

# STEREOTYPES and ARCHETYPES CONNECTED WITH WOOD

## WOOD IN THE HEALTHCARE FACILITIES

Assoc. Prof. VERONIKA KOTRADYOVÁ, PhD.

Faculty of Architecture /BCD lab, Slovak University of Technology in Bratislava, Slovakia



Design: Veronika Kotradyová, Michal Hronský, Peter Daniel, Dušan Kočlik

# BCDLAB

Body Conscious Design Laboratory  
Faculty of Architecture STU Bratislava Slovakia

Research and development center of Faculty of  
architecture, Slovak University of Technology  
since 2012

1.

# Relation between civilisation diseased and built environment

Human centered design/ Body conscious design,  
smart design...

Interdisciplinary research methodology for  
exploring the relation of environment with its  
elements and human beings

## 10. reduction of stimuli



## 5. intimacy vs socialisation



11 principles of spatial design for well-being

Well-being phenomena and  
application of natural local materials  
in built-environment

**Project**  
**INTERACTION**  
**OF**  
**MAN AND WOOD**

since 2011

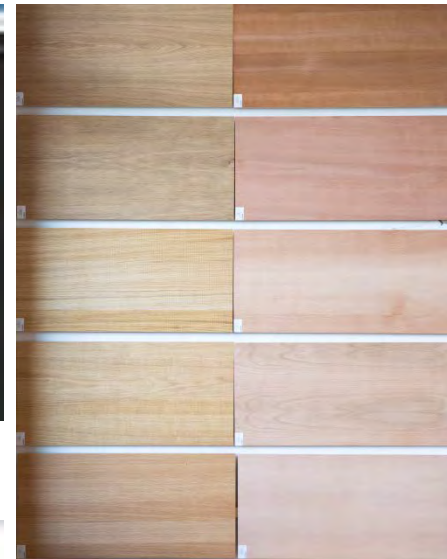
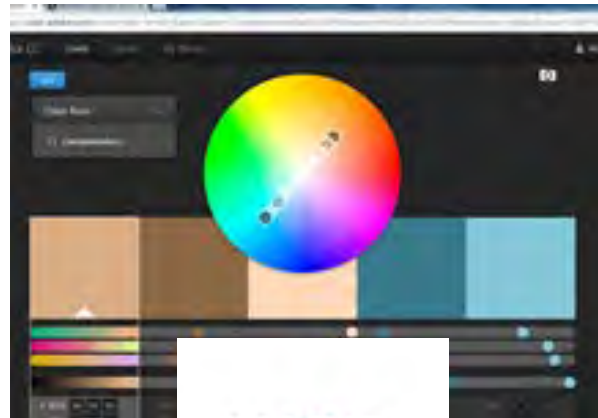
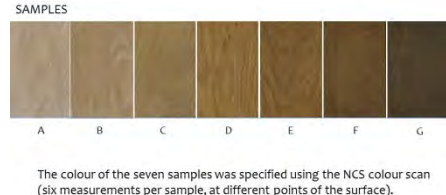
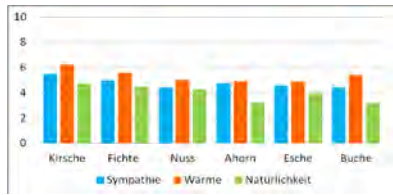
2011-2012 in cooperation with Prof. Alfred Teischinger, Institut für  
Holztechnologie und Nachhaltige Rohstoffe, BOKU Vienna,  
since 2013 Slovak project APVV 0594-12  
in multidisciplinary research cooperation on STU Bratislava



# Visual /aesthetic interaction with wood

Appeal and authenticity of wood surface – color/texture

Categorisation of wood colors, Wood color tool and Basic Wood Guide- tools for application and combination of different wood species and other colors in spatial design, naturalness of oak wood color, intentional UV- modification of wood surface



HELL

MEDIUM

DUNKEL



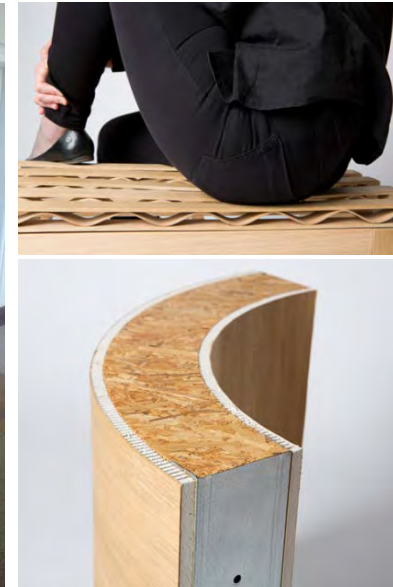
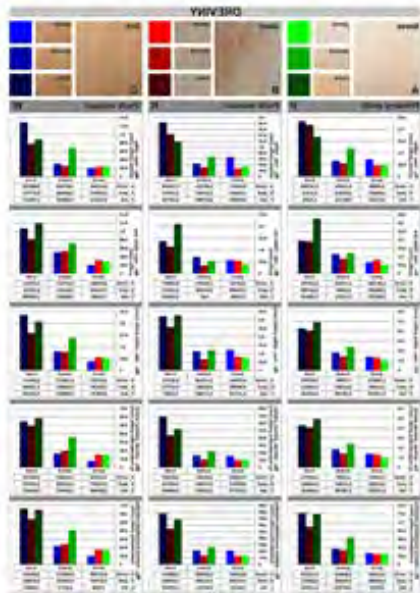
# Tactile interaction

parameters for contact comfort, especially thermal conductivity, roughness and hardness



Average values from tests in Austria and Slovakia together

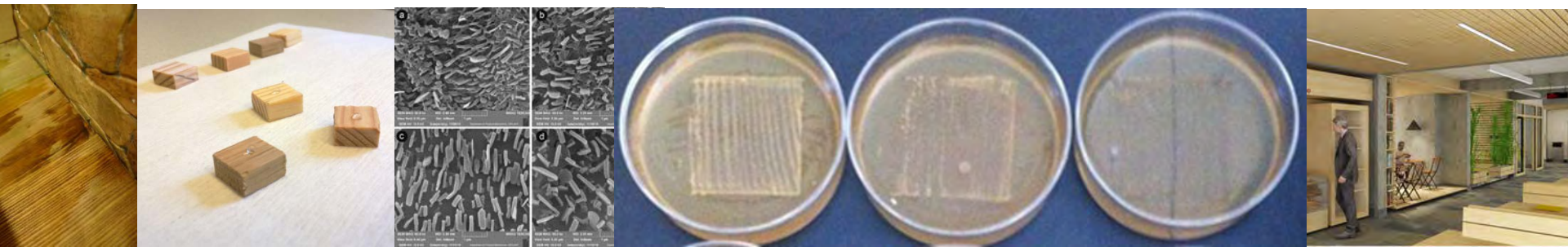
| Features of Material                             | cold / warm |     | smooth / rough |     | poor/good control oversitting |     | hard / soft |     | wet / dry |     | discomfort/ comfort |     |
|--|-------------|-----|----------------|-----|-------------------------------|-----|-------------|-----|-----------|-----|---------------------|-----|
|  | I.          | II. | I.             | II. | I.                            | II. | I.          | II. | I.        | II. | I.                  | II. |
| Milestones                                       |             |     |                |     |                               |     |             |     |           |     |                     |     |
| polypropylen                                     | 3,1         | 4,3 | 2,0            | 2,1 | 5,7                           | 4,3 | 3,3         | 3,1 | 4,4       | 4,2 | 3,9                 | 4,1 |
| aluminum   | 0,7         | 2,2 | 2,1            | 2,2 | 4,0                           | 4,4 | 2,6         | 3,2 | 6,5       | 4,1 | 2,9                 | 2,8 |
| beech plywood (5mm thick) lacquered              | 4,4         | 5,3 | 3,1            | 3,3 | 4,9                           | 5,1 | 4,4         | 4,5 | 4,7       | 4,3 | 4,2                 | 4,4 |
| solid beech glued board (25mm thick) lacquered   | 4,5         | 5,4 | 2,0            | 2,6 | 4,9                           | 4,6 | 4,8         | 4,7 | 4,2       | 4,0 | 4,9                 | 4,4 |
| solid beech glued board (25mm thick) oiled       | 5,5         | 6,3 | 5,3            | 5,1 | 6,7                           | 5,9 | 5,3         | 4,4 | 5,8       | 5,8 | 5,9                 | 5,2 |
| solid beech glued board (25mm thick) raw         | 5,2         | 6,1 | 5,1            | 5,1 | 5,9                           | 5,6 | 4,7         | 4,3 | 5,4       | 5,5 | 5,2                 | 4,9 |
| solid spruce glued board (18 mm thick) lacquered | 5,8         | 6,7 | 2,4            | 2,8 | 4,6                           | 4,9 | 4,1         | 4,1 | 5,5       | 5,5 | 4,6                 | 4,6 |
| solid spruce glued board (18 mm thick) oiled     | 6,8         | 7,1 | 4,5            | 4,1 | 6,4                           | 6,4 | 5,9         | 5,6 | 5,6       | 6,6 | 6,0                 | 5,6 |
| solid spruce glued board (18 mm thick) raw       | 7,3         | 7,5 | 5,6            | 4,9 | 7,4                           | 7,0 | 5,9         | 5,9 | 6,8       | 6,5 | 6,3                 | 5,8 |
| WPC (22mm thick)                                 | 3,0         | 3,9 | 4,5            | 4,9 |                               |     | 3,9         | 3,2 | 4,9       | 4,9 | 4,8                 | 3,2 |
| plexiglass, (8mm thick)                          | 1,9         | 3,1 | 3,1            | 3,1 |                               |     | 2,6         | 2,8 | 4,8       | 4,7 | 3,5                 | 2,2 |
| cork raw (8mm thick)                             | 8,0         | 8,5 | 5,6            | 5,6 |                               |     | 6,2         | 6,9 | 6,9       | 7,0 | 6,3                 | 6,9 |





# Performace comfort and hygiene

Superhydrophobic surfaces – ADRE Plasma - Nanowaxes  
Antimicrobial effect of wood, Wood and health care facilities



## Somatic interaction

Relation between material surface features and Body positions and postures,  
potential of soft wood species like alder, aspen, lime tree, poplar



**Acoustic Interaction** – effect of wood on the acoustic well-being, psychoacoustics and wood elements like music instruments in space

**Olfactoric and gustatoric interaction** – wood essences and taste - wood tasting and relation of dining area



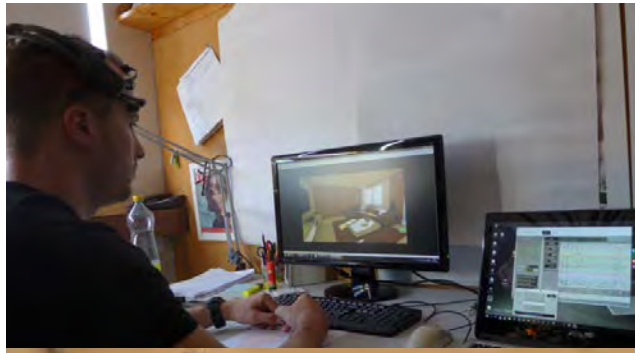
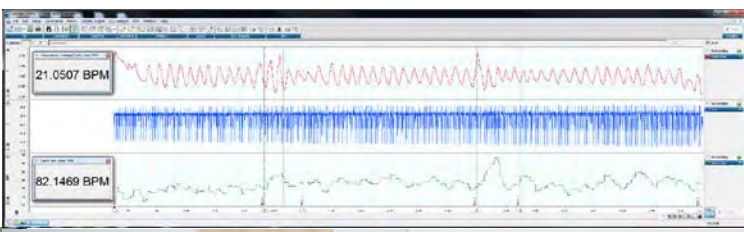
# OBJECTIVE PHYSIOLOGICAL MEASUREMENT in BCDlab



Hardware used for measuring of EEG by respondents: Multifunctional holter from Nanodesing (left) and EEG - Sensor EPOC+ , company Emotiv (right)

Average values of single signals.

|   | Respondent 1 |                               |                            | Respondent 2 |                               |                           | Respondent 3 |                                |                           |
|---|--------------|-------------------------------|----------------------------|--------------|-------------------------------|---------------------------|--------------|--------------------------------|---------------------------|
|   | SMR          | HRV                           | RF                         | SMR          | HRV                           | RF                        | SMR          | HRV                            | RF                        |
| Setting 1 balanced                          | 7.42         |                               |                            | 5.61         | 55.7±3.7                      | 19.02                     | 35.2         | 85±4.7                         | 31.31                     |
| Setting 2 balanced less stimulation         | 7.41         | 76.3±2.3 variation s:67 to 83 | 16.8 variations:16 to 19   | 4.54         | variati ons: 47 to 72         | variatio ns: 18 to 23     | 37.8         | variatio ns: 73 to 101         | variation s:14 to 57      |
| Setting 3 misbalance d too much stimulating | 6.96         | 78.1±3.2 variation s:71 to 85 | 17.2 variati ons: 14 to 18 | 3.16         | 55.3±4.1 variati ons:50 to 72 | 18.1 variatio ns:18 to 19 | 14.8         | 85.9±4.5 variation s: 79 to 95 | 27.2 variation s:18 to 56 |



Physiology parameters by different body positions by work in BCDlab / FA STU in Bratislava, testing of physiology responses by different environmental simulation and testing of responses by visual and tactile contact with different materials, EEG-Parameters SMR, HRV, RF and Respiration were measured.

# BCD-app – interactive web application



BCD – app – web- Application for simulation of different material settings in a space, with getting feedback for users

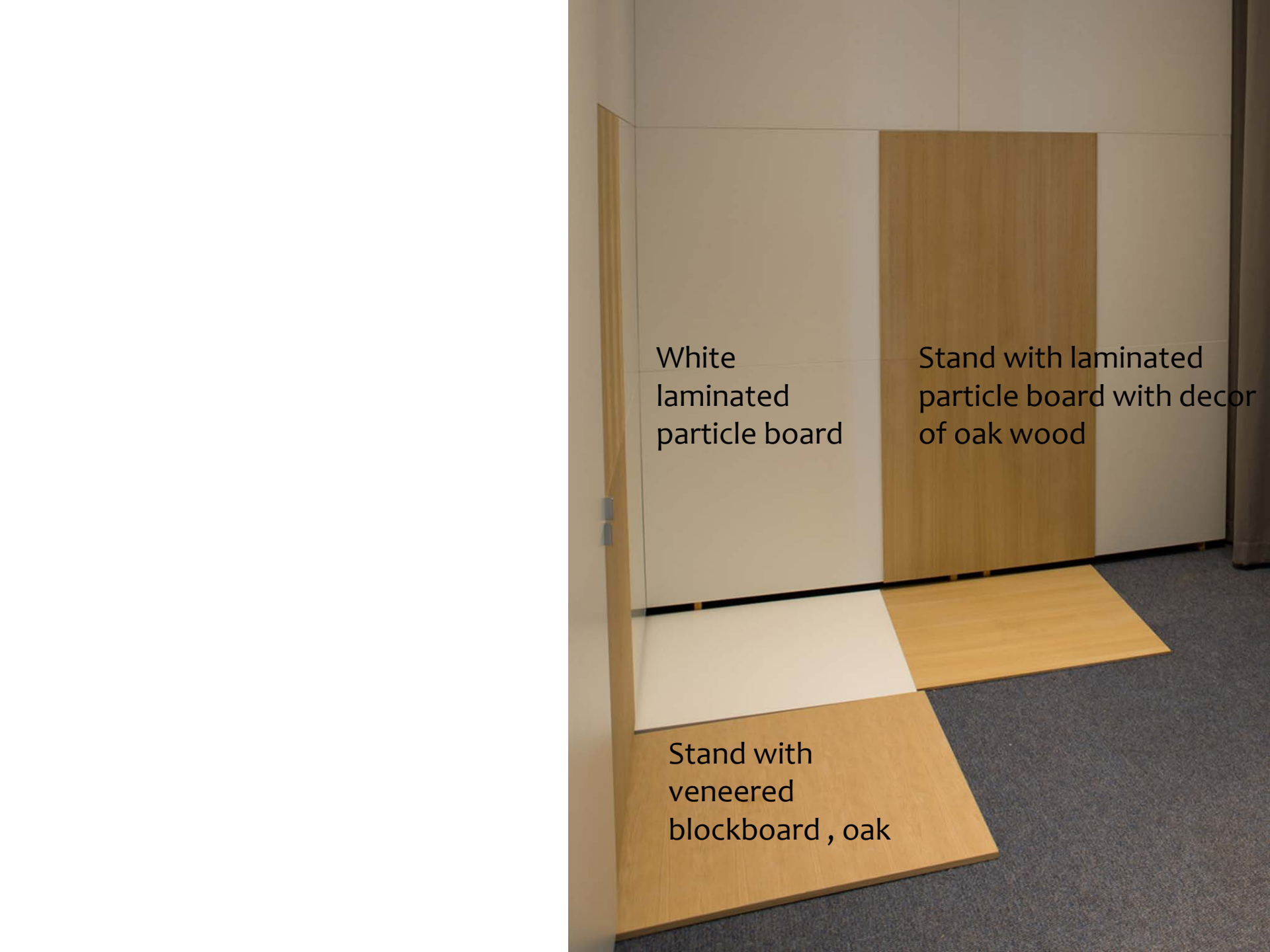
# Environmental Simulations and their Role in the Research of Human Responses to Environmental Stimuli

*Veronika Kotrádyová, Igor Salcer, Erik Vavrinský*



*Samples of three environmental settings in the web-application BCDlab that respondents had to face by our pilot test, first is the balanced one, second is with too much brown colour of natural like materials and the last one is stimulating strongly.*



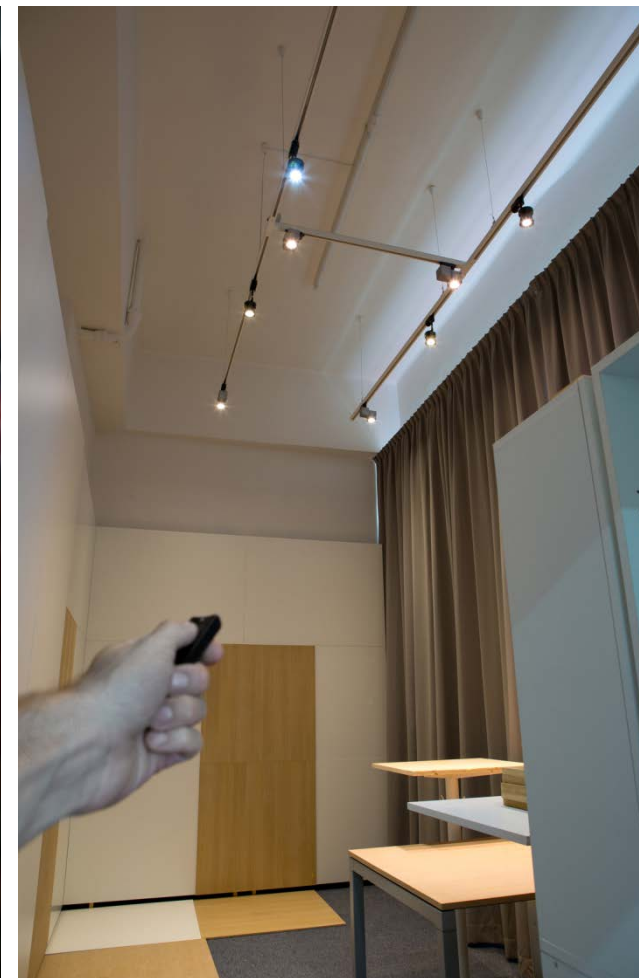


White  
laminated  
particle board

Stand with laminated  
particle board with decor  
of oak wood

Stand with  
veneered  
blockboard , oak





Metodika merania fyziologických reakcií v BCDlab

# **Socio- cultural interaction**

research of cultural and biological relationship  
between man and wood and other natural  
materials

Genetic memory, nervous system, rituals and  
habituation

archetypes and stereotypes connected with  
wood

## **STEREOTYPES ABOUT WOOD**

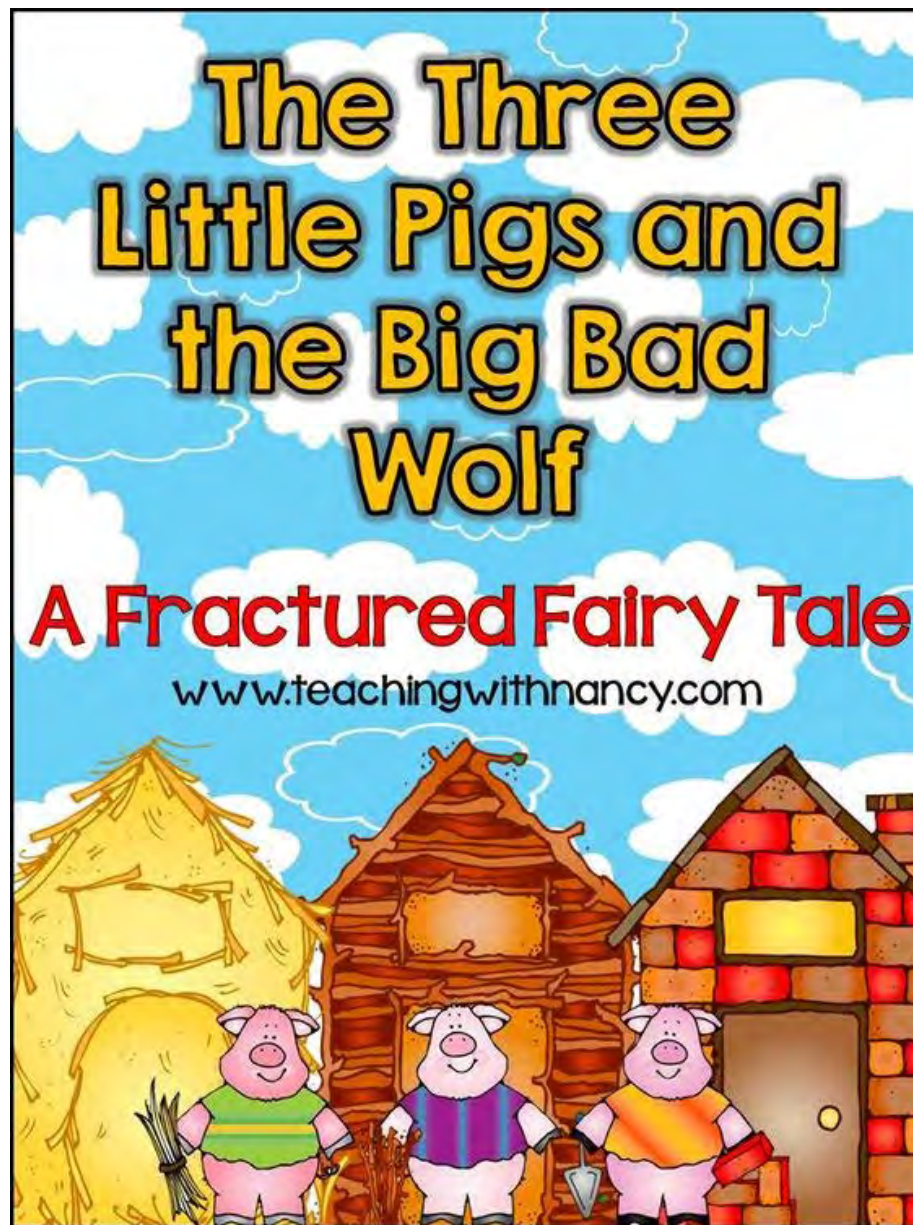
**low durability and risk of irregular aging**

**low hygiena**

**high price**

**burning**

**(big fires in the history, why?)**



low durability supported by fairytales







Surface of plywood seats at the Porto airport





Need to clean in a wet way with  
chemical detergents  
is part of our western culture

Maintenance through the renewal

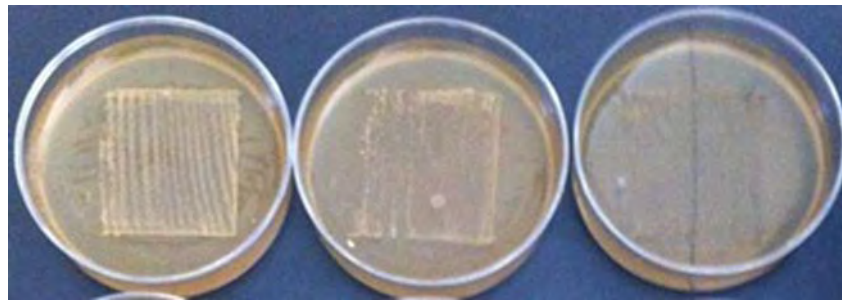
PERFORMANCE COMFORT



STEREOTYPES  
mostly from second half of 20.century  
**concerning hygiene standards**  
supported by chemical industry





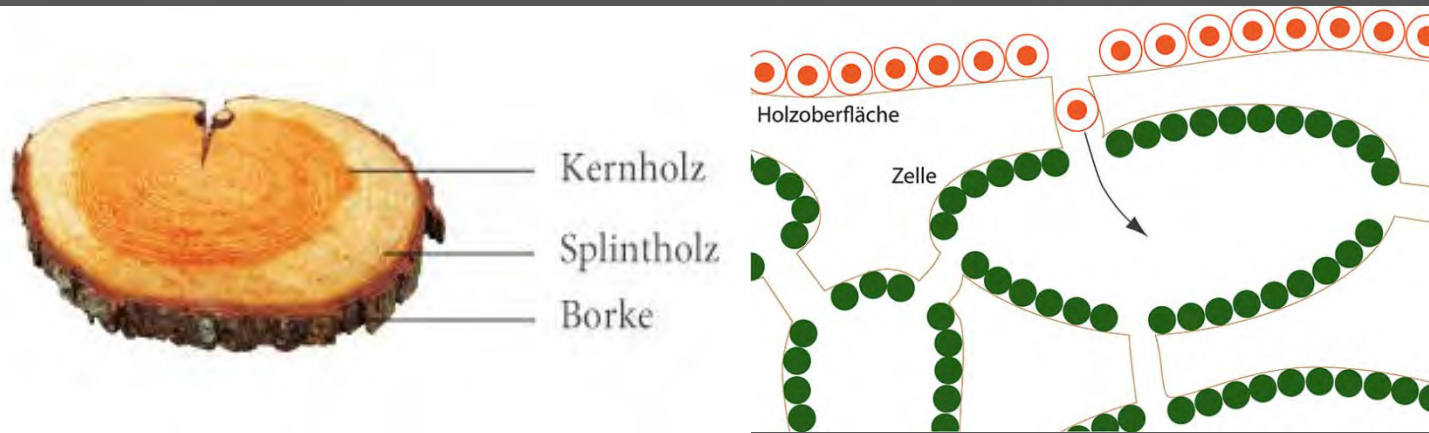


Survival of *Staphylococcus aureus* on the different surface via log CFU obtained from the swabs after wipe.argin settings

| Blocks                                   | Time   |         |
|--|--------|---------|
|  | 0 hour | 20 hour |
| Laminated particle board                 | 7,43   | 7,11    |
| Pine board                               | 6,56   | 2,95    |
| Pine board finishing with oil-wax        | 7,39   | 6,78    |
| Pine board finishing with acrylic laquer | 7,42   | 7,2     |
| Oak board                                | 3,76   | 2,34    |
| Oak board finishing with oil-wax         | 7,41   | 3,57    |
| Oak board finishing with acrylic laquer  | 7,32   | 6,72    |

## ANTIMICROBIAL FEATURES OF WOOD

Wood has antimicrobial features,  
thanks to extractives especially pine, oak and larch  
and anatomical structure by all wood species  
....thats why it belongs to kitchens, health care facilities or schools







Butcher blocks – less effective  
natural antimicrobial behaviour of wood

Important is, that it  
does not matter, what  
kind of mechanical  
finishing it has,  
the antimicrobial  
behaviour is the same



Too much Hygiene → lowering the Immunity and supporting the Resistance of Bacteria → multiresist Germs



Excessive hygiene does not only result in allergies, but it also reduces our resistance to antibiotics. **Triclosan** is a widely used biocide that is considered as an effective antimicrobial agent against different microorganisms. It is included in many consumer and personal health-care products like soaps, deodorants, toothpaste, shaving creams, mouthwashes and detergents. The association between triclosan and increasing of bacterial resistance was confirmed (Yazdankhah et al. 2006, Bírošová & Mikulášová, 2009)

S. P. Yazdankhah , A. A. Scheie, E. A. Høiby, B. T. Lunestad, E. Heir, T. Ø. Fotland T, K. Naterstad , H. Kruse H. Triclosan and antimicrobial resistance in bacteria: an overview. Microb Drug Resist. Summer;12(2) (2006), 83-90.

Bírošová, L., Mikulášová, M: Development of triclosan and antibiotic resistance in *Salmonella enterica* serovar Typhimurium. J Med Microbiol. 2009, 436-441, doi: 10.1099/jmm.0.003657-0.



# ARCHETYPES

Wooden tectonics

Log structures,  
traditional roof  
constructions  
makes us feel safe,  
relaxed and comfortable



**AUTHENTICITY... TRUTH**

**Truth is the best material**

*Wolfgang Haipl*

**AGING**

**CONFLIKT  
BETWEEN POSSIBILITIES OF MAINTENANCE  
AND AUTHENTICITY**

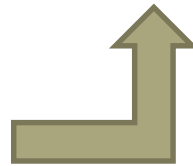
# WHY WOOD IN THE HEALTH CARE FACILITIES?

Design like in civil spaces

Aesthetic and tactile  
qualities leading to wellbeing

Antimicrobial features

Moisture and VOC-emissions  
management



Complex comfort

Good microclimate

Reduction of  
environmental stress and  
stress from being in the  
health care facility self

Reduction of time spent in  
the hospital



Kantonspital, Chur





ABS extrusion.



Polypropylene extrusion (PP).



HPL folia (laminát)



Hospic, St. Goddard





Hospital - Landeskrankenhaus in Feldkirch – Vorarlberg, Austria, using of clay bearing structure



2a.

# Interdisciplinary case study „Wood in health care facilities“

architecture, design, art  
microbiology, indoor air quality - VOC -emissions  
wood science – dendrochronology  
physiology and emotional impact







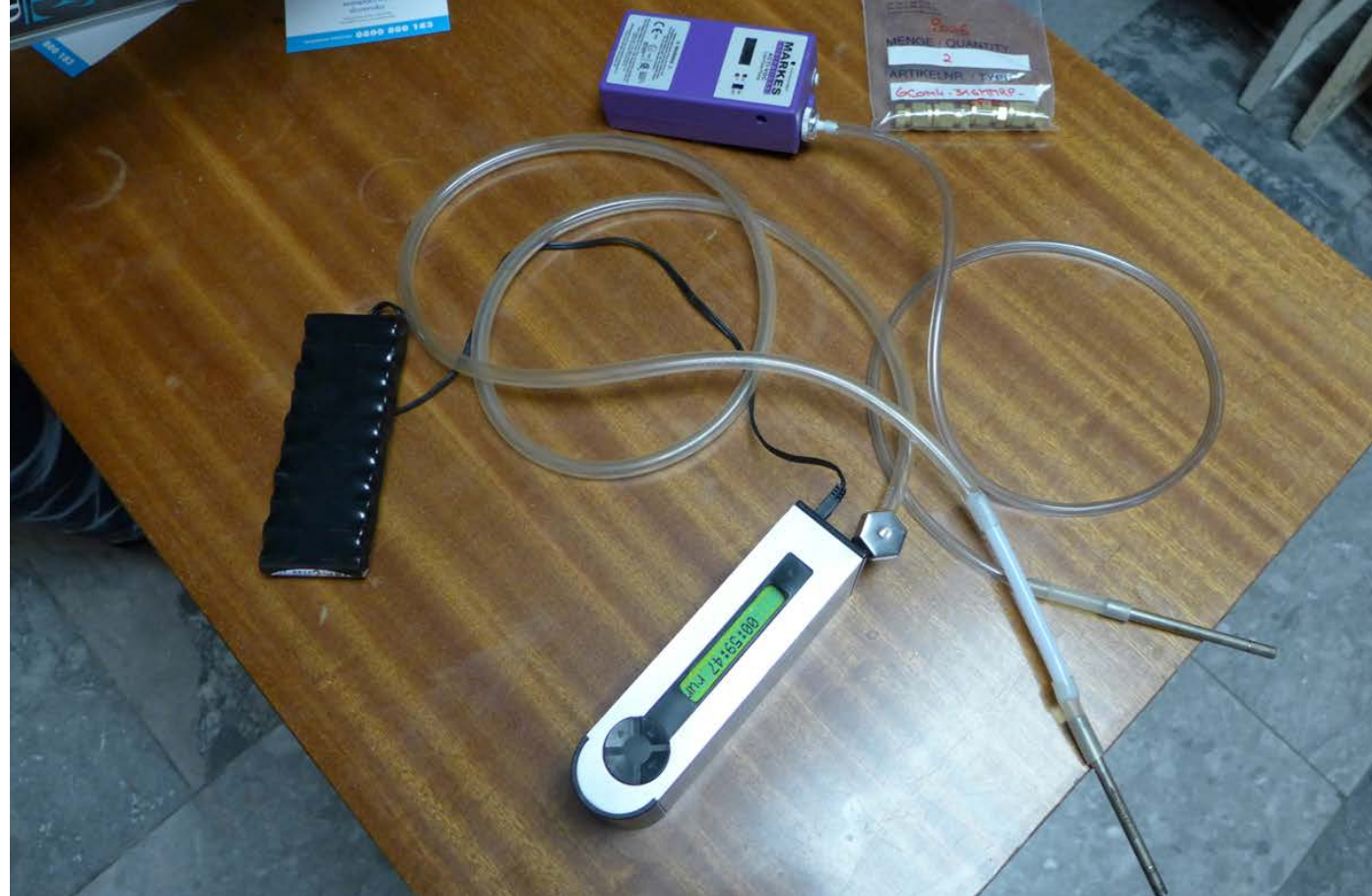




# National oncological institute in Bratislava







- Documenting and evaluation the state prior and after the reconstruction by objective and subjective parameters
- microbial quality of air and surfaces
    - VOC - emissions
  - emotional and physiological responses of respondents  
(invited respondents, no oncological patients)





Časť vestibulu na Nár. onkologickom ústave v Bratislave, súčasť vedecko-umeleckej štúdie Drevo v nemocničnom prostredí,  
dizajn: Martin Boleš a Veronika Kotradyova







Piece of art „Story of the tree“

## PRÍBEH STROMU

V letokruhoch viditeľných v priečnom reze dreva vieme prečítať celý život stromu, z ktorého pochádza. Sú obrazom toho, že v živote stromu ako aj človeka sú dobré aj horšie časy.

V mladosti rastie strom najrýchlejšie, v zrelom veku stále pomalšie. Keď je dobré počasie – teplo, vlhko a dostáva sa mu dostatok slnka, priestoru a ochrany, môžu mať jeho ročné prírastky – letokruhy aj centimeter. Za nepriaznivých podmienok rastie strom pomalšie, prírastky sú malé a letokruhy husté. Strom to ale v konečnom dôsledku posilní a drevo vznikajúce za takých podmienok je mimoriadne pevné.

Keď je strom chorý - keď ho napadne hmyz alebo huby, jeho rast sa spomaluje. Môže to vážne ohroziť jeho život, ale dokáže sa z toho vyliečiť vďaka svojim obranným mechanizmom a znovu rýchlo rásť...

Objekt na stene je vyrobený zo zvyškov hranolov na výrobu lavičiek v tejto časti vestibulu.

Smrekovec použitý na tieto lavičky vzkličil okolo roku 1934 v chotári obce Osrbľie na Horehroní. Spočiatku rástol veľmi rýchlo a po prvých štyroch rokoch dosiahol svoje prvé maximum v prírastku.

Ale keď mal 10 rokov - v roku 1944, jeho rast sa spomalil a vo svojich sedemnástich v roku 1951 dosiahol svoje prvé rastové minimum. Boli to ťažké časy pre stromy aj pre ľudí. Potom

*1996 postihla Osrbľie veterná smršť, prežili prevažne tie jedince, ktoré boli*

*1986 dopadol aj na územie Slovenska rádioaktívny mrak z Černobyľu*

*1944 od augusta bolo na Horehroní povstalecké územie a prebiehal tu výcvik vojsk, od októbra tu operovali partizánske jednotky, jeseň aj zima boli veľmi ťažké pre ľudí aj pre stromy*

*31.1. 1945 oslobodili mesto Brezno a jeho okolie sovietski a rumunskí vojaci, doteraz je v množstve starých stromov uviaznutá munícia z povstania a oslobodzovacích bojov*

*1934 vzkličenie*

*1938 prvé rastové maximum*

## V ŽIVOTE ČLOVEKA AJ STROMOV SÚ LEPŠIE A HORŠIE ČASY...

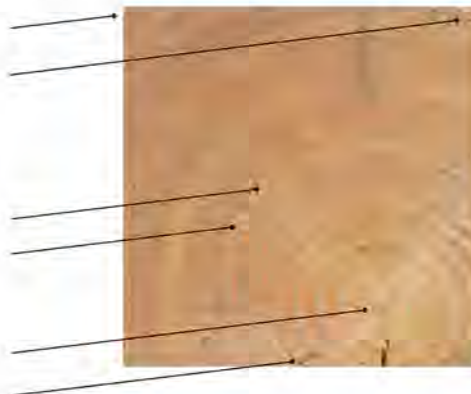
bol jeho život ako na hojdačke - dobré roky sa striedali s horšími, ale pomalinky rástol a silnel.

Keď mal 52 rokov - v roku 1986 dosiahol ďalší svoj životný vrchol, vzápätí ho však vystriedal rapidný pokles prírastkov. Potom sa opäť striedali dobré a horšie roky. Prírastok bol stále menší, ale strom rástol pomaly svojím tempom, čo ho urobilo dostatočne silným, aby prežil veternú smršť v roku 1996, ktorá vtedy najviac postihla Osrbľie. Mal vtedy 61 rokov. Ako sedemdesiatnik mal prevažne dobré obdobia a v osemdesiatke dosiahol vek zrelosti.

Drevo z tohto stromu teraz žije tu s človekom. Praskliny vznikli pri sušení reziva a pri náhlych zmenách vlhkosti a teploty vzduchu v miestnosti. Každá zmena v životných podmienkach sa tak na ňom prejaví. Práve tie praskliny robia každý kus dreva jedinečným a to má s človekom spoločné...

Drevo tak rozpráva svoj príbeh a ponúka podporu a pomoc svojimi dobrými vlastnosťami...

*Autormi objektu na stene sú Veronika Kotradyová a Martin Mjartan v spolupráci Martinom Bolešom a Wandou Borysko z Fakulty architektúry STU v Bratislave. Dendrochronologická analýza dreva vznikla v spolupráci s Dipl.-Ing. Dr.nat.techn Michaelom Grabnerom z Institut für Holztechnologie und Nachwachsende Rohstoffe, BOKU Viedeň.*









In cooperation with Kompetenzzentrum WOOD K plus Vienna there were running measuring and evaluation of VOC-emissions in the same premises of lobby, in original state and after the 3 weeks and 3 and 7 months after the installation of the solid wood elements. Its aim is to declare that wood without chemical surface finishing can absorb other toxic VOC - emissions and to desorb into the indoor air less and to provide so called „**sink-efekt**“.

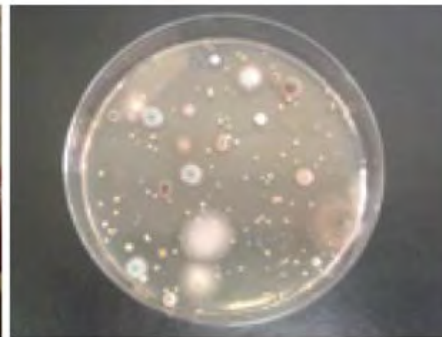
For the further progress in this field we need to prepare new studies in the healthcare facilities

## Overall amount of colony forming units (CFU) of microorganisms in the indoor air (evaluated from microbial fallout on to Petri dishes left open to the air)

|  | State prior to the wood implementation<br>May 2016 | State 3 weeks after the wood implementation<br>November 2016 | State 4 months after the wood implementation<br>March 2017 | State 7 months after the wood implementation,<br>June 2017 |
|--|--|--|--|--|
| Air in the corner of the lobby         | 51 CFU/dm <sup>2</sup> /h                          | 20 CFU/dm <sup>2</sup> /h                                    | 36 CFU/dm <sup>2</sup> /h                                  | 42 CFU/dm <sup>2</sup> /h                                  |
| Near to the column by the sitting area | 56 CFU/dm <sup>2</sup> /h                          | 24 CFU/dm <sup>2</sup> /h                                    | -  | 38 CFU/dm <sup>2</sup> /h                                  |
| Near to the corridor to the ambulances | 30 CFU/dm <sup>2</sup> /h                          | 27 CFU/dm <sup>2</sup> /h                                    | 33 CFU/dm <sup>2</sup> /h                                  | 36 CFU/dm <sup>2</sup> /h                                  |

## Overall amount of colony forming units of microorganisms on the surfaces (determined by swabbing method)

|   | State prior to the wood implementation<br>May 2016 | State 3 weeks after the wood implementation<br>November 2016 | State 4 months after the wood implementation<br>March 2017 |
|---|--|--|--|
| Sitting elements (seat)                       | 6 CFU/cm <sup>2</sup>                              | 3 CFU/cm <sup>2</sup>  | 12 CFU/cm <sup>2</sup>                                     |
| Sitting elements (backlean)                   | > 15 CFU/cm <sup>2</sup>                           | 1 CFU/cm <sup>2</sup>  | 1 CFU/cm <sup>2</sup>                                      |
| Bench (gap between single timbers)            | -  | -  | 2 CFU/cm <sup>2</sup>                                      |
| Table with magazines                          | > 15 CFU/cm <sup>2</sup>                           | 4 CFU/cm <sup>2</sup>  | 6 CFU/cm <sup>2</sup>                                      |
| Stone floor                                   | > 15 CFU/cm <sup>2</sup>                           | 5 CFU/cm <sup>2</sup>  | 7 CFU/cm <sup>2</sup>                                      |
| Wood panelling on the wall (1,5 m from floor) | -  | 2 CFU/cm <sup>2</sup>  | 3 CFU/cm <sup>2</sup>                                      |
| Wood panelling on the wall (1,5 m from floor) | -  | -  | 3 CFU/cm <sup>2</sup>                                      |
| Plastic char in the nearby part of foyer      | -  | -  | 9 CFU/cm <sup>2</sup>                                      |



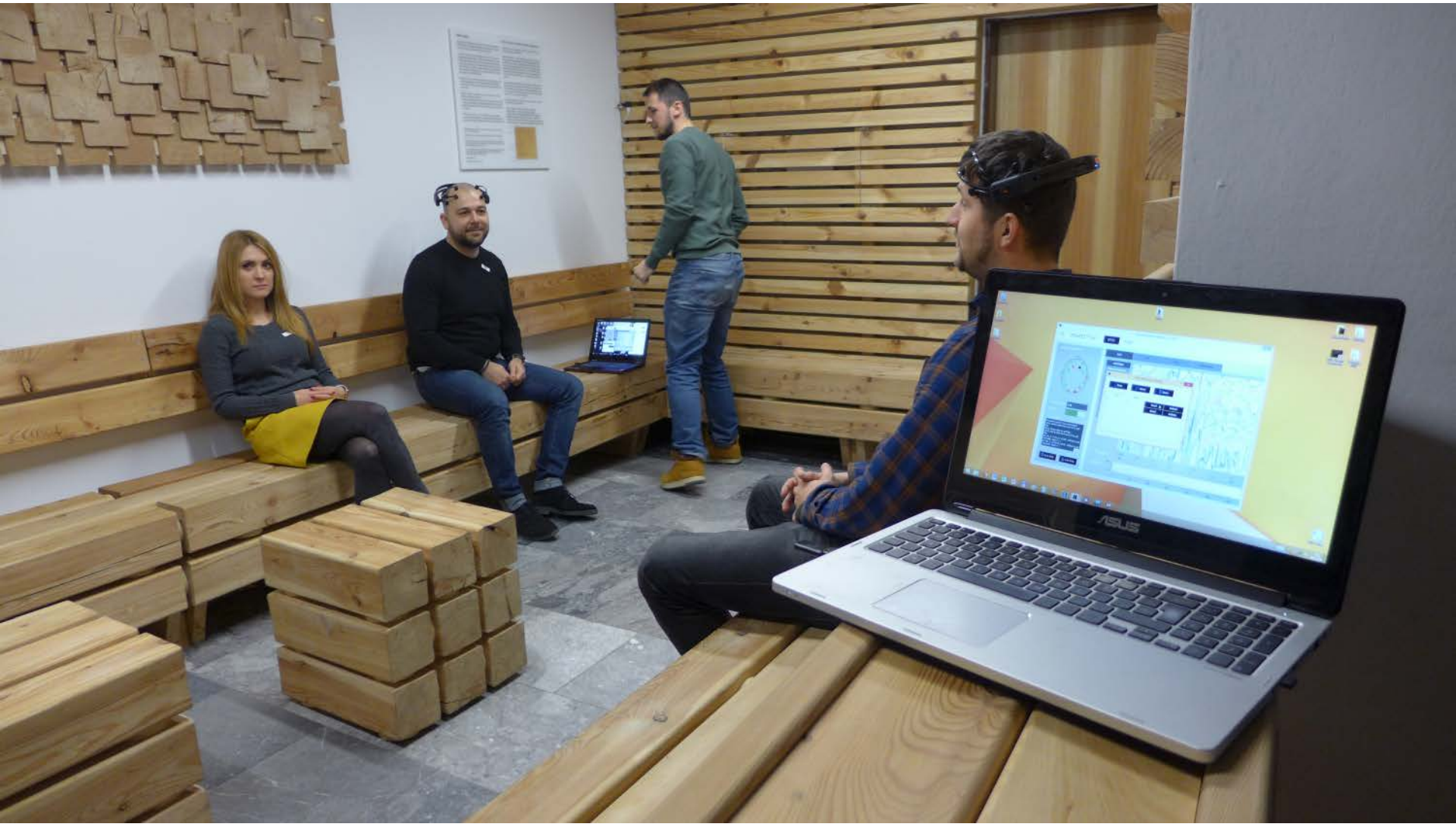


Testing after 4 months of using  
dirt is from users cloths and bags  
cleaning by ethanol (alcohol based)  
and SAVO (chlorid based cleaning)



## EXPERIMENT, 2018

EEG helter, measuring of brain waves with EPOC plus, emotions in cooperation with Facemedia-facial expressions, stress related kortizol, questionnaire, calibration through comparison with being in another part of foyer first by one group and then opposite by other group (40 respondents)

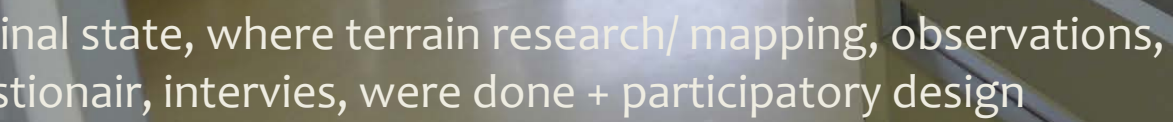


# PROJECT OF ROOM FOR MOTHER MILK PREPARATION

Klinika neonatologie LF UPJŠ a DFN v Košiciach,  
prednosta MUDr.Peter Krcho, PhD., primarka MUDr. Vanda Chovanova









Question nr. 10 „What do you think, has interior design of this room impact to your physical and menthal state and state of your baby?

**All respondents have answered “yes”**  
with a lot of emotional comments

Pre ilustráciu, pár odpovedí:

„Určite áno, ak sa mamička cíti fajn po psychickej aj fyzickej stránke, prenáša tento stav aj svoje dieťaťko“

„ Táto miestnosť je strohá, človek sa sústreďí na každú kvapku mlieka, zlepšenie vybavenia by prinieslo menej sústredenia sa a stresovania“.

Revitalizácia tejto miestnosti teda má z pohľadu tejto vzorky respondentov rovnako ako na základe všetkých svetových výskumov ohľadom vplyvu prostredia na človeka zmysel













## **CONCLUSION OF THE CASE STUDY**

Wood is suitable for health care facilities

It has regenerative impact for human

It has natural antimicrobial effect (by larch and pine)

By intensive direct interaction it gets dirty and loose its full  
ability to correct the microclimate in space

It is able to correct quality of indoor air  
(microorganisms and VOC's)

the zoning of finished and unfinished surfaces is necessary

**AND ENCOURAGING FURTHER HEALTH CARE FACILITIES**



# WOOD IN THE WELLNESS AND FITNESS AREA





Wooden dumbbell (with brass elements), design: Veronika Kotradyova





**WOOD IN GASTRONOMY**  
**Conflict of hygiene and tastefulness**









# KOMFORT V MIKROPROSTREDÍ



VERONIKA KOTRADYOVÁ

premedia

Kotradyova, V. : Comfort in  
microenvironment, Premedia, Bratislava,  
2015



Kotradyova, V et all. : Human centered  
Design, STU, Bratislava, 2015

INTERAKCIA  
ČLOVEKA  
A DREVA  
INTERACTION  
OF MAN  
AND WOOD  
VERONIKA  
KOTRADYOVÁ

Kotradyova, V et all. : Interaction of  
man and wood, in a progress

## Thank you for your attention !

kotradyova@fa.stuba.sk  
www.fa.stuba.sk  
www.bcdlab.eu

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