Faculty of Forestry and Wood Technology

InnovaWood Meeting
24.-25.4.2014, Tulln/ A

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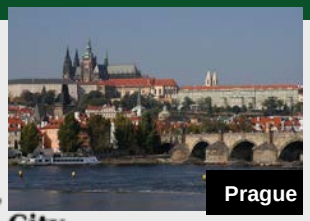
Overview about work topics

in Department of Wood Science/ Faculty of Forestry and Wood Technology, Mendel-University in Brno/ Czech Republic

Mendel University in Brno

Content

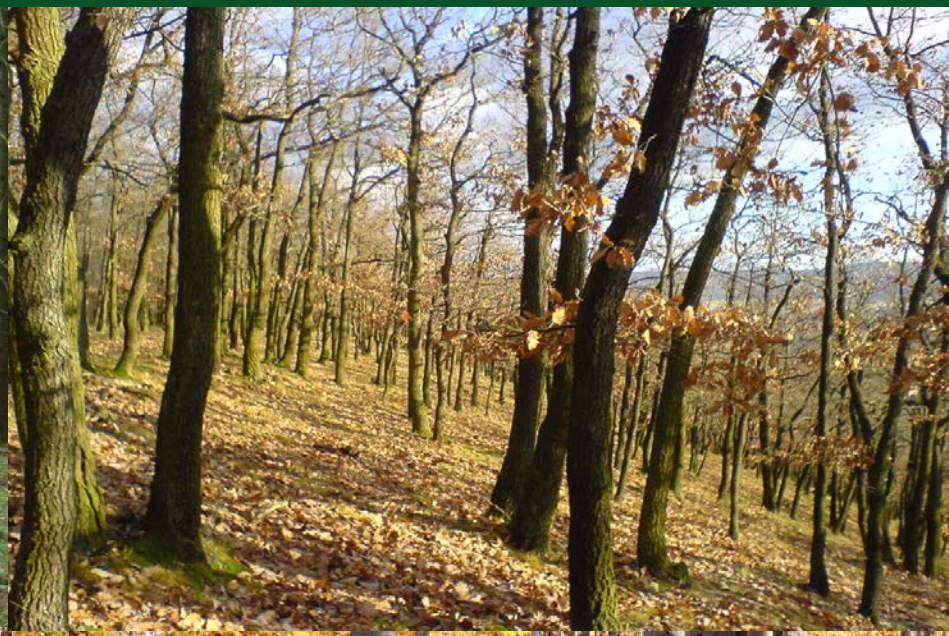
Czech Republic



3 traditional regions and 14 current administrative regions


Brno

Czech Republic - Forests



Czech Wood Industry

Timber wood industry – about 26,000 employees.

The biggest sawn timber producer - STORA ENSO TIMBER ŽDÍREC, s.r.o., STORA ENSO TIMBER PLANÁ, s.r.o., Mayer - Melnhof Holz Paskov, s.r.o., LESS – TIMBER, s.r.o.

Particleboards: KRONOSPAN CR, spol. s r.o. in Jihlava and Wood-processing association Lukavec.

Pulp&Paper: Biocel Paskov, a.s. (export of 280,000 tons of VIAN – PASKOV pulp) and Mondi Štětí, a.s. (500,000 tons).

Czech furniture – production: Jitona a.s., Koryna Koryčany a.s., TON a.s.

PLOMA, a.s. (plywoods), SAPELI, a.s. (doors), OKAL CZ s.r.o. (buildings), Strunal CZ (guitairs, violins), Petrof spol. s r.o. (Pianos).

Brno – Moravian centre of Education

Population: 400,000 - 2nd largest city in Czech Republic

Historical capital of Moravia, major higher education centre (85,000 students), high-tech centre for the CZ and region

Big changes in 1990s

5 public universities:

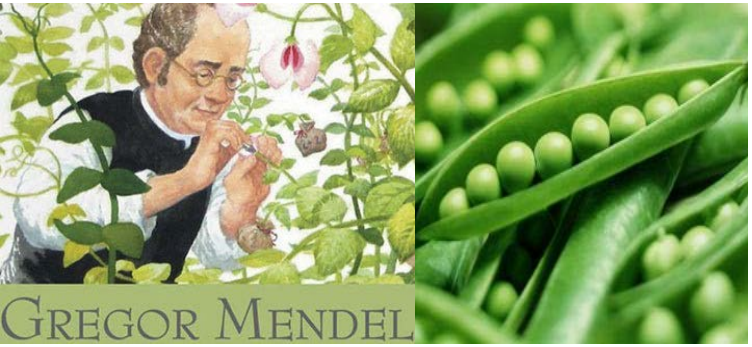
- Masaryk University
- Brno University of Technology
- Mendel University of Agriculture and Forestry
- University of Veterinary and Pharmaceutical Sciences
- Janáček Academy of Music and Performing Arts (JAMU)

1 state university: University of Defence

5 private universities

- Established in 1919 as the University of Agriculture

- Now it bears the name of JOHANN GREGOR MENDEL (Augustinian priest, scientist and philosopher, founder of modern genetics, discovered 3 basic laws of the genetics while doing his research on crossing a pea in Augustinian abbey in Brno)



Mendel University of Agriculture and Forestry in Brno

Mendel University in Brno 2010

- MENDELU consists of 5 faculties:

1) Agronomy, 2) Forestry and Wood Technology,
3) Business and Economics, 4) Horticulture,
5) Regional Development and International Studies

- 10,700 students (approx. 12,5 % in Brno, 2,5 % in CZ)

- 1,542 staff from which 501 academic, 188 research

Univ. of Agriculture in 1919

Mendel Uni Brno now

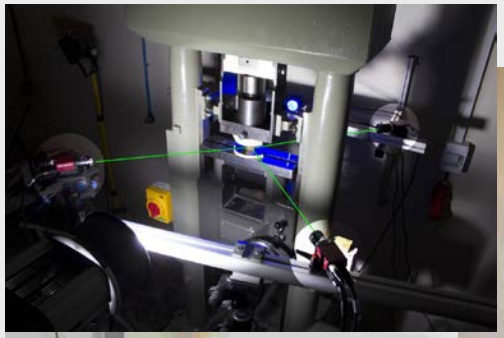

Faculty of Forestry and
Wood Technology

- 150 members of teaching staff,
- 1,800 students; study: bc. (3 years), master (2 years), dr. (3 years)
- 14 departments:

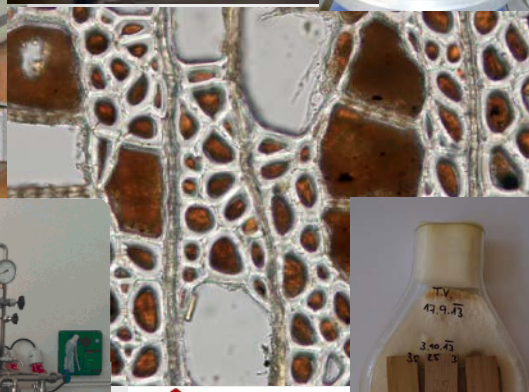
Department of Geodesy and Photogrammetry
Department of Geology and Pedology
Department of Mathematics
Department of Forest Botany, Dendrology and Typology
Department of Forest and Timber Industry Economics and Policy
Department of Forest Engineering and Reclamation
Department of Forest and Timber Industry Technology
Department of Forest Protection and Game Management
Department of Forest Establishment and Silviculture
Department of Forest Management
Institute of Forest Ecology
Department of Wood Basic Processing
Department of Furniture and Design
Department of Wood Science

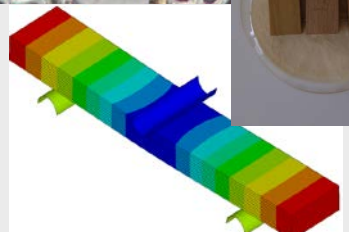
teaching and research

- wood anatomy
- dendrochronology
- arborist/ biomech. trees
- wood properties
  - chemical
  - physical
  - mechanical
  - DIC, FE
- numerical modelling
- drying of wood
- preservation of wood
- wood modification







wood.mendelu.cz

Laboratory of Wood Anatomy - Brno (Vladimír Gryc, Hanuš Vavrčík)

Wood identification: paleoanatomy (description of fossils wood), cooperation with Charles University in Prague

Archaeological wood

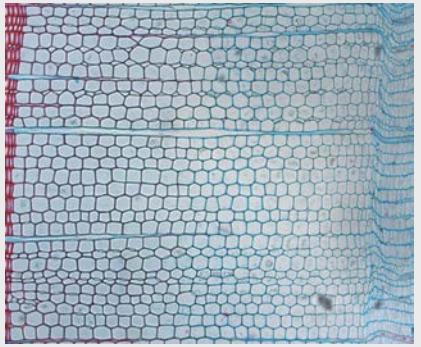
Recent wood

(private customers, companies, government institutions)

Wood formation: Cambial activity, Influence of temperature and precipitation to radial grow

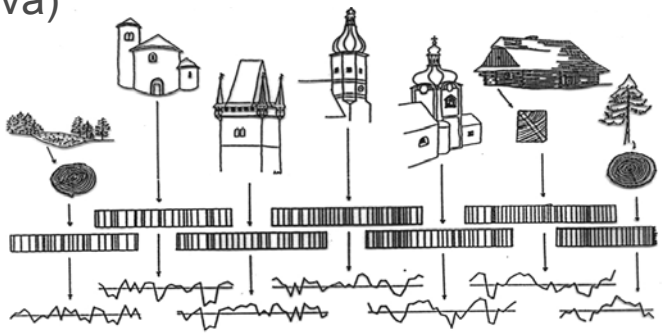
Norway spruce: Rájec-Němčice (CZ) – old and young stand, Ås (Norway) – drought stress; **Beech**

Equipment: microtomes (sledge and rotary microtome), microscopes (transient & incident), ImageJ, WinCell, R, Statistica, TableCurve 2D & 3D



Dendrochronology & Dendroecology

Laboratory of Dendrochronology - Brno (Michal Rybníček, Tomáš Kolář, Věra Filková)



Standard chronology: Spruce, Oak, Fir - Recent & Subfossil trees

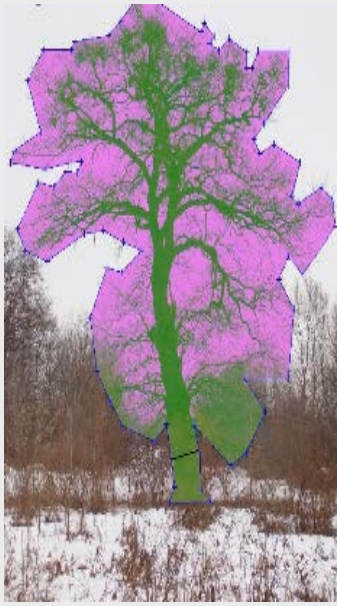
Help in archeology: Old constructions and buildings, Ancient artefacts age determining

Dendroclimatological overlaps: correlation tree ring width with climatic data

Projects: Standard oak dendrochronolgy of subfossil trees, Environmental aspects of death wood in river ecosystems, Adaptation of carbon deponia at landscape in context of global climate changes

Equipment: measuring tables TimeTable (TT-85-0-100/5 and TT-60-0-100/10), stereomicroscop Nikon SMZ 660 and Leica S6D, software (PAST 32, WinDendro, ARSTAN, STATISTICA,...)

Arboriculture Office in Brno (Luděk Praus, Petr Horáček, Jaroslav Kolařík, Barbora Vojáčková,...)



Assessment of tree condition

Tree and stand stability, Load analysis of trees

Arboriculture – care about tree

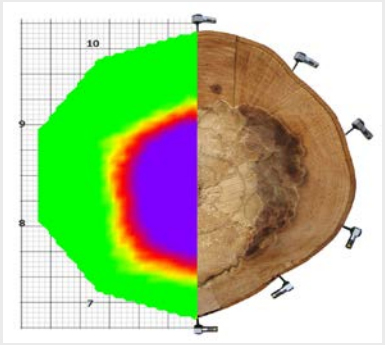
Influence of properties of wood on mechanical behaviour of a tree

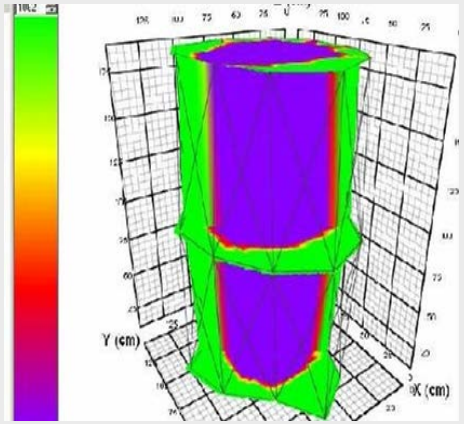
Mechanics of a tree root system

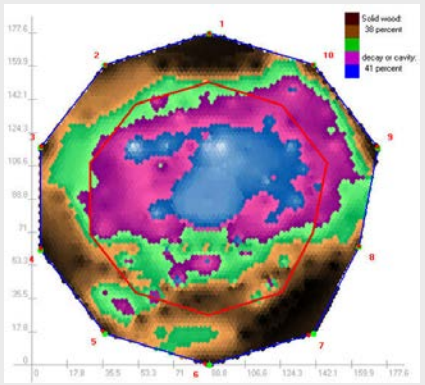
FE models of a tree and its parts

Non-destructive testing of wood and trees

Equipment: sets for pulling test (sensors, winch, etc.), acoustic tomograph Fakopp, electrical resistivity tomograph, ultrasound testing devices, etc.





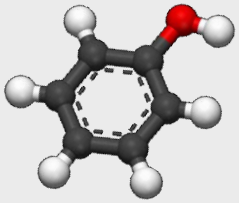


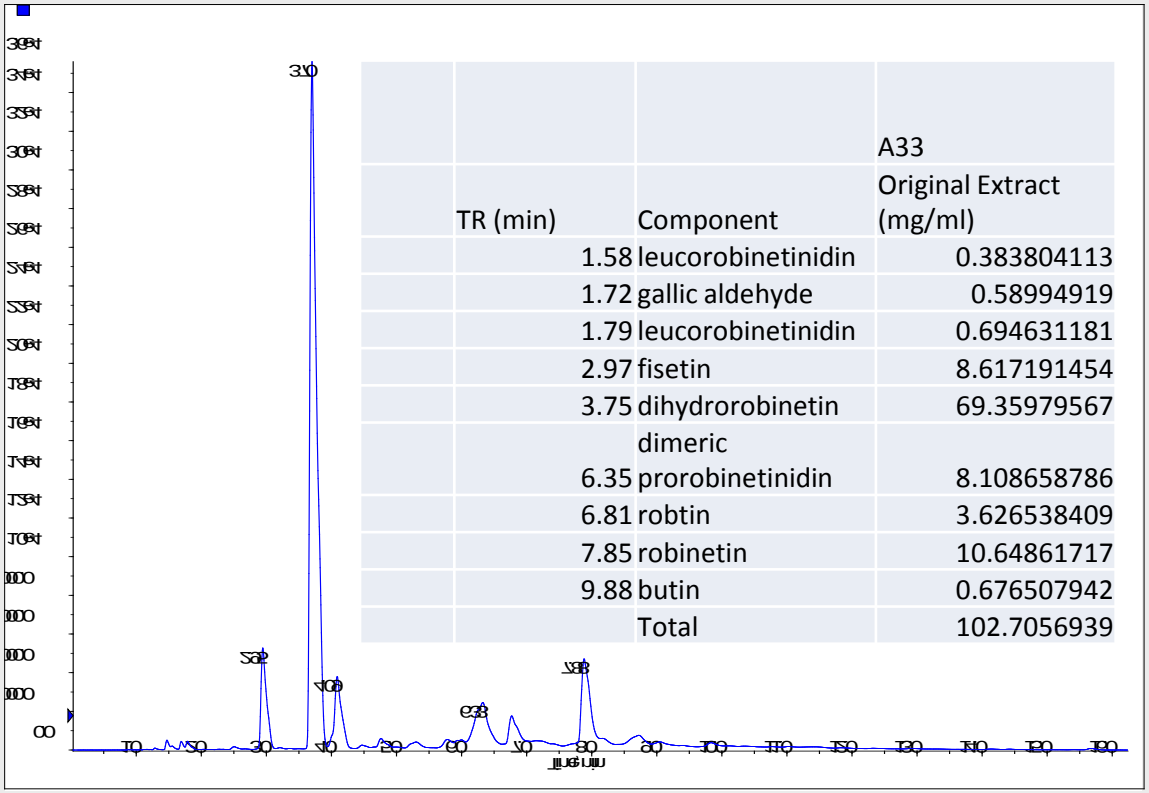
Wood Chemistry

- **Equipment:**
- Fex-Ika Extractor
- HPLC
- GC-MS

Phenolic compounds →aims of investigation:

- Amount/ Composition of extractives in wood
- Influence of extr./ phenolics on wood durability
- Impregnation with extractive compounds
- Testing of phenolics on impact to durability





			A33
	TR (min)	Component	Original Extract (mg/ml)
	1.58	leucorobinetinidin	0.383804113
	1.72	gallic aldehyde	0.58994919
	1.79	leucorobinetinidin	0.694631181
	2.97	fisetin	8.617191454
	3.75	dihydrorobinetin	69.35979567
	6.35	dimeric prorobinetinidin	8.108658786
	6.81	robtin	3.626538409
	7.85	robinetin	10.64861717
	9.88	butin	0.676507942
		Total	102.7056939

HPLC-Chromatogram of methanol-water 1:1 Robinia-heartwood extract
(Sáblik, Pashova, Rademacher, Hofmann [Sopron])

Physical and Mechanical Properties of Wood & WBC

Laboratory of PhMPW in Brno (Petr Horáček, Jan Tippner, Luděk Praus, Václav Sebera)

Modernized testing machine ZDM 5/51 50kN + Mtest software, 2x CCD video-extensometer.

Densitometer X RAY DENSELAB, Heat Flow Meter HFM 436 Lambda.

Pedagogy and Research of Students, Measuring of properties of solid wood, WBC and biomaterials, Wood and composite mechanics, Tests according to EN or Czech standards, Verification of numerical simulations.

Laboratory of Mech. Properties in Brno Útěchov

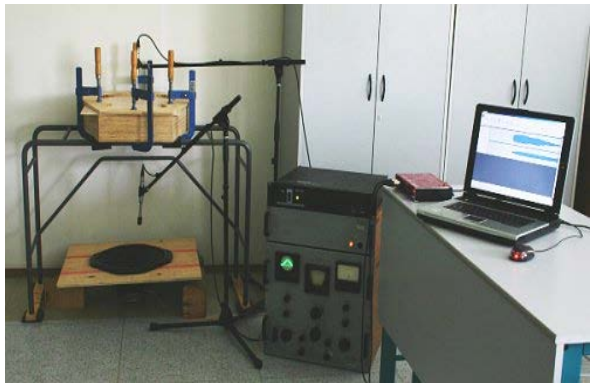
Testing Machine Zwick Z050 50 kN + TestXpert software, 5kN & 10 kN machines, drying oven, device for measuring of permeability, DIC sets with VIC software and other DIC sw

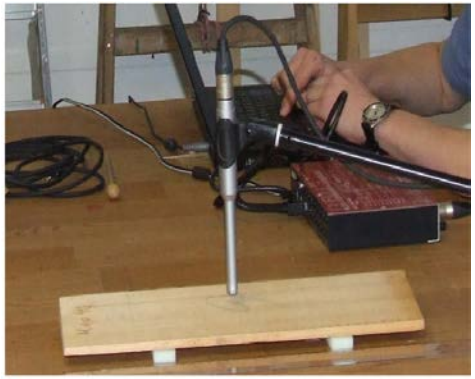
Lab. of Acoustics of Wood in Brno, Útěchov (Jan Tippner)

Nondestructiove testing of Wood with Ultrasound devices (Arborsonic Decay Detector, Fakopp Ultrasonic Timer with different sensors) and by frequency resonant method (microphones, AC/DC converter, FFT software)

Experimental Modal analysis & Chladni Patterns (soundboards of musical instruments)

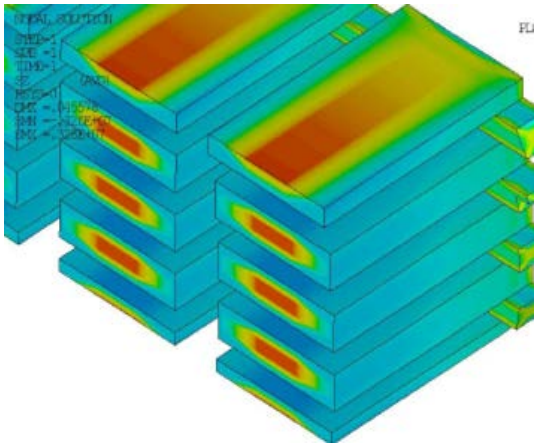
Frequency and Modal Analysis with very small Accelerometers and DEWETRON device with DEWESOFT & FRF module



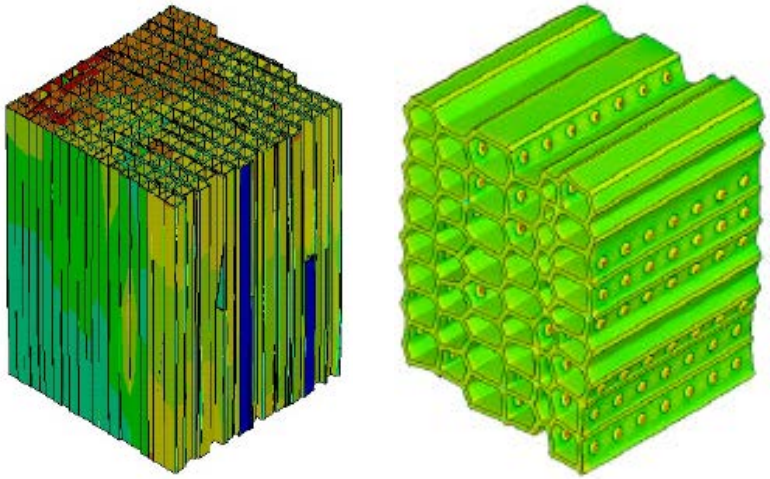


Numerical Modeling

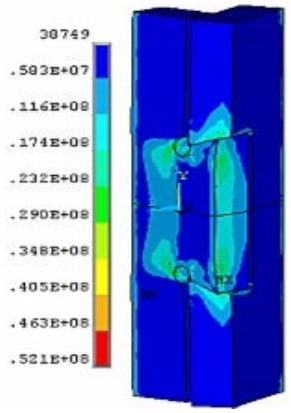
Heating of Timber:



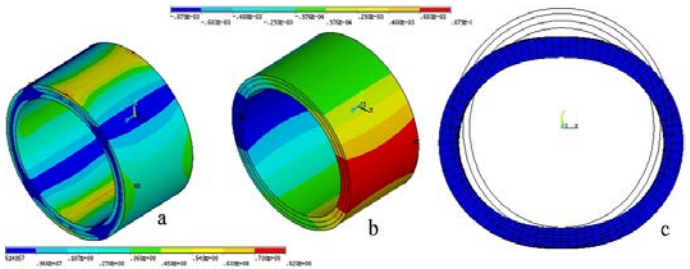
Modelling of structure:



Optimization of furniture joints:



Bamboo:



Laboratories of Wood Modifications in Brno Útěchov (Aleš Dejmal, Petr Pařil, Vojtěch Koiš, Jakub Domeny)

Dried timber quality assessment

Verification of parameters of the drying environment

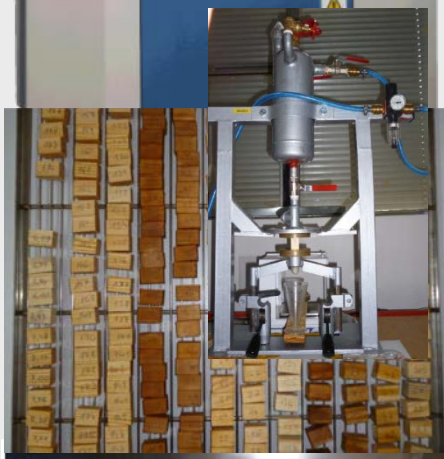
Chemical treatment – Impregnation (vacuum/pressure)

Thermal modification – e.g. dimensional stabilisation, durability, color

Microwave modification – e.g. changing of permeability

Wood volumetric mass modification by pressing

Equipment: testing climatic chambers, laboratory drying kiln, vacuum/pressure autoclave, drying ovens, microwave chambers, vacuum/convectional oven, steam oven, moisture-meters, etc.



Laboratory of Wood Protection in Brno Útěchov (Jan Baar)

Assessment of bio-degradation of Wood and WBC

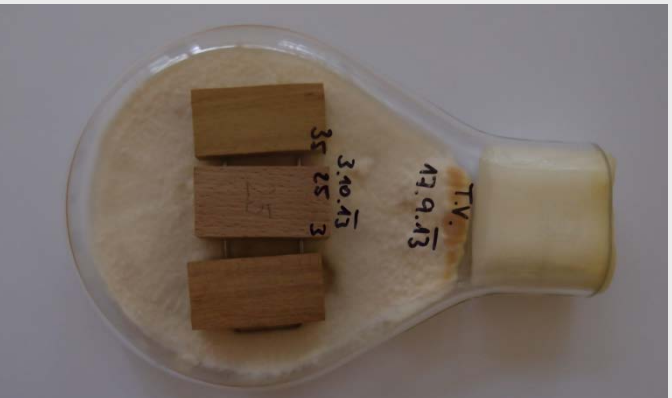
Biology of bio-degrading fungi and insects

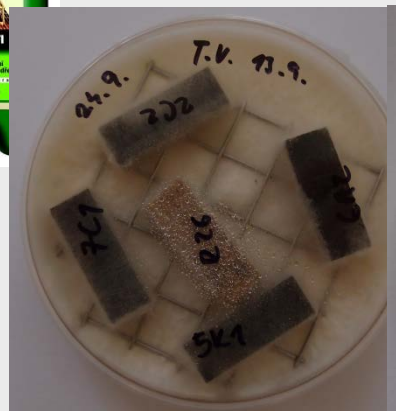
Measuring of changes of physical & mechanical properties

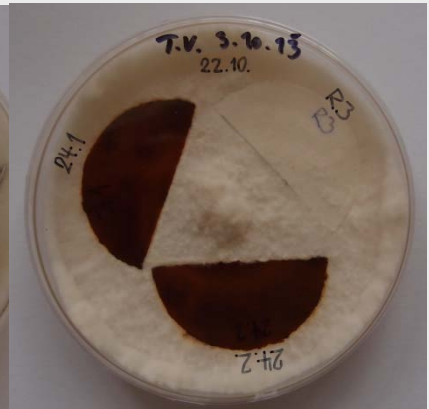
Instrument assessment of timber condition

Assessment of timber quality, defects and degree of degradation

Equipment: hazard box, autoclave for sterilisation, incubation boxes







InWood

The establishment of an international research team for the development of new wood-based materials – till 2015

Project focus

– academic and nonacademic staff (mainly MENDELU)

– students

3 Main activities

– new team

– internationalization

– further education

IGA-V (modified Beech wood for flooring)

GACR, Hor2020 (material use of modified SR-plantation wood [planned])

esf european social fund in the czech republic
EUROPEAN UNION
MINISTRY OF EDUCATION, YOUTH AND SPORTS
OP Education for Competitiveness
INVESTMENTS IN EDUCATION DEVELOPMENT

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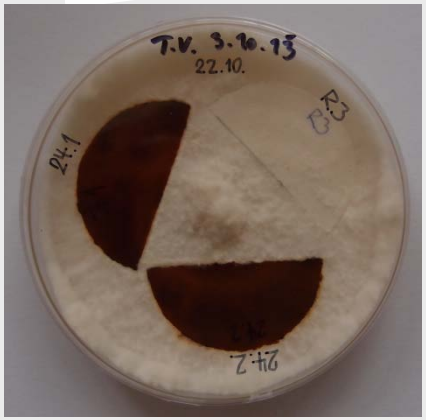
- New Team
- New Methods
- New properties
- New materials
- New products



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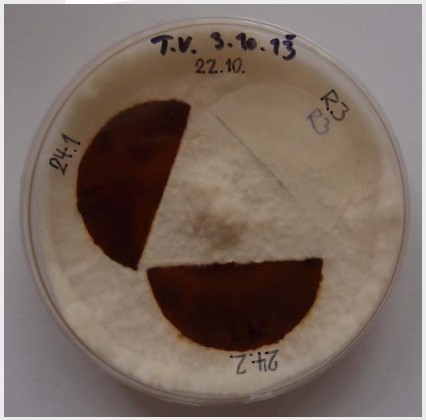

Mendel University in Brno

- Thanks for your attention!