



## International Evaluation Panel Meeting with the Institute Research Community within SAS Evaluation in 2016

The Institute of Construction and Architecture pursues the fundamental research in the selected domains applicable in construction and architecture:

**Applied mechanics,**

**Non-metallic and building materials science and building structures,**

**Building physics,**

**Architecture and urbanism.**

It was realised within the frame of various domestic and international research programmes.





## Topics:

- ❖ mathematical-physical modelling and numerical simulations of multi physical phenomena in composite materials
- ❖ development of advanced computational methods for modelling of smart materials.

## Projects:

- Numerical simulations of multi field problems in multiphase porous media
- Optimal design of smart composite materials
- Multiscale modelling of coupled fields in composite materials
- Computational methods for fracture analyses of quasicrystal materials
- Applications of meshless methods in computational mechanics - SAS-MOST Taiwan JRP

**International cooperation:** University of Siegen; Univ. of Akron; NTU Taiwan; Kinki Univ. Osaka; Queen Mary Univ.; Univ. of Coimbra; Shandong Univ. of Technology; Dalian Univ. of Technology; City Univ. Hong Kong; UNSW Sydney; Carleton Univ. Ottawa

## **Statistics of publications**

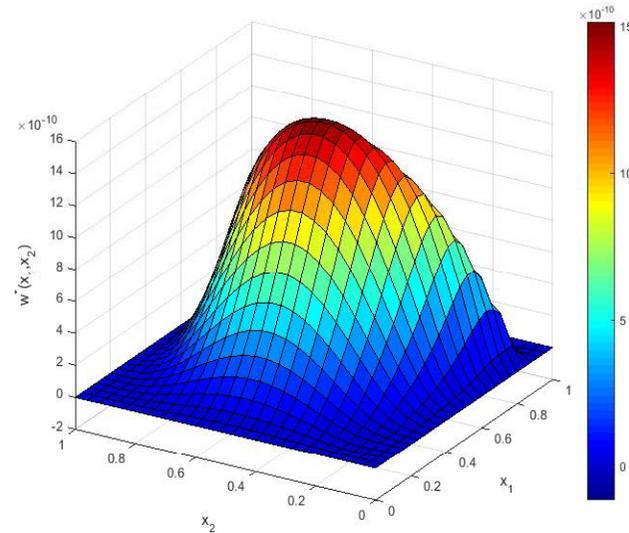
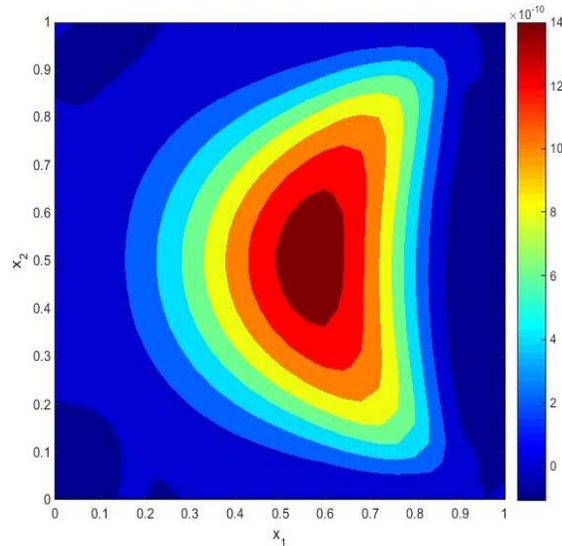
Papers in CC journals: 54; Chapters in monographs: 4; Papers in other journals: 23;

Papers (reviewed) in conf. proceedings: 36; PhD theses: 3; Master theses: 3



## 1. Composite materials - bending of elastic FGM plates

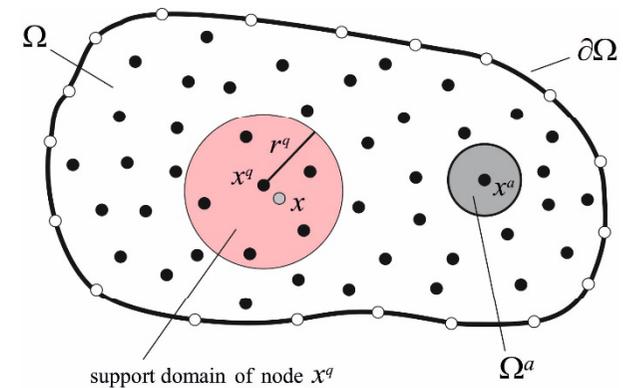
- Developed unified formulation for 3 theories of plate bending (KLT, FSDPT, TSDPT)
- Considered transversal and/or horizontal gradation of Young's modulus and mass density
- Development of advanced computational method for numerical simulations of new effects and phenomena
- Reveal of coupling between in-plane deformation and bending
- Reveal of the multiple gradation coupling effect
- Study of coupling effects in transient response of FGM plates on impact loadings





## 2. Development of mesh reduction methods

- Desingularized Boundary Element Method (BEM) formulations
- Triple-reciprocity BEM
- Combination of mesh-free with other numerical methods
- Mesh-free formulations
- Inverse problems
- Scaled boundary finite element method

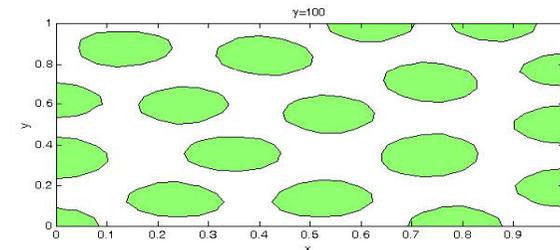
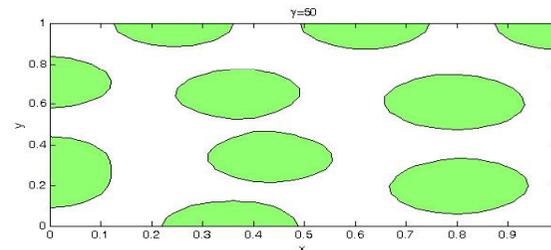
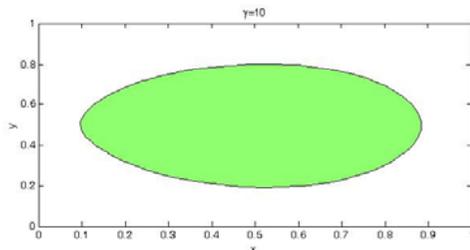


## 3. Crack problems

Thermoelastic crack problems

## 4. Numerical simulation of nonlinear reaction diffusion problems

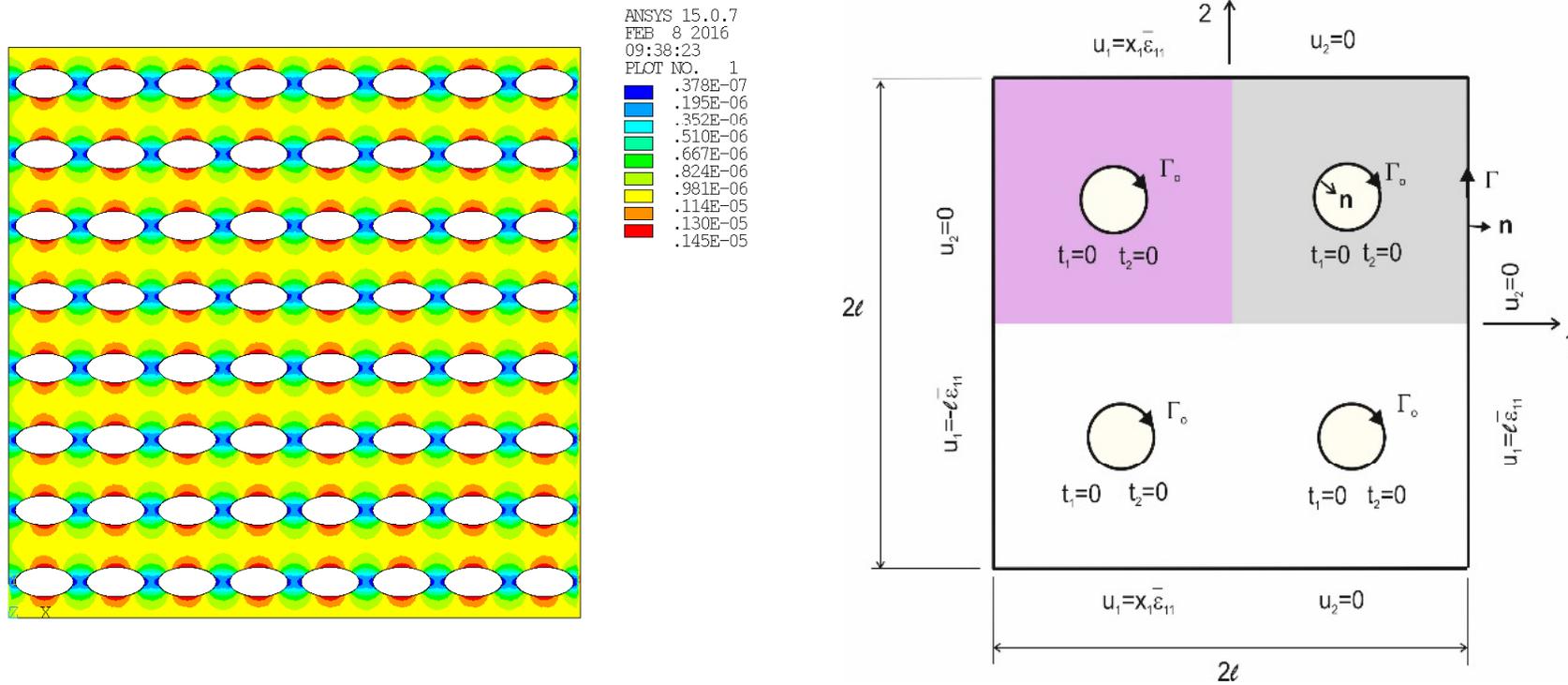
Development of mesh-free methods for numerical simulations





## 5. Porous media

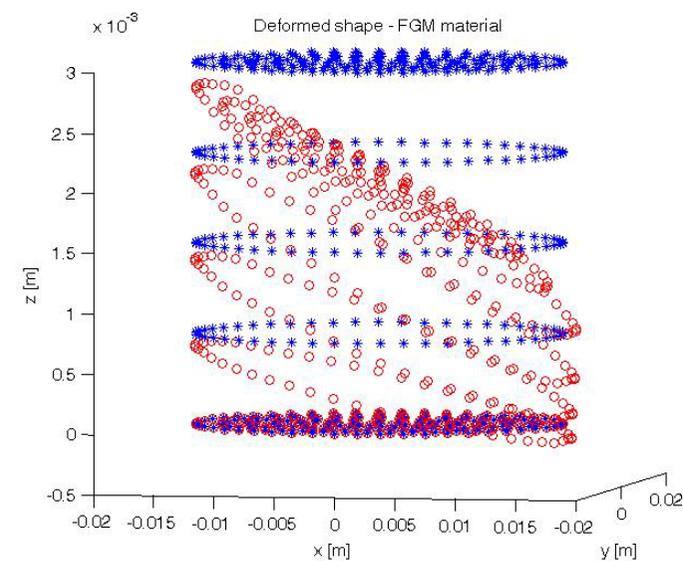
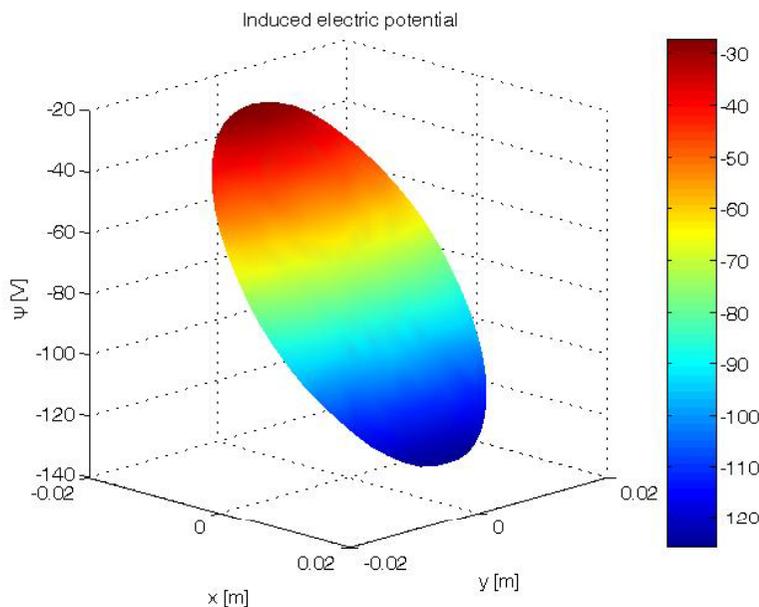
- Development of mesh-free methods for b. v. p. in poroelasticity
- Elaboration of homogenization concept – evaluation of effective material coefficients





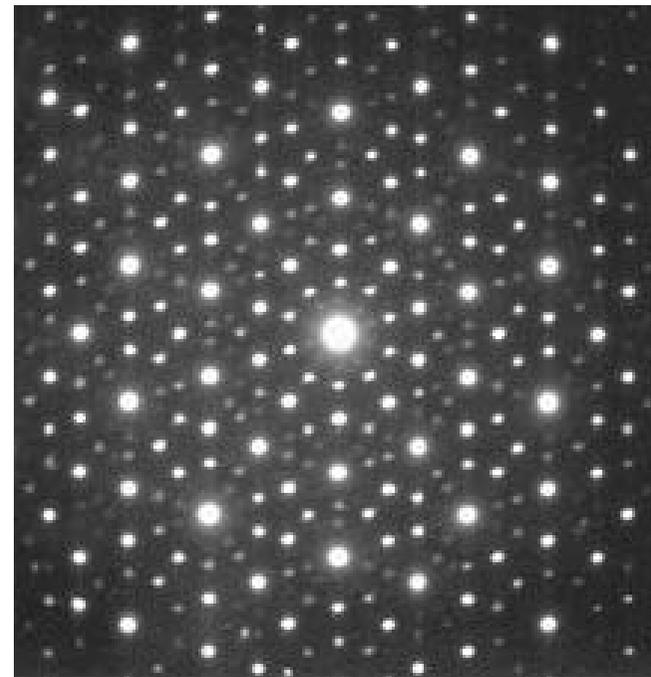
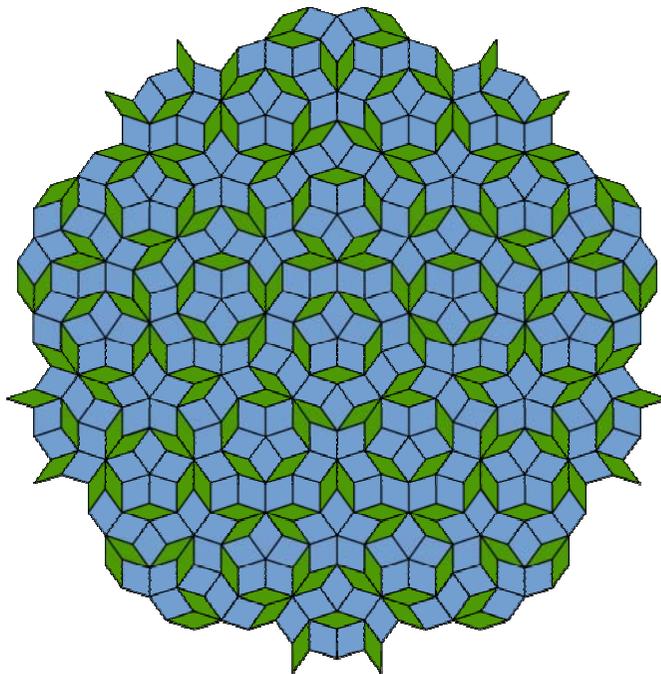
## 6. Piezo effects

- Study of layered composite structures of piezo-materials
- Analysis of FGM composite structures of piezo-materials (enhancement of electromagnetic coefficient in FGM with piezoelectric and piezomagnetic phases )
- Investigation of crack problems in piezo-material structures



7. **Quasi-crystals**

Development of numerical methods for simulation of mechanical response of quasi-crystals



## Applied Mechanics – Research team



Prof. Ing. Jan Sladek, DrSc. – head of dept.

Prof. RNDr. Vladimír Sladek, DrSc.

Ing. Ladislav Sator, PhD.; Ing. Miroslav Repka, PhD.

(Ing. Peter Stanak, PhD.; Ing. Slavomír Krahulec, PhD. )

Dipl. Eng. Michael Wünsche, PhD. research visitor (SASPRO)

- Research team was selected as one of the 22 top research teams in whole SAS
- Memberships in editorial boards of int. scientific journals
- Invitations: to present keynote lectures at int. conf., to memberships in scientific committees; to evaluation committees
- Invitations to participate in common projects and also to lecture to PhD students abroad
- Accredited programme of doctoral study: **5.1.7 Applied mechanics**, January 2012 – September 2015.
  - 3 PhD students - awarded by the Rector Price as the best in all university programme study. Two of them were awarded by the President of SR.
  - During the PhD study our students completed the long term research fellowship stays abroad : University of Coimbra, Coimbra, Portugal ; The University of New South Wales, Sydney; City Univ. Hong Kong
  - 3 master students – awarded for the best Master theses
- WÜNSCHE, Michael – Multiscale modeling of layered, fibre reinforced and porous magnetoelectric materials, project SASPRO no. 0106/01/01, in period: 09/2015 – 08/2017.

## Applied Mechanics – Future work



- The mathematical-physical modelling and numerical simulations of multi physical phenomena in composite materials
- The development of advanced computational methods applicable to structural design with including the multi-field and multiscale modelling of smart materials

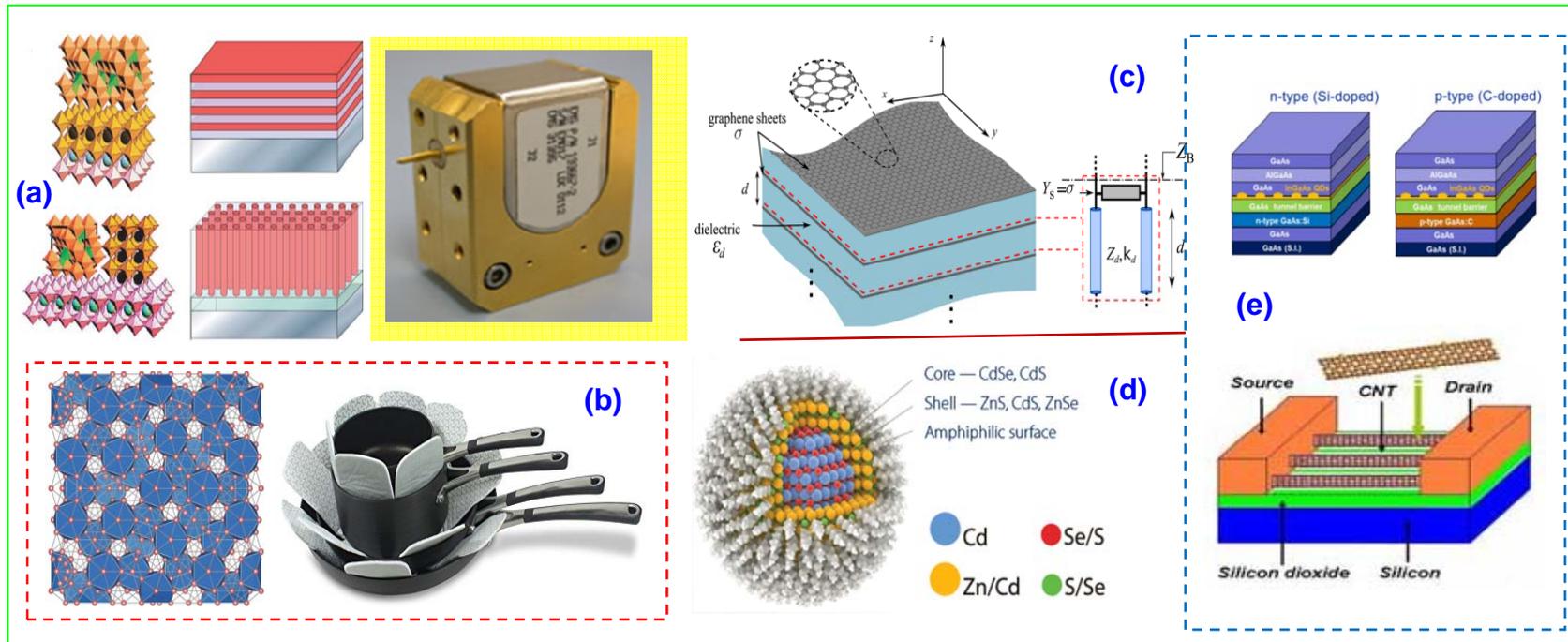
### Europa / Research / Participant Portal notification

Dear Proposal Participant,

The following proposal has been submitted to the Participant Portal Submission System:

Submitted by	: Jan SLADEK ( <a href="mailto:jan.sladek@savba.sk">jan.sladek@savba.sk</a> )
Proposal acronym	: CLASSIC
Proposal ID	: 741604 (internal reference number: SEP-210374426)
Call	: ERC-2016-ADG
Type of action	: ERC-ADG
Topic	: ERC-2016-ADG
Call closure	: 2016-09-01 17:00:00
Date of submission	: 2016-08-30 10:14:02

# COUPLED LAYERED AND SMART STRUCTURES IN COMPOSITES: DESIGNING LAYERED MULTIPHASE STRUCTURES WITH EMBEDDED NANO-COMPONENTS



## Various layered and coupled composites reinforced by CNT/GS/QCs for potential applications In different science and engineering branches

- (a) layered MEE composite and a nanodevice;
- (b) quasicrystal structure and its coated pans;
- (c) a layered composite with embedded graphene sheets;
- (d) layered nanoparticles made of different semiconductor materials;
- (e) semiconductor device with CNT)



**Main objectives:**

1. carry out *ab initio*/MD combined with micromechanics method to predict material properties in small scale (with nanocomponents made of CNT/GS/QCs);
2. derive formulations and analytical solutions for CNT/GS-reinforced magnetoelastic (MEE) layered composites with QC coating under both static and time-harmonic loads;
3. carry out the damage analysis by introducing defects into the layered composites;
4. study asymptotic fields at crack tip vicinity in multifield gradient theory with size effect.

## Non-metallic and building materials science



### Topics:

- ❖ Study of chemism, mechanism and kinetics of the hydration and hardening of hydraulic binders
- ❖ development of specific low energy and ecological binders was pursued.

### Projects:

- Development of Composite materials for application in deep geothermal wells
- Progressive ternary blended cement systems with high-performance properties for material technologies and hydrothermal conditions
- Synthesis and characterisation of the chemically bonded phosphate ceramic binders
- High porous inorganic materials for thermal insulating applications
- Applications of ecocements CEM V (A, B) kind according to EN 197-1 in structural concrete – ERDF Slovakia - Austria
- Contracts and research projects with industrial and other commercial partners

**International cooperation:** Brno University of Technology, Czech Republic; German Cement Works Association; Czech cement association and Research Institute of Binding Materials Prague, Ltd.; Research Institute for Building Materials, Czech Republic; IRCELYON, Institut de Recherches sur la Catalyse et l'Environnement de Lyon , France



### Development of Composite materials for application in deep geothermal wells

#### Publications:

Preparation and properties of cementitious composites for geothermal applications. Chemical Papers, 2012, Volume, 66 Issue, 9 Pages 881-890 DOI: 10.2478/s11696-012-0166-y, IF= 1,096

Hydration of high alumina cement–silica fume composite with addition of Portland cement or sodium polyphosphate under hydrothermal treatment. Journal of Thermal Analysis and Calorimetry, 2013, 113:385–394, DOI 10.1007/s10973-013-3042-2. IF = 1.982

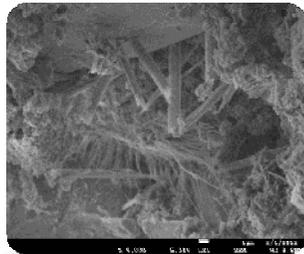
Influence of hydrothermal curing regimes on the hydration of fiber-reinforced cement composites. Journal of Thermal Analysis and Calorimetry, 2013, 113:219–229, DOI 10.1007/s10973-013-2943-4. IF = 1.982.

Cooperation: GA Drilling, a. s., Trnava

# Non-metallic and building materials science

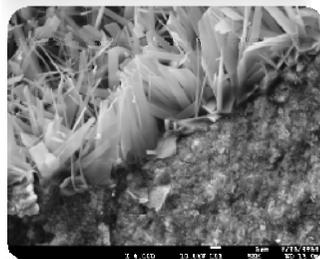


## Progressive ternary blended systems with high-performance properties for material technologies and hydrothermal conditions



### GOWC cured under 200°C/1.2 MPa.

Destruction effect of hydrothermal. Transformation of C-S-H gel in to  $C_6S_2H_3$  (Jaffeite). Increase of permeability, decrease of compressive strength



### GOWC4 (40:40:20) cured under 200°C/1.2 MPa.

Formation of stable plate C-S-H. No transformation of C-S-H gel in to  $C_6S_2H_3$  (Jaffeite). Decrease of permeability, increase of compressive strength

Publications: Effect of hydrothermal curing on early hydration of G-Oil well cement, Journal of Thermal Analysis and Calorimetry 2014, Volume: 116, Issue: 2, Pages: 597-603. IF= 2.042; Performance of G-Oil Well cement exposed to elevated hydrothermal curing conditions. Journal of Thermal Analysis and Calorimetry, 2014, 118, 865-874. DOI 10.1007/s10973-014-3917-x. IF= 2.042

International cooperation: Centre for Material Research in Brno University of Technology (Czech Republic)



Prof. Martin - Tchingnabé Palou, PhD. - head of dpt.

Ing. Eva, Kuzielová, PhD.

Mgr. Gabriela Orešková, PhD.

Ing. Matúš Žemlička

- Close connection of building chemistry, building physics and structural engineering, resulting in common project and education activities:
- 2 proposals were applied in program Horizon 2020 Industrial Leadership
- Laboratories for research and development of building construction materials: Laboratory for material research, Thermophysical laboratory and Mechanical and technological laboratory
- The accreditation proposal of new doctoral study programme: **5.1.7 Technology of Buildings** (with Faculty of Civil Engineering, Slovak University of Technology) is in the assessment process. The programme includes the cooperation of building chemistry, building physics, structural engineering
- Cooperation with industry

## Non-metallic and building materials science - Future work



Project „**Research on High Performance Cementitious Composites under hydrothermal conditions for potential applications in deep bore wells**“ starting since 2016

The research and development of two kinds of High performance cementitious composites (geopolymer binders -GPB and chemically bound phosphate ceramic binders - CPCB) for potential application in severe chemical, physical and mechanical load conditions basing on numerical simulation of geothermal wells.

The synthesis of geopolymer zeolites (GPZ) and hydroxyapatite (HA) thank to their sorption and selectivity capacity for application in chemistry and energy industry, in environment and biomedicine.



Max. pressure: 25 bar  
Max. equivalent temperatures: 250 °C  
Volume: 7,8l



## Topics:

- ❖ **Heat and mass transfer in building materials and structures**, modelling of thermophysical properties of building materials, simulations of hygrothermal fields in porous media
- ❖ **Modelling of microphysical and optical properties of materials, radiation and heat transport** of in nonhomogenous multicomponent media, nano- micro- structures, methods and theory of electromagnetic (optical) diagnostics of disperse systems.

## Building physics - Heat and mass transfer in building materials and structures



### Projects:

- ERDF project: Building the centre of excellence for research and development of structural composite materials – 2nd stage
- Probabilistic modelling of hygrothermal performance of buildings
- IEA Energy in Buildings and Community Programme Annex 55 RAP-RETRO “Reliability of Energy Efficient Building Retrofitting - Probability Assessment of Performance & Cost”.

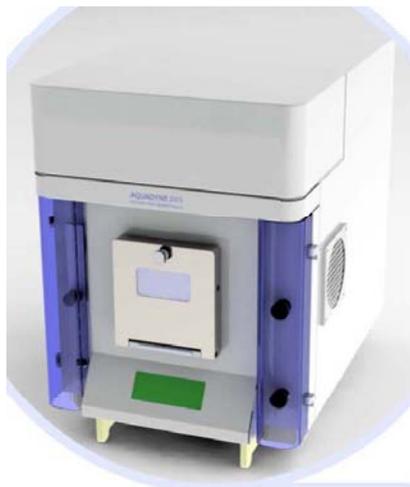
**International cooperation:** KU Leuven, TU Vienna, CVUT Prague, TU Dresden, National Cheng-Kung University, Taiwan, Lodz University of Technology, CIB (International Council for Research and Innovation in Building and Construction),

# Heat and mass transfer in building materials and structures - Recent research results



ERDF project: Building the centre of excellence for research and development of structural composite materials – 2nd stage (Institute of Materials & Machine Mechanics SAS, Institute of Physics SAS, Institute of Construction and Architecture SAS, Institute of Measurement Science SAS, Institute of Normal and Pathological Physiology SAS, Faculty of Mechanical Engineering STU in Bratislava)

Activity: Development of methods for assessment stability of composites for civil engineering structures under climatic changes



# Heat and mass transfer in building materials and structures - Recent research results

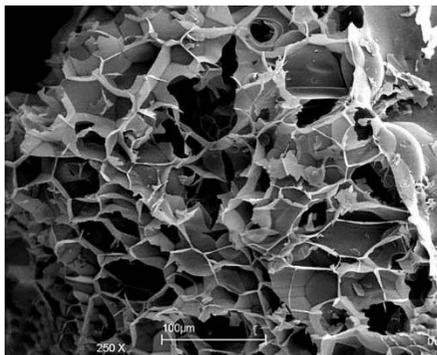


Patent registered in Slovakia:

PV: SK 288311 B6, Thermal insulation system and method of its application, (Bágeľ Ľubomír, Matiašovský Peter), owner ÚSTARĀCH SAV



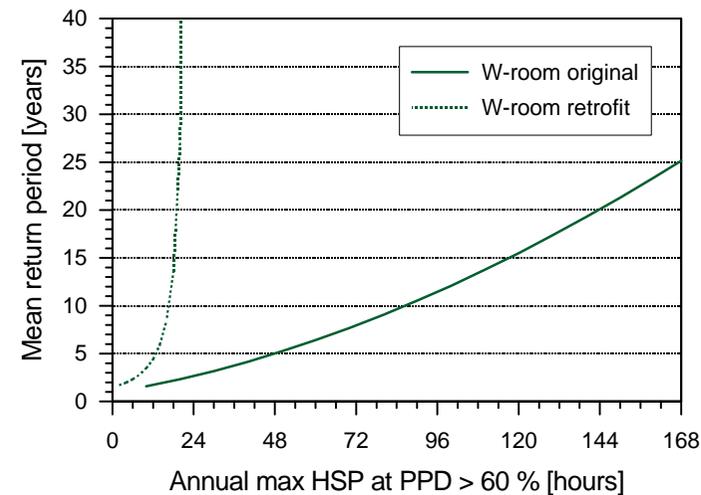
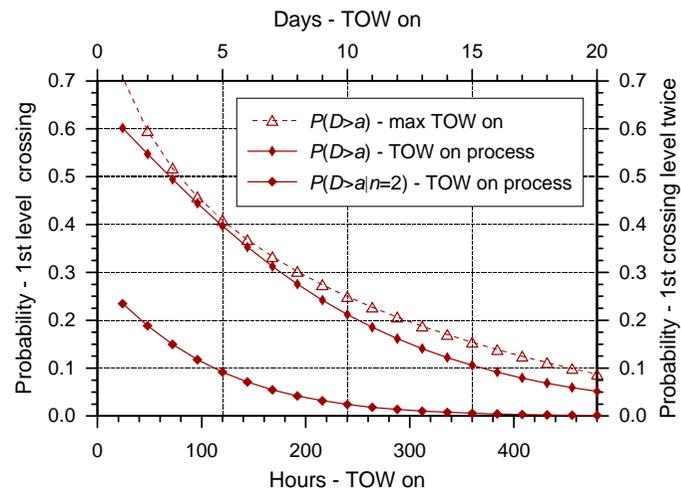
Result of previous project “Capillary active thermal insulation system for building renovation”



# Heat and mass transfer in building materials and structures - Recent research results



## Probabilistic modelling of hygrothermal performance of buildings



Publications: Probabilistic modelling of mould growth in buildings. Journal of Building Physics, 2014, vol. 37, no. 4, p. 348-366. (1.027 - IF2013); Probabilistic modelling of extreme indoor heat exposure induced by heat waves. In Building Simulation, 2015, vol. 8, iss. 5, p. 477-485. (1.029 - IF2014); (2015 - Current Contents).

International cooperation : IEA Energy in Buildings and Community Programme Annex 55 RAP-RETRO “Reliability of Energy Efficient Building Retrofitting - Probability Assessment of Performance & Cost”.

# Heat and mass transfer in building materials and structures - Research team



Ing. Peter Matiašovský, CSc., director of Inst.

Mgr. Oľga Koronthályová, CSc.

Ing. Peter Mihálka, PhD.

Mgr. Matúš Holúbek, PhD.

- Memberships in editorial boards of int. scientific journals
- Memberships in scientific committees; evaluation committees
- Invitations to participate in common projects



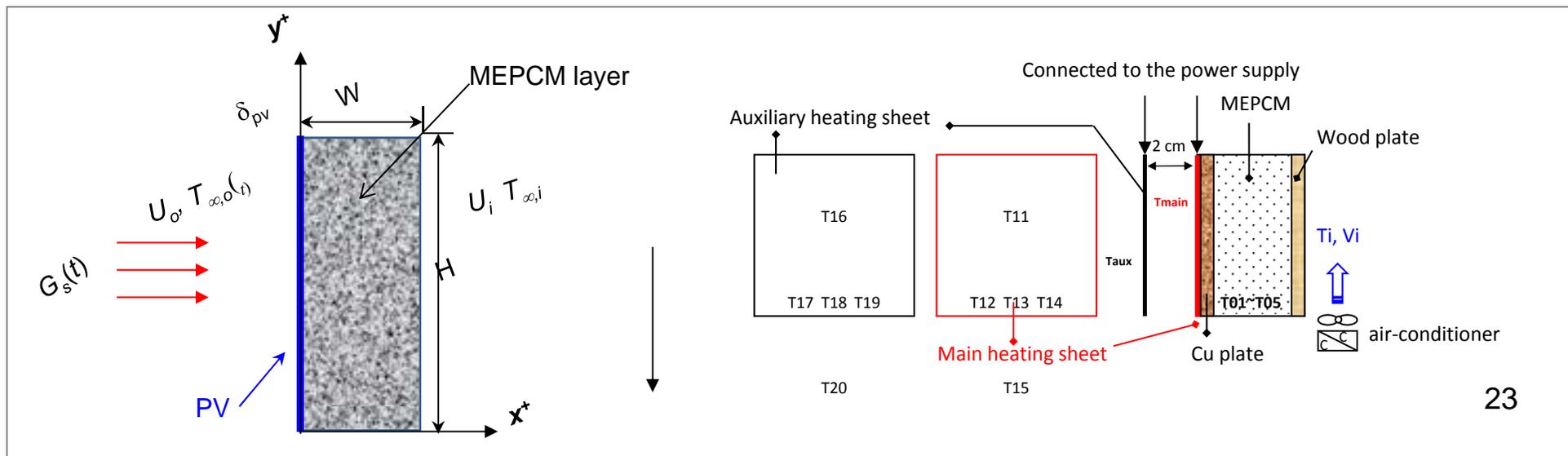
# Heat and mass transfer in building materials and structures

## - Future work

- Heat and mass transfer in building materials and structures,
- Modelling of thermophysical properties of building materials,
- Simulations of hygrothermal fields in porous media,
- Development of integrated tools for simulation of complex hygrothermal performance of building thermal systems:

**Project SAS-MOST Taiwan JRP 2015/7 „Novel thermal management design for BIPV modules incorporating MEPCM layers“** starting since 2016

Innovative building-integrated photovoltaic (BIPV) by integrating building structure, a heat flow mechanism, and a microencapsulated phase change material (MEPCM) with a photovoltaic (PV) module.



# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



## Research results:

- Spectral sky radiance under broken cloud arrays
- Skyglow modeling and retrieval of city emission function
- Optical properties of electrically charged (nano)-particles
- Optical characterization of atmospheric aerosols

## Main objectives:

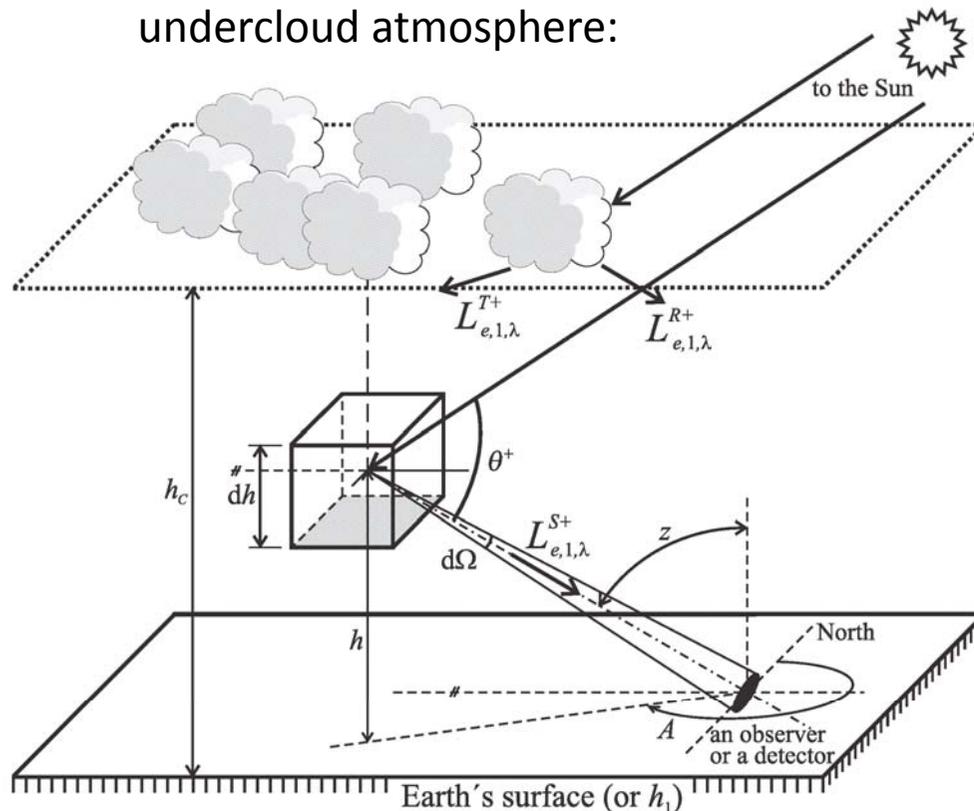
- to characterize light conditions in ambient environment
- to make the daylight availability forecasting more accurate by incorporating the aerosol & cloud optics into radiative transfer models
- To make night skyglow forecasting more accurate in urban & suburban areas, and, to use remote sensing methods in retrieval the city emission function
- to focus on the new optical effects in the nanoparticles we uncovered only recently as these can be important in better utilization of electromagnetic radiation
- (specifically, the optical resonances in nanoparticles we have found theoretically can be decisive in the development of new devices and novel technologies in the nanosciences, such as optical attenuators, modulators, and switches)

# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



## Spectral sky radiance under broken cloud arrays

The geometry of single scattering in an undercloud atmosphere:



### Solution methods:

Radiative transfer equation &  
Method of successive orders of  
scattering

### Model parameters:

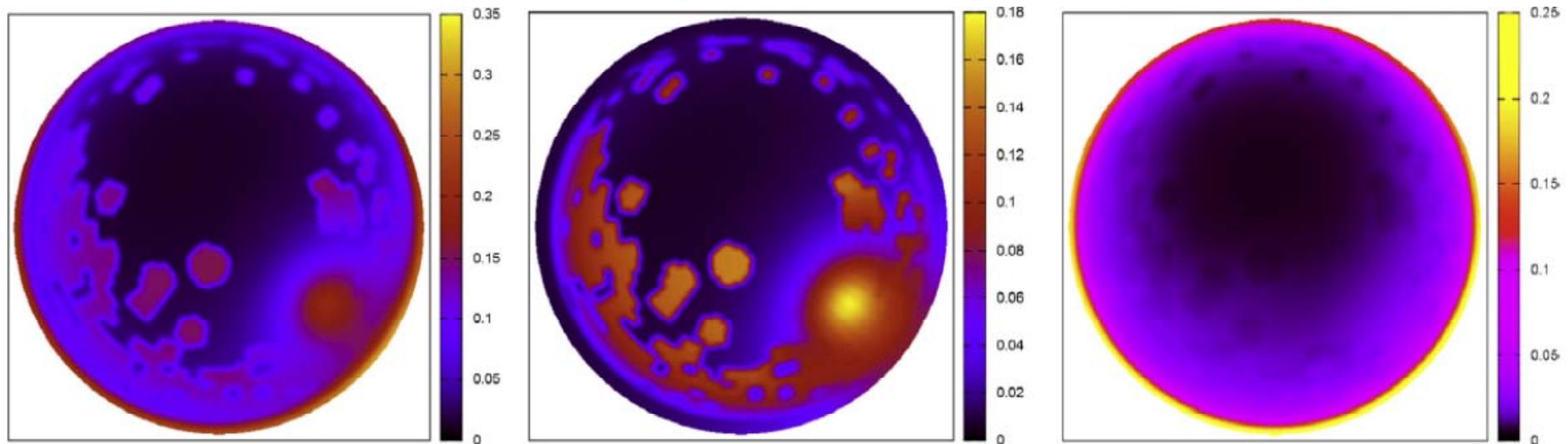
Aerosol optics (Mie theory,  
scattering phase function,  
effective medium theory)  
Cloud optics (Mie theory, diffuse  
reflection, multiple scattering  
theory, water content)

The single-scattering radiances from broken clouds and a cloud-free atmosphere are well separated, while their non-trivial superposition is used to determine a second-order approximation to the radiative field.

# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



## Spectral sky radiance under broken cloud arrays: results



Zenith normalized sky radiances.

From left to right: total radiance, 1st & 2<sup>nd</sup> scattering order approximations.

Publications: 2x Atmosph. Environ. (*IF2014*:3.281, *IF2011*:3.465), 4x Solar Energy (*IF2014*:3.469, *IF2013*:3.541, *IF2011*:2.475), Lighting Res. Technol. (*IF2012*:1.197).

Research partner: Christian A. Gueymard, Solar Consulting Services, Inc., Colebrook, New Hampshire, USA.

International cooperation: Ch. Gueymard (USA), H. Horvath (Austria), A. Valenzuela (Spain), G. Videen (USA)

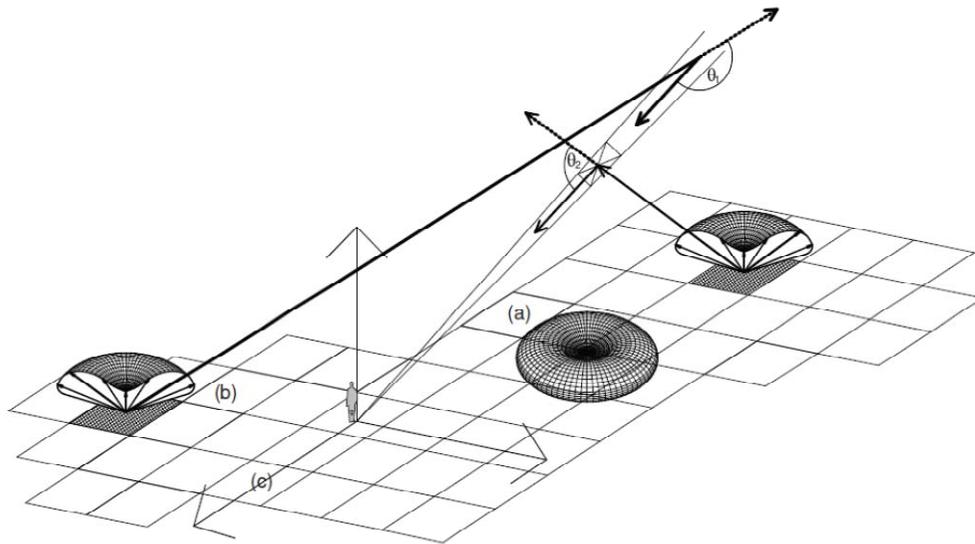
# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



2012-2015

## Skyglow modeling and retrieval of city emission function

The sky luminance in an urban area:



Theoretical model:

$$L_{\lambda}(z_o, a_o) = M(z_o) \int_S \int_{h=0}^H B_{\lambda}[z_E(h)] \cos^2 z_E(h) \times \frac{t_{\lambda}(h, z_E) t_{\lambda}(h, z_o)}{h^2} \Gamma_{\lambda}(h, \theta) dh ds$$

Inversion model:

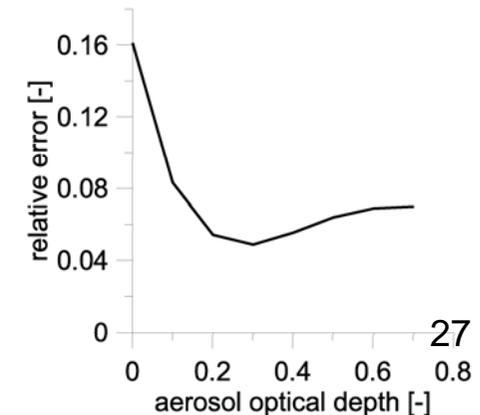
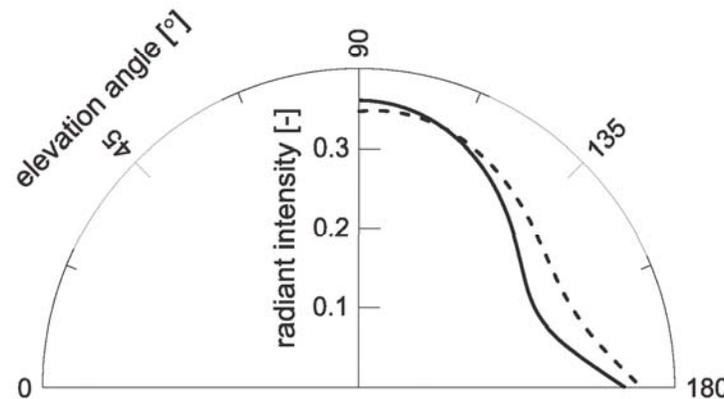
$$\int_{z_E=0}^{\pi/2} K_{\lambda}(z_E; z_o, a_o) J_{\lambda}(0, z_E) dz_E = L_{\lambda}(z_o, a_o)$$

$$\mathbf{L} = \mathbf{K} \mathbf{J} + \boldsymbol{\varepsilon}$$

$$\mathbf{J}_{\alpha} = (\mathbf{K}^T \mathbf{K} + \alpha \mathbf{I})^{-1} \mathbf{K}^T \mathbf{L}$$

where Tikhonov regularized solution is found as:

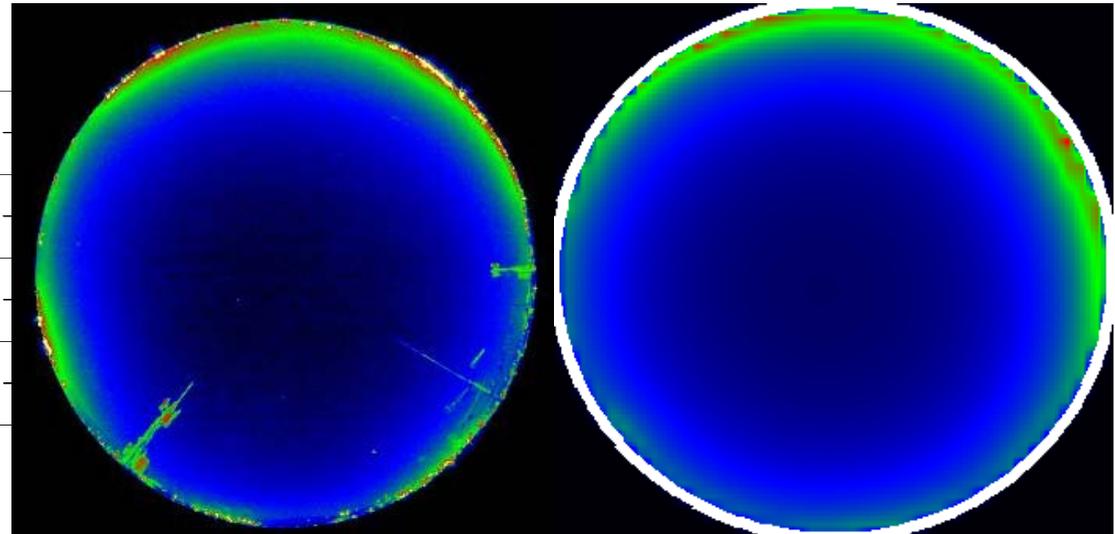
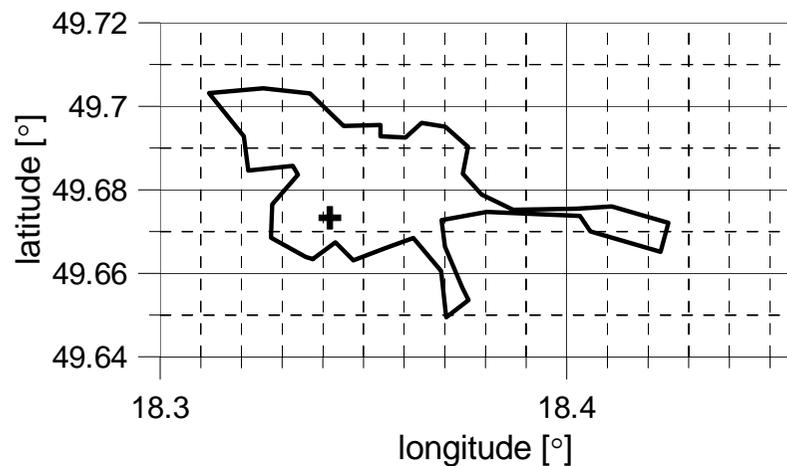
Test on synthetic data:



# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



## Skyglow modeling and retrieval of city emission function



From left to right: measuring point, measured and reproduced sky radiance patterns.

Publications: 4x MNRAS (*IF2013*:5.226, *IF2014*:5.107), 1x J. Environ. Manage. (*IF2012*:3.057), PlosOne (*IF2012*:3.730), 2x JQSRT (*IF2013*:2.288), 1x J. Opt. (*IF2014*:2.059)

Research partners: H. A. Solano-Lamphar (Mexico), S. Bará (Santiago de Compostela, Spain), T. Posch (Austria), S. Ribas (Barcelona, Spain)

International cooperation : M. Aubé (Canada), H.A. Solano-Lamphar (USA), T. Posch (Austria), S. Ribas & A.Sanchez de Miguel (Spain)

# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



2012-2015

## Optical properties of electrically charged (nano)-particles

Modified boundary conditions with  $\eta$  being surface charge density and  $K$

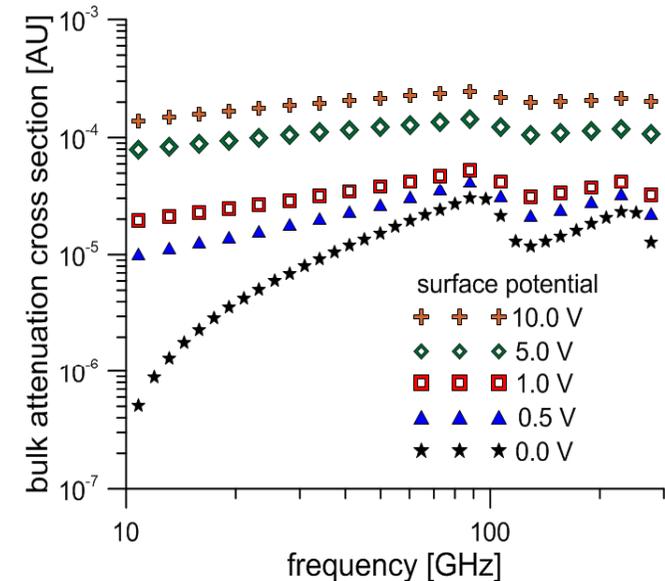
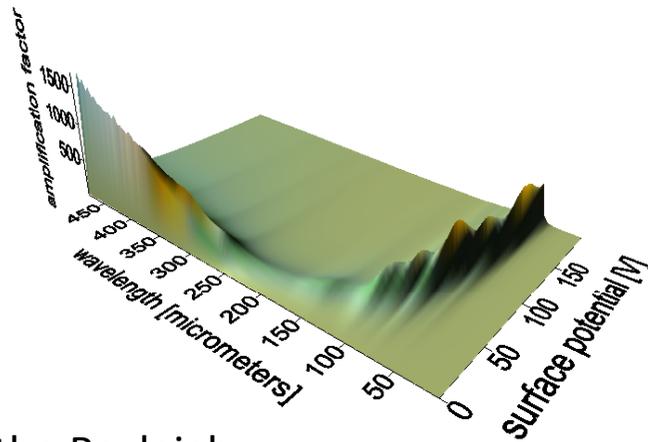
$$(\epsilon_0 \vec{E}_2 - \epsilon_1 \vec{E}_1) \cdot \vec{n} = \eta \quad \text{surface charge density}$$

$$(\epsilon_0 \vec{H}_2 - \epsilon_1 \vec{H}_1) \cdot \vec{n} = 0 \quad \text{Charge-induced resonances can reproduce previously unexplained amplified microwave attenuation observed in sandstorms:}$$

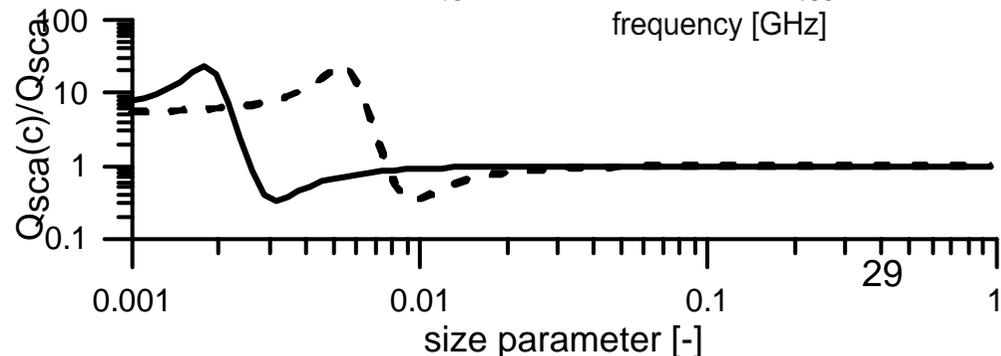
$$\vec{n} \times (\vec{E}_2 - \vec{E}_1) = 0$$

$$\vec{n} \times (\vec{H}_2 - \vec{H}_1) = \vec{K}$$

$$\nabla \cdot \vec{K} = -\frac{\partial \eta}{\partial t}$$



We have found that the Rayleigh approximation known over a century is not a valid approach for analysis the optical effects by electrically charged particles much smaller than the wavelength of the incident radiation:

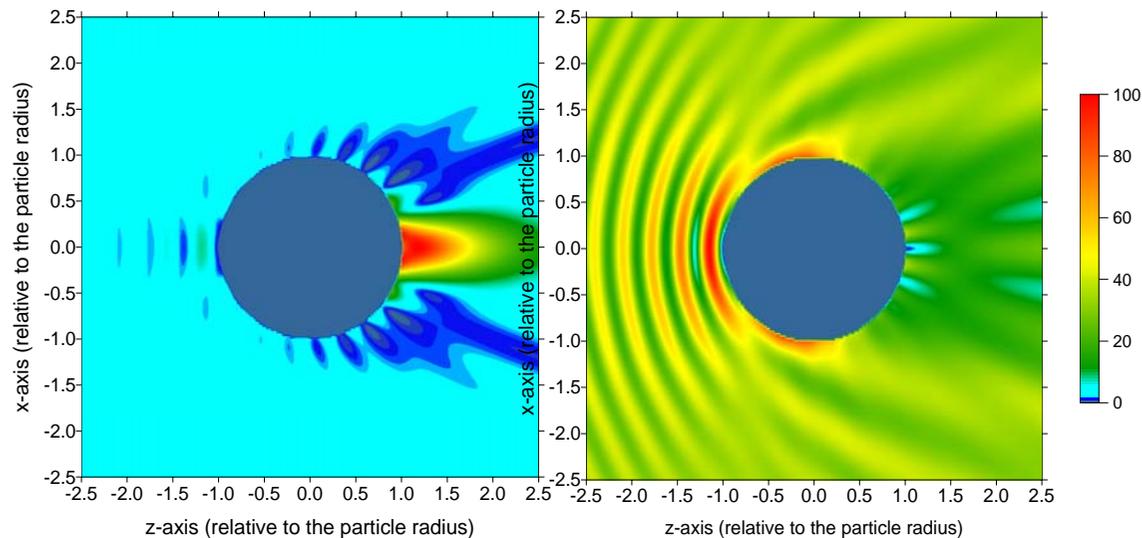


# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results

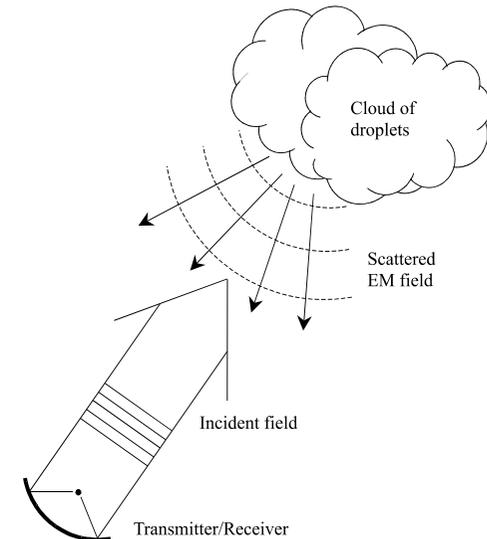


2012-2015

## Optical properties of electrically charged (nano)-particles: applications



From left to right: neutral & charged particle.  
Near field enhancements (attenuators)



Patent: PCT/SK2014/000024 and  
US priority No: US 15/105,560

Publications: 2x Opt. Lett. (*IF2011*:3.399, *IF2014*:3.292), Laser Phys. Lett. (*IF2012*:7.714), 1x Ann. Phys. (*IF2014*:3.048), 2x JQSRT (*IF2014*:2.645), 1x Appl. Opt. (*IF2014*:1.784)

Research partner: G. Videen (Army Res. Lab., USA)

International cooperation : G. Videen (USA), A. Yuffa (USA), G. Wurm (Germany), M. Yurkin (Russia)

# Modelling of microphysical and optical properties of materials, radiation and heat transport - Recent research results



## **Patent applications registered in European Union:**

PCT/SK2014/000020, Method of isolation of circulating cells from the peripheral blood (Kocifaj Miroslav, Mego Michal), co-owners: ÚSTARČH SAV + Univerzita Komenského

PCT/SK2014/000024, Method and Apparatus for Lightning Threat Indication (Kocifaj Miroslav, Klačka Jozef, Videen Gorden), co-owners: ÚSTARČH SAV + Videen Gorden + Univerzita Komenského

## **Patent applications registered in Slovakia:**

PV: 50064-2014, Method and system for 3D reconstruction of fine structure with use of RTG tomography combined with elastic scattering (Kocifaj Miroslav, Mego Michal), coowners: ÚSTARČH SAV + Univerzita Komenského

PV: 05010-2014, Capsule for targeted application of the pharmaceutical agent and method its release out of the capsule (Kocifaj Miroslav, Mego Michal) co-owners: ÚSTARČH SAV + Národný onkologický ústav

# Modelling of microphysical and optical properties of materials, radiation and heat transport - Research team



Mgr. Miroslav Kocifaj, PhD.  
RNDr. Ladislav Kómar, PhD.  
Mgr., Jaromír Petržala, PhD.

- Memberships in editorial boards of int. scientific journals
- Invitations: to present keynote lectures at int. conf., to memberships in scientific committees; to evaluation committees
- Invitations to participate in common projects and also to lecture to PhD students abroad

**International cooperation:** TU Vienna, US Army Research Laboratory, Pacific Northwest National Laboratory (USA), Adelphi, CÉGEP de Sherbrooke, Canada, as well as the participations in international organisations, CIE (International Commission on Illumination), ISES (International Solar Energy Society), OSA (Optical Society of America).

# Modelling of microphysical and optical properties of materials, radiation and heat transport - Future work



## Optical signatures of electrically charged irregularly shaped particles (ERC/ESA)

- Reduced backscattering from colloids of metallic particles (optical invisibility)
- particles at liquid interfaces, charged particles in industrial plasma, hydrometeors
- Exceptional extinction bumps that do not have relation to material properties
- Cooperating partners: USA, Germany, France, Austria, Russia

## Street Lighting's Impact on Sky Glow (PNNL/NSF or EU project)

- Designing optimum parameters of outdoor lighting for a given location
- Energy impacts and tackle the issue that is uplight
- A new generation of SkyGlow tool and database at solid-state lighting page
- Cooperation with Pacific Northwest National Laboratory (USA)
- Other partners: Mexico, Canada, Austria, Ireland, Spain

# Architecture and urbanism



2012-2015

## Topics:

- ❖ Complex research of the 20th century and contemporary architecture in Slovakia, from the aspect of: history, structural, functional and typological specifics
- ❖ International context and monument protection
- ❖ Popularisation of Science

## Projects:

- Differentiated typology of modernism: the theoretical basis for maintenance and conservation of works of modern architecture”
- The South East Europe Transnational Cooperation Programme SEE/B/0009/4.3/X ATRIUM “Architecture of Totalitarian Regimes of the 20th Century in Urban Management
- Modern town-planning concepts and traditional town: analysis of conflicts and coexistences
- Values of modern architecture in Slovakia: specification and possibilities of protection

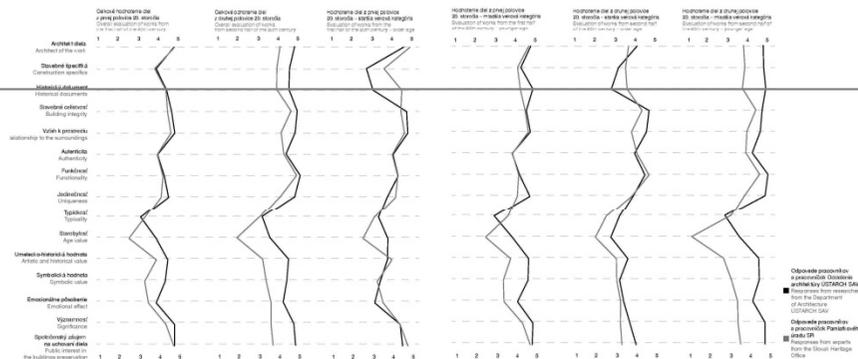
**International cooperation:** Faculty of Architecture, University of Ljubljana, Frankfurt University of Applied Sciences The University of Edinburgh, Edinburgh College of Art, Department of Civil Engineering, Architecture and Georesources, Técnico Lisboa, Institute for innovation & sustainable Development – AEIPLOUS, Patras, Institut für Stadt- und Regionalforschung Österreichische Akademie der Wissenschaften

# Monitoring and Protection of 20th Century Architecture



2012-2015

Hodnotenie vybraných 50 najvýznamnejších diel modernej architektúry na Slovensku  
Evaluation of the selected 50 most important works of modern architecture in Slovakia



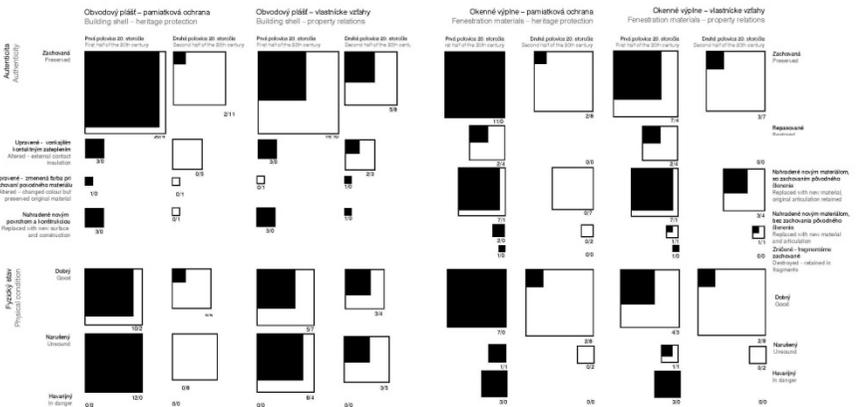
## REGISTER - of modern architecture in Slovakia



### REGISTER of modern architecture in Slovakia

The Register is the outcome of the work of the Department of Architecture of the Institute of Construction and Architecture, Slovak Academy of Sciences (ÚSTARCH SAV) and presents the best works of 20th century Modernist architecture in Slovakia. Like the architecture of all preceding eras, modern architecture is a document of the historic situation in our territory, a document of specific processes and phenomena that occurred in the past century. At the same time, modern architecture represents the first authentically Slovak manifestation – moreover of high artistic quality and great international recognition – of domestic architectural culture. These qualities underline not only its historical, artistic or functional values, but also confirm its position as a significant symbol of the national heritage. The task of the Register is to draw attention to the most significant works of our modern architectural heritage on the part of the preservation authorities, public administration, local and city governments, the actual owners of these buildings, and even the public at large. The Register of Modern Architecture in Slovakia is supported by the projects: VEGA 2/0171/10, 2/0036/14 a APVV 0204-07, APVV-0375-10.

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Differentiated typology of modernism: the theoretical basis for maintenance and conservation of works of modern architecture

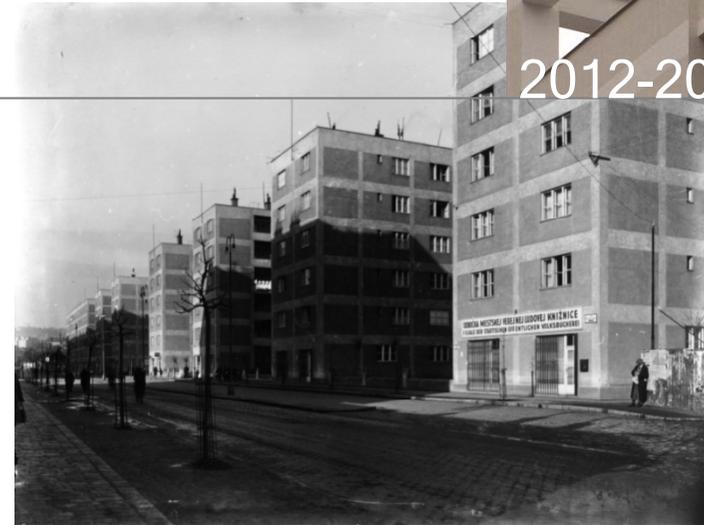
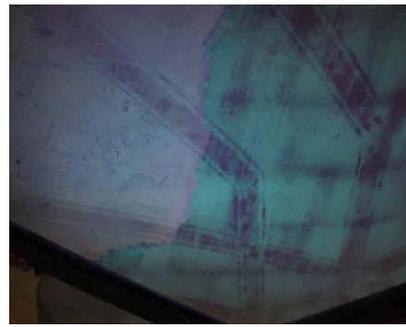
- monitoring of modern architecture
- stratigraphy of selected types of modern architecture monuments

## Register of Modern Architecture in Slovakia

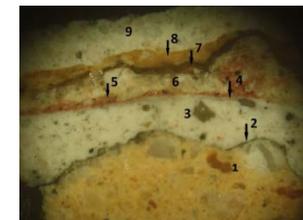
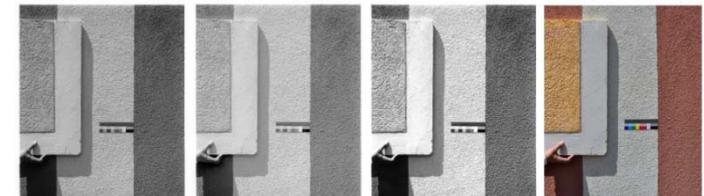
### Docomomo Virtual Exhibition

International platform for presentation of research results on Modern Movement architecture

# Monitoring and Protection of 20th Century Architecture



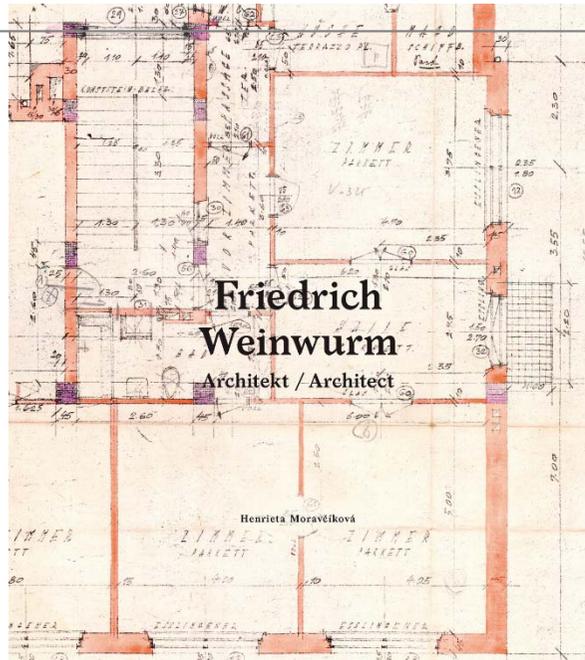
2012-2015



Synagogue, Žilina, 1930  
 - Architectural and historical survey  
 - methods of the monument protection  
 Awarded by Bauwelt Advancement Award  
 2013

Unitas housing complex, Bratislava, 1931  
 Comparative photographic experiment,  
 and optical microscopy of the facade plaster  
 Future anterior, Columbia University 2014 36

# Discovery, explanation and interpretation of the architectural work of F. Weinwurm



2012-2015

Awarded

Deutsches Architektur Museum Architectural Book Award 2015  
 "Martin Kusy Prize" for the theoretical work in the field of architecture 2014  
 National award for the „Most outstanding book in Slovakia“ 2014

Future development of the topic...

WEINWURM – exhibition in Slovak National Gallery – to be opened in December 2017

# Architecture of Totalitarian Regimes of the 20th Century in Urban Management



2012-2015

28 / 10 / 2013 / 18.00

Department of architecture  
ÚSTARCH SAV and Slovart invite  
You for a book presentation

Slovak National Gallery, Café Bertinka  
Ludovít Štúr Square 4, Bratislava  
Guests: Alexandra Kusá, director  
general SNG, Jan Tabor, Forum  
für experimentelle Architektur  
& Bratislava Hat Slovensko

This publication takes up a controversial theme in Slovak architecture: the influence of totalitarian or authoritarian political regimes on architectural production. Particular attention is paid to the relationship between modernist and authoritarian order. Using the example of 20th-century architecture in Slovakia, the different ideas of modernist and authoritarian architects and how the different effects of these ideas are reflected in the same time, the architecture of the time of its creation. The architectural-historical analysis, at a distance of several decades, is supplemented by a selection of archival illustrative material, as well as contemporary photographs by Olja Triaška Stefanovič. The unique graphic form of the book is designed by Lubica Segečová.



## SPÄTMODERNE SLOWAKEI GEBAUTE IDEOLOGIE

**Das Verhältnis zwischen Moderne und Totalitarismus im Spiegel der Architektur**  
Architektur entstand in der Slowakei behalve während des gesamten 20. Jahrhunderts unter nichtdemokratischen Regimes. Im weiteren europäischen Kontext ist dies kein einmaliger Fall: Ähnliche Umstände bestimmten zwischen dem architektonischen Schaffen in einer Reihe weiterer Staaten, beispielsweise Deutschland, Italien und Spanien, kurzzeitig auch Österreich, sowie in Nationen des ehemaligen sowjetischen Einflussbereichs. In den architektonischen Werken, die diese Regimes verkörpern, beeinflussen oder erlauben ermöglichen, ist eine gewisse Ähnlichkeit festzumachen – ohne dabei auf die Unterschiede in Organisation und Mechanismen der Machtübertragung der verschiedenen Regime einzugehen. Das Verhältnis zwischen Moderne und Totalitarismus sowie deren Widerspiegelung in der Architektur sind Grundlage von Ausstellung und begleitender Publikation der neuesten Ausstellung der Reihe Architektur im Programm des Wiener Städtischen Versicherungswesens.

**Das Verhältnis zwischen Moderne und Totalitarismus im Spiegel der Architektur**  
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**AUSSTELLUNGSDAUER**  
11.02. - 14.03.2014

**Architektur im Ringtum**  
810 Wien, Schottenring 18  
T +43 (0) 1 80 300 2110  
F +43 (0) 1 80 300 2118  
www.wst-veranstaltungen.at

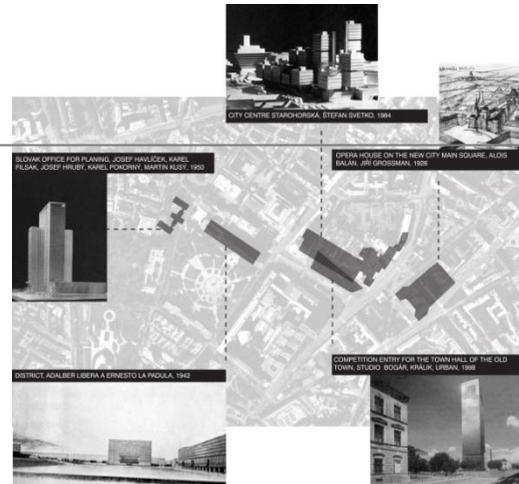
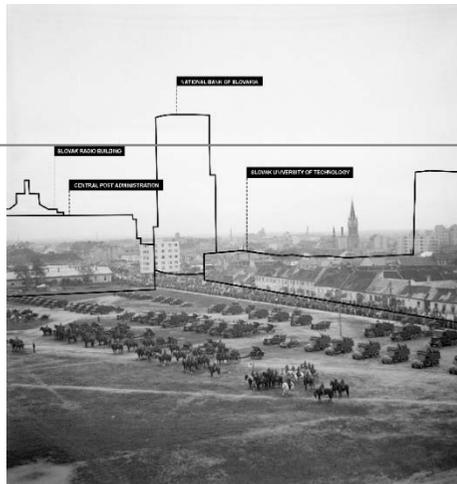
**Öffnungszeiten**  
Montag bis Freitag 9:00 - 18:00 Uhr  
Freitage geschlossen  
Freier Eintritt

**Verkaufsort**  
11.02. - Schottenring 18, 11  
Architektur im Ringtum, 11  
Architektur im Ringtum 1A

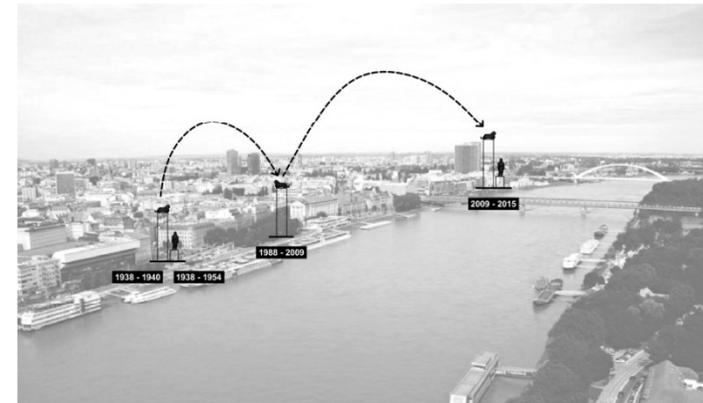
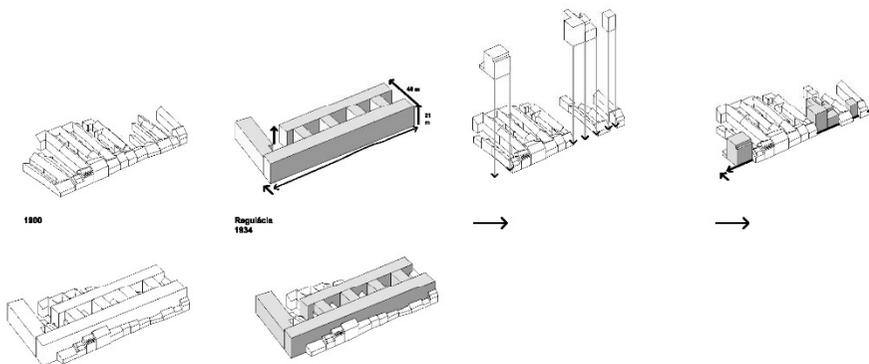


Theoretical analysis of the Modern Architecture of Totalitarian Regimes of the 20th Century and its Sustainability Strategy  
 ATRIUM. The South East Europe Transnational Cooperation Program – SEE/B/0009/4.3/X  
 Spätmoderne Slowakei: gebaute Ideologie? Exhibition. Architektur im Ringtum, Vienna 2014

# Phenomenon of the unplanned town



2012-2015



Modern town-planning concepts and traditional town: analysis of conflicts and coexistences,  
VEGA 2/0171/10

Future development of the topic...

Bratislava – The unintended town – Monograph to be published 2018 (VEGA/16)

Comparative study of the historical intentions in frame of a town – via tools of augmented reality (collaboration with Grand Pano)

# Women in Architecture

## 5.2.4 Emancipated but Still Accompanied

HENRIETA MORAVČIKOVÁ  
Slovenská akadémia vied, Slovak Republic

### ABSTRACT

Slovakia's first architecture school opened in 1946, and the first Slovak women architects, three graduates of this school, began working in 1950. In the 1950s, state ideology and the law guaranteed women equal rights. However, problems resulting from the nation's poor economy and the hesitation of Slovak women, who had emancipation forced upon them by state policy, complicated women's social status. Meanwhile, throughout the 1960s, other processes, including Slovak emancipation, modernization and industrialization, combined with increased building production, the construction of national institutions, and the establishment of specialized planning institutes accelerated women's entry into public life.

Although the building sector provided opportunities for women architects, their situation was far from easy. A woman on a building site could perform a laborer's tasks but she was not expected to supervise construction. Women could move about only when accompanied by a man, such as a classmate, husband or superior officer. The situation in the state design offices was similar. Strict professional discipline and the time-consuming nature of creative work combined with familial responsibilities placed enormous pressure on women architects. After a promising start, many left architecture and worked in supporting roles. In the 1960s, Viera Mecková [1933-] and Oľga Ondreičková [1935-] managed to transcend these limitations. Both were studio directors, designed important public buildings and received awards. Mecková worked in a regional centre that carried out state commissions and conceptual projects similar to the work of Superstudio. When she was 35 years old, Ondreičková completed a structure for the World Ski Championships in the High Tatras, which insured her later success. This paper examines these women, their positions, the similarities and dissimilarities in their approaches to architecture, and their careers. It considers the situation of women architects in the former Czechoslovakia and focuses on the strategies that they employed to gain recognition.

### KEYWORDS

Women, architects, emancipation, Slovakia, design, recognition

5. TWENTIETH CENTURY

2012-2015

Ideological Equality: Women Architects in Socialist Europe. EAHN European architectural history network international meeting, Torino , 19-21.06.2014

First generation of Women Architects in Slovakia. Exhibition, FA STU, December 2015

Future development of the topic...

International network Women's creativity since the Modern Movement / Creative Europe Programme, starting 2017

Ideological Equals – monograph to be published at Routledge 2017



prof. Dr. Ing. arch. Henrieta Moravčíková, head of dept.

Mgr. Peter Szalay, PhD.

Mgr. PhDr. Katarína Haberlandová,

Ing. arch. Laura Pastoreková,

- Memberships in editorial boards of int. scientific journals
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- memberships in scientific committees; evaluation committees
- Invitations to participate in common projects and also to lecture to PhD students abroad

**Complex research of the 20th century and contemporary architecture in Slovakia, from the aspect of: history, structural, functional and typological specifics, international context and monument protection.**



## Future work

In particular:

The Unplanned City: Architectural and Urban Conceptions of the 20th Century and their Influence on the Urban Structure of Bratislava (VEGA/2017 – 2019)

*Bratislava – The Unintended Town* – monograph to be published 2018

Comparative study of the historical intentions in frame of a town – via tools of augmented reality (collaboration with Grand Pano)

Women in Architecture

International network Women's creativity since the Modern Movement / Creative Europe Programme, starting 2017

*Ideological Equals* – monograph to be published at Routledge 2017

International connections and impact of the work of Friedrich Weinwurm

*WEINWURM* – exhibition in Slovak National Gallery – to be opened in December 2017

Slovak Architecture Yearbook

Critical reflection of the contemporary architecture in Slovakia, in collaboration with Slovak chamber of Architects, Architect's council of Europe and independent international experts

first published in 2016

Next issue to be published in 2017

# Institute of Construction and Architecture



2012-2015

International Evaluation Panel Meeting with the Institute Research Community  
within SAS Evaluation in 2016

**Thank you for your attention**