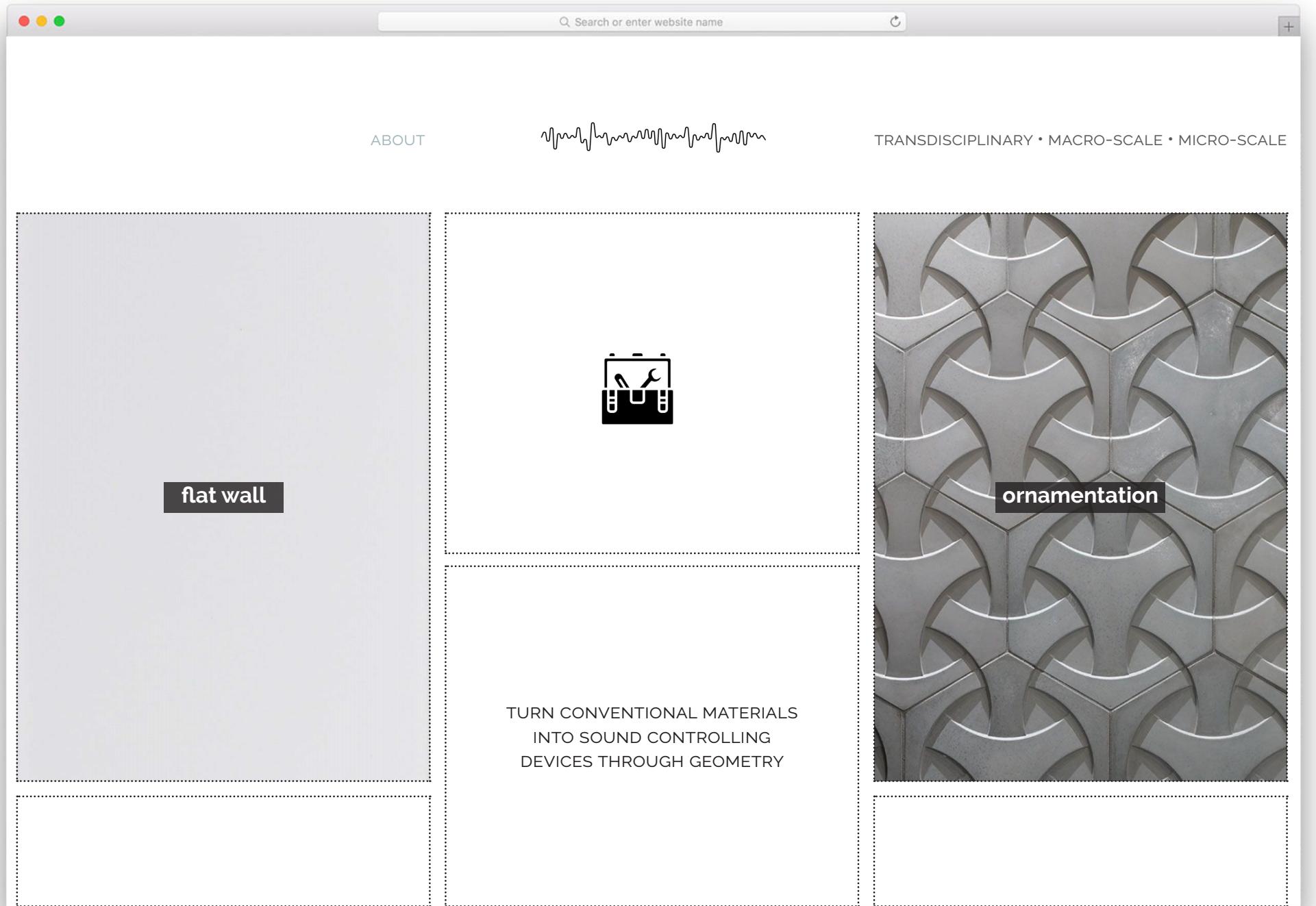


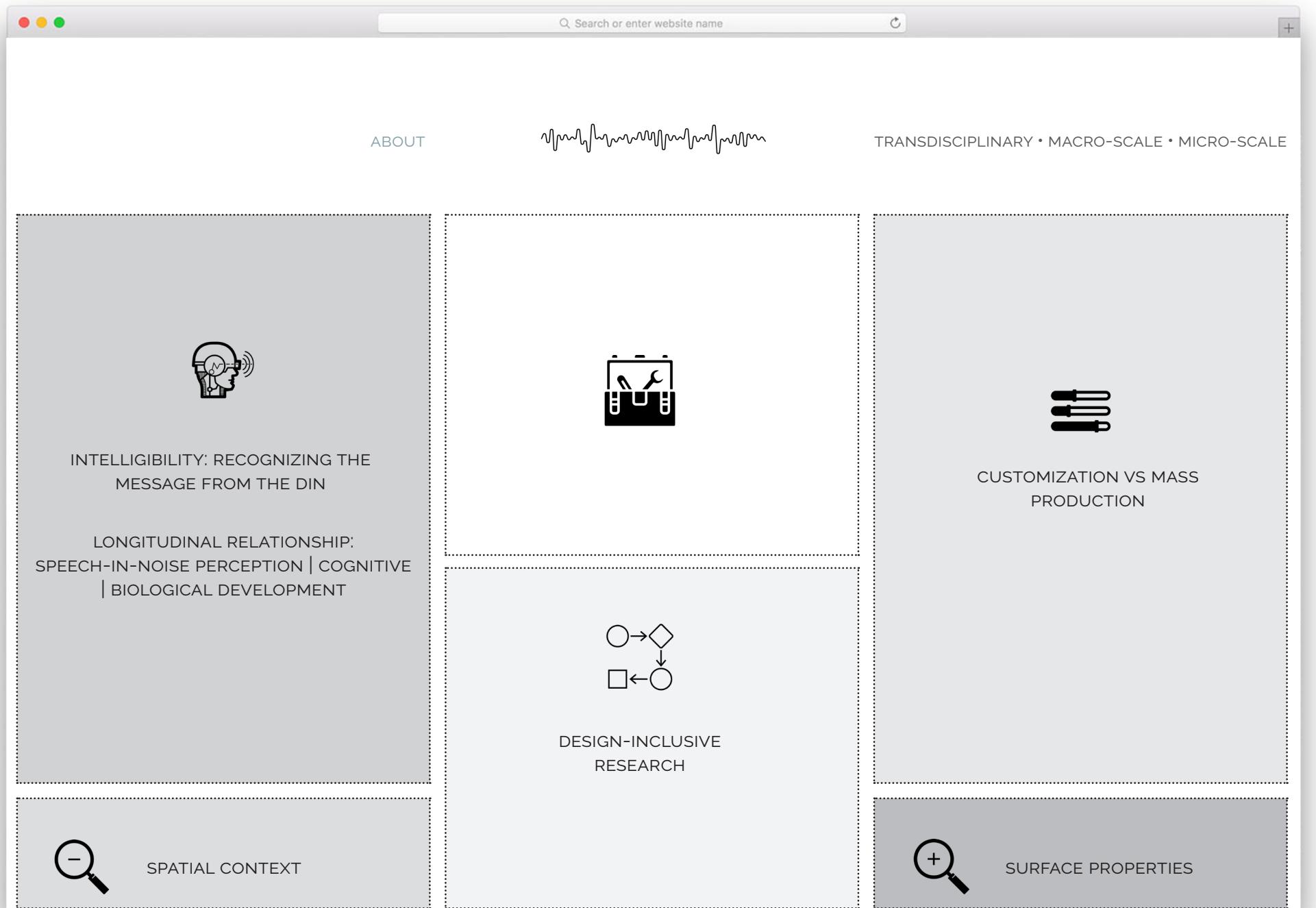
LOCATION:
OPEN-PLAN PRESCHOOLS



TOOLBOX



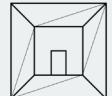






ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

 TRANSDISCIPLINARY APPROACH

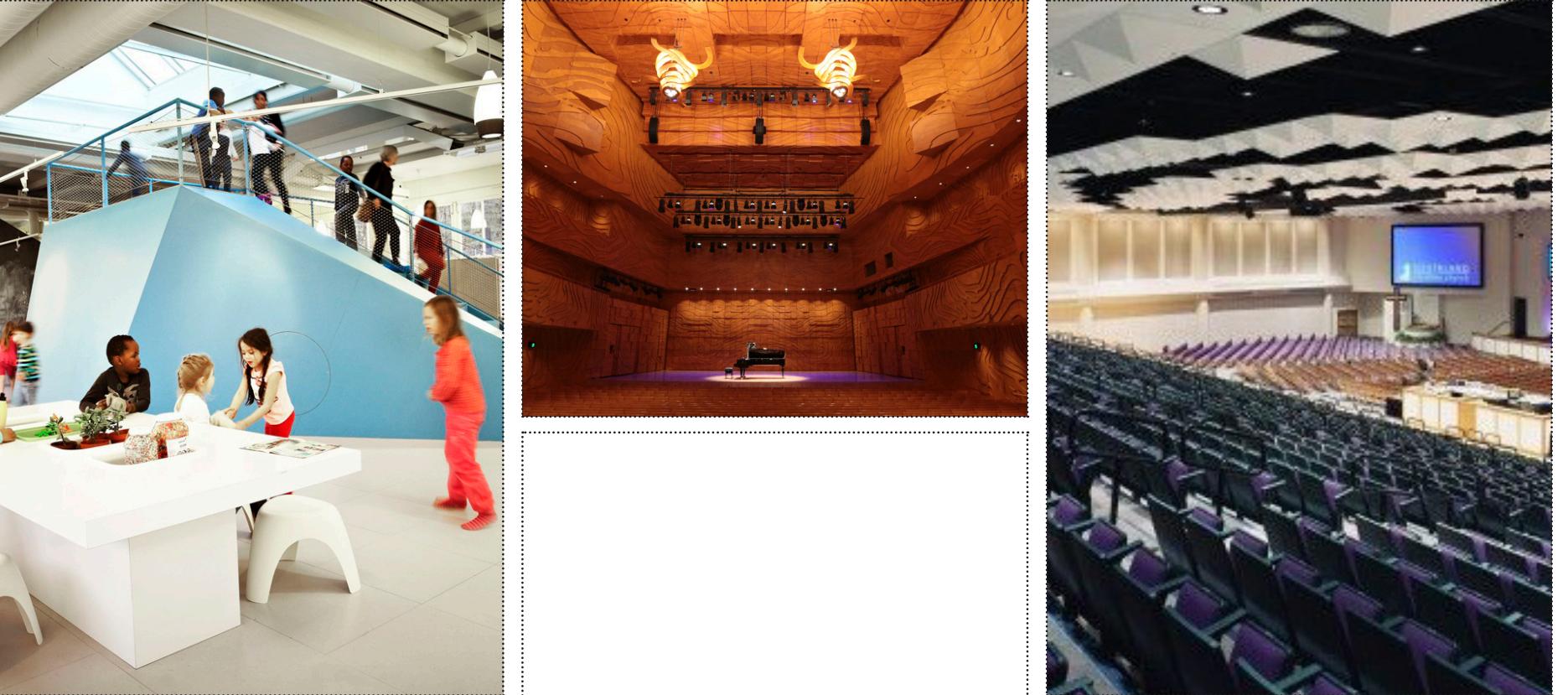








ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

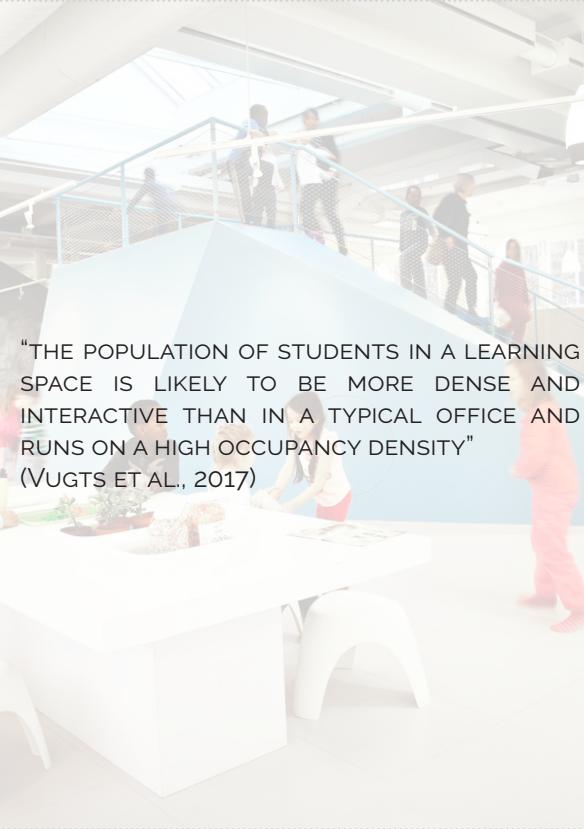


The page features three main images arranged horizontally. The first image shows a modern interior space with a prominent blue ramp and a white reception desk where children are interacting. The second image is a wooden concert hall with a grand piano on stage and a highly textured wooden ceiling. The third image shows a large auditorium with rows of purple seats and a stage area. Below these images are three empty, dotted rectangular boxes, likely placeholders for additional content or links.



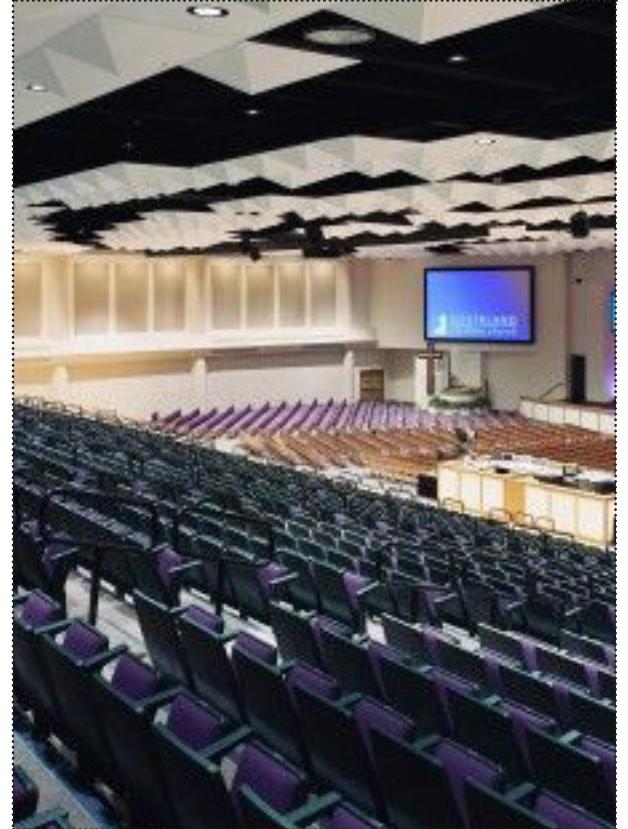
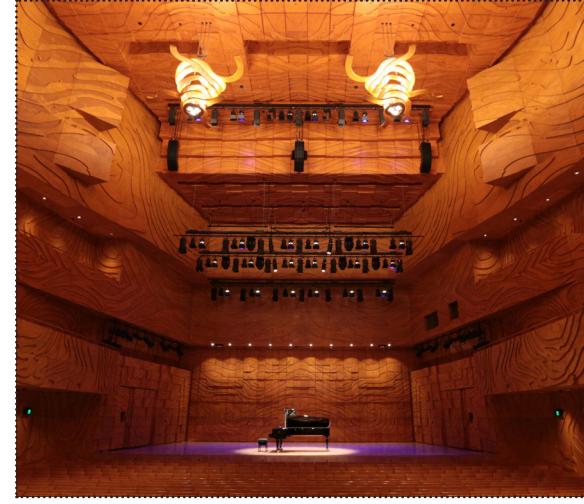
TOOLBOX

ABOUT

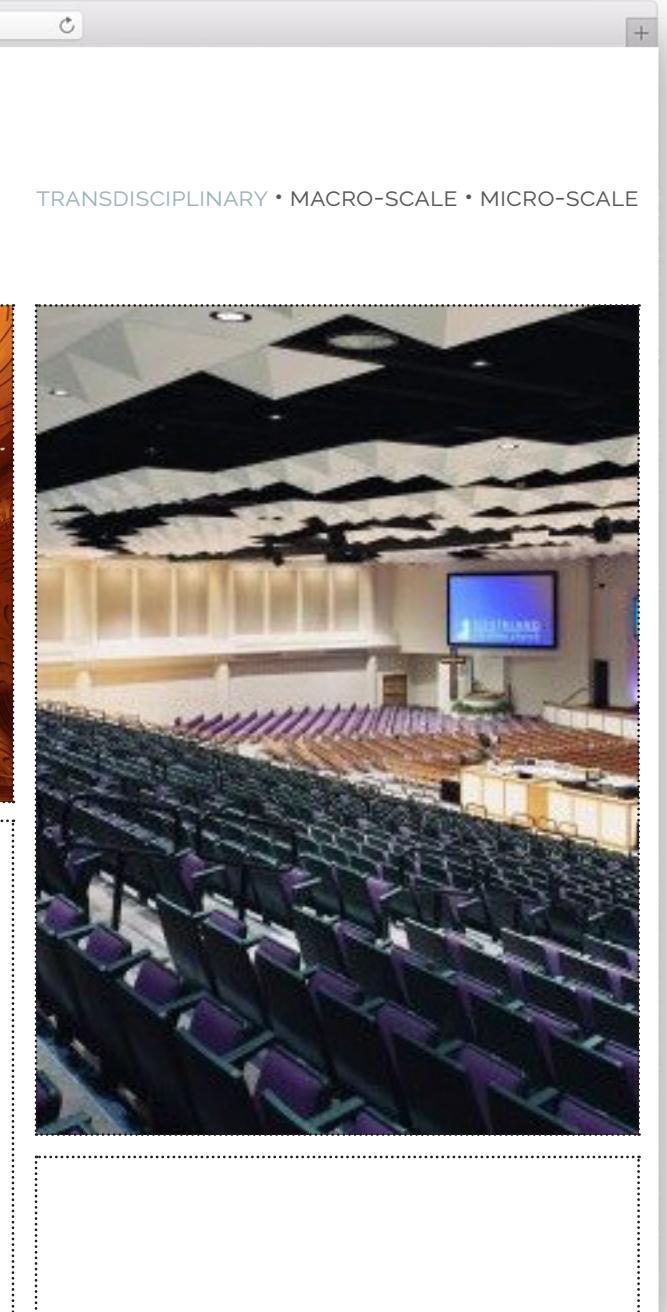


"THE POPULATION OF STUDENTS IN A LEARNING SPACE IS LIKELY TO BE MORE DENSE AND INTERACTIVE THAN IN A TYPICAL OFFICE AND RUNS ON A HIGH OCCUPANCY DENSITY"
(VUGTS ET AL., 2017)

WAVEFORM



TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



The screenshot shows a web browser window with a light gray header bar. On the left, there are three colored window control buttons (red, yellow, green). In the center, there is a search bar with the placeholder text "Search or enter website name". On the right side of the header are standard browser controls: a magnifying glass icon, a search field, a refresh button, and a plus sign for opening new tabs.

The main content area is titled "TOOLBOX" vertically on the left. At the top center, there is a small wavy line icon representing sound or noise. To its left is a "ABOUT" link. To its right is a "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE" link.

The central part of the page features a large gray rectangular box with the text "PSYCHOLOGY NEUROSCIENCE" in bold capital letters. Above this box is a small icon of a person's head facing right. Below it is a large white rectangular area containing three columns of text and icons:

- STRONGLY AFFECTED BY NOISE:** RAISING THEIR VOICES, LOSING CONCENTRATION OR WITHDRAWING
Icon: A simple silhouette of a person's head facing right.
- ATTENTION, MEMORY, SENSORY PERCEPTION AND LINGUISTIC COGNITION ARE UNDERDEVELOPED**
Icon: A silhouette of a person's head with a gear inside, representing cognitive processes.
- LONG-LASTING IMPACT ON COGNITIVE PERFORMANCE , PRELITERACY AND AUDITORY PERCEPTION**
Icon: An open book icon.

Below these columns is a large white rectangular box with the word "ACOUSTICS" repeated twice in gray text. To the right of this box is another large white rectangular area containing two columns of text and icons:

- SPEECH-IN-NOISE PERCEPTION:** MOSTLY HINDERED BY THE CHILDREN'S VOICES AND ACTIVITIES (1-4KH)
Icon: A small wavy line icon representing sound.
- EXPOSED TO INFORMATIONAL MASKING (CONFUSING THE SOURCE)**
Icon: A silhouette of a person's head facing right.

At the bottom of the page, there are two large empty white rectangular boxes, likely placeholders for additional content or links.

ABOUT 

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

**PSYCHOLOGY
NEUROSCIENCE**


STRONGLY AFFECTED BY NOISE:
RAISING THEIR VOICES, LOSING
CONCENTRATION OR WITHDRAWING


ATTENTION, MEMORY, SENSORY
PERCEPTION AND LINGUISTIC
COGNITION ARE UNDERDEVELOPED

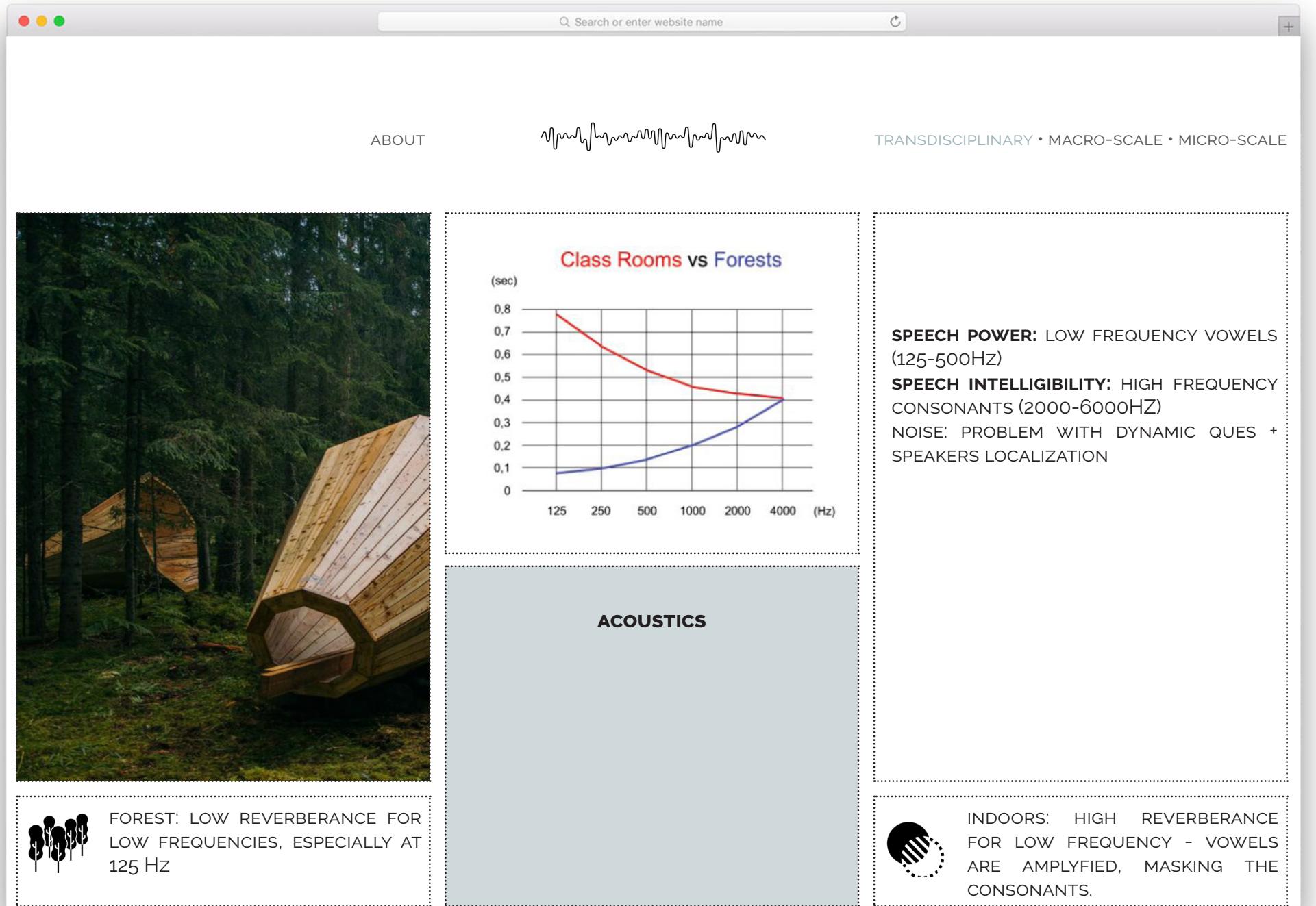

LONG-LASTING IMPACT ON COGNITIVE
PERFORMANCE, PRELITERACY AND
AUDITORY PERCEPTION

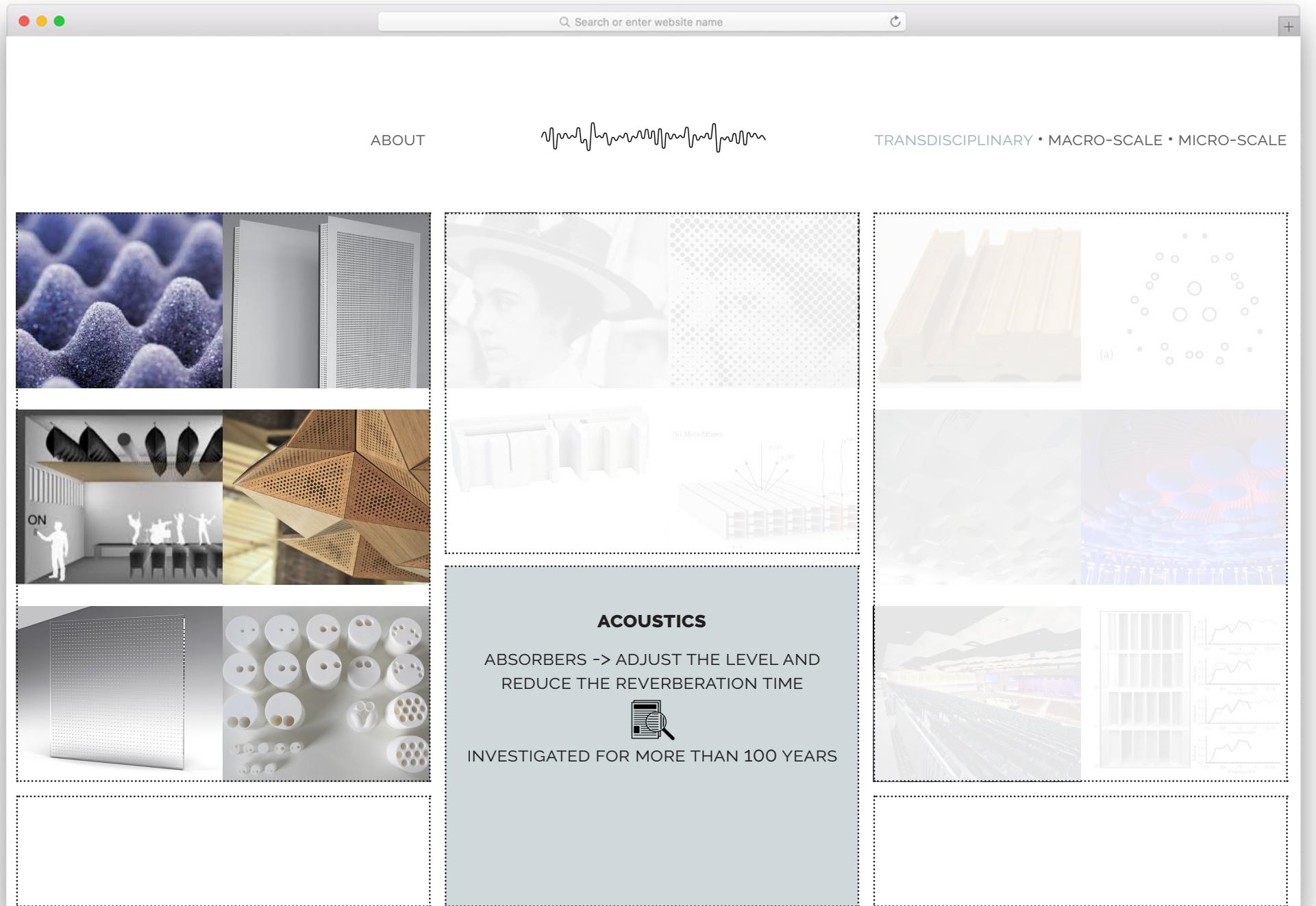
ACOUSTICS


SPEECH-IN-NOISE PERCEPTION:
MOSTLY HINDERED BY THE
CHILDREN'S VOICES AND ACTIVITIES
(1-4KH)

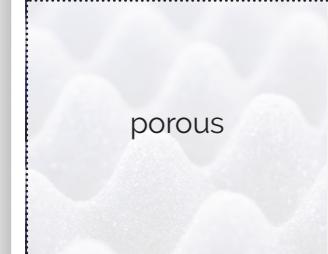

EXPOSED TO INFORMATIONAL
MASKING (CONFUSING THE SOURCE)


LISTEN TO A BROADBAND OR TO ALL
FREQUENCIES SIMULTANEOUSLY





ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



porous



plate



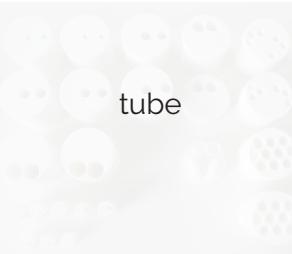
membrane



helmholtz



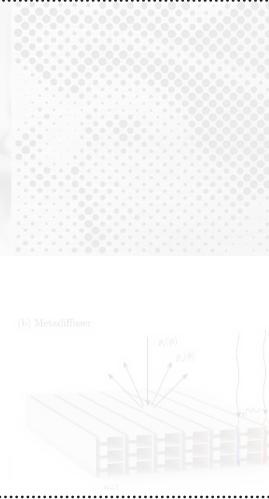
mf



tube



(b) Metadiffuser



ACOUSTICS

DIFFUSERS → DELAY AND TEMPORALLY DIFFUSE EARLY REFLECTIONS, AVOID SOUND FOCUSING + FLUTTER ECHOES, WHILE PRESERVING SOUND ENERGY

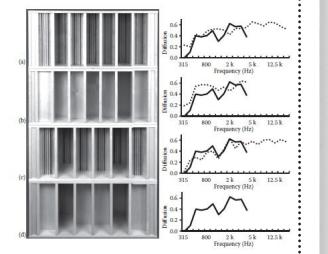


INVESTIGATED IN RECENT DECADES



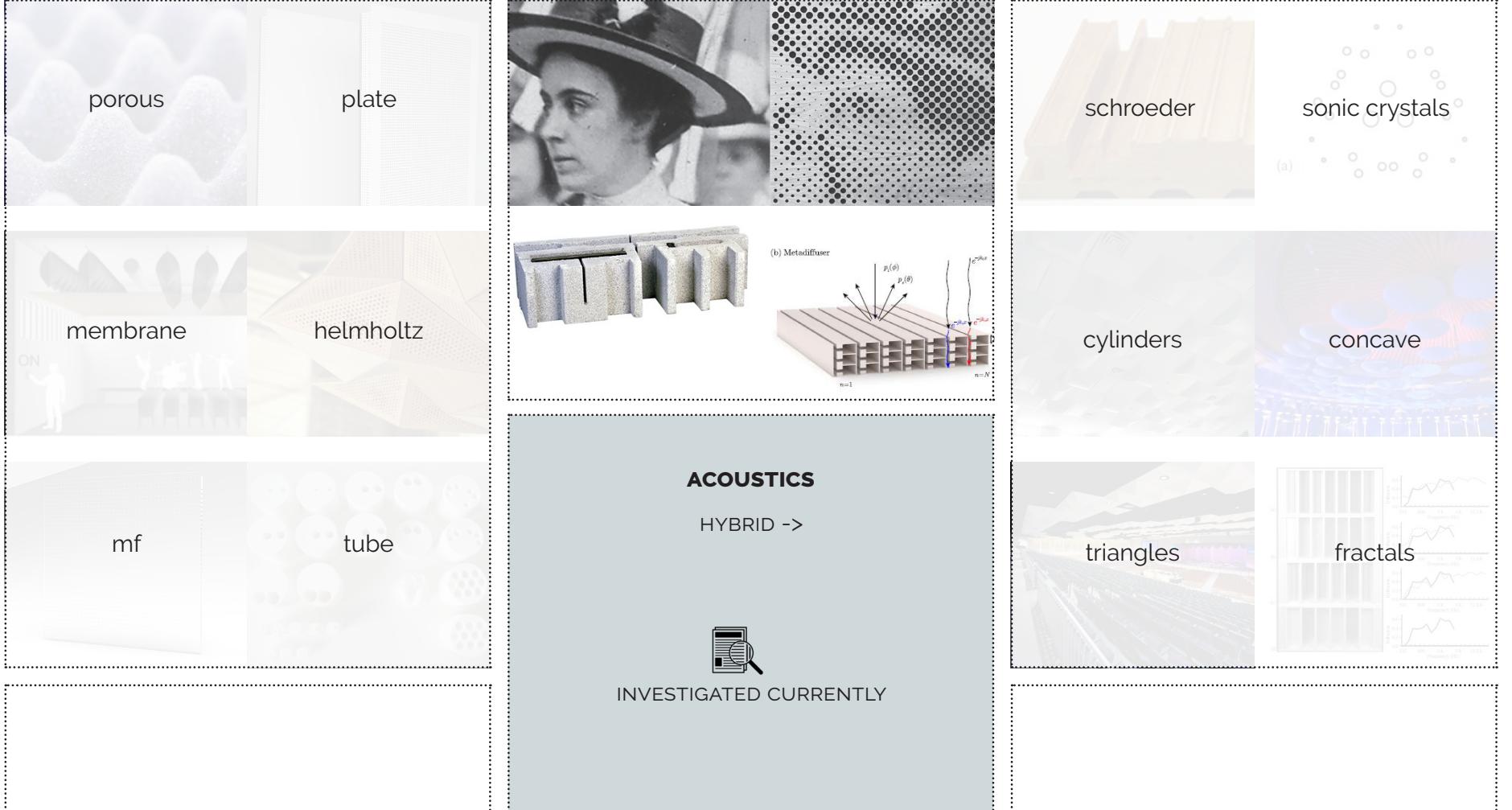
(a)





The graphs show sound absorption coefficients (0.0 to 1.0) versus Frequency (Hz) (315, 630, 1250, 2500, 5000, 10000, 20000). The top graph shows a broad peak around 1000-2000 Hz. The middle graph shows a peak around 1000-2000 Hz. The bottom graph shows a peak around 1000-2000 Hz.

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porous plate

membrane helmholtz

mf tube

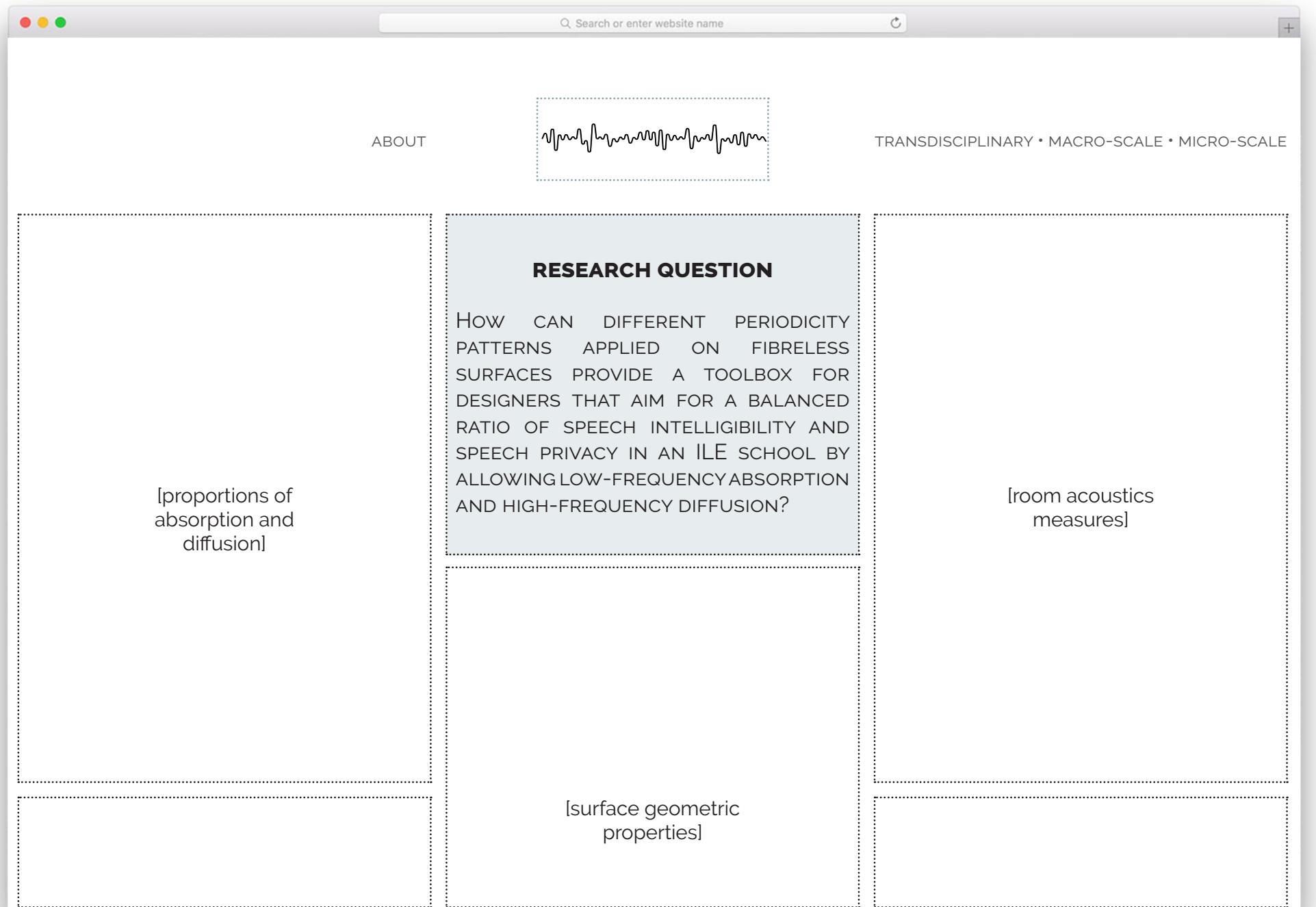
(a) schroeder sonic crystals

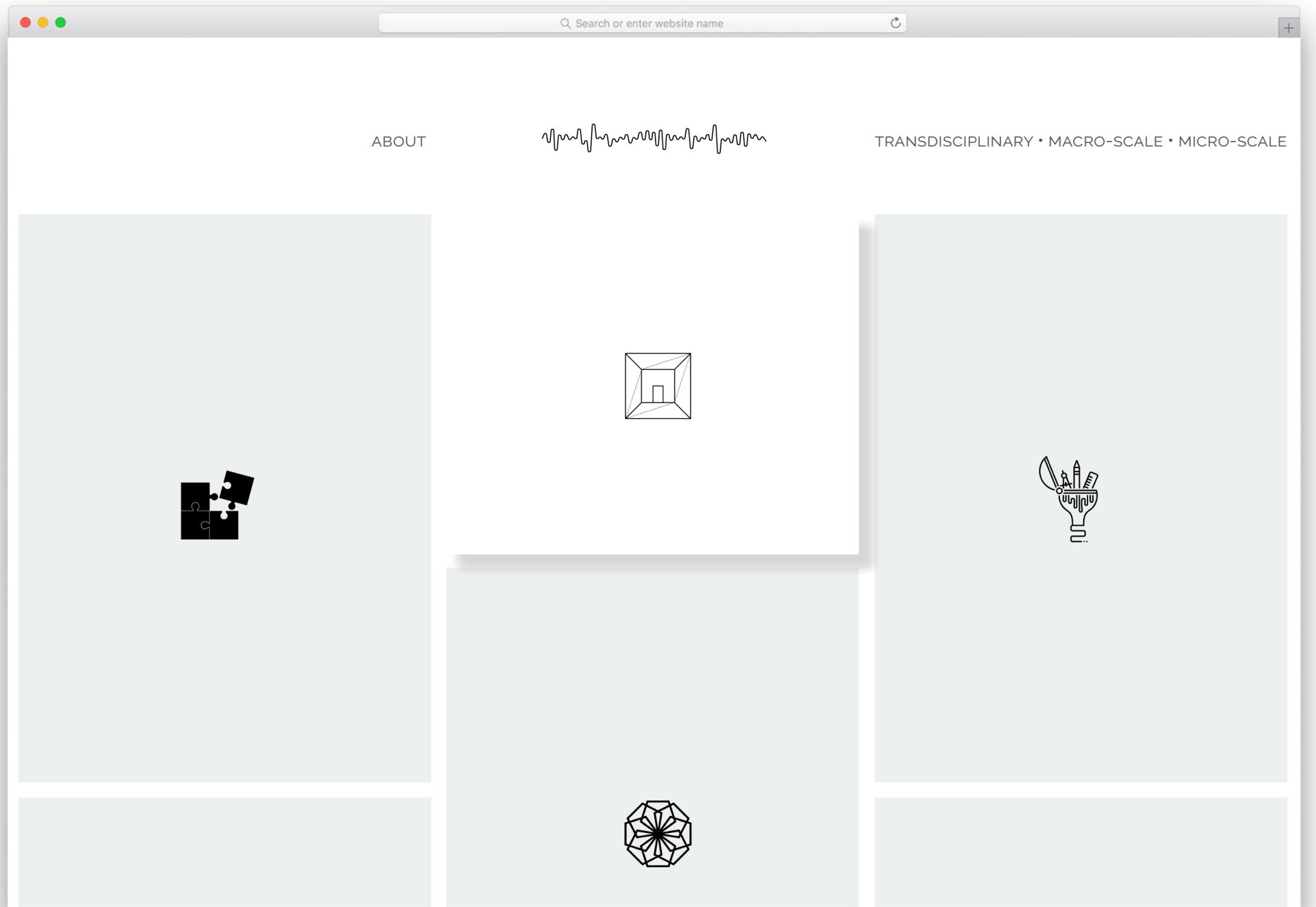
cylinders concave

triangles fractals

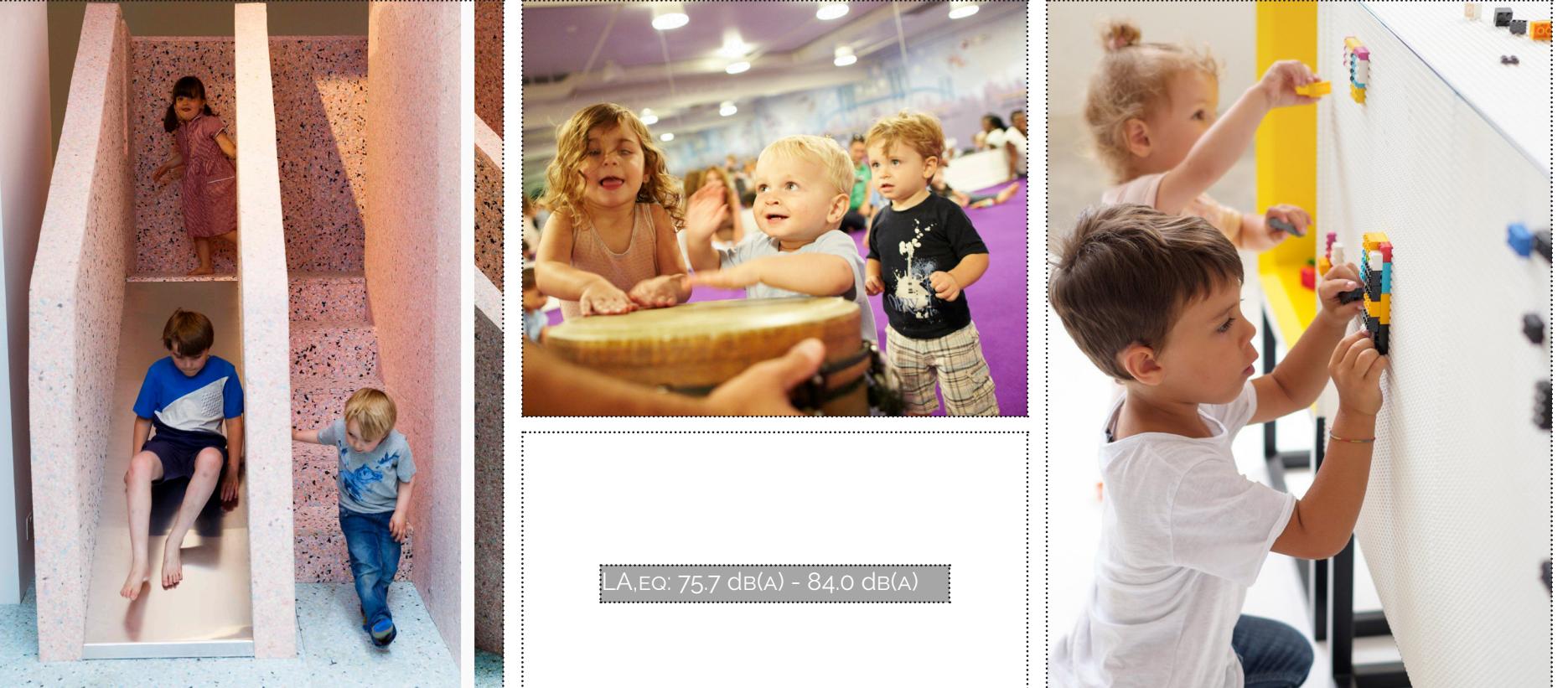
ACOUSTICS
HYBRID ->

INVESTIGATED CURRENTLY





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LA, EQ: 75.7 dB(A) - 84.0 dB(A)

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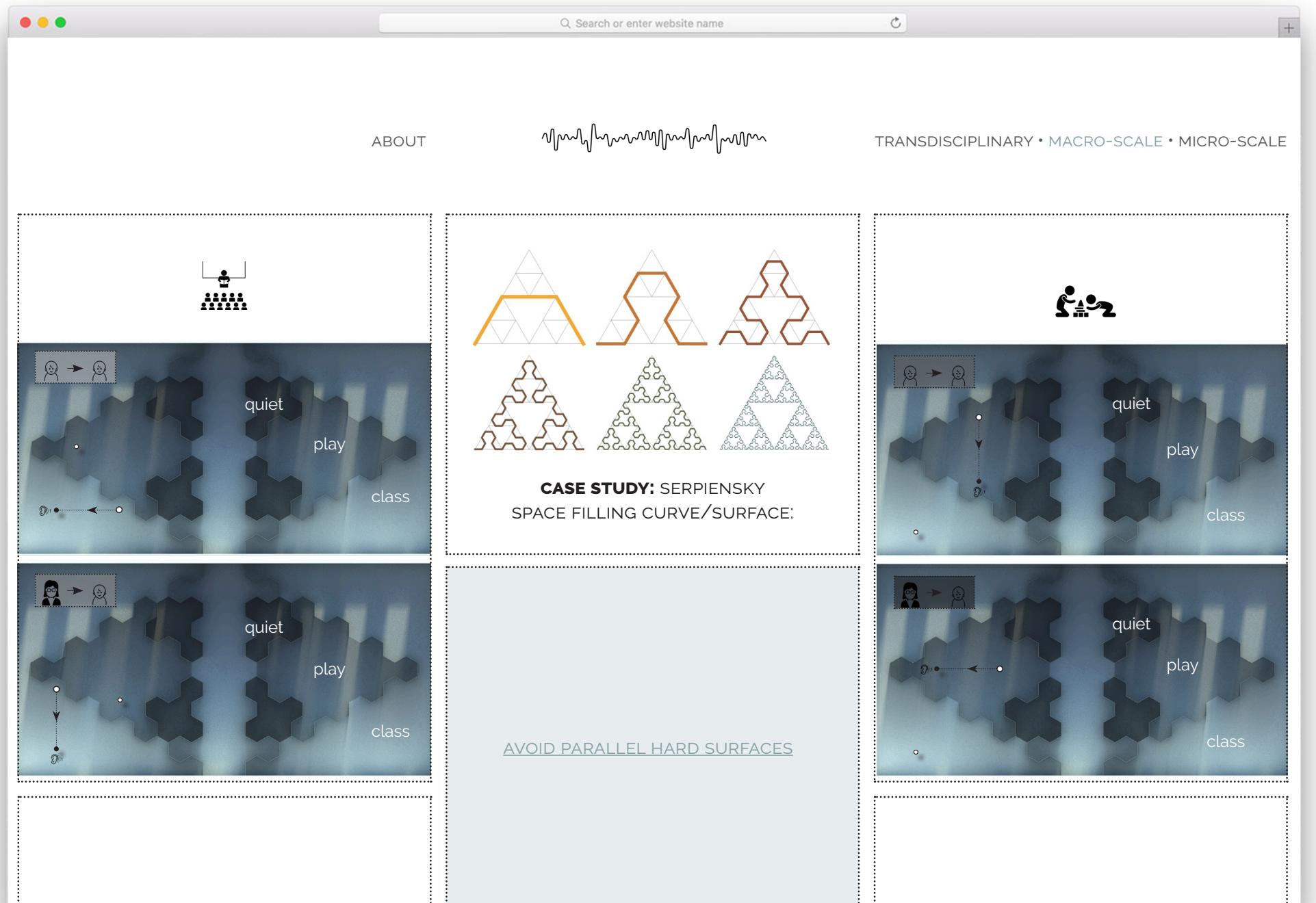
| Measures | Parameters | Comments | |
|----------------------------------|---------------------|----------|--|
| noise levels | | | |
| 1 play area | $L_{A,EQ}$ DB(A) | >60 | CURRENTLY UP TO 80dB(A) |
| 2 high task concentration | | 45-55 | |
| reverberation time | | | |
| 1 open work-space | T_{30} [s] | 0.4-0.6 | THOUGH LOW, SPL CAN REMAIN HIGH |
| 2 play room | | 0.4 | |
| Intelligibility | | | |
| 1 speech intelligibility | STI | 0.6-1 | REFLECTIONS TO RETAIN THE SOUND ENERGY INSIDE |
| 2 speech privacy | | 0.2< | |
| Early-Arriving Speech Energy | | | |
| 1 inside zone | U_{50} | ? | REVISITE WEIGHT FACTORS |
| 2 outside zone | | ? | |

60-75 CHILDREN: 1800M³
PLAYROOM USERS: 7, IMPACT ON NOISE LEVEL
GROUP SIZE PER CLASSROOM: 15
ACTIVITY ZONES:
PLAYROOM-CLASS-WITHDRAWAL

BACKGROUND NOISE LEVEL **REVERBERATION TIME** **ROOM GEOMETRY**
SPEECH INTELLIGIBILITY **SMALL-TO-NOISE RATIO**

CHOOSE SCENARIO:
1. ABSORPTIVE
2. NORMAL

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CASE STUDY: SERPIENSKY SPACE FILLING CURVE/SURFACE:

AVOID PARALLEL HARD SURFACES

ABOUT

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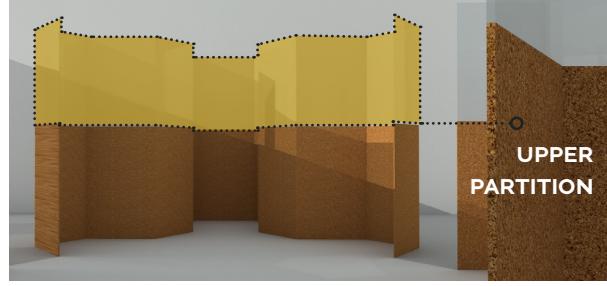
%

| ABSORPTION COEFFICIENTS (A) | | | | | | | |
|-----------------------------|-----------------------------------|-----|-----|----|----|----|----|
| upper partition (0.8m) | Octave band centre frequency (Hz) | | | | | | |
| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| 1 | 6 | 28 | 70 | 68 | 74 | 53 | 53 |
| 2 | 10 | 45 | 85 | 30 | 10 | 5 | 5 |
| 3 | 50 | 90 | 90 | 25 | 25 | 25 | 25 |

lower partition (1m)

| | | | | | | | |
|---|----|----|----|----|----|----|----|
| 4 | 50 | 90 | 90 | 25 | 25 | 25 | 25 |
|---|----|----|----|----|----|----|----|

PROHIBIT THE TEACHER'S DIRECT SPEECH FROM BEING TRANSMITTED TO THE IMMEDIATE SURROUNDINGS + TRANSPARENCY TO OBTAIN VISUAL CONTROL.



call

GA "VIRTUAL" MEASUREMENT:
APPROXIMATIONS OF SOUND PROPAGATION
(ENERGY-BASED RATHER THAN SOLVING THE
WAVE EQUATION),

%

| SCATTERING COEFFICIENTS (s) | | | | | | | |
|-----------------------------|-----------------------------------|-----|-----|----|----|----|----|
| upper partition (0.8m) | Octave band centre frequency (Hz) | | | | | | |
| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 25 | 25 | 25 | 50 | 50 | 50 | 50 |

lower partition (1m)

| | | | | | | | |
|---|----|----|----|----|----|----|----|
| 4 | 25 | 25 | 25 | 50 | 50 | 50 | 50 |
|---|----|----|----|----|----|----|----|



ABOUTTRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

T30

| | 125 | 250 | 500 | 1k | 2k | 4k | 8k | 16k |
|------|------|------|------|------|------|------|------|------|
| d1.4 | 0.60 | 0.40 | 0.40 | 0.45 | 0.55 | 0.50 | 0.30 | 0.20 |
| d2.4 | 0.60 | 0.40 | 0.40 | 0.50 | 0.60 | 0.55 | 0.35 | 0.25 |
| d3.4 | 0.50 | 0.30 | 0.30 | 0.40 | 0.45 | 0.40 | 0.25 | 0.15 |

1. MPP FOIL "MICROSORBER"
2. MPP GLASS, 5 MM CAVITY
3. BALANCED

STI

| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
|------|------|------|------|------|------|------|------|
| d1.4 | 0.45 | 0.55 | 0.55 | 0.60 | 0.65 | 0.70 | 0.65 |
| d2.4 | 0.45 | 0.55 | 0.60 | 0.65 | 0.70 | 0.75 | 0.65 |
| d3.4 | 0.45 | 0.55 | 0.55 | 0.60 | 0.65 | 0.70 | 0.65 |

ABSORPTION COEFFICIENTS (A)

| upper partition (0.8m) | Octave band centre frequency (Hz) | | | | | | |
|------------------------|-----------------------------------|-----|-----|----|----|----|----|
| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| 1 | 6 | 28 | 70 | 68 | 74 | 53 | 53 |
| 2 | 10 | 45 | 85 | 30 | 10 | 5 | 5 |
| 3 | 50 | 90 | 90 | 25 | 25 | 25 | 25 |

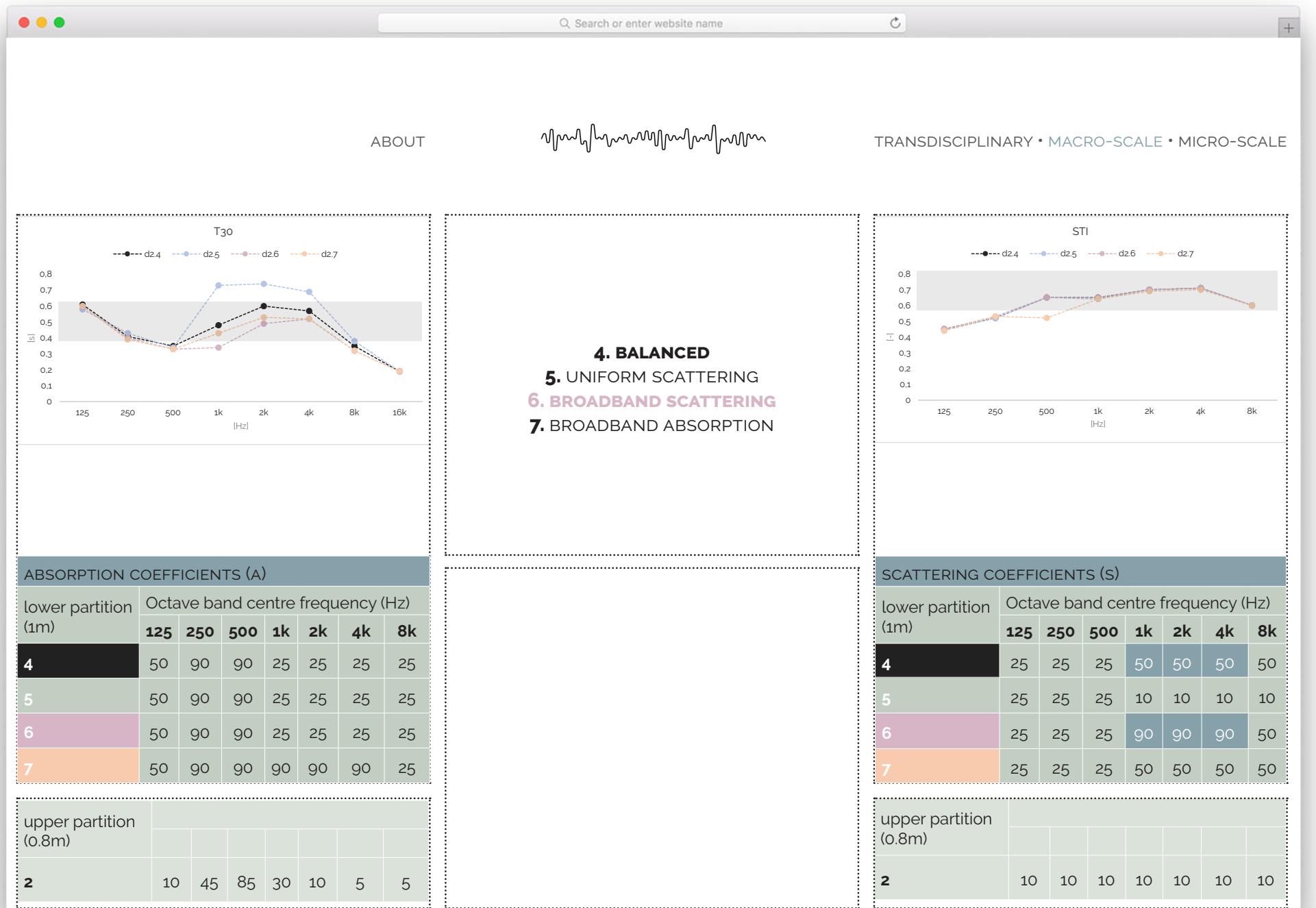
**REVISE CERTAIN ACOUSTIC MEASURES
TAILOR-MADE FOR VARIOUS USERS
(WEIGHT FACTORS+HYPOTHESIS)**

SCATTERING COEFFICIENTS (s)

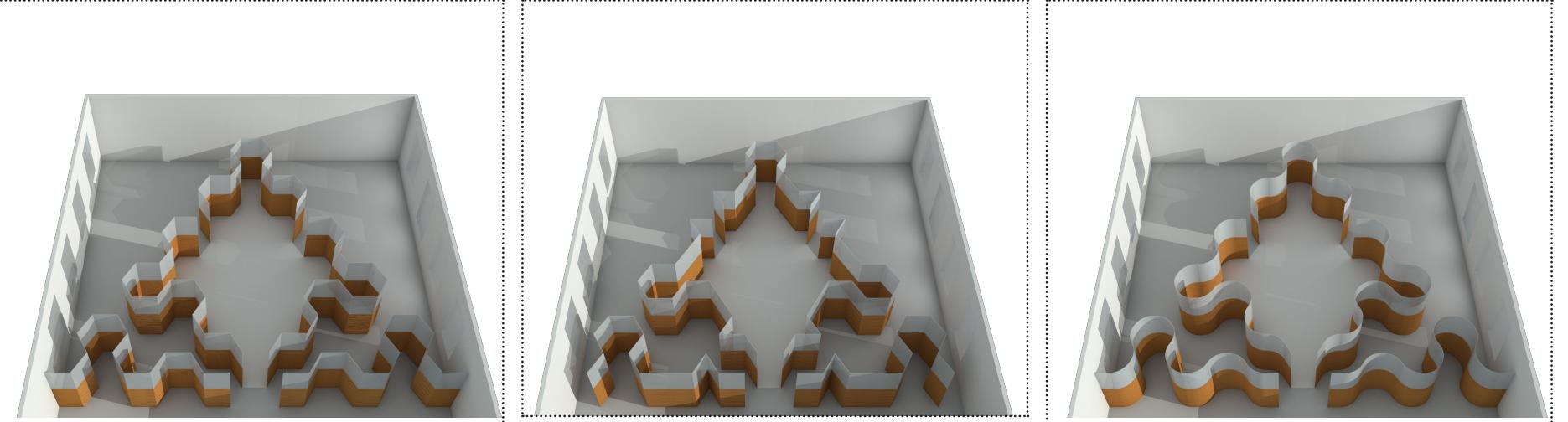
| upper partition (0.8m) | Octave band centre frequency (Hz) | | | | | | |
|------------------------|-----------------------------------|-----|-----|----|----|----|----|
| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| 1 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 2 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| 3 | 25 | 25 | 25 | 50 | 50 | 50 | 50 |

lower partition (1m)

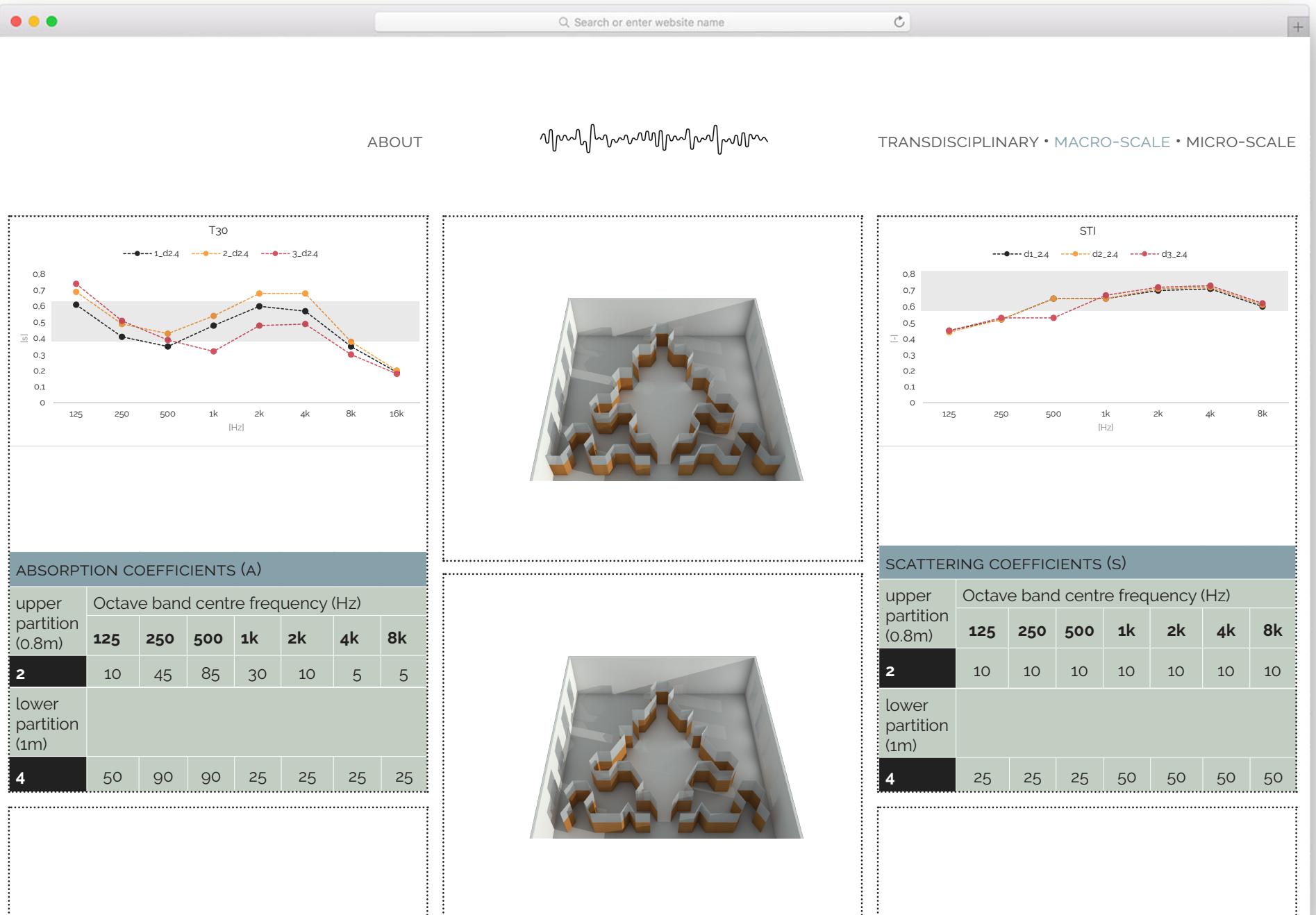
| | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
|---|-----|-----|-----|----|----|----|----|
| 4 | 50 | 90 | 90 | 25 | 25 | 25 | 25 |



ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



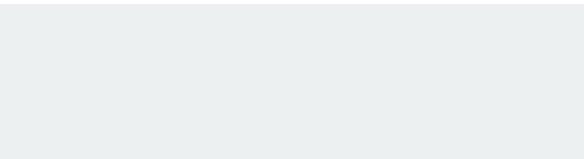
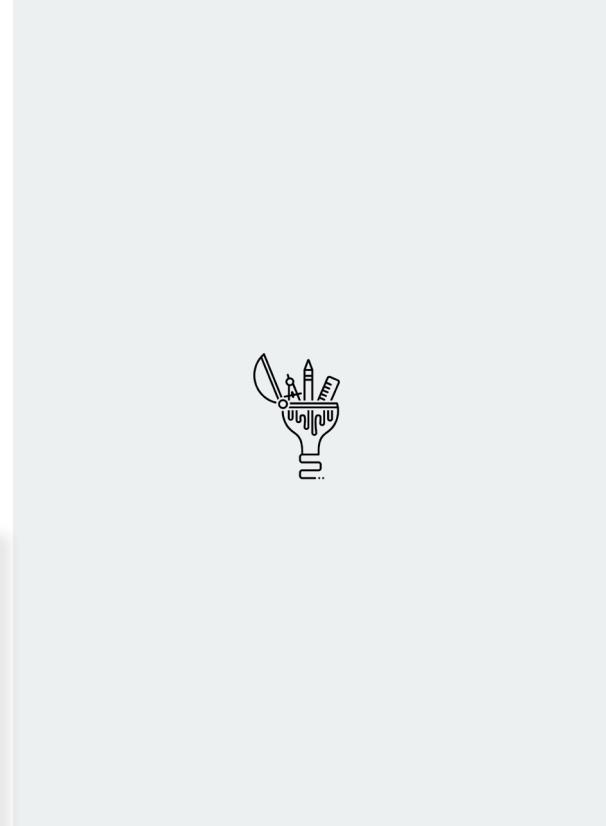
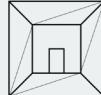
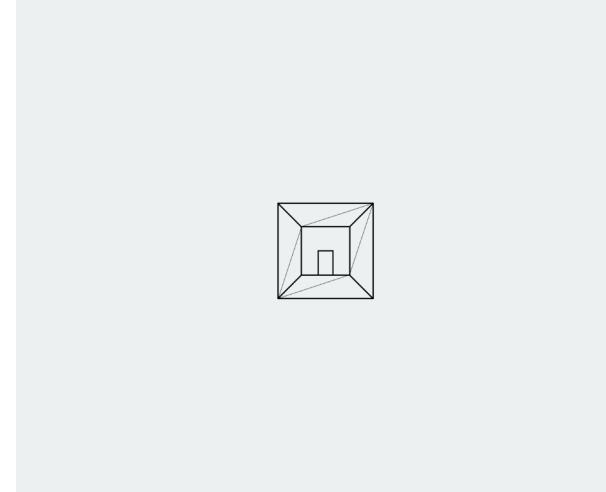
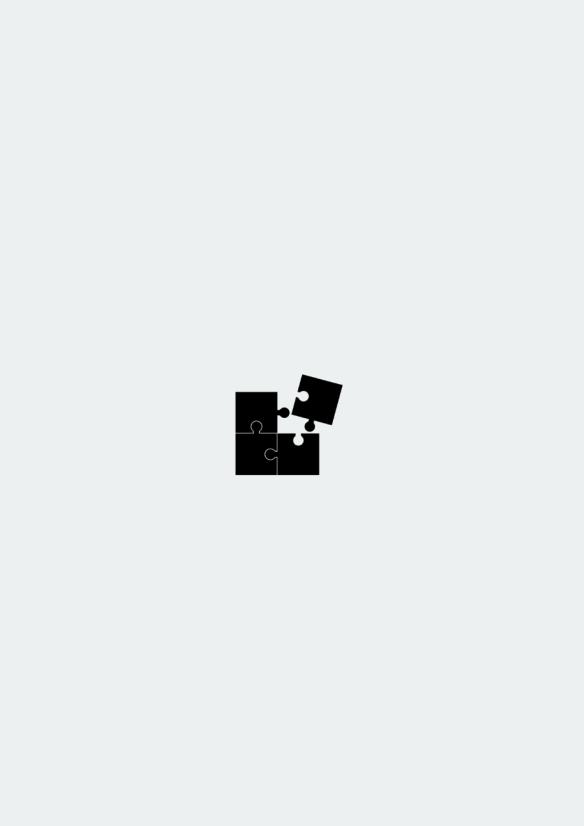
INSIGHT OF THE COMPLEXITY
BETWEEN GEOMETRY AND
ACOUSTICAL PROPERTIES





TOOLBOX

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

 » COMPLEX SURFACES
-> GREATER SCATTERING

 » PERIODIC SURFACES: REDUCE THE COMPLEXITY OF THE REFLECTED SOUND FIELD
NON-PERIODIC SURFACES: POTENTIAL FOR UNIFORM DIRECTIVITY

 » LONG NUMBER SEQUENCE WITH GOOD APERIODIC AUTOCORRELATION

 » NON-REPETITIVE SEQUENCE VIA THE GEOMETRY ARTICULATION

| | periodicity | parameters | profile | constraints |
|-------|---|---|---|-------------------------------|
| steps | <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • side length • well • period | <ul style="list-style-type: none"> • extruded • tapered | amount of cells production |

WIDTH + DEPTH CONSTRAINTS FOR SPATIAL AND TEMPORAL DISPERSION



VISUAL FREEDOM OF THE SHAPE



COMPLEXITY: LOW LEVEL RULES / HIGH LEVEL OF SELF-ORGANIZATION



SIMPLICITY + ARCHITECTURAL SMARTNESS: PRESERVING THE ECONOMY OF MEANS FOR THE END USERS

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

| | |
|---|---|
|  | » COMPLEX SURFACES → GREATER SCATTERING |
|  | » PERIODIC SURFACES: REDUCE THE COMPLEXITY OF THE REFLECTED SOUND FIELD NON-PERIODIC SURFACES: POTENTIAL FOR UNIFORM DIRECTIVITY |
|  | » LONG NUMBER SEQUENCE WITH GOOD APERIODIC AUTOCORRELATION |
|  | » NON-REPETITIVE SEQUENCE VIA THE GEOMETRY ARTICULATION |
| | |

| steps | periodicity | parameters | profile | constraints |
|-------|---|---|---|-------------------------------|
| | <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • side length • well • period | <ul style="list-style-type: none"> • extruded • tapered | amount of cells production |

| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

| | | | |
|---|---|--|--|
| WIDTH + DEPTH CONSTRAINTS FOR SPATIAL AND TEMPORAL DISPERSION | | | |
|  | VISUAL FREEDOM OF THE SHAPE | | |
|  | COMPLEXITY: LOW LEVEL RULES / HIGH LEVEL OF SELF-ORGANIZATION | | |
|  | SIMPLICITY + ARCHITECTURAL SMARTNESS: PRESERVING THE ECONOMY OF MEANS FOR THE END USERS | | |
| | | | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

| | periodicity | parameters | profile | con-strains |
|-------|---|---|---|----------------------|
| steps | <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • cells • period • well | <ul style="list-style-type: none"> • extruded • tapered | amount finite set |

COMPLEX SURFACES
-> GREATER SCATTERING

»  PERIODIC SURFACES: REDUCE THE COMPLEXITY OF THE REFLECTED SOUND FIELD

NON-PERIODIC SURFACES: POTENTIAL FOR UNIFORM DIRECTIVITY

»  LONG NUMBER SEQUENCE WITH GOOD APERIODIC AUTOCORRELATION

»  NON-REPETITIVE SEQUENCE VIA THE GEOMETRY ARTICULATION

| well | depth-to-length ratio | | | |
|----------------|-----------------------|--------------------|---------------------|------------------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

WIDTH + DEPTH CONSTRAINTS FOR SPATIAL AND TEMPORAL DISPERSION

VISUAL FREEDOM OF THE SHAPE

COMPLEXITY: LOW LEVEL RULES / HIGH LEVEL OF SELF-ORGANIZATION

SIMPLICITY + ARCHITECTURAL SMARTNESS: PRESERVING THE ECONOMY OF MEANS FOR THE END USERS



ABOUT

The interface features three main panels. The left panel displays a complex, organic tessellation pattern composed of irregular polygons. The middle panel shows a regular grid of rectangles with a green double-headed arrow indicating a scale or relationship between adjacent units. The right panel presents a geometric pattern of nested, rotated triangles forming a star-like shape. A search bar at the top center contains the placeholder text "Search or enter website name". Below the search bar are icons for refresh and a plus sign. The bottom of the interface is divided into several empty rectangular boxes for further content.

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

ABOUT

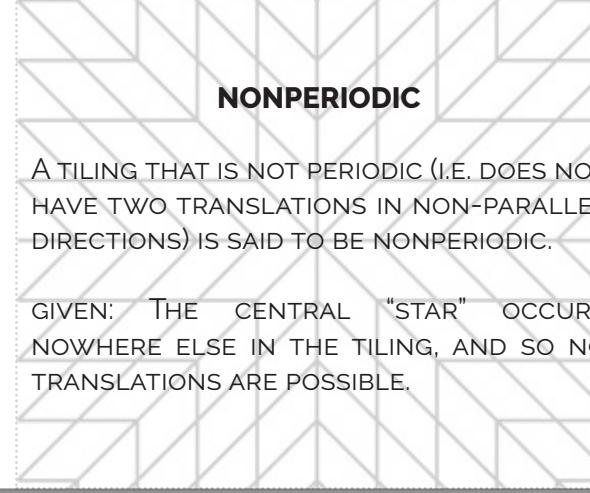
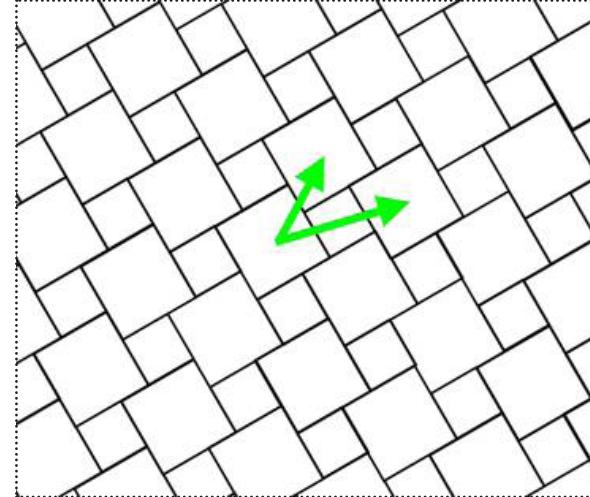
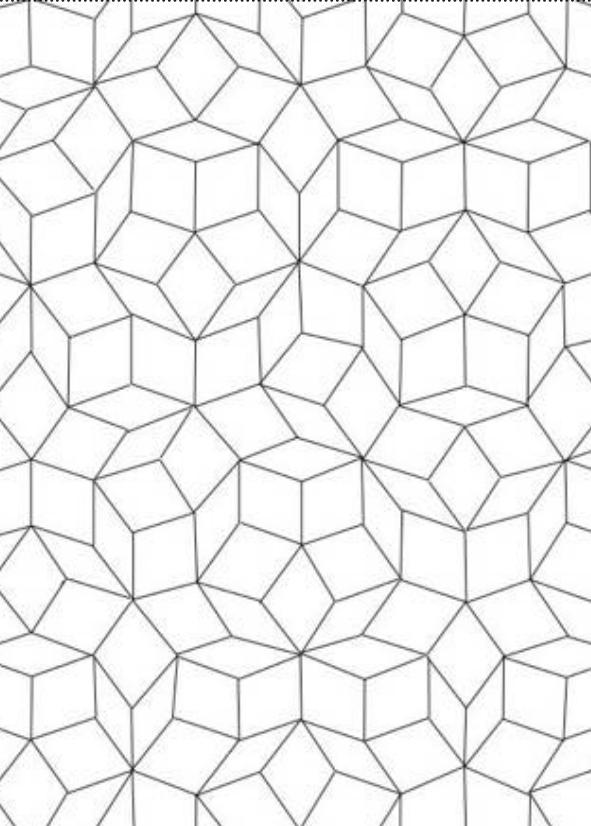
SEARCH

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

PERIODIC

A TILING IS SAID TO BE PERIODIC IF THERE EXIST, AMONG THE SYMMETRIES OF THE TILING, AT LEAST TWO TRANSLATIONS IN NON-PARALLEL DIRECTIONS.

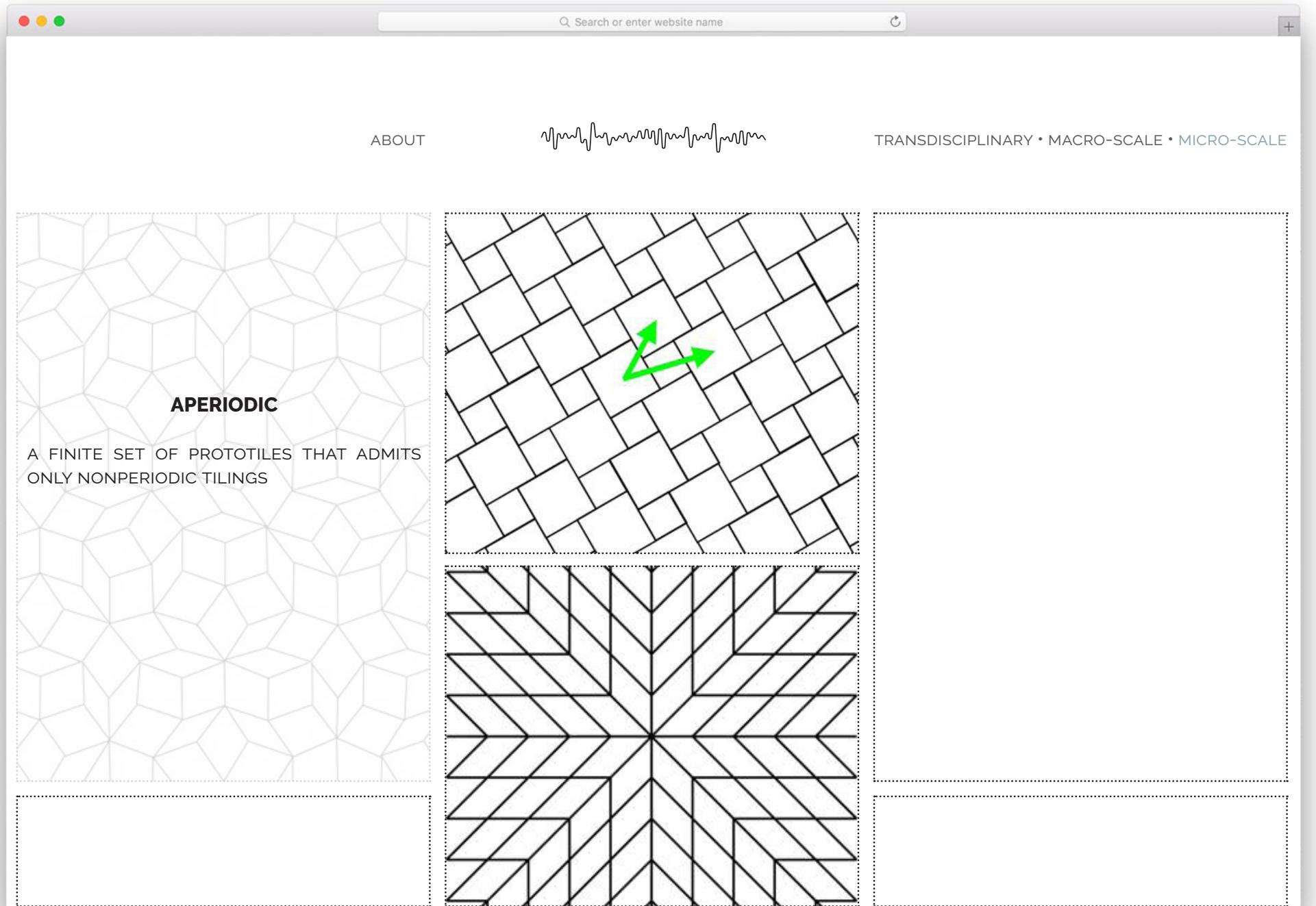
ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



NONPERIODIC

A TILING THAT IS NOT PERIODIC (I.E. DOES NOT HAVE TWO TRANSLATIONS IN NON-PARALLEL DIRECTIONS) IS SAID TO BE NONPERIODIC.

GIVEN: THE CENTRAL "STAR" OCCURS NOWHERE ELSE IN THE TILING, AND SO NO TRANSLATIONS ARE POSSIBLE.





TOOLBOX

ABOUT

A small icon of a wavy line with a circular arrow at the top right.

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

A large, semi-circular abstract pattern composed of numerous small, irregularly shaped polygons in shades of blue and grey, arranged in a tessellated, organic-looking design.

A rectangular abstract pattern composed of numerous small, irregularly shaped polygons in shades of blue and grey, arranged in a tessellated, organic-looking design.

A rectangular abstract pattern composed of numerous small, irregularly shaped polygons in shades of blue and grey, arranged in a tessellated, organic-looking design.

A large, semi-circular abstract pattern composed of numerous small, regular hexagons in shades of blue and grey, arranged in a more structured, grid-like pattern compared to the other images.

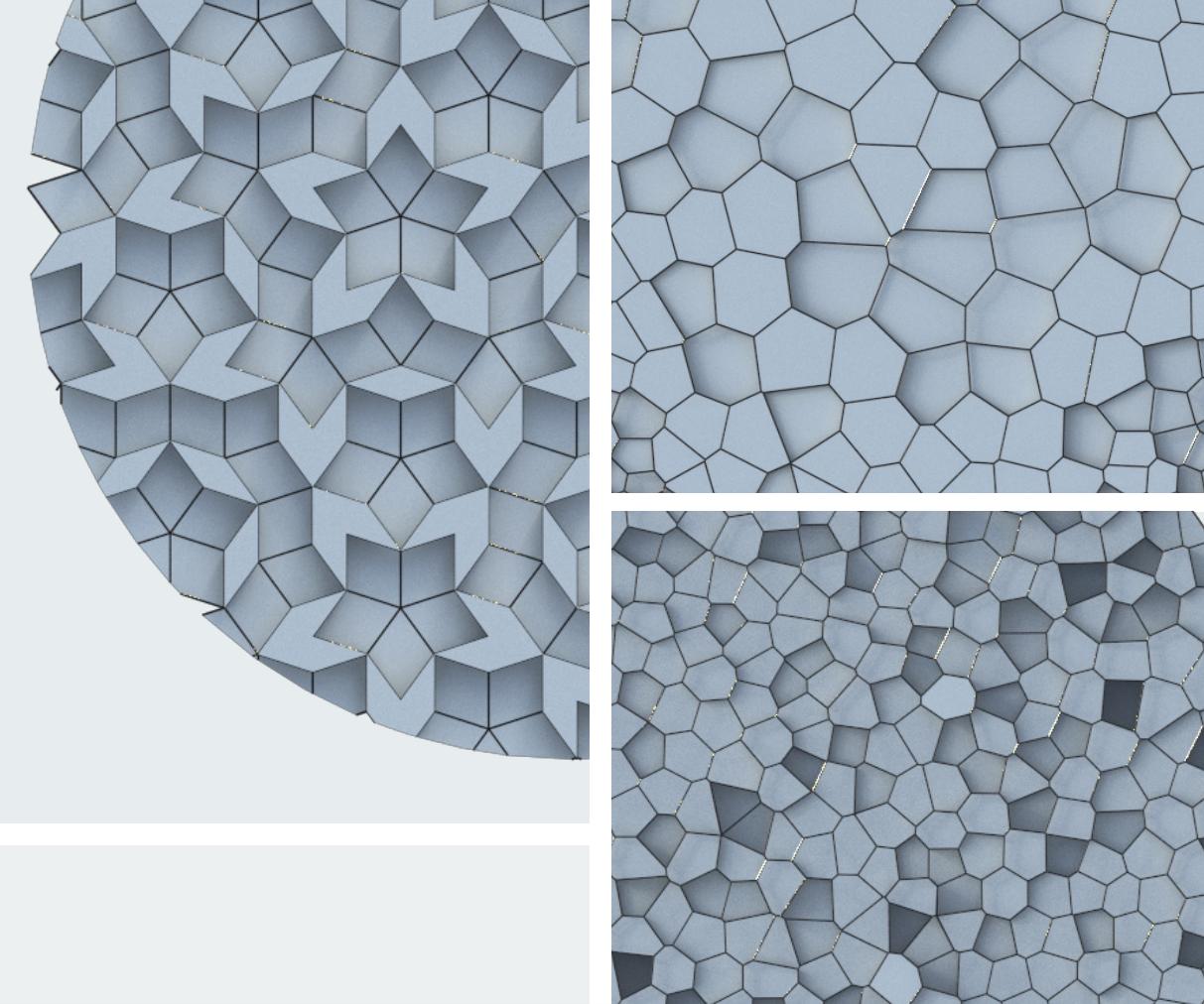
A large, semi-circular abstract pattern composed of numerous small, regular hexagons in shades of blue and grey, arranged in a more structured, grid-like pattern compared to the other images.



The screenshot shows a web browser window with the following elements:

- Toolbar:** Standard Mac OS X-style toolbar with red, yellow, and green buttons.
- Address Bar:** "Search or enter website name" with a magnifying glass icon and a refresh button.
- Page Content:**
 - Header:** "ABOUT" and a wavy line icon.
 - Section:** "PENROSE" with a large, light-grey Penrose tiling image.
 - Text:** "TWIN PARALLELOGRAMS": TWO PROTOTILES WITHOUT GAPS OR OVERLAPS. THE PAIR OF RHOMBUSES HAS EQUAL SIDES BUT THEIR ANGLES DIFFER.
PROPERTIES: RATIO OF THE TWO IS THE GOLDEN MEAN, SELF-SIMILARITY, FIVEFOLD ROTATIONAL SYMMETRY
 - Image:** Three smaller images of Penrose tilings in blue and grey, arranged vertically below the main image.
 - Footers:** Two light-grey rectangular blocks at the bottom of the page.
- Page Footer:** "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE"

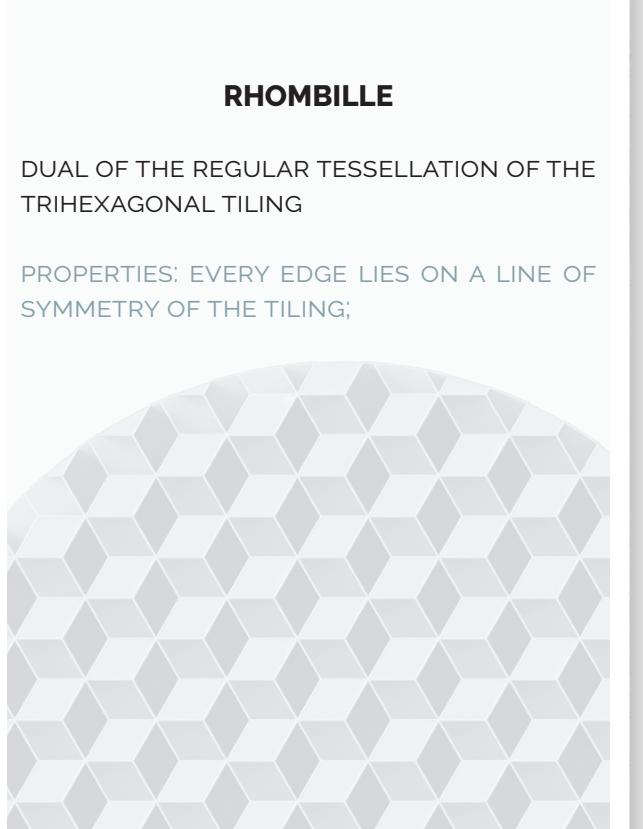
ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



RHOMBILLE

DUAL OF THE REGULAR TESSELLATION OF THE TRIHEXAGONAL TILING

PROPERTIES: EVERY EDGE LIES ON A LINE OF SYMMETRY OF THE TILING;



The screenshot shows a web browser window with a light gray header bar containing a search bar and a plus sign icon. Below the header is a navigation bar with three colored dots (red, yellow, green) and a menu icon. The main content area features a central wavy line icon above the word "ABOUT". To the right is a horizontal text "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE". The central part of the page displays three large Voronoi diagrams. The left diagram is a semi-circular shape with a complex, jagged boundary and a dense pattern of blue-shaded cells. The middle diagram is a rectangular shape with a smoother, more rounded boundary and a denser pattern of blue-shaded cells. The right diagram is a circular shape with a smooth boundary and a regular pattern of blue-shaded cells. Below the middle diagram, the word "VORONOI" is written in bold black capital letters. Underneath "VORONOI", there is descriptive text: "DIVISION OF SPACE INTO CONTIGUOUS NEIGHBOURING CELLS. DUAL TO ITS DELAUNAY TRIANGULATION". At the bottom of the page, there is a summary of Voronoi properties: "PROPERTIES: EACH POINT HAS AN ASSOCIATED CELL CONSISTING OF ALL THE POINTS CLOSER TO THAT SITE THAN TO ANY OTHER;". The entire page has a clean, modern design with a white background and a minimalist aesthetic.

ABOUT

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

VORONOI

DIVISION OF SPACE INTO CONTIGUOUS NEIGHBOURING CELLS. DUAL TO ITS DELAUNAY TRIANGULATION

PROPERTIES: EACH POINT HAS AN ASSOCIATED CELL CONSISTING OF ALL THE POINTS CLOSER TO THAT SITE THAN TO ANY OTHER;

The screenshot shows a web browser window with a light gray header bar containing a search bar and a plus sign icon. Below the header is a navigation bar with three colored dots (red, yellow, green) and a menu icon. The main content area features a large image of a Voronoi tessellation pattern. At the top center of this image is a small wavy line icon. To the left of the wavy line is the word "ABOUT". To the right is the text "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE". The central part of the image contains the title "VORONOI CVT" in bold capital letters, followed by a descriptive paragraph: "THE GENERATORS OF THE VORONOI TESSELLATIONS COINCIDE WITH THE MASS CENTROIDS OF THE RESPECTIVE VORONOI REGIONS , LLOYD'S ALGORITHM/RELAXATION: CLOSE APPROXIMATION OF CVT". Below this text is a smaller, darker version of the Voronoi pattern. The bottom of the image has two light gray rectangular bars.

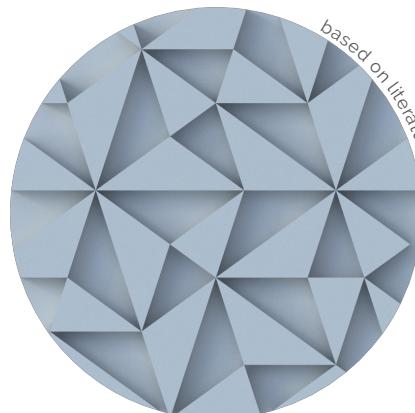
ABOUT

VORONOI CVT

THE GENERATORS OF THE VORONOI TESSELLATIONS COINCIDE WITH THE MASS CENTROIDS OF THE RESPECTIVE VORONOI REGIONS , LLOYD'S ALGORITHM/RELAXATION: CLOSE APPROXIMATION OF CVT

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



based on literature

ISO SCATTERING

AMOUNT OF ENERGY REFLECTED IN THE SPECULAR DIRECTION

-

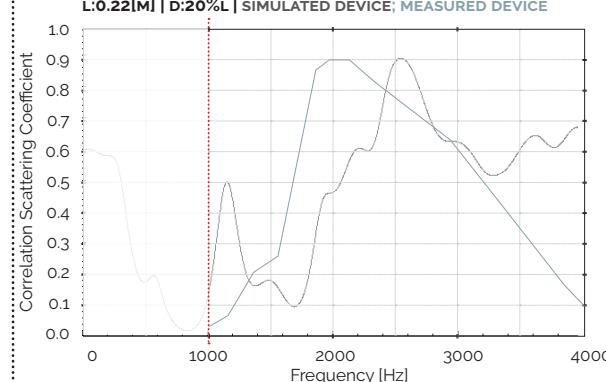
QUALITY OF THE PRODUCED DISPERSION

CORRELATION SCATTERING

DISSIMILARITY BETWEEN THE TEST AND FLAT SURFACE

MORE RESEARCH FOR COMPARISON PURPOSES

L:0.22[M] | D:20%L | SIMULATED DEVICE; MEASURED DEVICE



Correlation Scattering Coefficient

Frequency [Hz]

PACHYDERM ACOUSTICS PLUG-IN FOR GRASSHOPPER

! normal incidence: periodicity is highly dependent on the incidence angle



SCATTERING COEFFICIENT



ABOUT

SEARCH

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

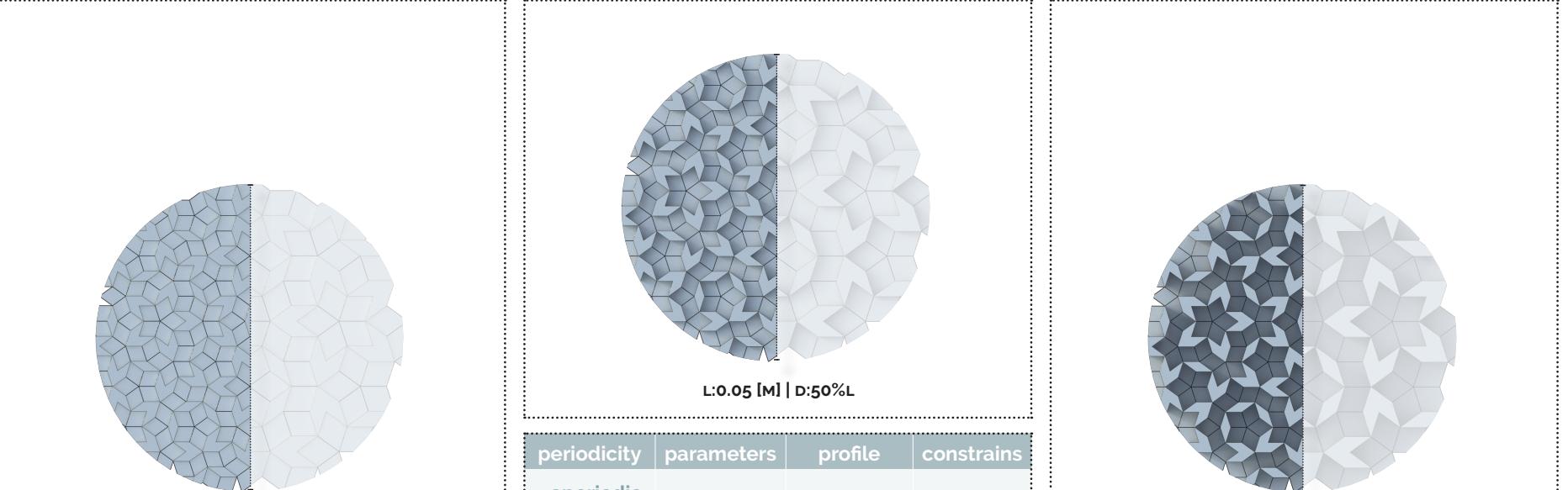
The screenshot shows a web browser window with a light gray header bar containing the standard Mac OS X red, yellow, and green buttons, a search bar with the placeholder "Search or enter website name", and a refresh button. Below the header is a navigation bar with three items: "ABOUT", a waveform icon, and "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE". The main content area is divided into several sections by dotted lines. On the left is a large grid of light gray hexagons. In the center is a smaller square containing a diagram of a hexagonal lattice with red dots at some vertices and black plus signs at others. To the right is a 3D perspective view of a stack of hexagonal prisms. At the bottom are two empty rectangular boxes.



ABOUT TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

SUPERIOR PERFORMANCE

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



| periodicity | parameters | profile | constraints |
|--|---|--|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

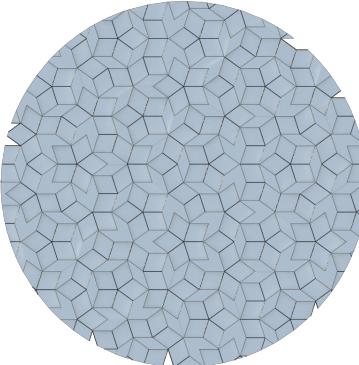
| well | depth-to-length ratio | | | |
|-------------------|-----------------------|----------------|-----------------|--------------------|
| <u>two depths</u> | $d=20\% l [m]$ | $d=50\% l [m]$ | $d=150\% l [m]$ | |
| various depths | $d=20\% l [m]: 3$ | | | $d=200\% l [m]: 3$ |
| narrow width | $d=20\% l [m]$ | $d=50\% l [m]$ | $d=150\% l [m]$ | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

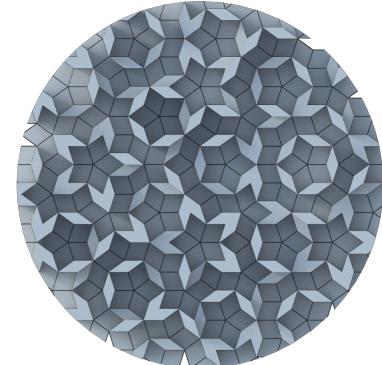


| periodicity | parameters | profile | constraints | |
|--|---|--|-------------------|-----------------|
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production | |
| well | depth-to-length ratio | | | |
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L



L:0.05 [M] | D:200%L

| periodicity | parameters | profile | constraints |
|--|---|--|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

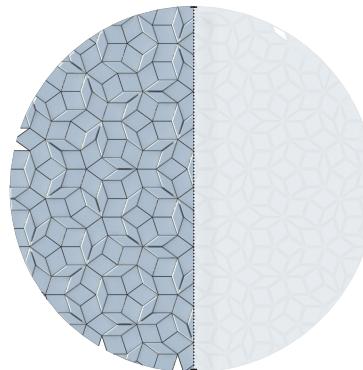
| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |



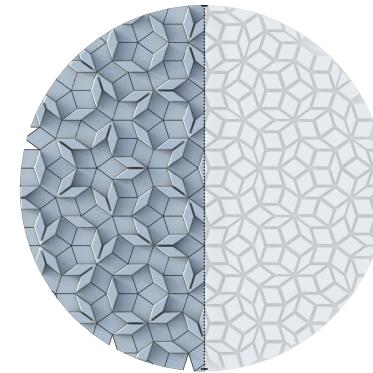
ABOUT



TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

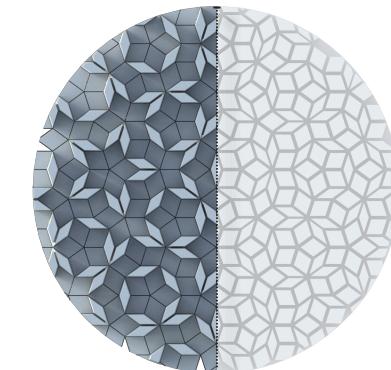


L:0.05 [M] | D:20%L



L:0.05 [M] | D:50%L

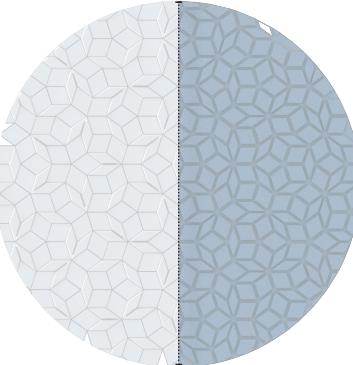
| periodicity | parameters | profile | constraints |
|---|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |



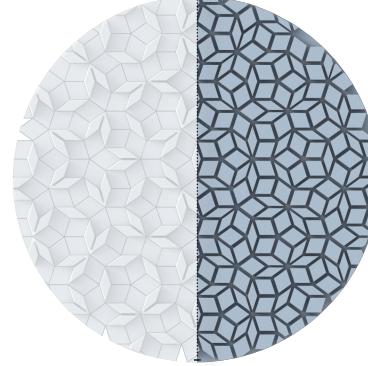
L:0.05 [M] | D:150%L

| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

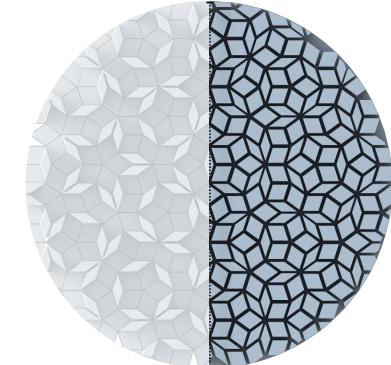
ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L



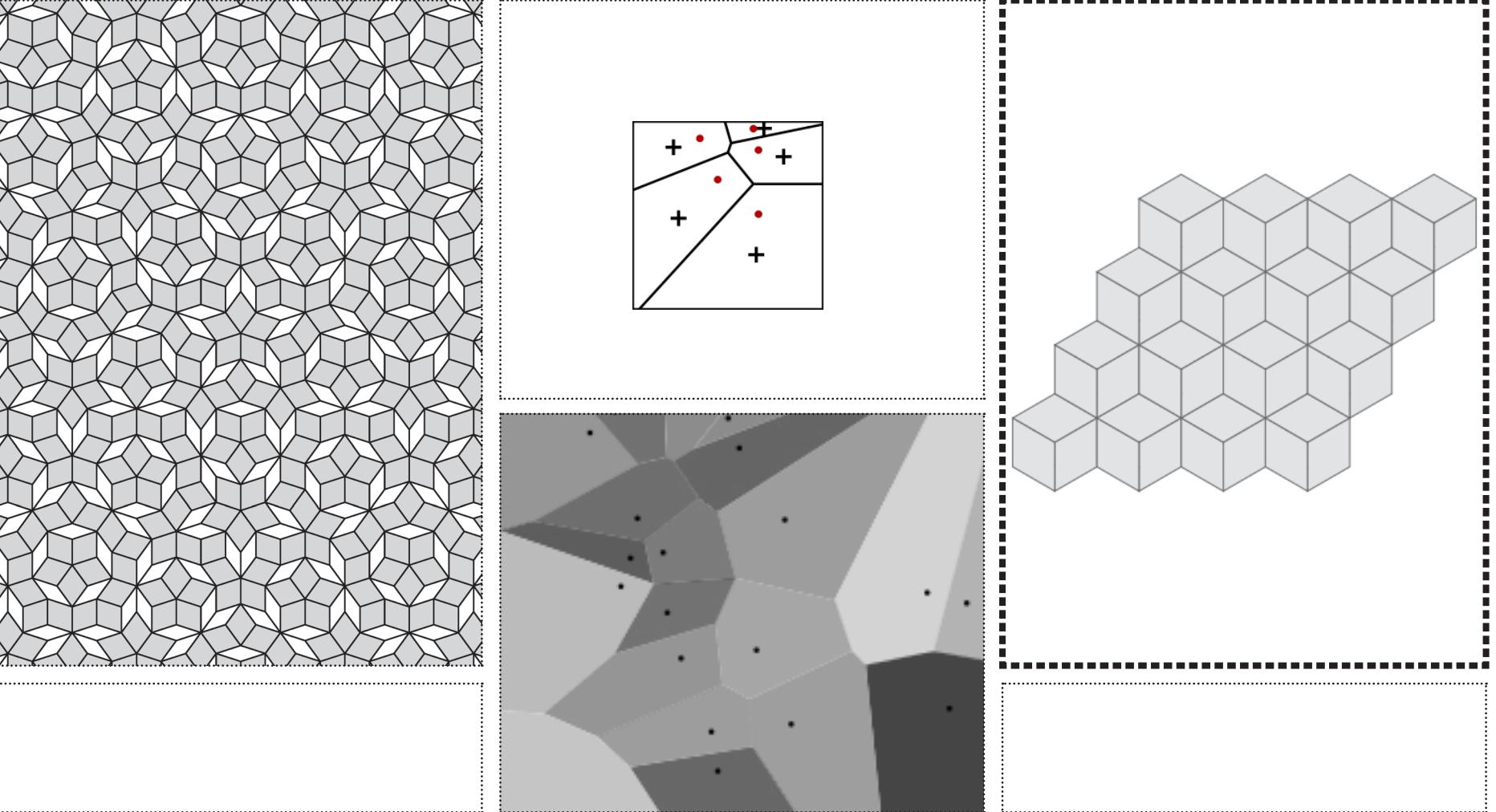
L:0.05 [M] | D:50%L



L:0.05 [M] | D:150%L

| periodicity | parameters | profile | constraints | |
|---|---|---|----------------------|-----------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production | |
| well | depth-to-length ratio | | | |
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



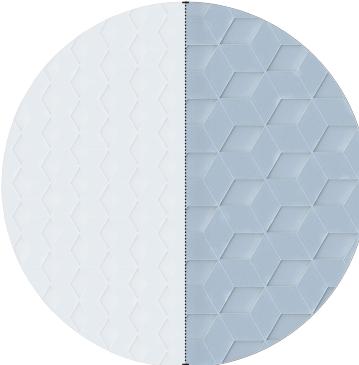
The image shows a web browser interface with a search bar at the top. Below the search bar are three buttons: red, yellow, and green. The main content area contains several geometric diagrams. On the left, there is a large pattern of light gray hexagons on a white background. In the center, there is a diagram of a Voronoi tessellation where a set of red dots (sites) determine the boundaries of their respective regions (cells), which are marked with black plus signs (+). Below this, there is a grayscale version of the same Voronoi tessellation, with darker shades representing different regions. To the right, there is a 3D perspective view of a hexagonal lattice structure composed of many small cubes.



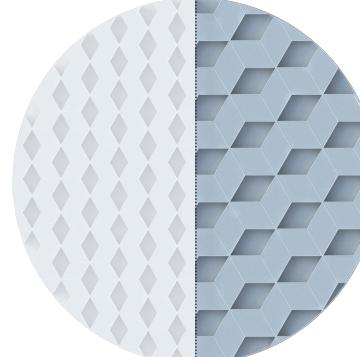
| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

| well | depth-to-length ratio | | | |
|-------------------|-----------------------|--------------------|---------------------|------------------------|
| <u>two depths</u> | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.085 [M] | D:20%L | EXTRUDED



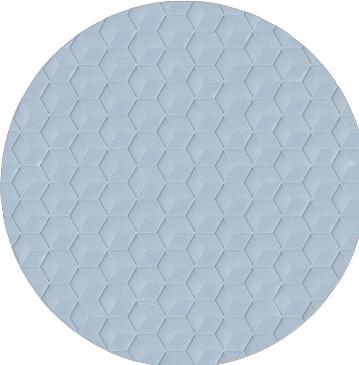
L:0.085 [M] | D:50%L | EXTRUDED

| periodicity | parameters | profile | constraints |
|--|---|--|--|
| <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • cells • period • well | <ul style="list-style-type: none"> • extruded • tapered | <ul style="list-style-type: none"> amount production |

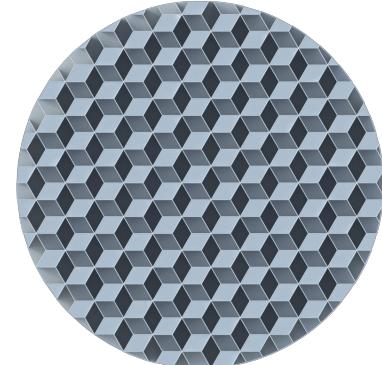
| well | depth-to-length ratio | | | |
|-------------------|-----------------------|-------------|--------------|-----------------|
| <u>two depths</u> | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |



ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L

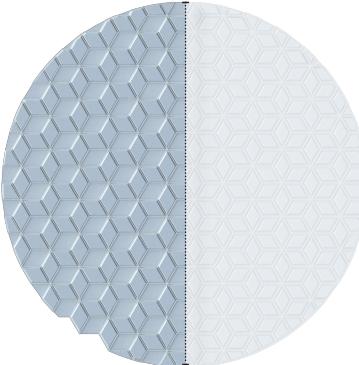


L:0.05 [M] | D:200%L

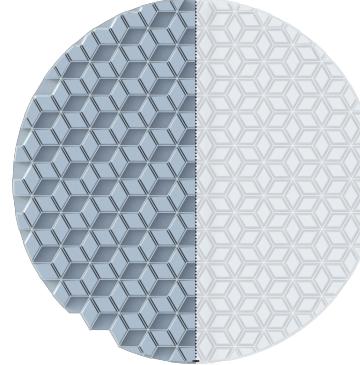
| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

| well | depth-to-length ratio | | | |
|----------------|-----------------------|--------------------|---------------------|------------------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

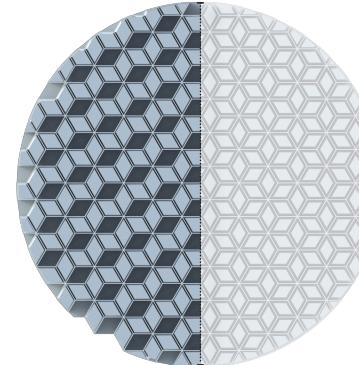
ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L



L:0.05 [M] | D:50%L

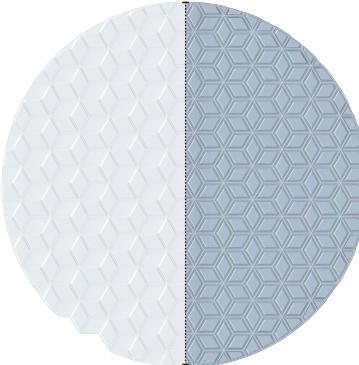


L:0.05 [M] | D:150%L

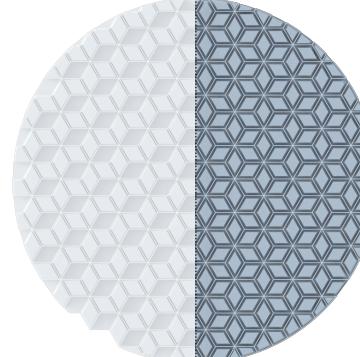
| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

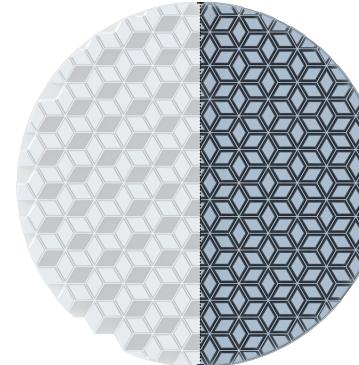


L:0.05 [M] | D:20%L



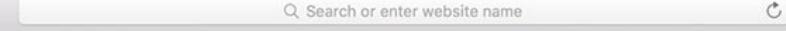
L:0.05 [M] | D:50%

| periodicity | parameters | profile | constraints |
|--|---|--|--|
| <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • cells • period • well | <ul style="list-style-type: none"> • extruded • tapered | <ul style="list-style-type: none"> amount production |

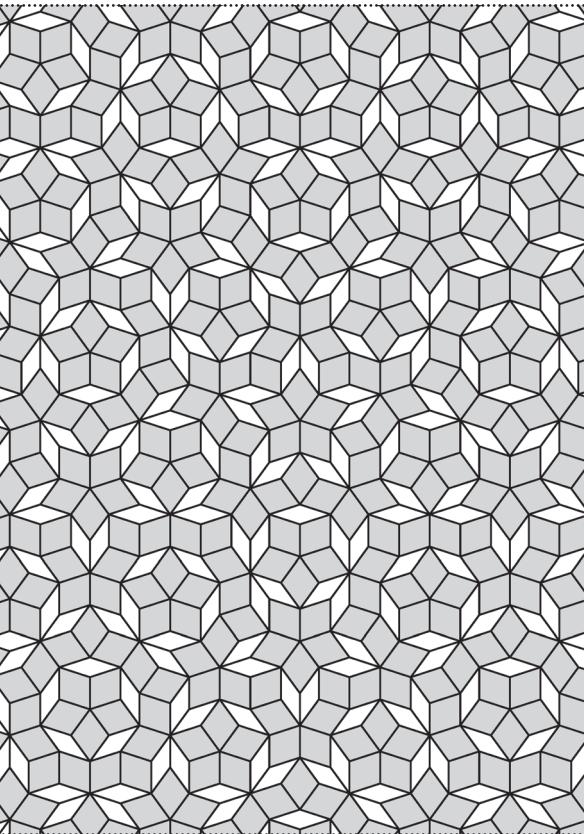


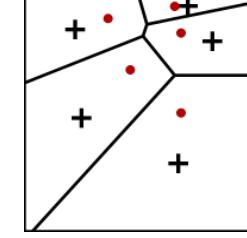
L:0.05 [M] | D:150%

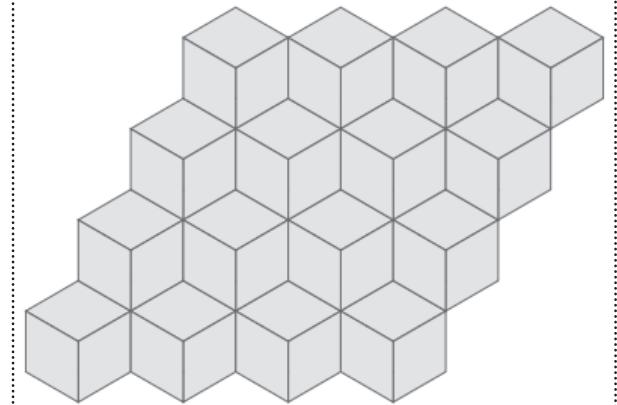
| well | depth-to-length ratio | | | |
|----------------|-----------------------|--------------------|---------------------|------------------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

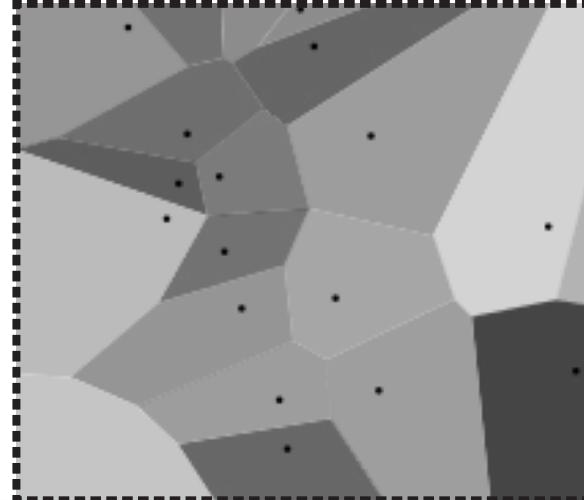










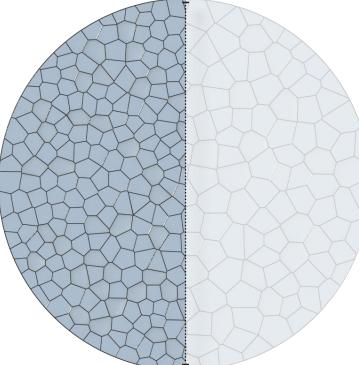


INFERIOR PERFORMANCE

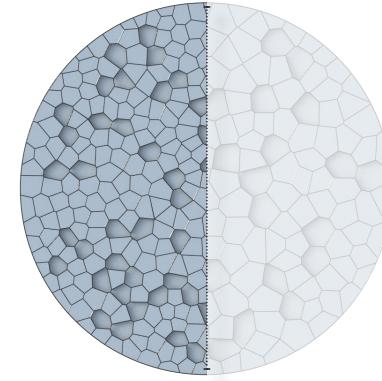
[ABOUT](#)



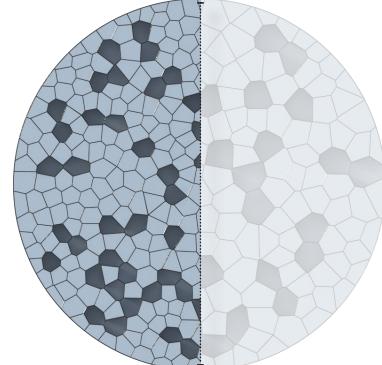
[TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE](#)



L:0.05 [M] | D:20%L | EXTRUDED



L:0.05 [M] | D:50%L | EXTRUDED



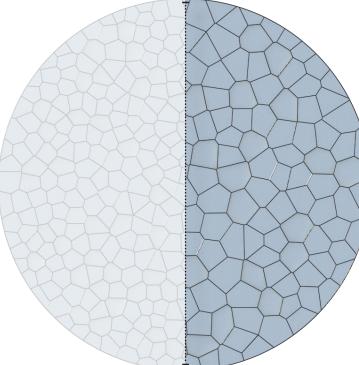
L:0.05 [M] | D:150%L | EXTRUDED

| periodicity | parameters | profile | constraints |
|--|---|--|----------------------|
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

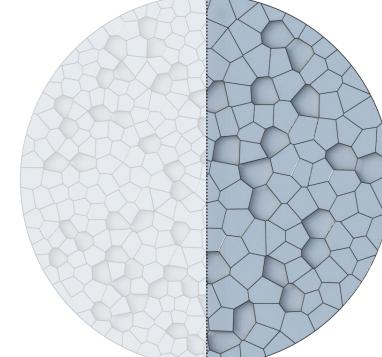
| well | depth-to-length ratio | | |
|----------------|-----------------------|-------------|-----------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] |
| various depths | d=20% l [m]: 3 | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

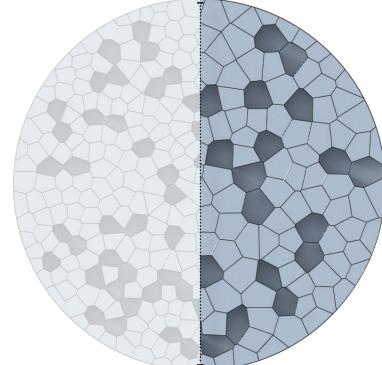
L:0.085 [M] | D:20%L | EXTRUDED



L:0.085 [M] | D:50%L | EXTRUDED



L:0.085 [M] | D:150%L | EXTRUDED



| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

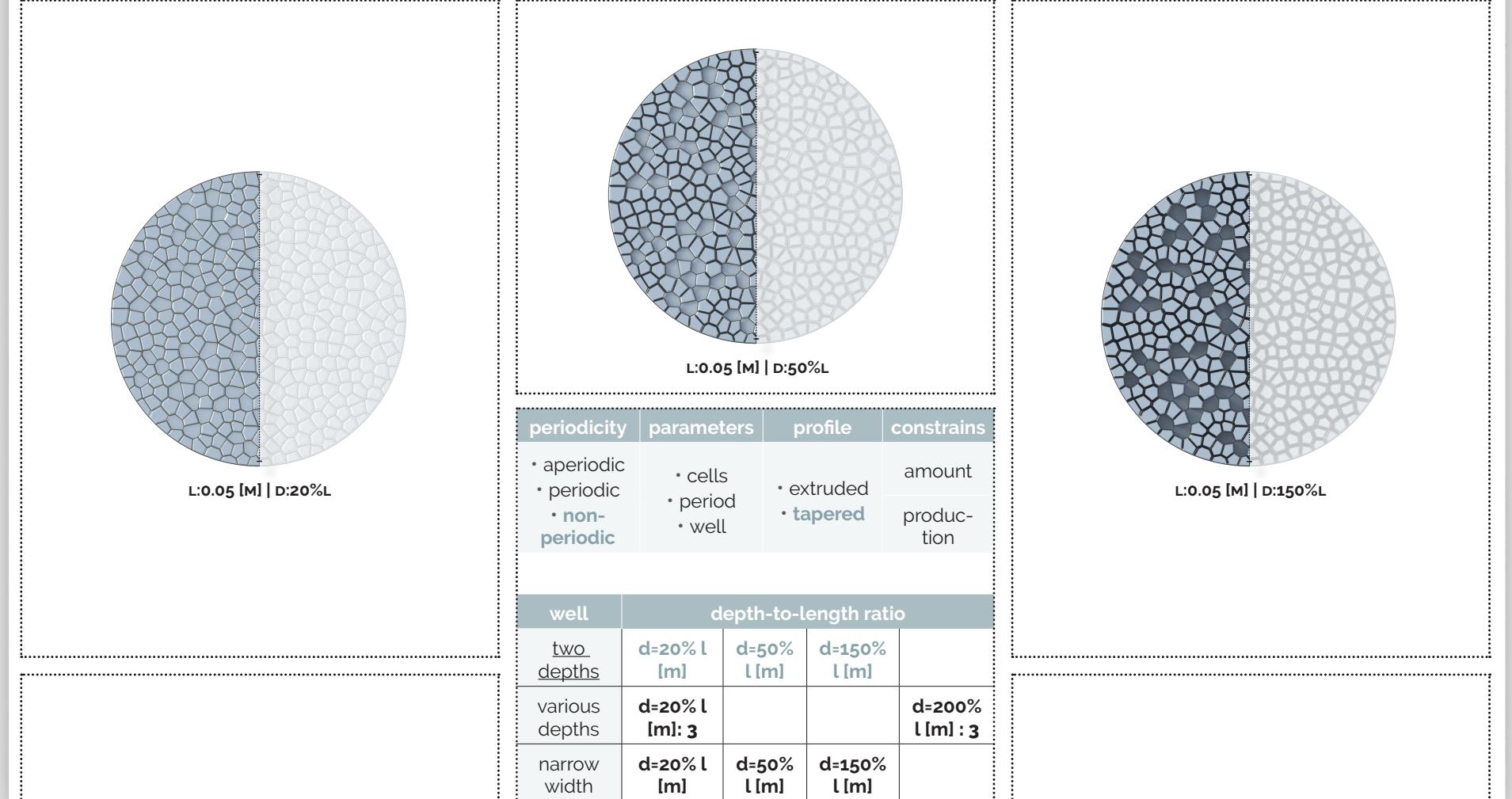
| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |



ABOUT TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

| L:0.05 [M] D:20%L | | | L:0.05 [M] D:200%L | | | | | | | | | | | | | | | | |
|---|---|--|--------------------------|-------------|-----------------------|---------|-------------|--|---|--|-------------------|----------------|----------------|--|-----------------|--------------|-------------|-------------|--------------|
| <table border="1"><thead><tr><th>periodicity</th><th>parameters</th><th>profile</th><th>constraints</th></tr></thead><tbody><tr><td><ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic</td><td><ul style="list-style-type: none">• cells• period• well</td><td><ul style="list-style-type: none">• extruded• tapered</td><td>amount production</td></tr></tbody></table> | | | | periodicity | parameters | profile | constraints | <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production | | | | | | | | |
| periodicity | parameters | profile | constraints | | | | | | | | | | | | | | | | |
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production | | | | | | | | | | | | | | | | |
| <table border="1"><thead><tr><th>well</th><th colspan="3">depth-to-length ratio</th></tr></thead><tbody><tr><td>two depths</td><td>d=20% l [m]</td><td>d=50% l [m]</td><td>d=150% l [m]</td></tr><tr><td>various depths</td><td>d=20% l [m]: 3</td><td></td><td>d=200% l [m]: 3</td></tr><tr><td>narrow width</td><td>d=20% l [m]</td><td>d=50% l [m]</td><td>d=150% l [m]</td></tr></tbody></table> | | | | well | depth-to-length ratio | | | two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | various depths | d=20% l [m]: 3 | | d=200% l [m]: 3 | narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] |
| well | depth-to-length ratio | | | | | | | | | | | | | | | | | | |
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | | | | | | | | | | | | | | | | |
| various depths | d=20% l [m]: 3 | | d=200% l [m]: 3 | | | | | | | | | | | | | | | | |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | | | | | | | | | | | | | | | | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



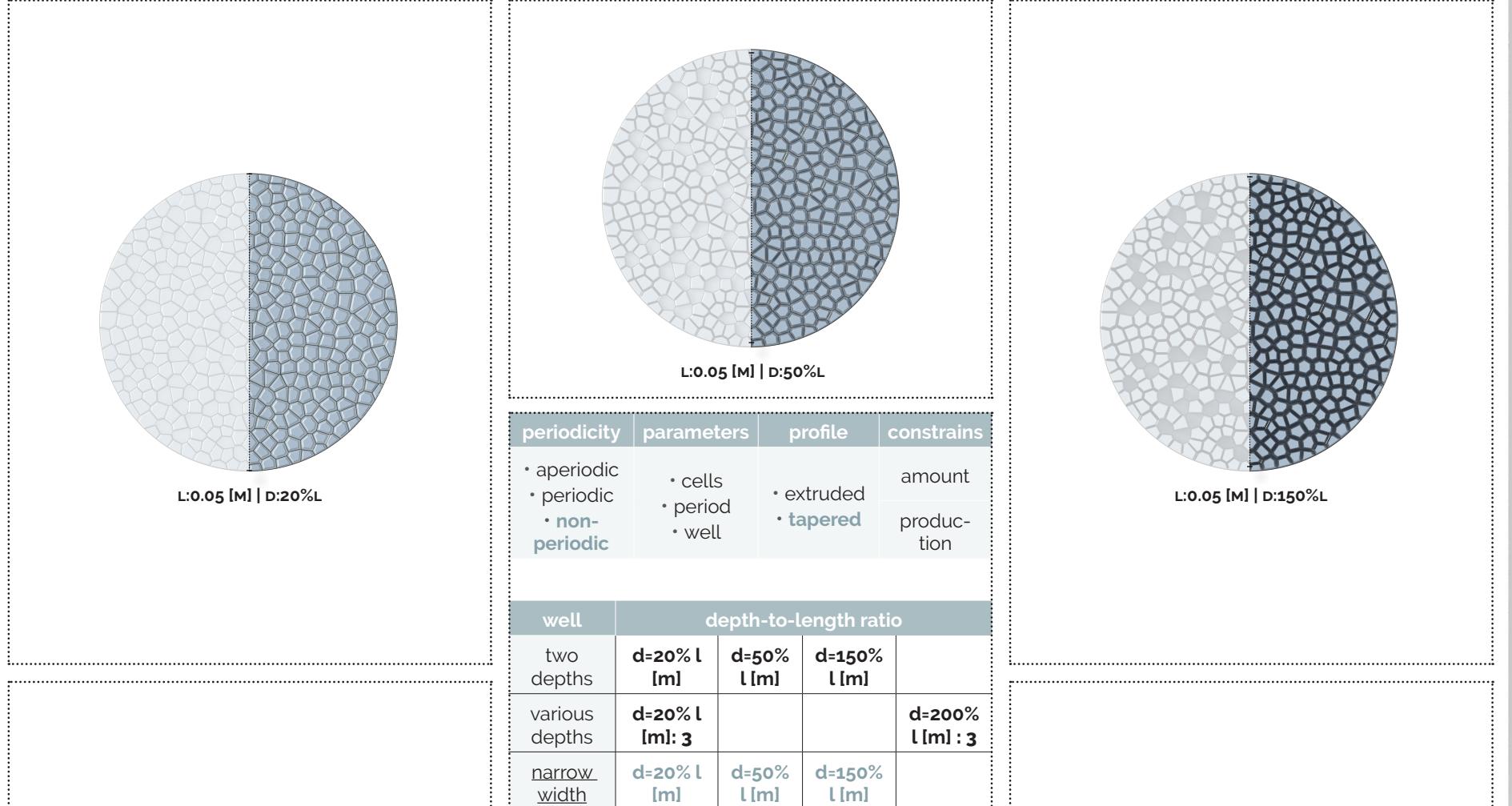
L:0.05 [M] | D:20%L L:0.05 [M] | D:50%L L:0.05 [M] | D:150%L

| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic<ul style="list-style-type: none">• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

| well | depth-to-length ratio | | | |
|-------------------|-----------------------|-------------|--------------|-----------------|
| <u>two depths</u> | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |



ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



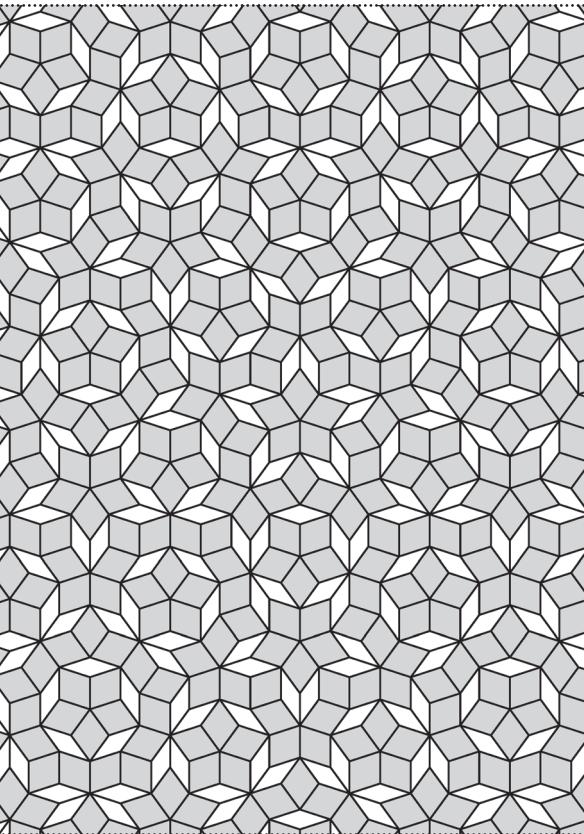
| periodicity | parameters | profile | constraints |
|---|---|---|--|
| <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • cells • period • well | <ul style="list-style-type: none"> • extruded • tapered | <ul style="list-style-type: none"> amount production |

| well | depth-to-length ratio | | | |
|----------------|-----------------------|--------------------|---------------------|------------------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |



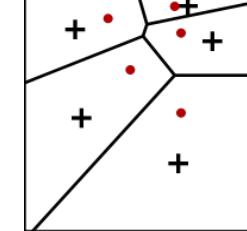
TOOLBOX

ABOUT

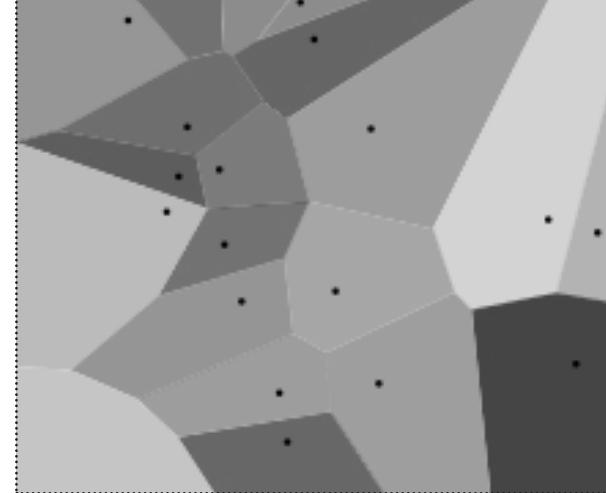


A large square image showing a complex, organic tessellation pattern composed of many small, light-grey hexagonal cells. It is framed by a dotted border.

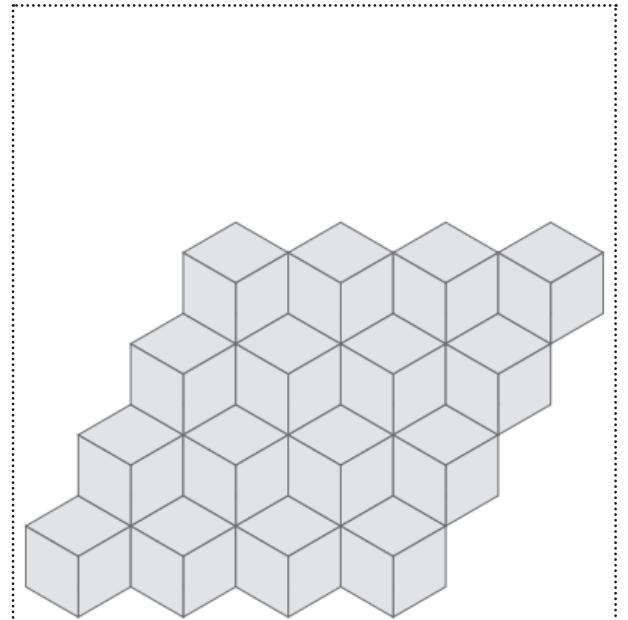
TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



A small diagram showing a square divided into four triangles. Red dots are placed at the midpoints of the top and right edges, while black plus signs are placed at the midpoints of the bottom and left edges.

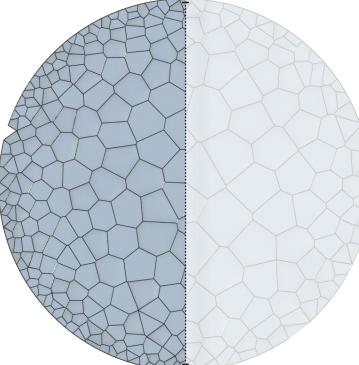


A large square image showing a geometric pattern of overlapping triangles in various shades of grey. Black dots are placed at the vertices of some of the triangles.

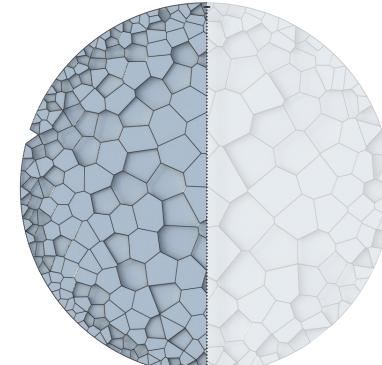


A large square image showing a perspective view of a 3D grid of light-grey cubes arranged in a stepped, pyramidal structure.

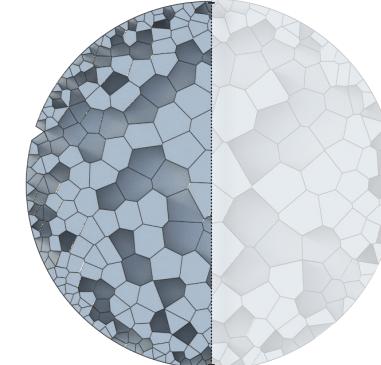
ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L | EXTRUDED



L:0.05 [M] | D:50%L | EXTRUDED



L:0.05 [M] | D:150%L | EXTRUDED

| periodicity | parameters | profile | constraints | |
|--|---|---|-------------------|-----------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production | |
| well | depth-to-length ratio | | | |
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.085 [M] | D:20%L | EXTRUDED

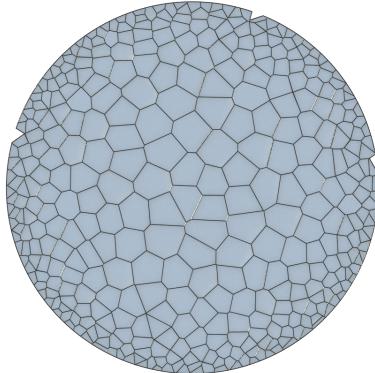
L:0.085 [M] | D:50%L | EXTRUDED

L:0.085 [M] | D:150%L | EXTRUDED

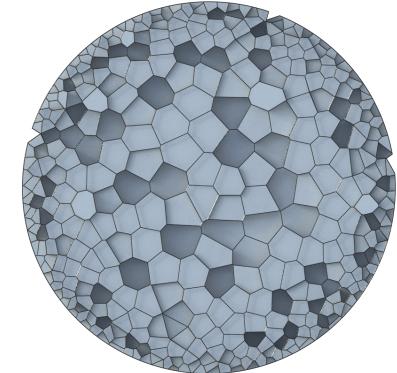
| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

| well | depth-to-length ratio | | |
|-------------------|-----------------------|-------------|-----------------|
| <u>two depths</u> | d=20% l [m] | d=50% l [m] | d=150% l [m] |
| various depths | d=20% l [m]: 3 | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L



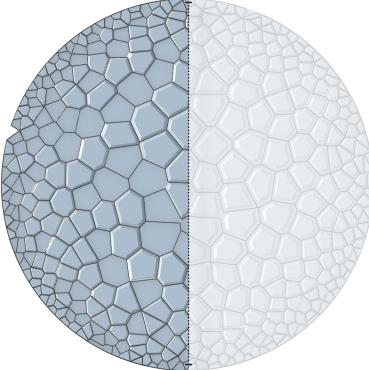
L:0.05 [M] | D:200%L

| periodicity | parameters | profile | constraints |
|--|---|---|-------------------|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | amount production |

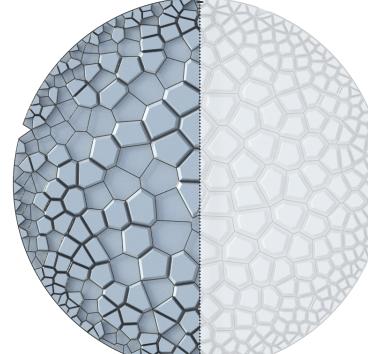
| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

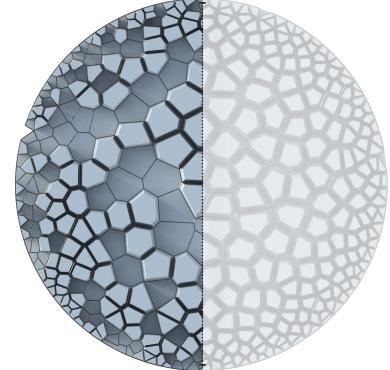


L:0.05 [M] | D:20%L



L:0.05 [M] | D:50%

| periodicity | parameters | profile | constraints |
|--|---|--|--|
| <ul style="list-style-type: none"> • aperiodic • periodic • non-periodic | <ul style="list-style-type: none"> • cells • period • well | <ul style="list-style-type: none"> • extruded • tapered | <ul style="list-style-type: none"> amount production |

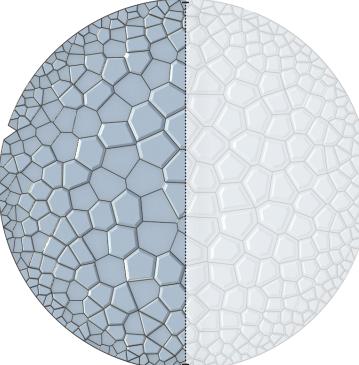


L:0.05 [M] | D:150%

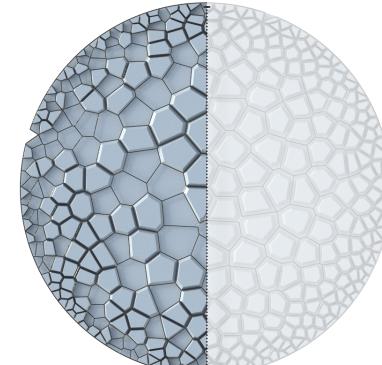
| well | depth-to-length ratio | | |
|-------------------|-----------------------|--------------------|-------------------------|
| <u>two depths</u> | d=20% l [m] | d=50% l [m] | d=150% l [m] |
| various depths | d=20% l [m]: 3 | | d=200% l [m] : 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] |

| well | depth-to-length ratio | | |
|-------------------|-----------------------|--------------------|-------------------------|
| <u>two depths</u> | d=20% l [m] | d=50% l [m] | d=150% l [m] |
| various depths | d=20% l [m]: 3 | | d=200% l [m] : 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] |

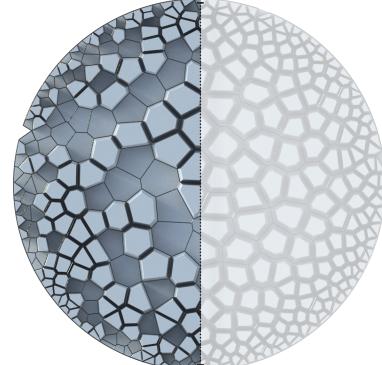
ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



L:0.05 [M] | D:20%L



L:0.05 [M] | D:50%

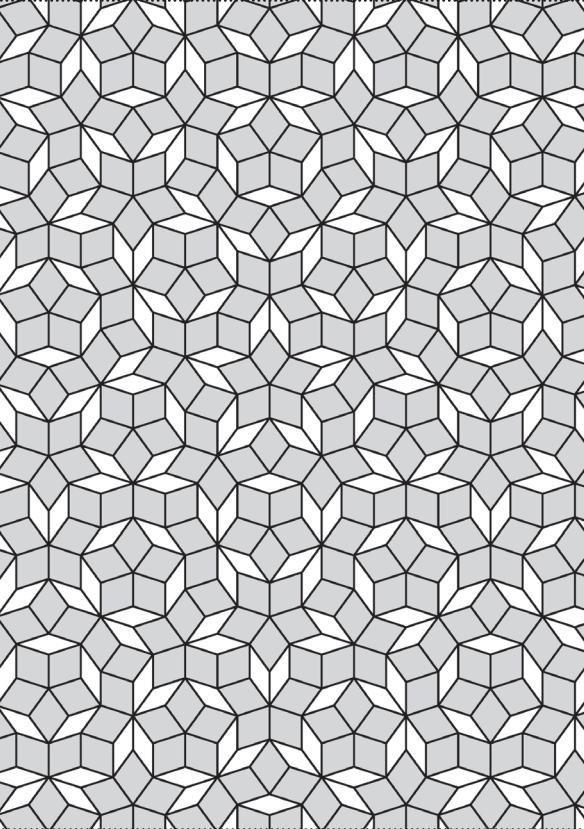


L:0.05 [M] | D:150%

| periodicity | parameters | profile | constraints |
|--|---|---|---|
| <ul style="list-style-type: none">• aperiodic• periodic• non-periodic | <ul style="list-style-type: none">• cells• period• well | <ul style="list-style-type: none">• extruded• tapered | <ul style="list-style-type: none">amountproduction |

| well | depth-to-length ratio | | | |
|----------------|-----------------------|-------------|--------------|-----------------|
| two depths | d=20% l [m] | d=50% l [m] | d=150% l [m] | |
| various depths | d=20% l [m]: 3 | | | d=200% l [m]: 3 |
| narrow width | d=20% l [m] | d=50% l [m] | d=150% l [m] | |

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



| | periodicity | parameters | profile | con-strains |
|-------|-------------|---|---|----------------------|
| steps | aperiodic | <ul style="list-style-type: none"> • cells • period • well | <ul style="list-style-type: none"> • extruded • tapered • | amount finite set |

| well | depth-to-length ratio | | | |
|--------------|-----------------------|--------------------|--|--|
| two depths | d=20% l [m] | d=50% l [m] | | |
| narrow width | d=20% l [m] | d=50% l [m] | | |

CHOOSE APERIODIC PATTERN 

CONSTRAINS: MINIMIZE AMOUNT + AVOID VARIABILITY OF ELEMENTS AND DEPTH 

INVESTIGATE DIFFERENT VERTICAL PROFILES 

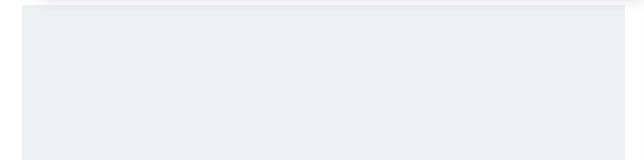
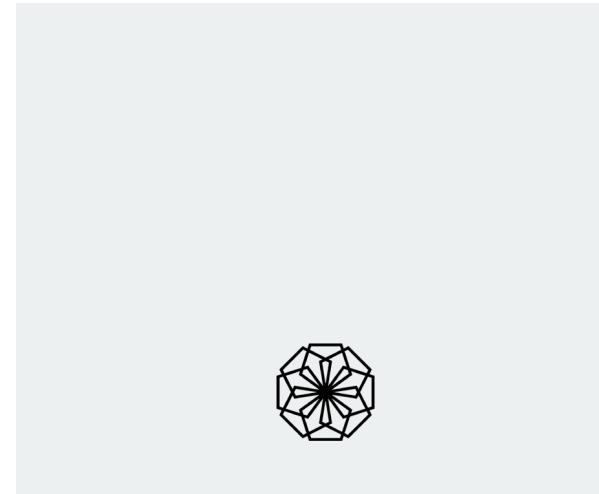
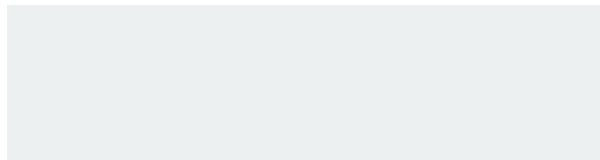
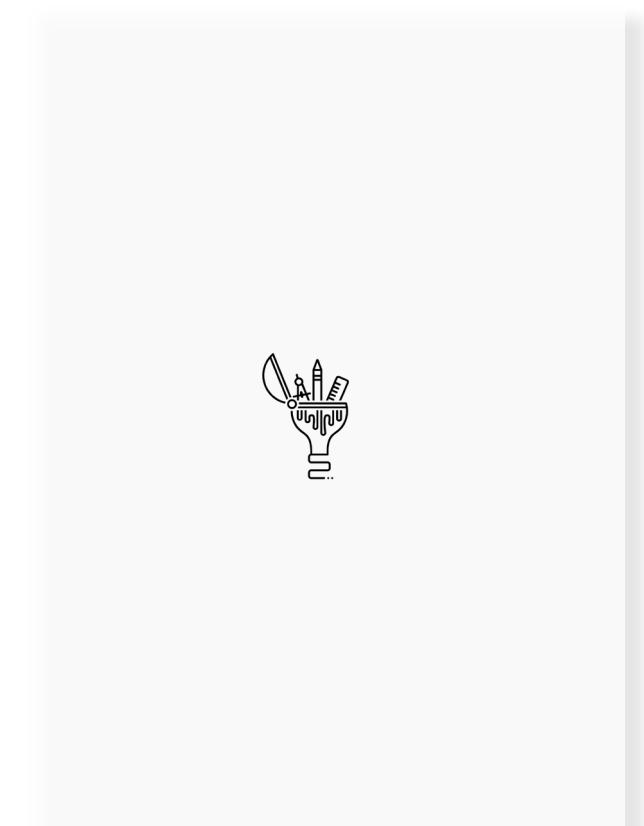
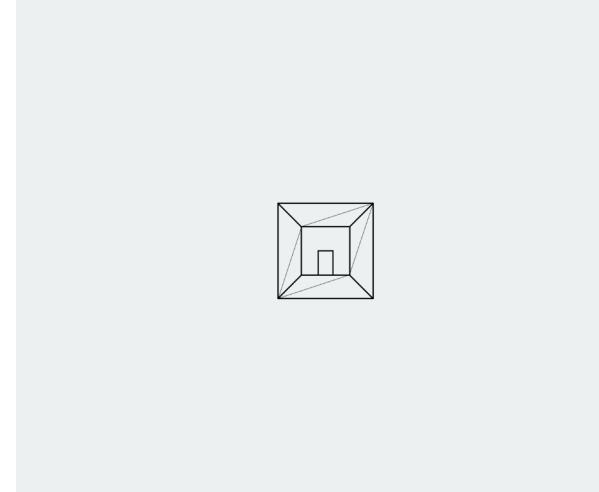
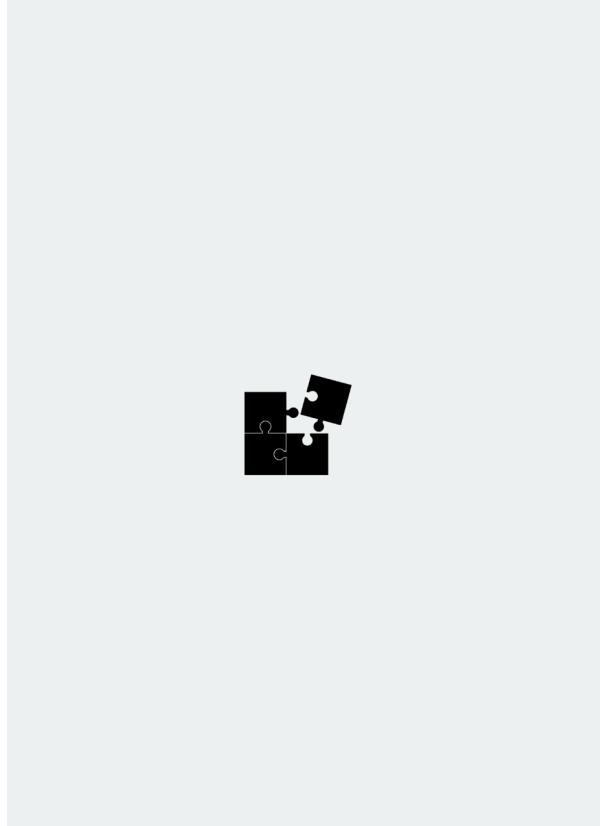
PARAMETERS: DEPTH-TO-LENGTH RATIO + PERIOD [BIG] + WELL [NARROW] 

AVOID MORE THAN 50% DEPTH-TO-LENGTH RATIO FOR IMPROVED SPEECH INTELLIGIBILITY



TOOLBOX

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

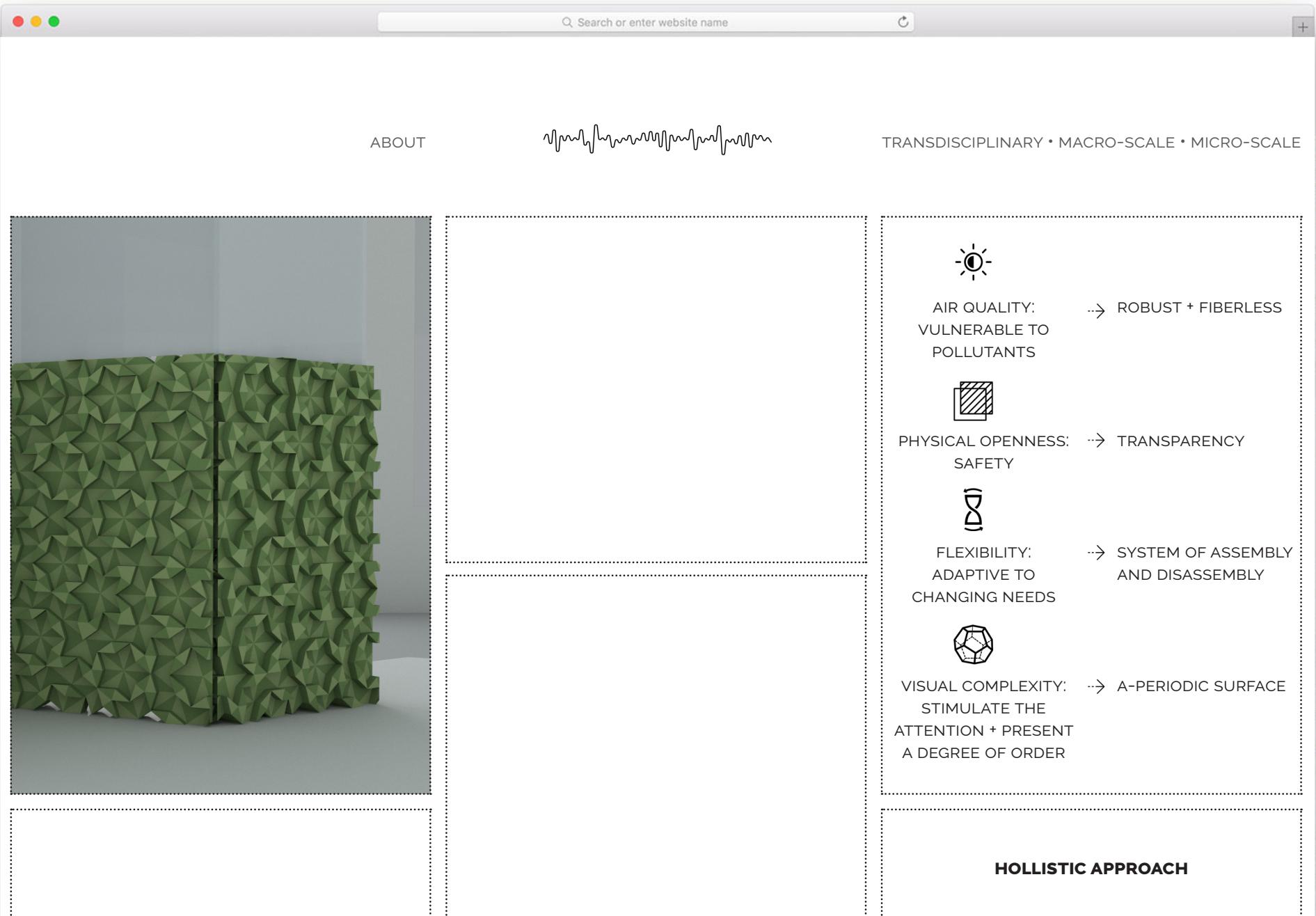












The image shows a screenshot of a web browser window displaying the 'TOOLBOX' website. The browser interface includes a top bar with three colored circles (red, yellow, green), a search bar with placeholder text 'Search or enter website name', and a refresh button. On the left side of the main content area, there is a vertical navigation menu with the word 'TOOLBOX' at the top, followed by a series of small, overlapping geometric shapes in shades of blue, green, and grey.

On the right side, the main content area is divided into several sections:

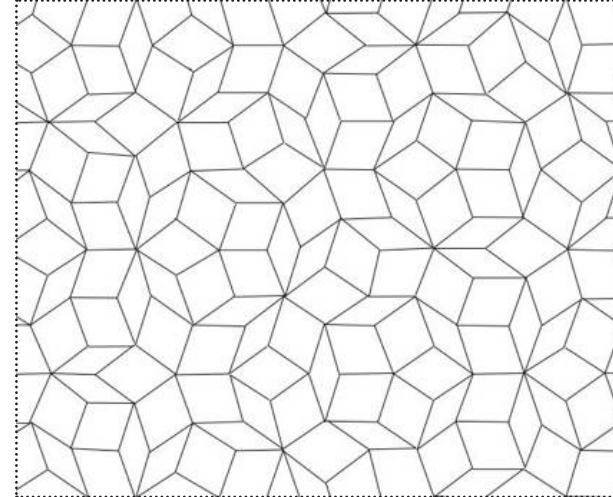
- ABOUT**: Located at the top left of the main content area.
- TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE**: Located at the top right of the main content area.
- AIR QUALITY: VULNERABLE TO POLLUTANTS**: Contains an icon of a sun with rays and a small cloud-like shape. Text: "AIR QUALITY: VULNERABLE TO POLLUTANTS" followed by a right-pointing arrow and the text "→ ROBUST + FIBERLESS".
- PHYSICAL OPENNESS: SAFETY**: Contains an icon of a square with diagonal hatching. Text: "PHYSICAL OPENNESS: SAFETY" followed by a right-pointing arrow and the text "→ TRANSPARENCY".
- FLEXIBILITY: ADAPTIVE TO CHANGING NEEDS**: Contains an icon of a stylized hourglass or DNA double helix. Text: "FLEXIBILITY: ADAPTIVE TO CHANGING NEEDS" followed by a right-pointing arrow and the text "→ SYSTEM OF ASSEMBLY AND DISASSEMBLY".
- VISUAL COMPLEXITY: STIMULATE THE ATTENTION + PRESENT A DEGREE OF ORDER**: Contains an icon of a complex, aperiodic surface pattern. Text: "VISUAL COMPLEXITY: STIMULATE THE ATTENTION + PRESENT A DEGREE OF ORDER" followed by a right-pointing arrow and the text "→ A-PERIODIC SURFACE".
- HOLLISTIC APPROACH**: Located at the bottom right of the main content area.



TOOLBOX

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

| pattern ▾ | profile ▾ | parameters ▾ |
|-------------------|-----------|--------------|
| Penrose tiles | | |
| Robinson tiles | | |
| Ammann tiles | | |
| Shield tiles | | |
| Danzer triangles | | |
| Wang tiles | | |
| Robinson triangle | | |

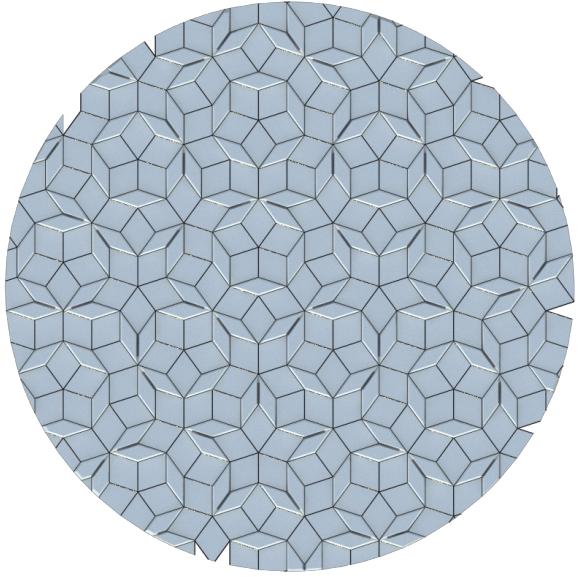
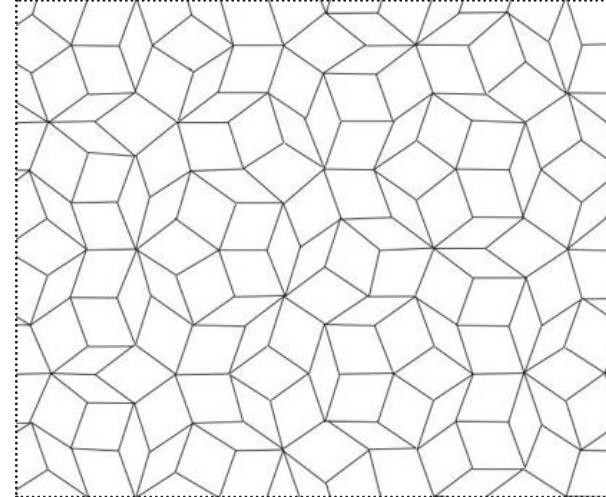


[open source platform]

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

pattern ▾ profile ▾ parameters ▾

tapered
extruded

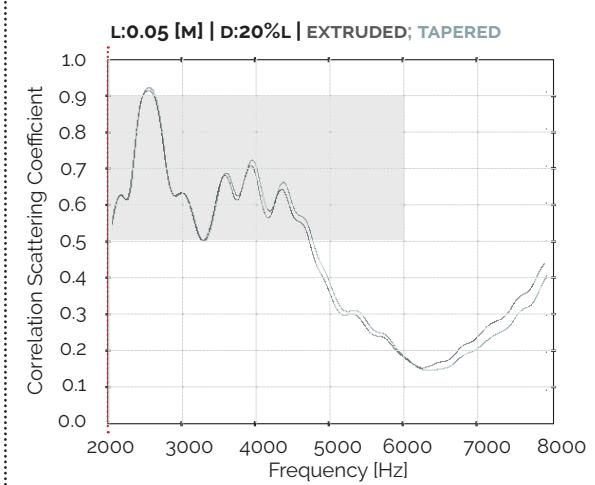


L:0.05 [M] | D:20%L | EXTRUDED; TAPERED

Correlation Scattering Coefficient

Frequency [Hz]

2000 3000 4000 5000 6000 7000 8000



COR. SCATTERING COEFFICIENT

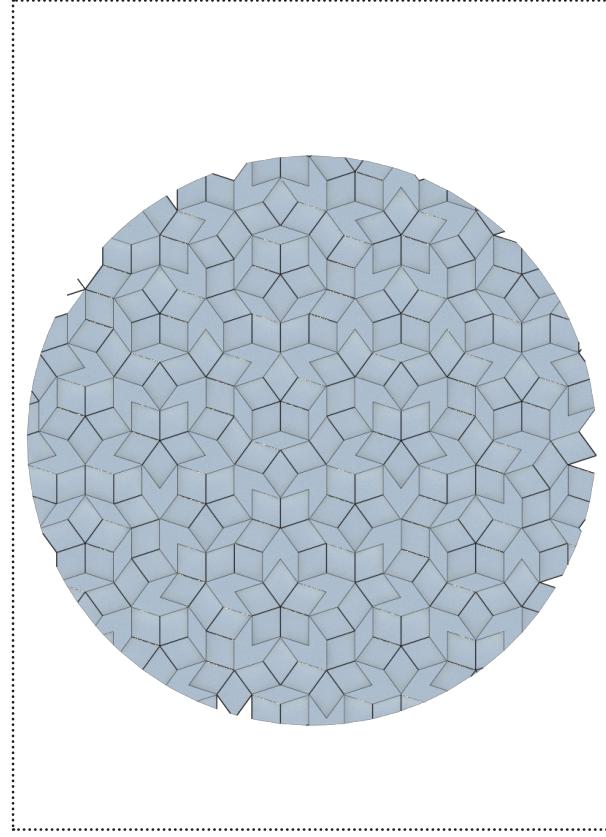
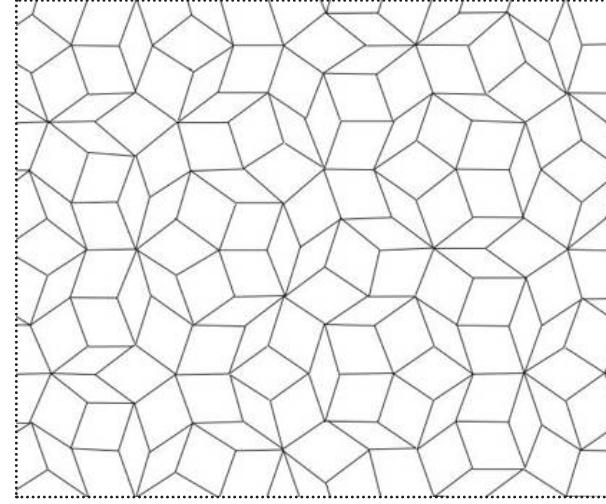


TOOLBOX

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

pattern ▾ profile ▾ parameters ▾

tapered
extruded

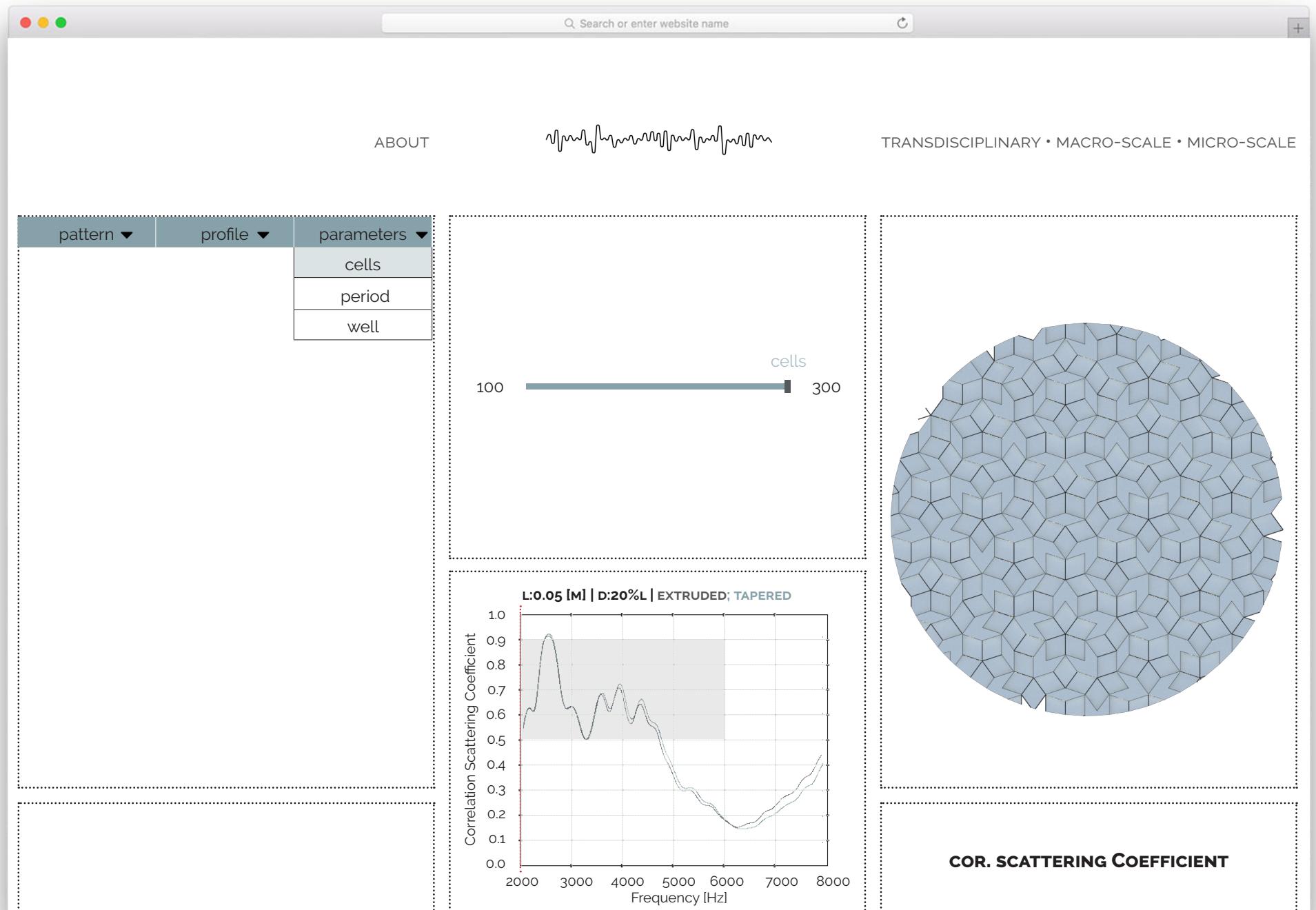


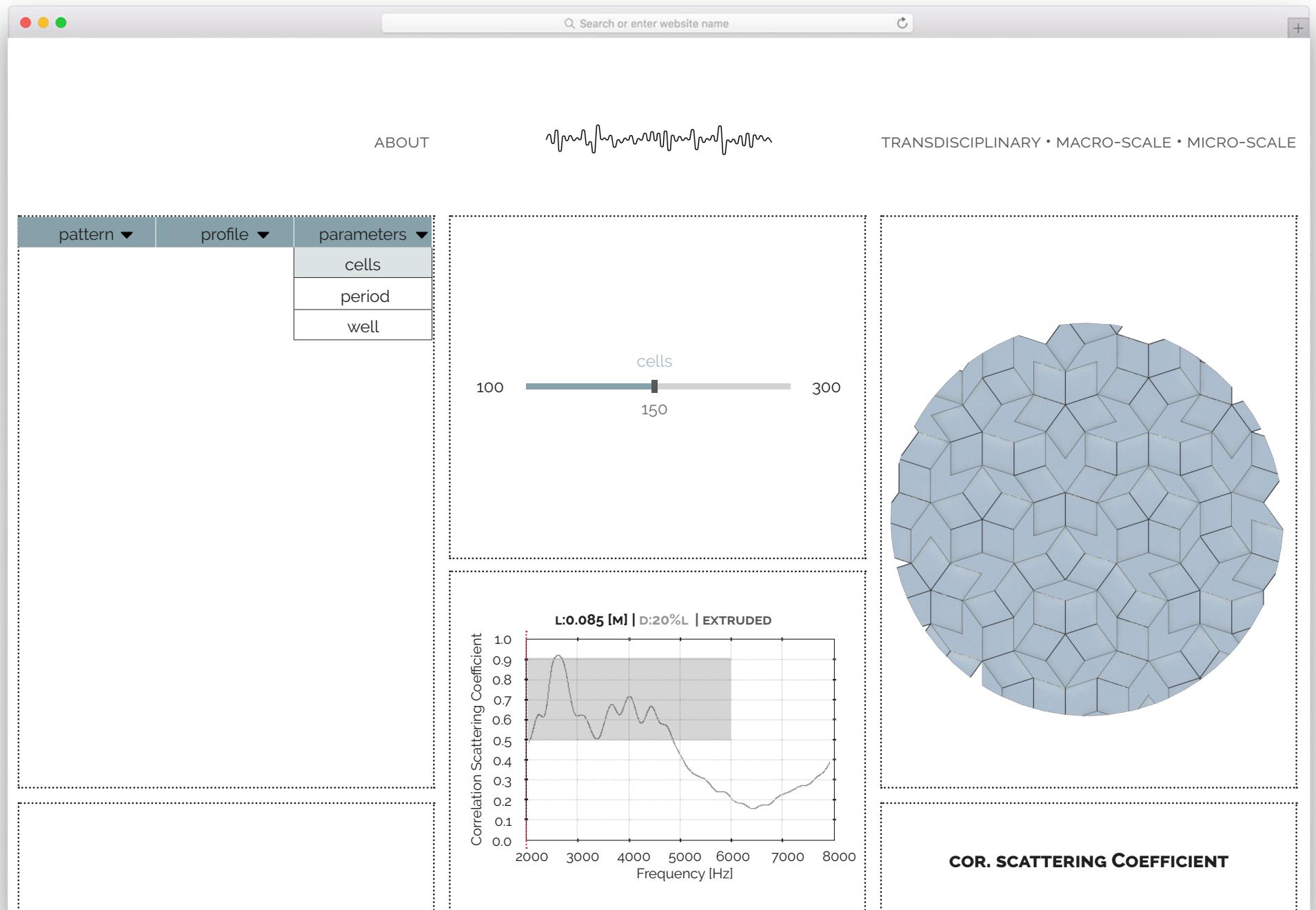
L:0.05 [M] | D:20%L | EXTRUDED; TAPERED

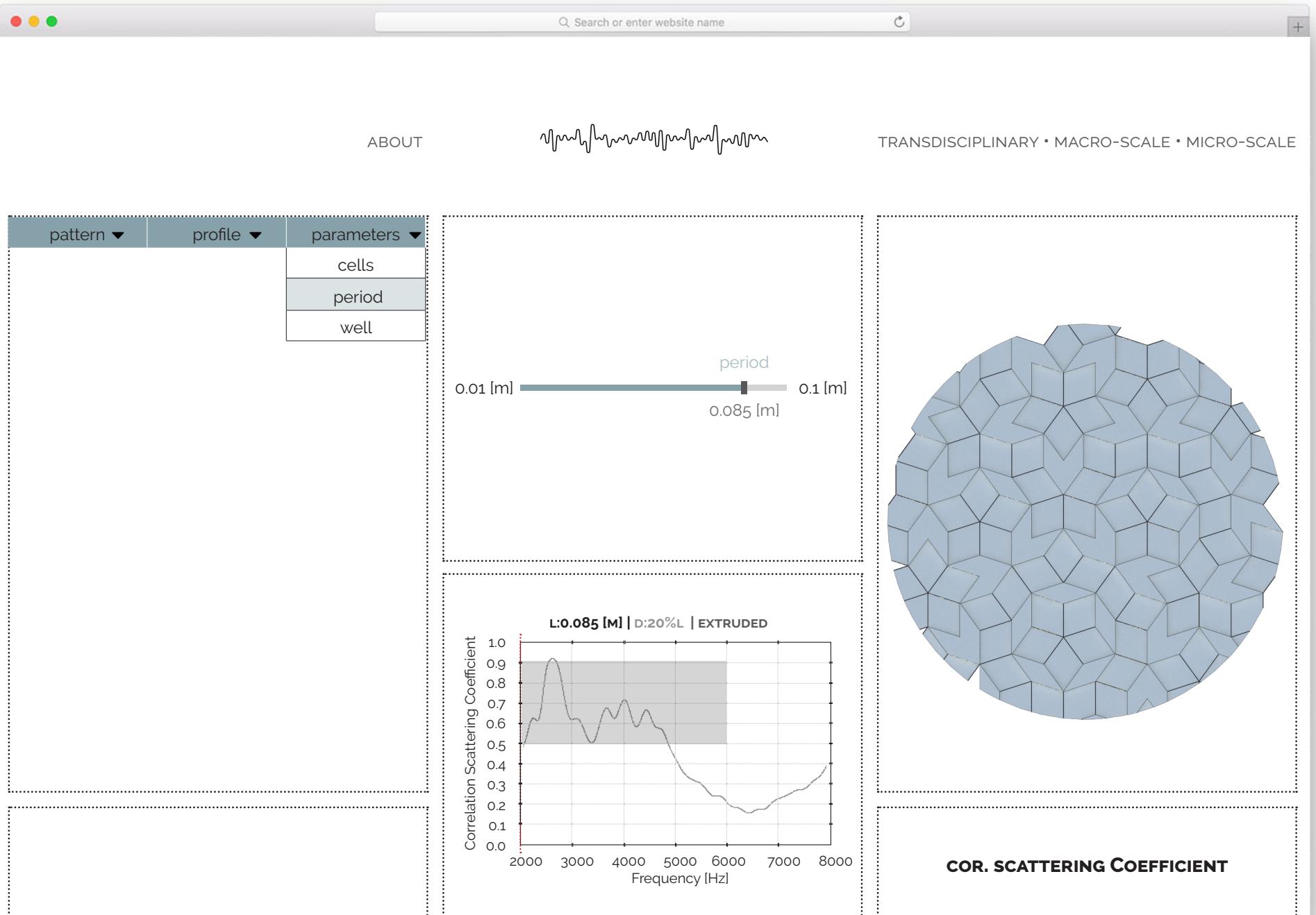
Correlation Scattering Coefficient

Frequency [Hz]

COR. SCATTERING COEFFICIENT









ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

pattern ▾ profile ▾ parameters ▾

cells
period
well

DEPTH ▾

two heights
 various heights
20%
0.01 [m]  0.1 [m]

WIDTH ▾

element size
 narrow

L:0.085 [M] | D:20%L | EXTRUDED

Correlation Scattering Coefficient

Frequency [Hz]

COR. SCATTERING COEFFICIENT



ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

pattern ▾ profile ▾ parameters ▾

cells
period
well

DEPTH ▾

two heights
 various heights

0.01 [m]  0.1 [m]
50%

WIDTH ▾

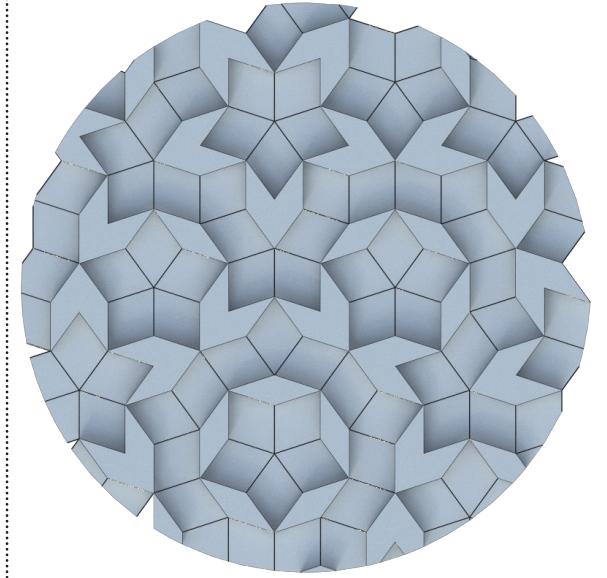
element size
 narrow

L:0.085 [M] | D:50%L | EXTRUDED

0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7 0.8 0.9 1.0

2000 3000 4000 5000 6000 7000 8000 Frequency [Hz]

COR. SCATTERING COEFFICIENT





ABOUT TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

absorption ▾ material ▾ system ▾

- porous
- plate
- membran
- helmholtz
- mf
- tube resonator

-- 15% PERFORATION RATIO, THICKNESS 0.4 MM

Frequency [Hz]

ABSORPTION COEFFICIENT



ABOUT TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

| absorption ▾ | material ▾ | system ▾ |
|--------------|-------------|----------|
| | cork | |
| | bamboo | |
| | desert sand | |
| | bioplastics | |
| | timber | |
| | mycelium | |

WEIGHT: HIGH FREQUENCIES REQUIRE LESS WEIGHT TO REFLECT SOUND

SENSITIVE USERS: ANTIMICROBIAL, NON-ALLERGENIC, FIRE RETARDANT

SUSTAINABILITY: HARVESTED FROM THE BARK OF LIVING CORK OAK TREES, AFTER 10 YEARS REGROWS



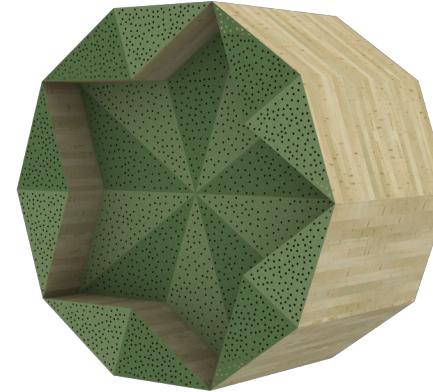
TOOLBOX

ABOUT 

TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

absorption ▾ material ▾ system ▾

- hybrid device
- dual function
- upcycling



ASSEMBLY - DISASSEMBLY



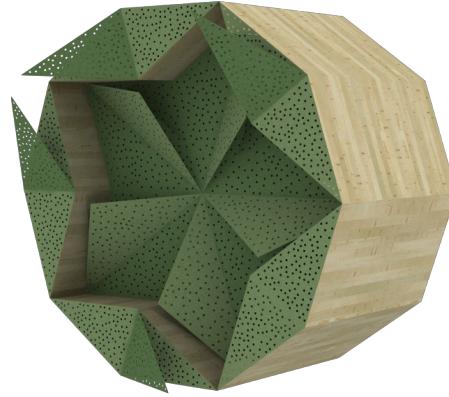
TOOLBOX

ABOUT 

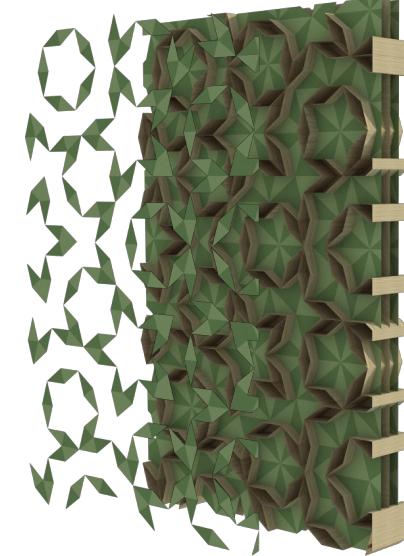
TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE

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INTERACTION:
ELEMENTS CAN ROTATE IN ORDER FOR
THE USERS TO MANIPULATE THE VISUAL
APPEARANCE



ASSEMBLY - DISASSEMBLY



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INTERACTION:
ELEMENTS CAN ROTATE IN ORDER FOR
THE USERS TO MANIPULATE THE VISUAL
APPEARANCE
AWARENESS:
MODIFYING THE MICRO-SCALE AFFECTS THE
MACRO-SCALE

ASSEMBLY - DISASSEMBLY



TOOLBOX

A simulated browser window with a search bar at the top.

ABOUT

A wavy line icon representing sound or signal.

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A 3D rendering of a complex geometric model composed of green and brown facets, resembling a dodecahedron or similar polyhedron.

DECAY:
REPLACEMENT OF ITS COMPONENTS SHOULD
BE AN OPTION.

UPCYCLING:
THE TILES CAN BECOME BLOCK PLAY
LEARNING RESOURCES,

A close-up view of the 3D geometric model, showing the intricate patterns and textures of the green and brown facets.

ASSEMBLY - DISASSEMBLY



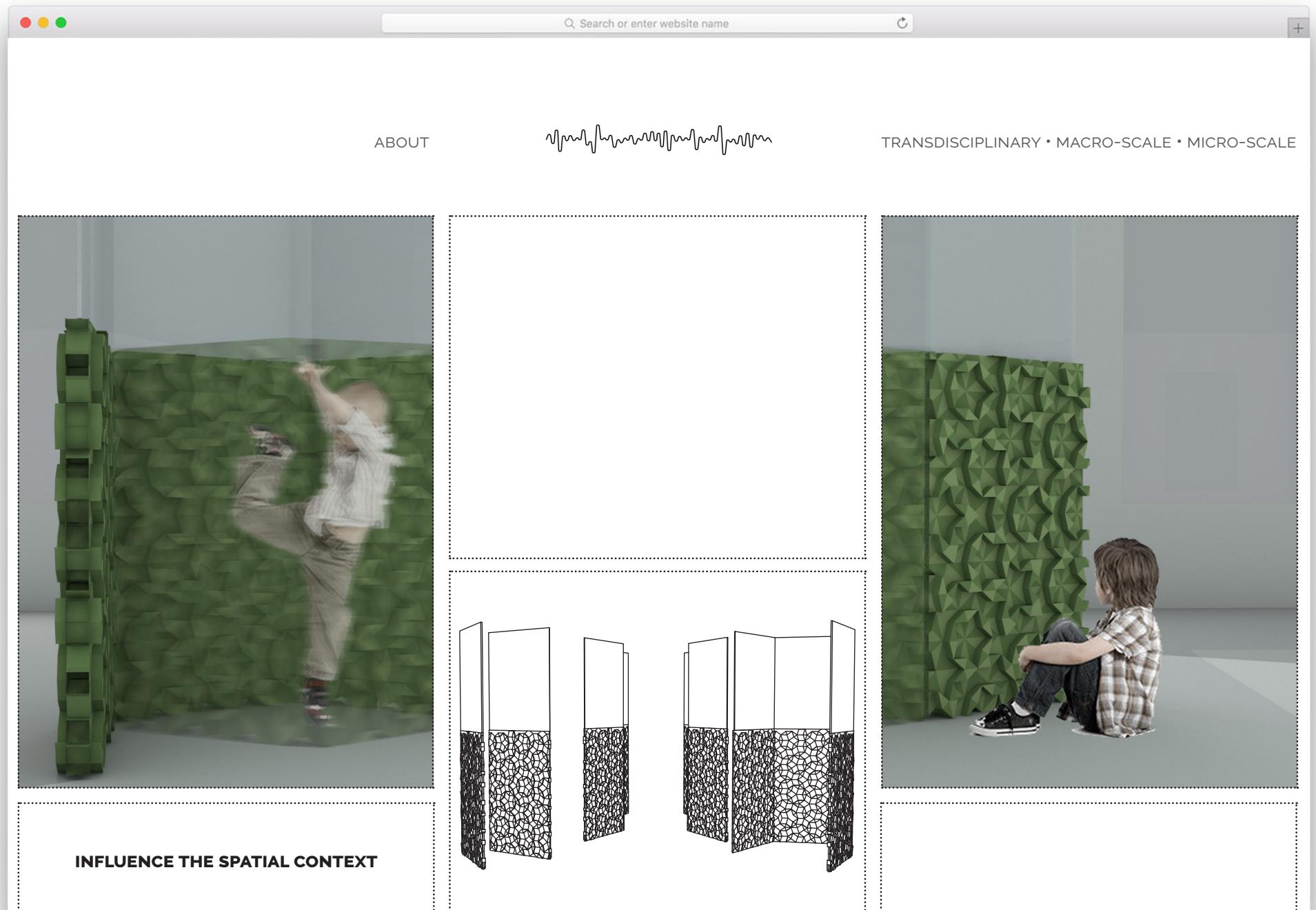
ABOUT

SEARCH

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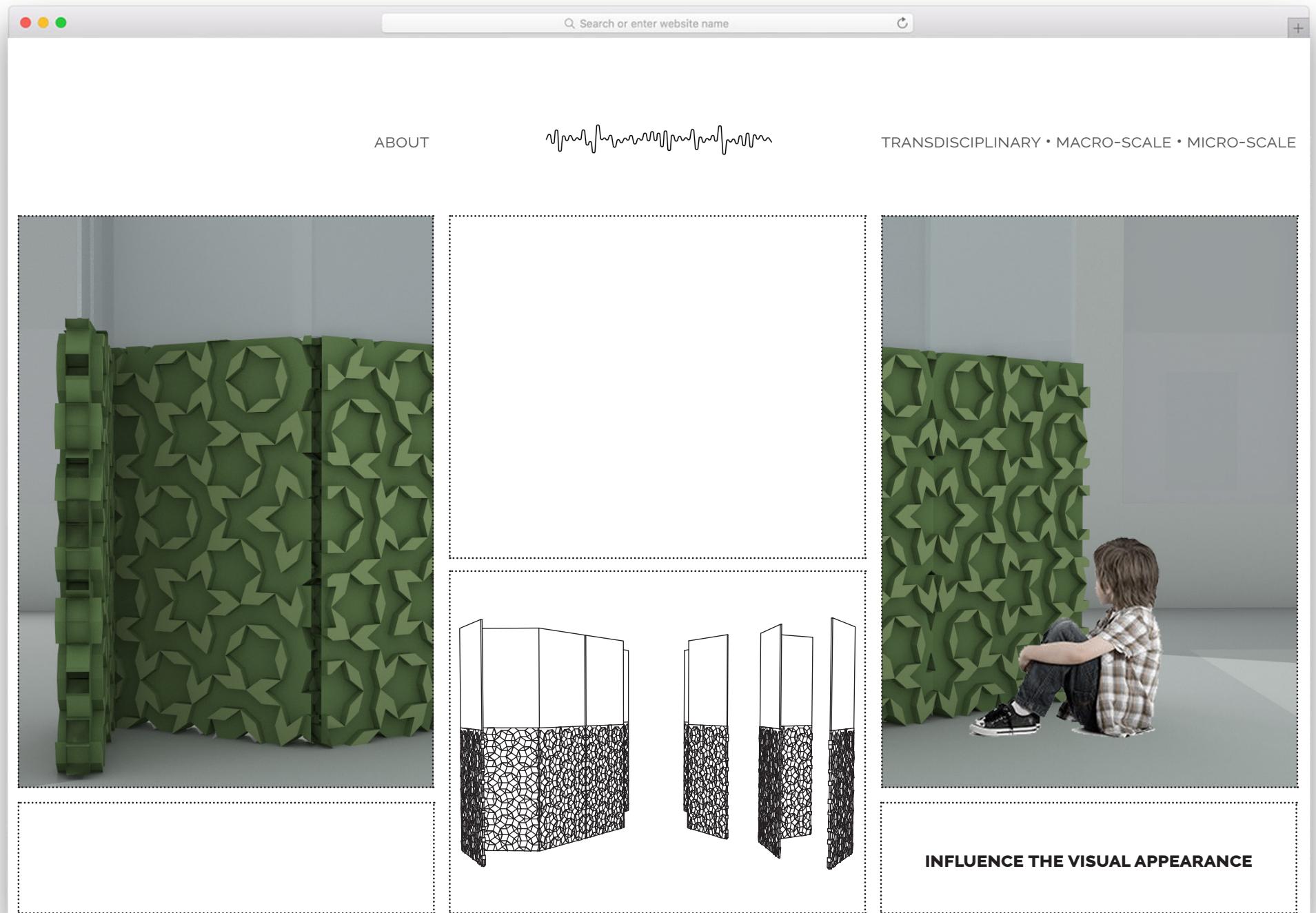
The screenshot displays a web-based application interface. At the top, there's a standard browser header with a search bar containing the placeholder 'Search or enter website name'. Below the header, the word 'ABOUT' is visible. In the center, there's a small, wavy line icon. To the right, the text 'TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE' is displayed. The main content area is organized into several sections separated by dotted lines. On the left, there's a large, detailed green 3D model of a surface with a star-like polygonal pattern. In the center, there's a blank white space. To the right, another green 3D model is shown. Below these larger models, there are two smaller, black, wireframe-style 3D models. The entire interface is enclosed within a dotted rectangular frame.

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INFLUENCE THE SPATIAL CONTEXT

ABOUT  TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE



INFLUENCE THE VISUAL APPEARANCE

The screenshot shows a web browser window with a light gray header bar containing a search field and a refresh button. The main content area has a white background.

- Top Left:** A large image of a green wall panel with a repeating geometric star-like pattern.
- Top Center:** A small wavy line icon.
- Top Right:** Text reading "TRANSDISCIPLINARY • MACRO-SCALE • MICRO-SCALE".
- Middle Left:** Text: "... move from an interdisciplinary to a transdisciplinary era, where various perspectives transcend each other to form a new more holistic approach."
- Middle Right:** A young child with long hair, wearing a plaid shirt and jeans, sitting cross-legged on the floor, facing the green wall panel.
- Bottom Left:** An empty rectangular placeholder box.
- Bottom Right:** An empty rectangular placeholder box.

ABOUT

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