FIRST INTERNATIONAL CONFERENCE

# ELMINA 2018

# PROGRAM

&

# BOOK OF ABSTRACTS

Rectorate of the University of Belgrade, Belgrade, Serbia
August 27-29, 2018
http://elmina.tmf.bg.ac.rs

**Organized by:**
**Serbian Academy of Sciences and Arts and Faculty of Technology and Metallurgy, University of Belgrade**

**Endorsed by:**
**European Microscopy Society and Federation of European Materials Societies**

FIRST INTERNATIONAL CONFERENCE
ELMINA 2018
Program and Book of Abstracts


| | |
|---|---|
| *Publisher:* | Serbian Academy of Sciences and Arts<br>Knez Mihailova 35, 11000 Belgrade, Serbia<br>Phone: +381 11 2027200<br>https://www.sanu.ac.rs/en/ |
| *Editor:* | Velimir R. Radmilović and Vuk V. Radmilović |
| *Technical Editor:* | Vuk V. Radmilović |
| *Cover page:* | Vuk V. Radmilović |
| *Printed in:* | Serbian Academy of Sciences and Arts<br>Knez Mihailova 35, 11000 Belgrade, Serbia<br>Phone: +381 11 2027128<br>stamparija@sanu.ac.rs |
| *Circulation:* | 50 copies |

ISBN 978-86-7025-785-6

**ORGANIZERS**

**SERBIAN ACADEMY OF SCIENCES AND ARTS**

Knez Mihailova 35, 11000 Belgrade, Serbia

Phone: +381 11 2027200 / https://www.sanu.ac.rs/

**FACULTY OF TECHNOLOGY AND METALLURGY, UNIVERSITY OF BELGRADE**

Karnegijeva 4, 11000 Belgrade, Serbia

Phone: +381 11 3370425 / https://www.tmf.bg.ac.rs/

ELMINA 2018

**CONFERENCE CHAIR**

Velimir R. Radmilović

**CONFERENCE MANAGER**

Vuk V. Radmilović

**INTERNATIONAL ADVISORY BOARD**

**Chair:** Robert Sinclair (USA)

**Members**: Sara Bals (Belgium), Gianluigi Botton (Canada), Vladimir Bumbaširević (Serbia), Fu-Rong Chen (Taiwan), Vladica Cvetković (Serbia), Rafal Dunin-Borkowski (Germany), Rolf Erni (Switzerland), Hamish Fraser (USA), Ferdinand Hofer (Austria), Randi Holmestad (Norway), Đorđe Janaćković (Serbia), Wayne D. Kaplan (Israel), Vesna Lačković (Serbia), Joachim Mayer (Germany), Paul Midgley (UK), Eva Olsson (Sweden), Stephen Pennycook (Singapore), Dejan Popović (Serbia), Tamara Radetić (Serbia), Quentin Ramasse (UK), Frances Ross (USA), Etienne Snoeck (France), Erdmann Spiecker (Germany), Leposava Šiđanin (Serbia), Maria Varela del Arco (Spain), Johan Verbeeck (Belgium).

**PROGRAM COMMITTEE**

**Chair:** Velimir R. Radmilović (Serbia)

**Members**: Nataša Bibić (Serbia), Vladimir Bumbaširević (Serbia), Zoran Đurić (Serbia), Jasmina Grbović Novaković (Serbia), Aleksandra Korać (Serbia), Zoran Popović (Serbia).

**ORGANIZING COMMITTEE**

**Chair**: Petar Uskoković

**Vice-chair**: Zlatko Rakočević

**Members**: Anđelika Bjelajac, Vladan Ćosović, Ivana Cvijović-Alagić, Željko Kamberović, Smilja Marković, Nataša Nestorović, Irena Nikolić, Mirjana Novaković, Vladimir Pavlović, Vuk Radmilović, Dragan Rajnović, Milica Ševkušić, Đorđe Veljović.

**TECHNICAL COMMITTEE**

**Chair:** Đorđe Veljović

**Members**: Anđelika Bjelajac, Jovana Dimitrijević, Ivana Drvenica, Špiro Đurđević, Tamara Matić, Daniel Mijailović, Katarina Nešović, Vladimir Pavkov, Jelena Petrović, Anđela Radisavljević, Mia Radonjić, Željko Radovanović, Ivana Radović, Milena Stevanović.

# Differential Polarization Laser Scanning Microscopy (DP-LSM) -Technique for Rapid Screening of Cell Walls of Different Plant Species

*Jasna Simonović Radosavljević[1], Daniela Djikanović[1], Gabor Steinbach[2], Aleksandra Lj. Mitrović[1], Jelena Bogdanović Pristov[1], Győző Garab[3], Ksenija Radotić[1]*

*[1] Institute for multidisciplinary study, University of Belgrade, Kneza Višeslava 1, 11000 Belgrade, Serbia*
*[2] Institute of Biophysics, Biological Research Center, Szeged 6701, Hungary*
*[3] Institute of Plant Biology, Biological Research Center, Szeged 6701, Hungary*

Plant cell walls represent the most abundant, renewable and biodegradable composite on Earth. It forms a large part of the plant body and defines its characteristics. The specific form and function of the cell walls and interaction with the environment are based on variation in its chemical composition and connections between the building macromolecules. The secondary cell walls are rich in biopolymers such as cellulose, hemicellulose and lignin, but the most abundant component is cellulose [1-3].

DP-LS microscopy is a useful and easily applicable technique for rapid screening of cell wall structural order, by mapping the linear dichroism of cellulose fibrils [4]. It allows screening and quantification of the alignment of cellulose fibrils, relative to one another, in cell walls [5]. The goal was to provide new information about structural characteristics of the isolated cell walls among species which may be a basis for their possible applications, such as biofuel and biomaterial industry, but also to understand what plant response to stress is.

We applied DP-LS microscopy to compare alignment of cellulose fibrils in cell walls of spruce, maize and liana (*D.balcanica*).

The confocal fluorescence intensity images were recorded on a Zeiss LSM 410 laser scanning microscope (Carl Zeiss Jena, Jena, Germany) equipped with a differential polarization (DP) attachment [6, 7]. The images were in resolution of 512x512 dots, covering the area of 50x50 and 64x64 μm. Each image consists of two channels: FDLD channel and fluorescence emission channel. FDLD values for dipoles

oriented along the Y axis correspond to 1, while the values of dipoles oriented along the X axis correspond to -1. The FDLD values are in the range from -1 to +1 due to the definition: FDLD = (I1-I2)/(I1+I2). (I1 fluorescence intensity was measured with vertically, I2 with horizontally polarized excitation). The acquired 8-bit TIFF images were set to have a color scale from blue (#0000FF) to yellow (#FFFF00) for the FDLD channel. The samples of isolated cell walls were stained with freshly prepared 2 % (w/v) solution of Congo Red for 1h, followed by rinsing in distilled water three times. Samples were excited at 488 nm, and fluorescence emission was observed above 560 nm.

Distribution of linear dichroism was analyzed on images of the cell wall (Fig. 1). Width of obtained distribution curves indicates degree of linear order in the analyzed structures. The distributions show a quite similar orientation for the three species. However, the narrowest is for maize, corresponding to simpler structure and more regular packing (observed parallel linear structures) of cellulose molecules than in the wood species.

The DP-LSM method is shown to be a simple and rapid way to check the structural complexity in the cell wall through cellulose labeling.

References:

[1] A Bacic, PJ Harris and Stone BA (1988) in: “The Biochemistry of Plants”, ed. J Preiss, (Academic Press, Inc., New York) p. 297-371.
[2] M O’Neill, P Albersheim and A Darvill in “ Methods in Plant Biochemistry”, ed. Dey PM, (Academic Press, London) p. 415–441.
[3] L Salmén and A-M Olsson, Journal of Pulp and Paper Science **24** (1998), 99-103.
[4] G Steinbach *et al*, Cytometry **73A** (2008), 202–208.
[5] A Savić *et al*, Microsc Microanal **22**(2016), 361–367
[6] G Garab *et al*, US Patent 6856391 (2005).
[7] G Steinbach *et al*, Acta Histochem **111** (2009), 316–325.

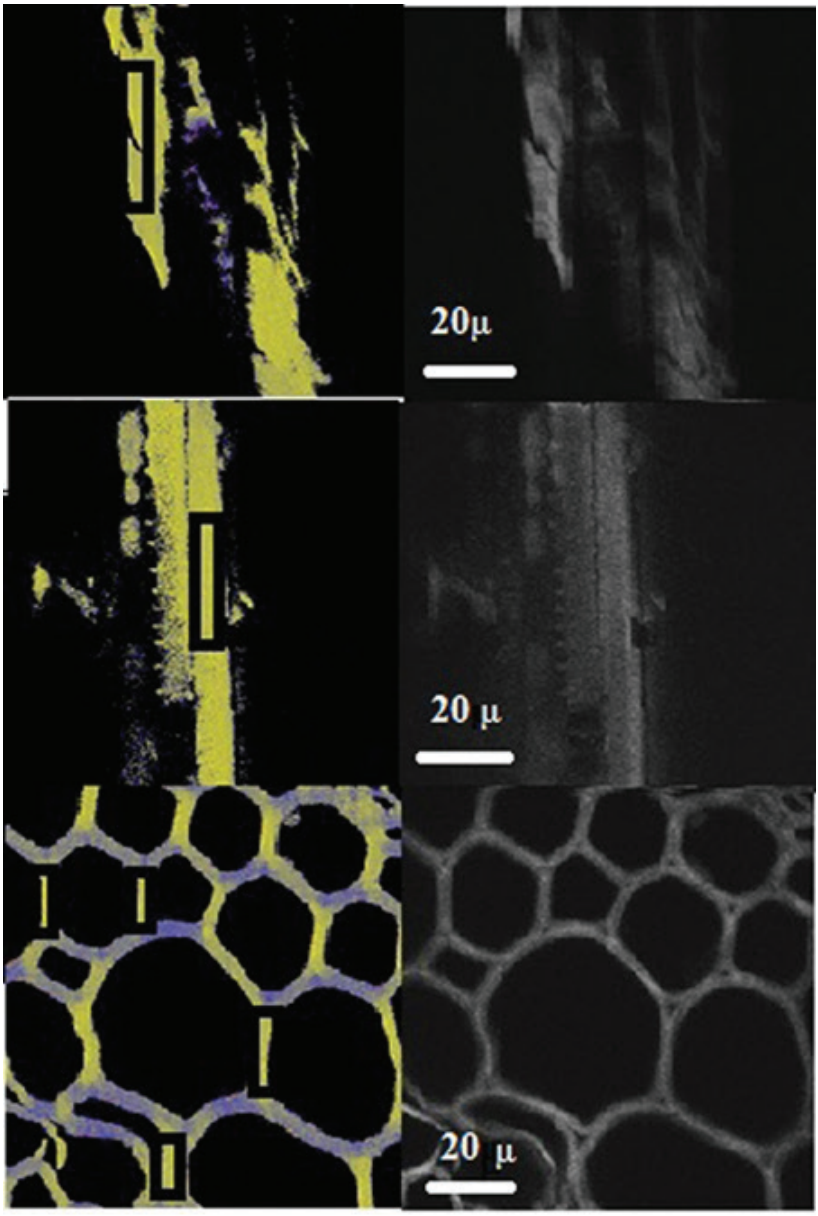


**Figure 1.** Confocal fluorescence-detected linear dichroism (FDLD) measurements (left panel), confocal fluorescence intensity (right panel) of the isolated cell walls of spruce, maize and liana stained with Congo Red.