

Institute of Complex Systems, FFPW, University of South Bohemia

<http://web.frov.jcu.cz/cs/ustav-komplexnich-systemu>



Dalibor Štys

Professor, Laboratory of experimental complex systems

stys@jcu.cz



CZECH
OPTICAL
CLUSTER

*Let's Make Optics for the Future.
Together.*

Introduction

We built new concept of microscopes:

- (a) Large field sight – largest sensors in the world
- (b) Quasi - spectral resolution in each of the images
- (c) Built-in real time analyses
- (d) Mechanically robust and stable

We seek:

- (a) Customers
- (b) Investors

Institute of Complex Systems, FFPW, University of South Bohemia

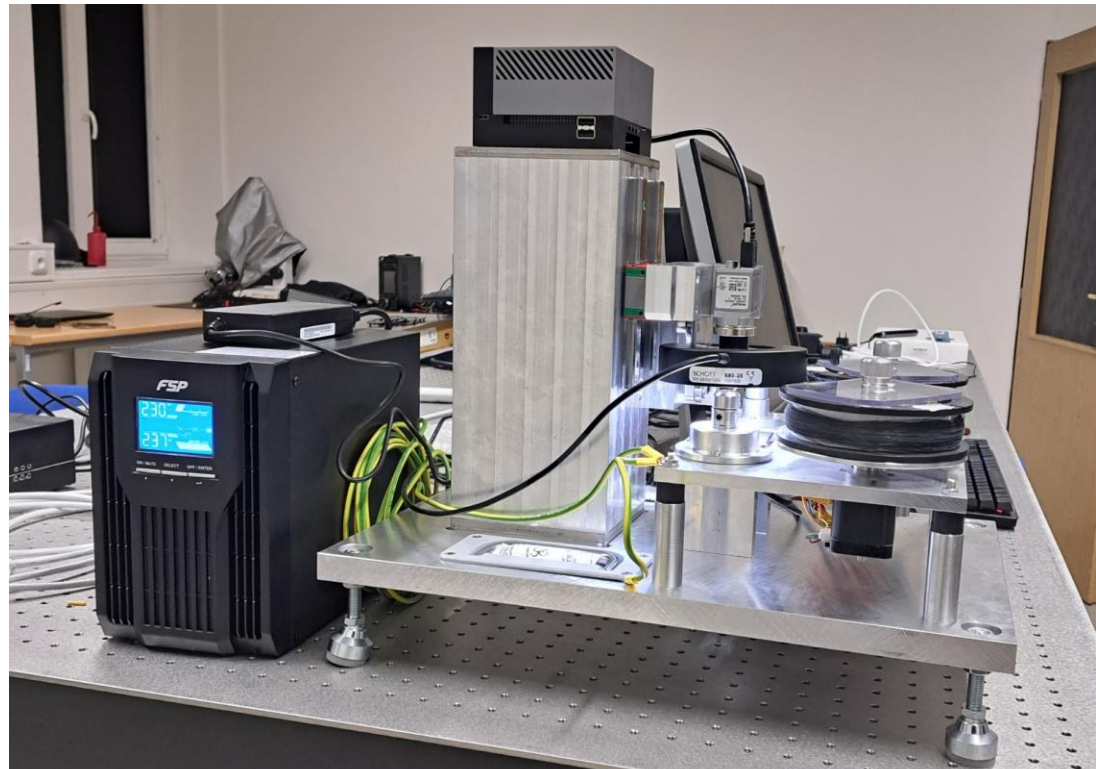
<http://web.frov.jcu.cz/cs/ustav-komplexnich-systemu-uks>

Dalibor Štys

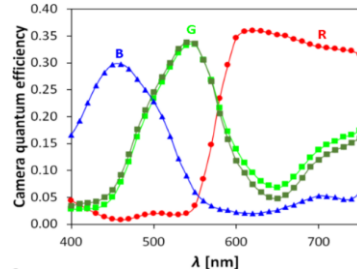
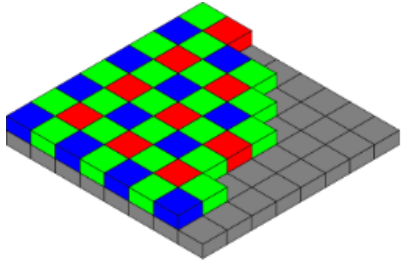
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**We develop
microscopes
for any combination of needs**



Digital camera as scientific instrument



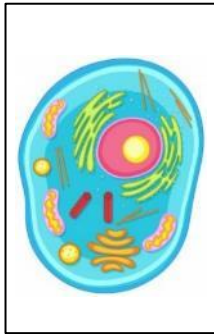
Color channels are not independent

Light source



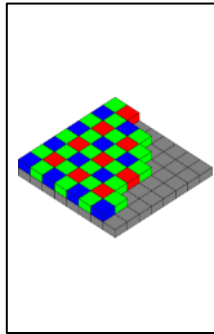
Spectrum
 $S(\lambda)$

Sample



Transparency
 $T(\lambda)$

Sensor filter



Transparency
 $F_c(\lambda)$

Signal

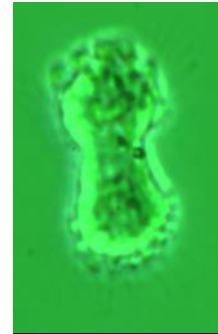


Image
 I_c

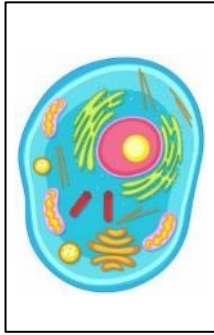
In - depth analysis of the whole image enables pointwise spectrum detection

Digital camera as scientific instrument

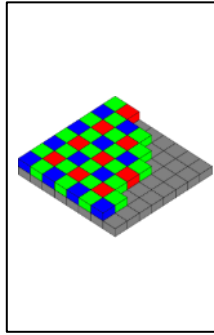
Light source



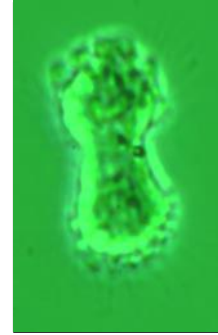
Sample



Sensor filter



Signal



Spectrum
 $S(\lambda)$

Transparency
 $T(\lambda)$

Transparency
 $F_c(\lambda)$

Image
 I_c

In - depth analysis of the whole image enables pointwise spectrum detection

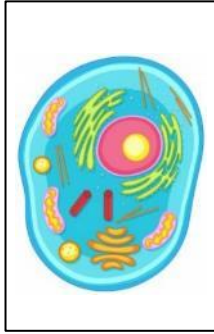
$$\sum_{c=1}^3 \int_{\lambda_-}^{\lambda_+} S(\lambda) \cdot T(\lambda) \cdot F_c(\lambda) d\lambda - I_c = 0$$

Digital camera as scientific instrument

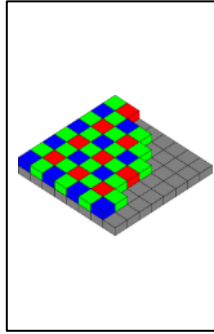
Light source



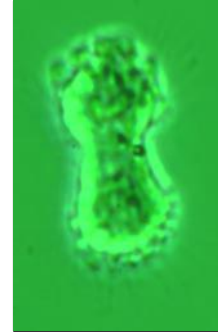
Sample



Sensor filter



Signal



In - depth analysis of the whole image enables pointwise spectrum detection

Spectrum
 $S(\lambda)$

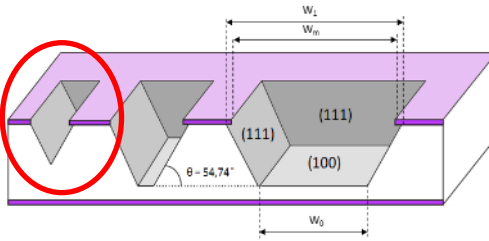
Transparency
 $T(\lambda)$

Transparency
 $F_c(\lambda)$

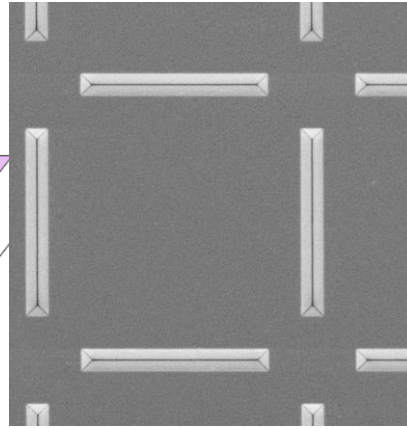
Image
 I_c

$$F_m = \sum_{c=1}^3 \exp \left| \int_{360}^{700} S(\lambda) F_c(\lambda) T_m(\lambda) d\lambda - I_c \right| + \frac{1}{N} \sum_{n=1}^N \left\{ R_{mn} \sum_i^{32} (T_m(\lambda_i) - T_n(\lambda_i))^2 \right\}$$

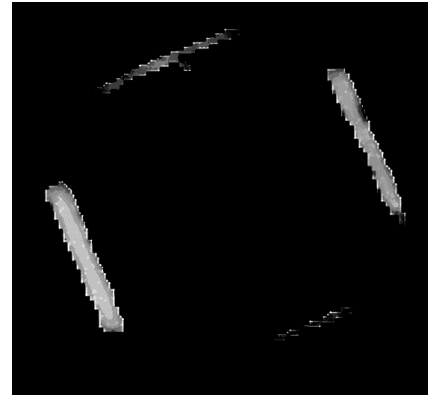
Comparison to scanning electron microscopy



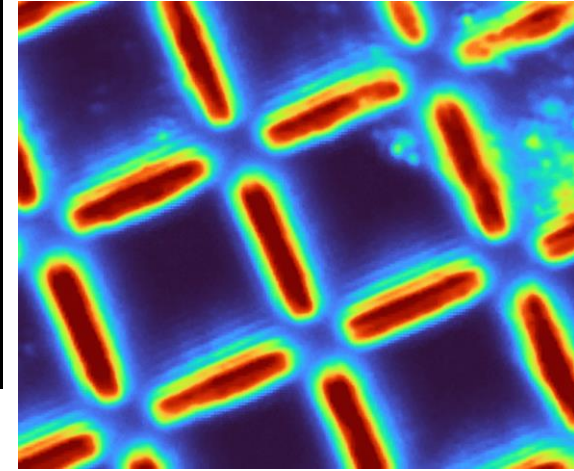
ELM
lithographic
standard



SEM image

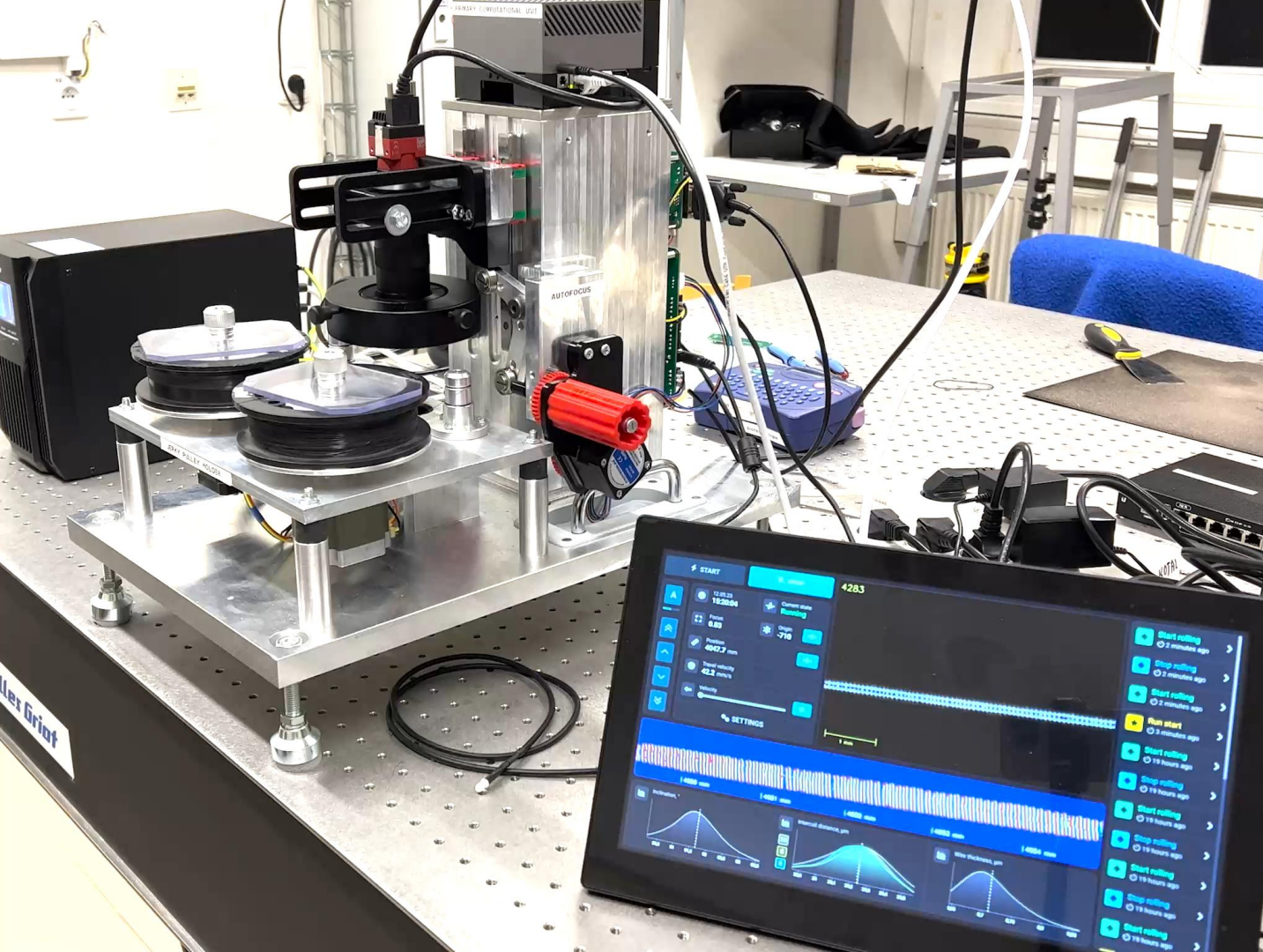


Selected
spectra



Complete
spectral image
in
pseudocolours

Tungsten spirals control technology



⚡ START

🛑 STOP

7084

A



Focus
1.50



Origin
-429



23:56:00 16.04.23



Current state
Switched off

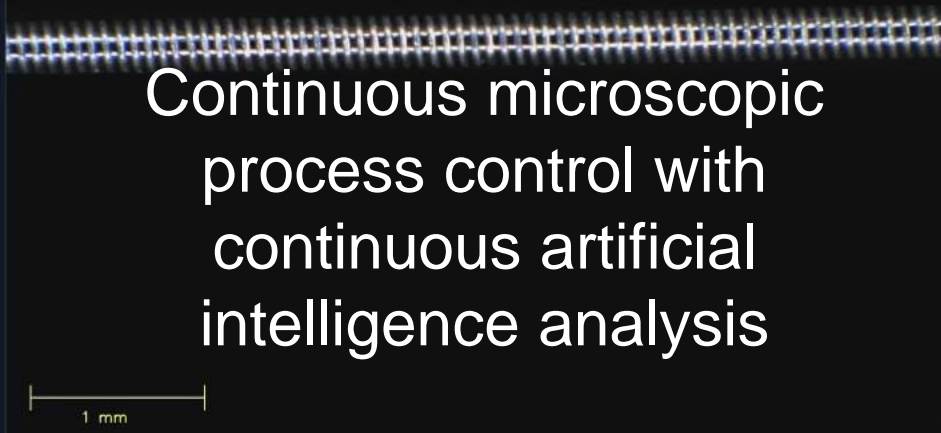


Position
18581.0 mm

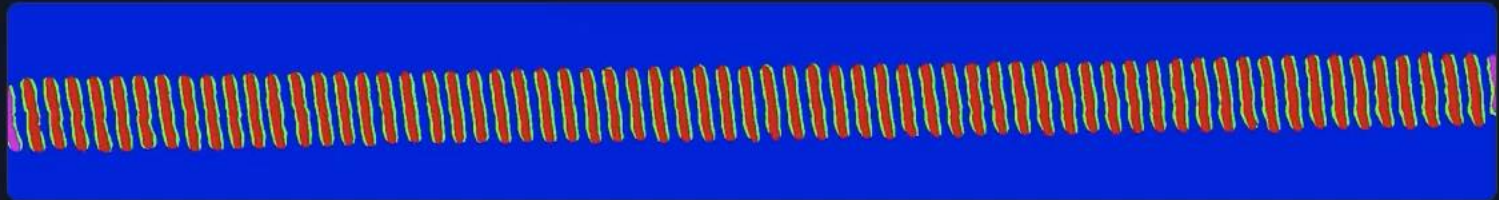


Travel velocity
56.6 mm/s

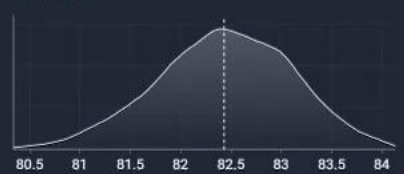
⚙️ SETTINGS



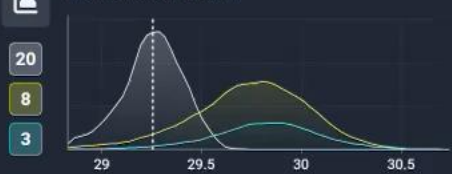
- Run start
🕒 4 minutes ago >
- Run start
🕒 14 minutes ago >
- Run start
🕒 16 minutes ago >
- Run start
🕒 17 minutes ago >
- Run start
🕒 18 minutes ago >
- Run start
🕒 20 minutes ago >
- Run start
🕒 21 minutes ago >
- Run start
🕒 22 minutes ago >
- Run start
🕒 41 minutes ago >
- Run start
🕒 43 minutes ago >
- Run start
🕒 1 hour ago >



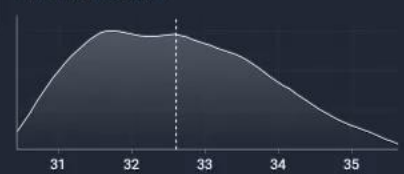
Inclination, °



Intercoil distance, μm



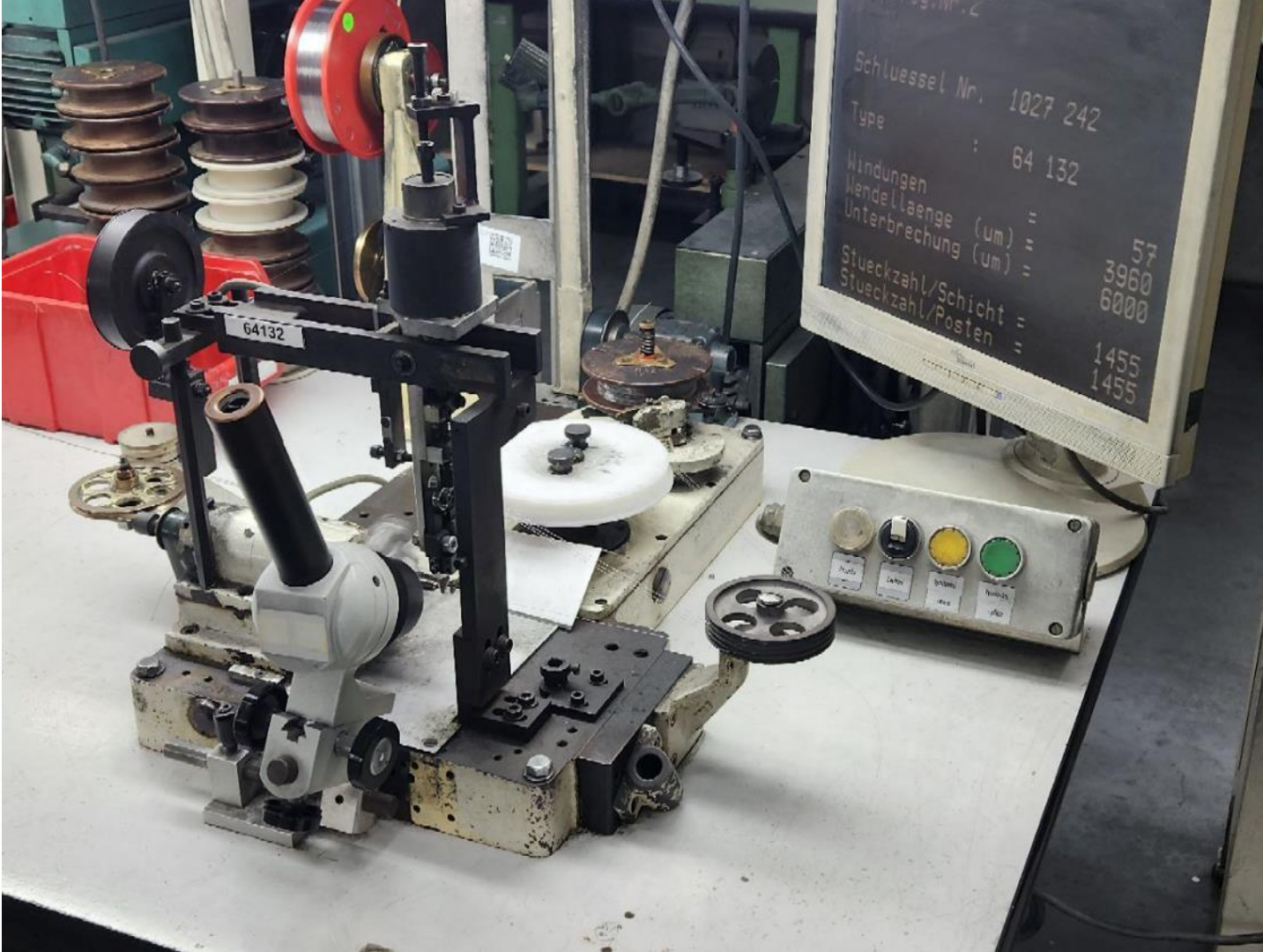
Wire thickness, μm



Tungsten spirals control technology

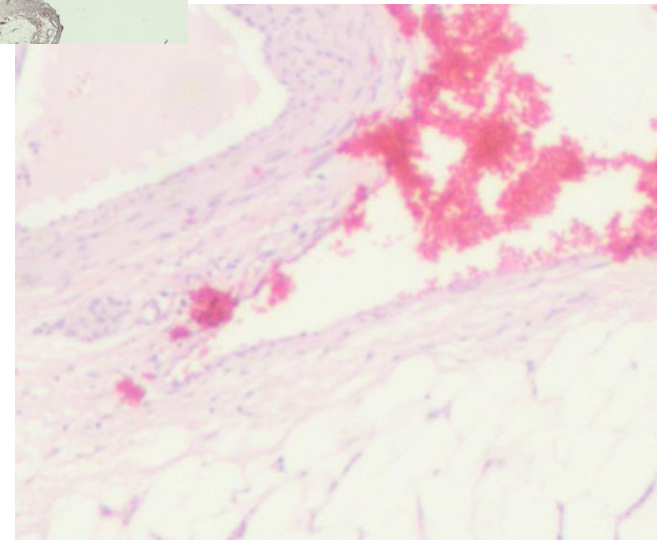
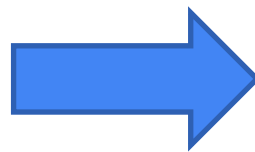
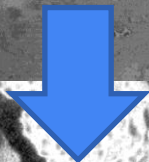
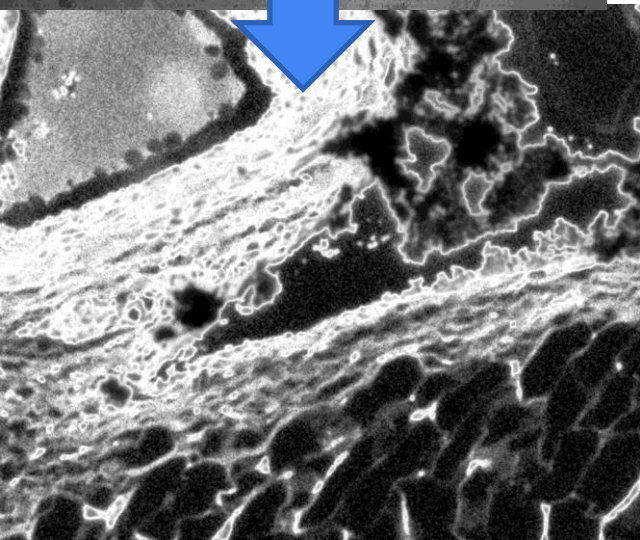
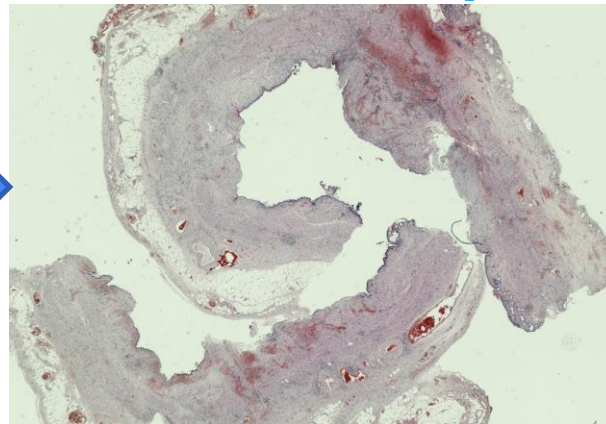
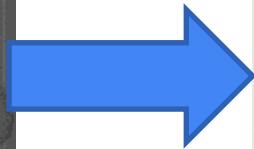
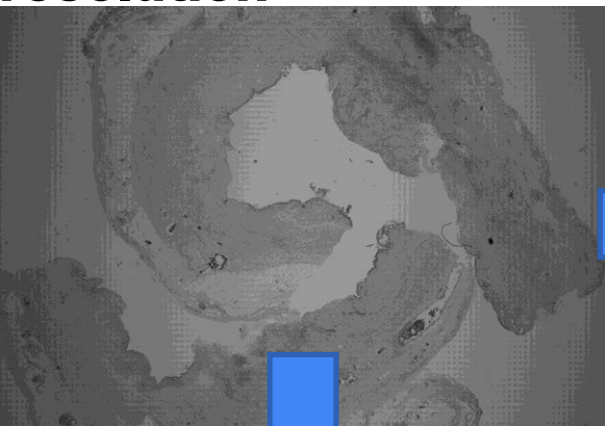


Tungsten spirals control technology

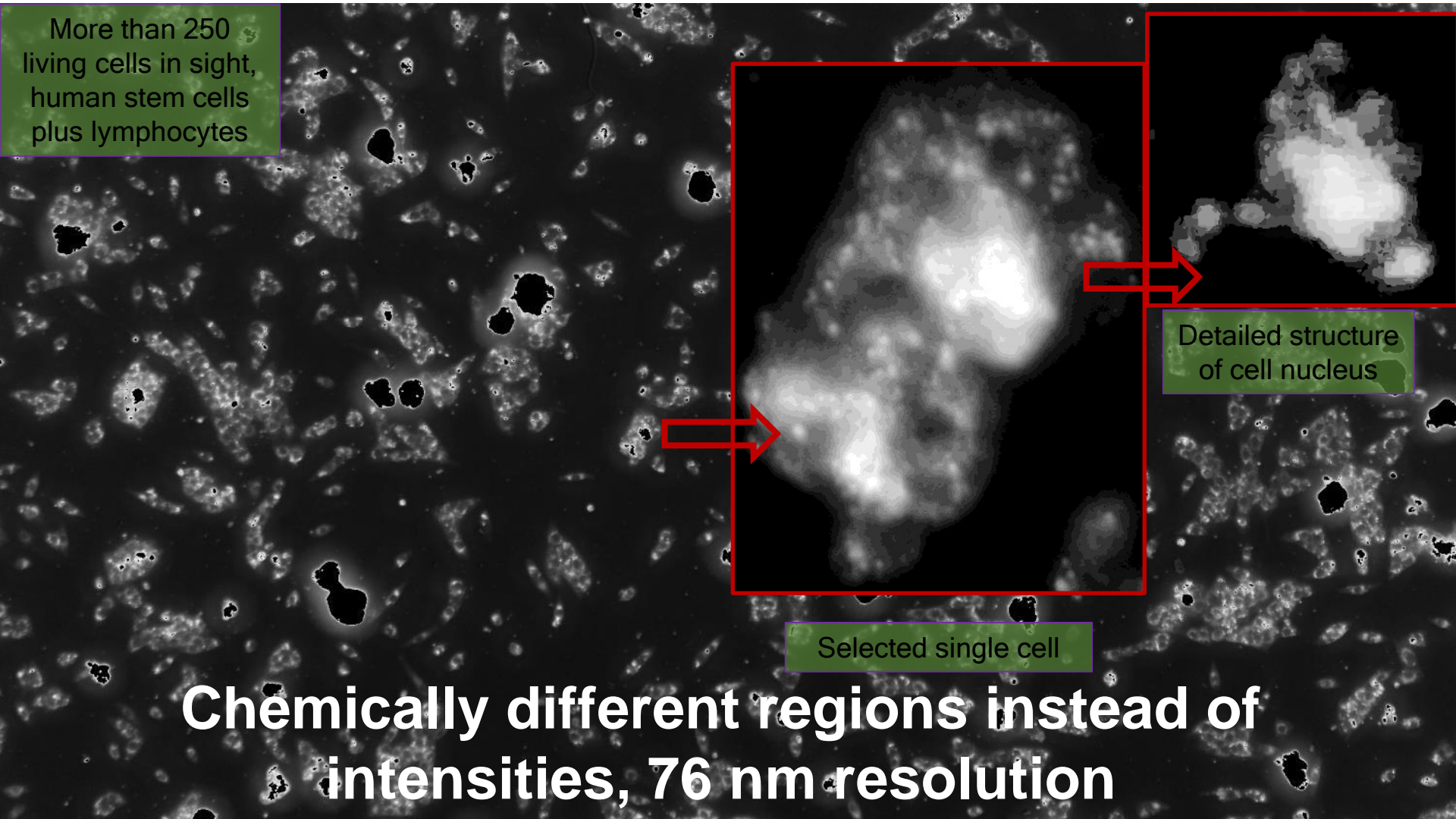


Reconstruction of native colours in the 1x1,5 cm² image with 330 nm resolution

Fast digital pathology



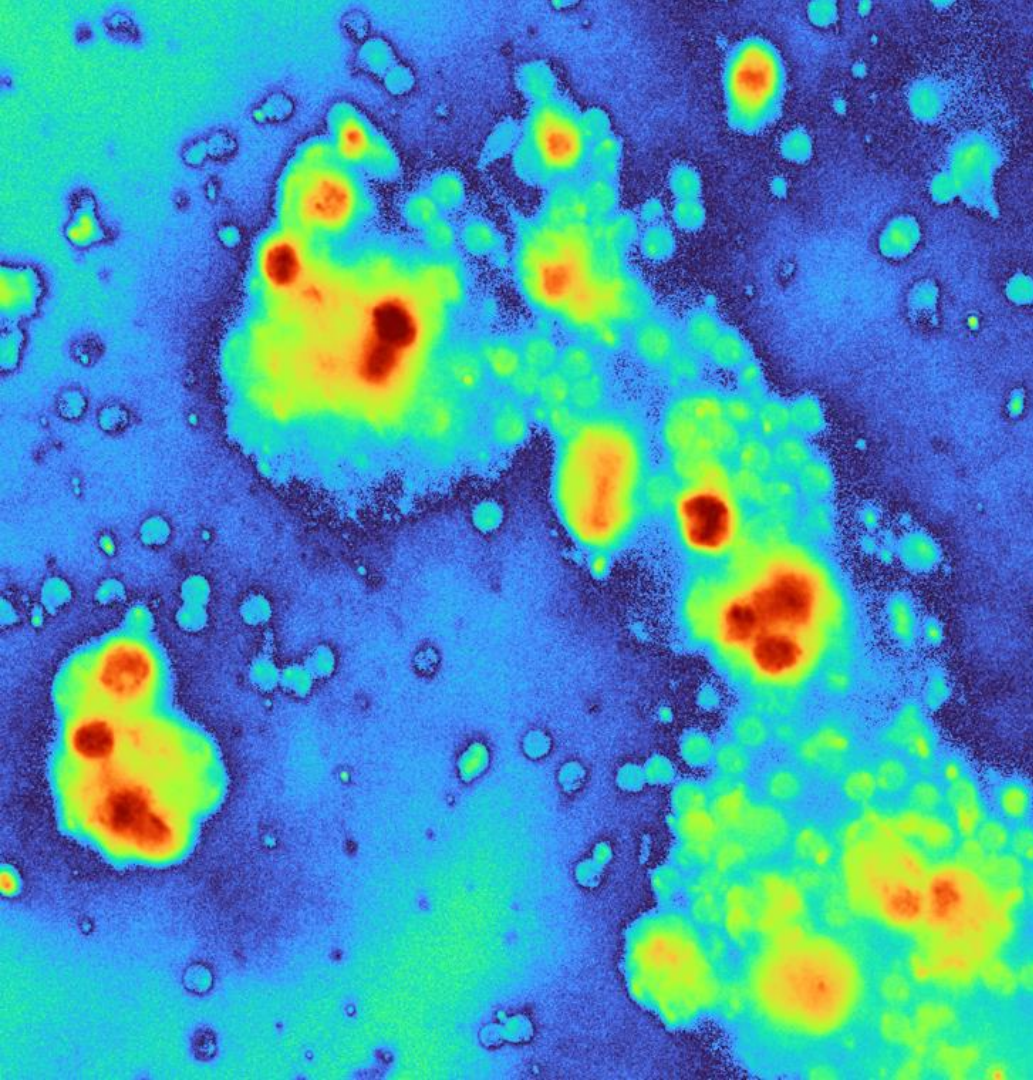
More than 250 living cells in sight, human stem cells plus lymphocytes



Detailed structure of cell nucleus

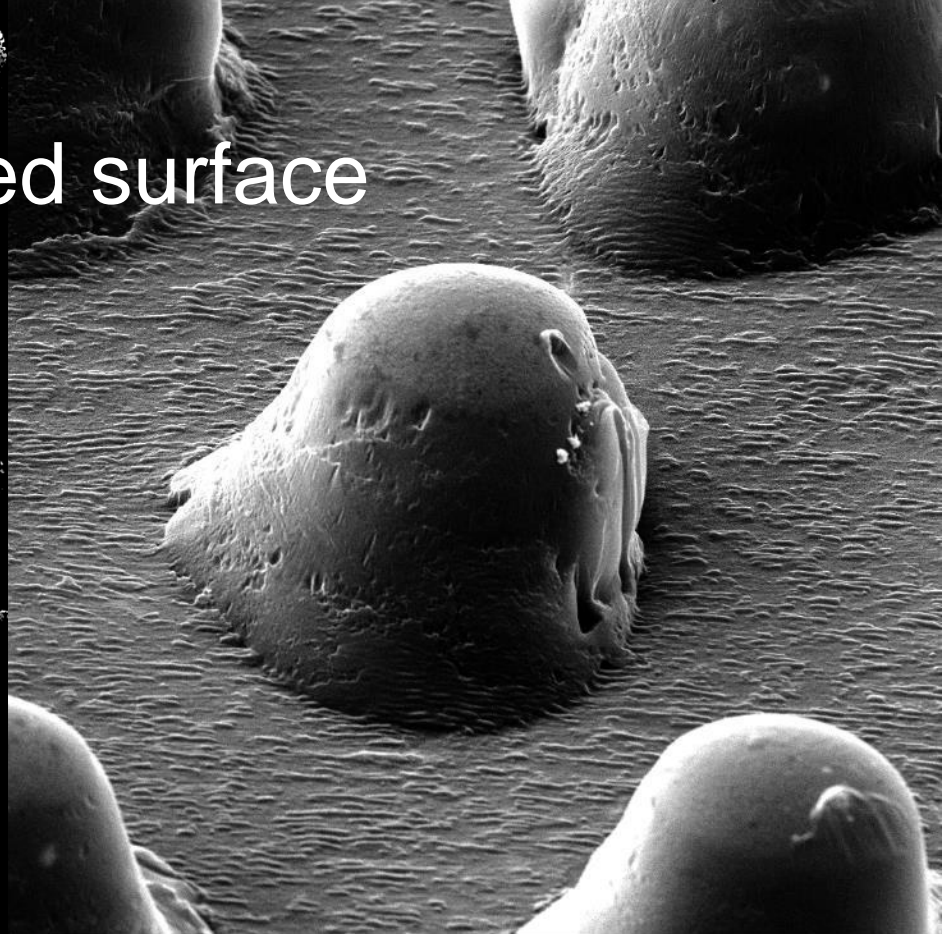
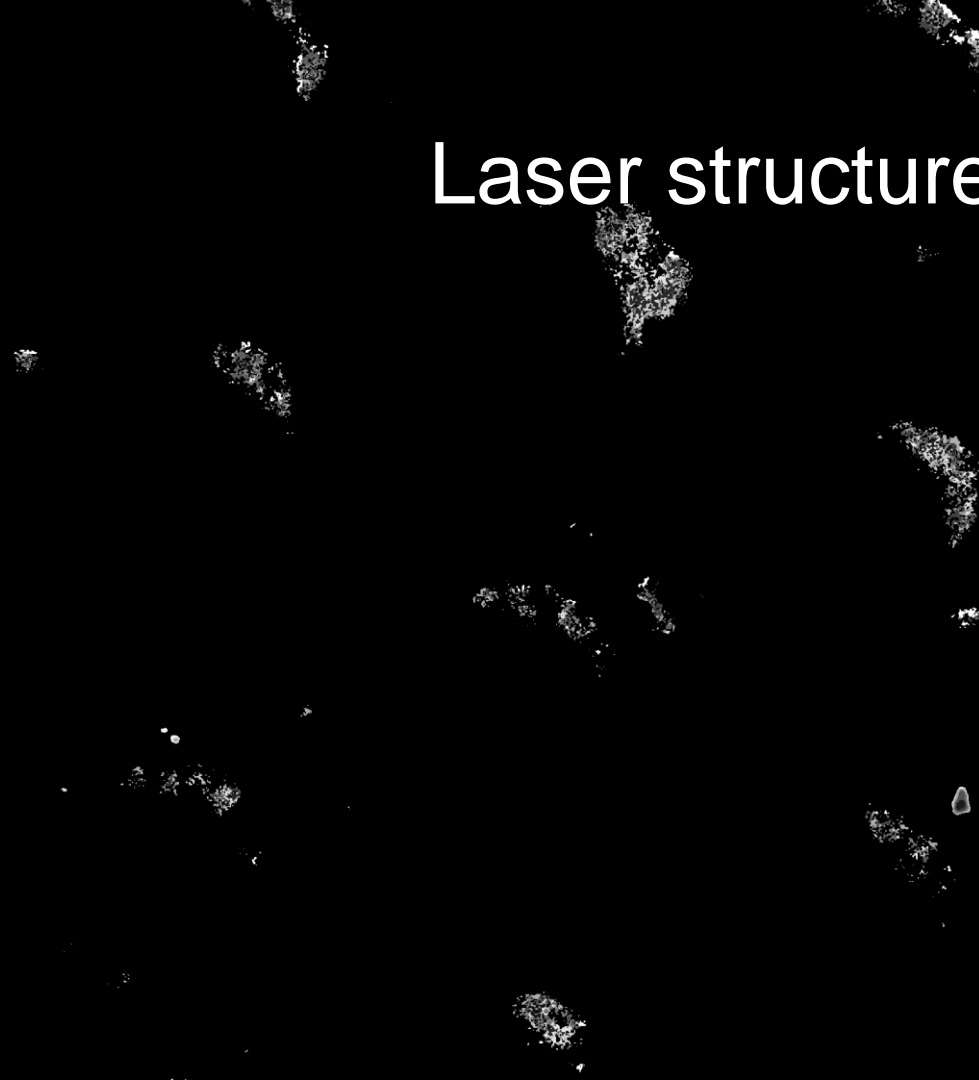
Selected single cell

Chemically different regions instead of intensities, 76 nm resolution



**Faster and more
specific
immunological
analysis**

Laser structured surface



	Mag 5.00 kx	FoV 55.8 μm	WD 18.61 mm	10 μm
Speed 5	BC 300 pA	Scan Mode RESOLUTION	Energy 15 keV	



**Large field of sight quality control, i.e $2 \times 3 \text{mm}^2$
at $76 \times 76 \text{nm}^2$ pixel size**

Und viele andere Anwendungen

Wir suchen:

Aufträge

Investoren

Technische und naturwissenschaftliche Fragen

Wir sind spezialisiert auf tschechisch-österreichische
Projekte

Wir sprechen Deutsch

WE ARE RETURNING THE WORD QUALITY ITS CONTENT

Institute of Complex Systems,
FFPW,
University of South Bohemia,

Zámek 136
Nové Hradý (near Weitra)

stys@jcu.cz

+420 777 729 581

