

# Kepler Science Day

Medizinische Technologien – Innovative Ideen

## Supracellular Medical Research / Zellträgerstrukturen aus Polymeren

S. Mayr<sup>1</sup>, B. Buchroithner<sup>1</sup>, J. Heitz<sup>3</sup>, T. A. Klar<sup>3</sup>, P. Hinterdorfer<sup>3</sup>, H. Stangl<sup>2</sup>, R. Etrich<sup>4</sup>  
J. Lazar<sup>4</sup>, J. Ludwig<sup>4</sup>, D. Ruzek<sup>5</sup>, Herbert Stangl<sup>6</sup>, S. Winkler<sup>2</sup>, B. Plochberger<sup>1</sup>, J. Jacak<sup>1</sup>

<sup>1</sup> University of Applied Sciences Upper Austria (FH OÖ), School of Medical Engineering, Linz, Austria

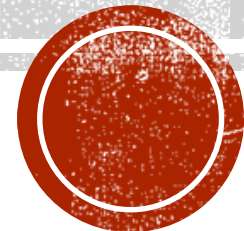
University of Applied Sciences Upper Austria (FH OÖ), Hagenberg, Austria

<sup>3</sup> Johannes Kepler University Linz (JKU), Linz, , Austria

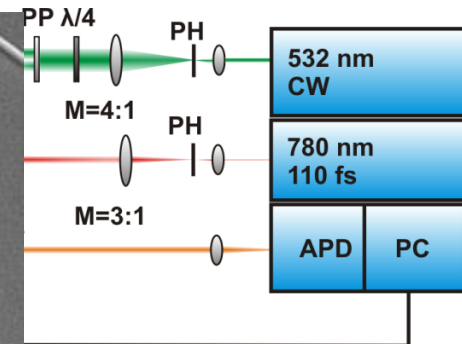
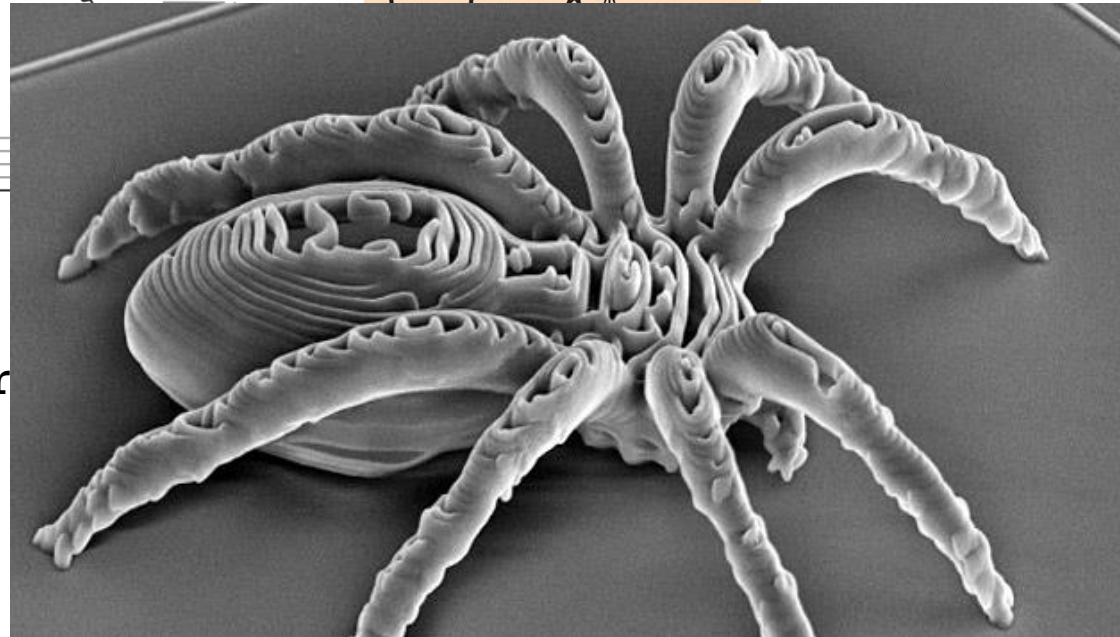
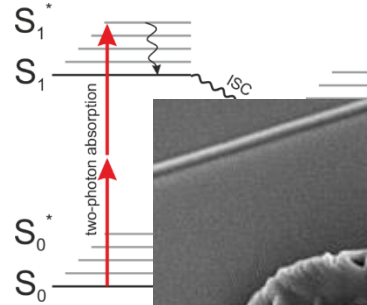
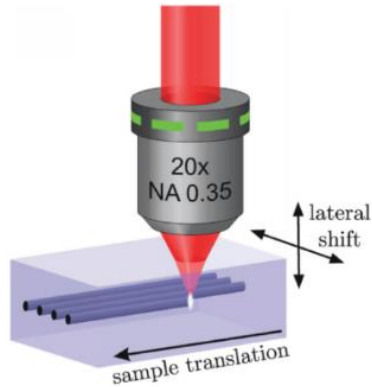
<sup>4</sup> Mikrobiologický ústav AV ČR, Nové Hrady, Czech Republic

<sup>5</sup> Biologické centrum AV ČR, České Budějovice, Czech Republic

<sup>6</sup> Medical University of Vienna, Center for Pathobiochemistry and Genetics, Vienna, Austria



# 3D MULTIPHOTONEN LITHOGRAPHIE / STIMULATED EMISSION DEPLETION (STED) LITHOGRAPHIE

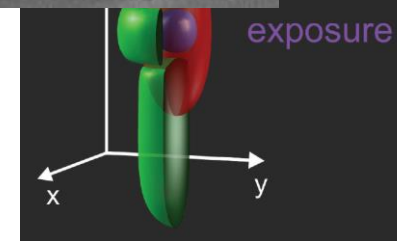
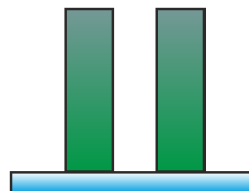


- Multiphotonenanregung startet Polymerisation

## Strukturgrößen:

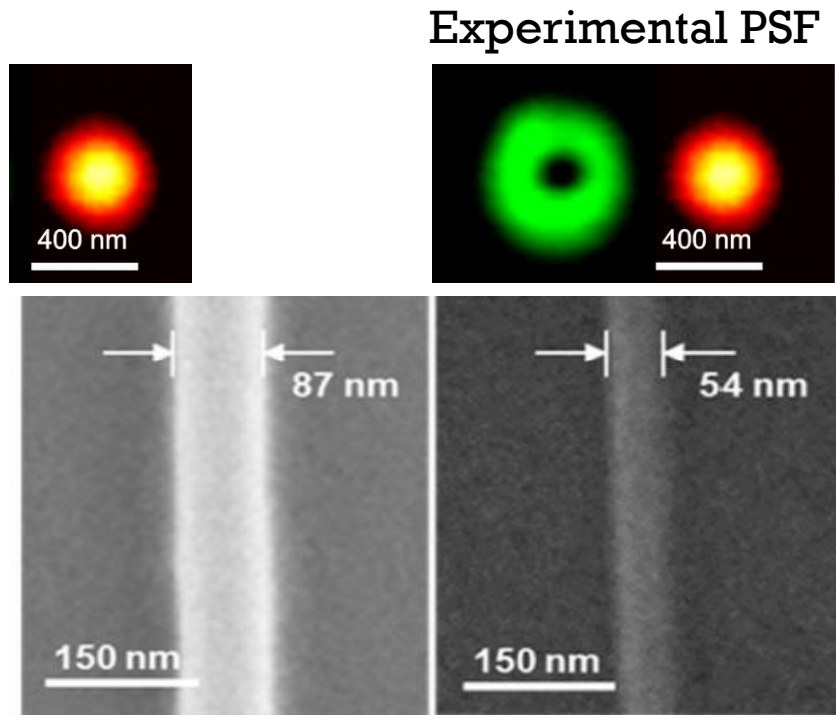
- ~ 100 nm Strukturgröße (800 nm Laseranregung)
- ~ 200 nm Strukturauflösung

feature after development

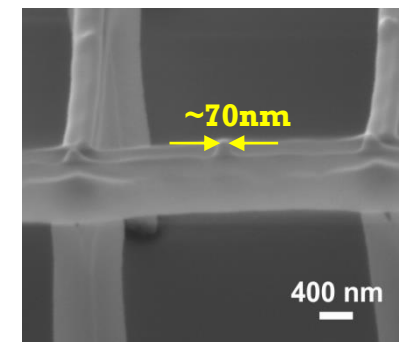
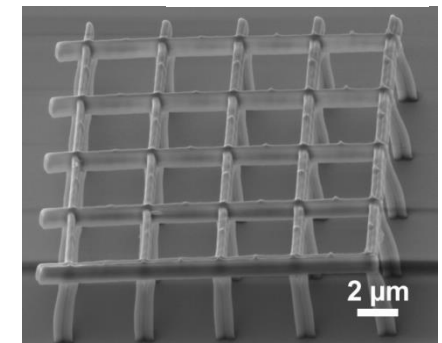
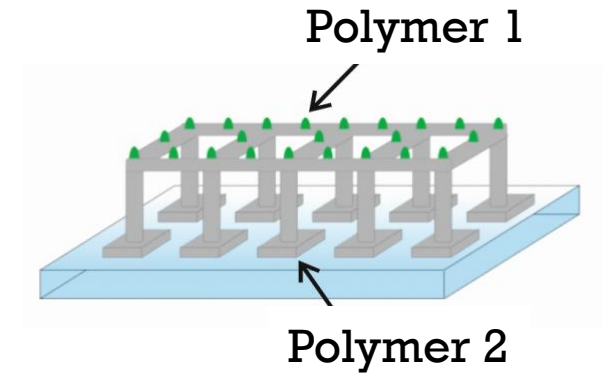
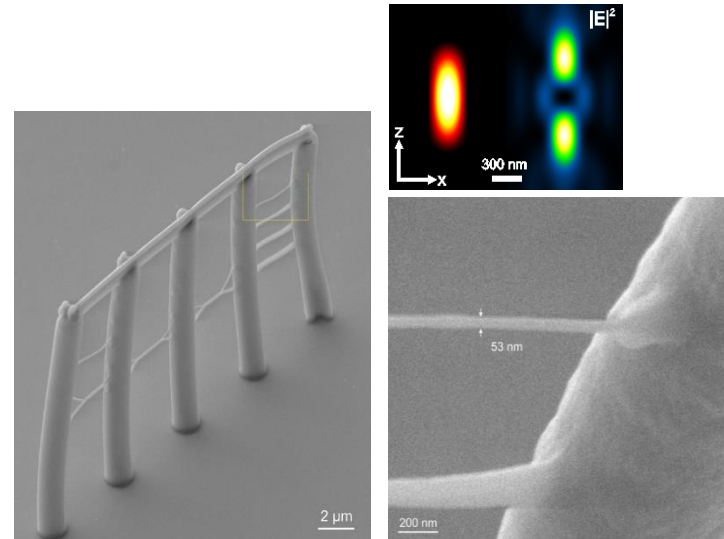


# NANOLITHOGRAPHIE

## Strukturgrößen



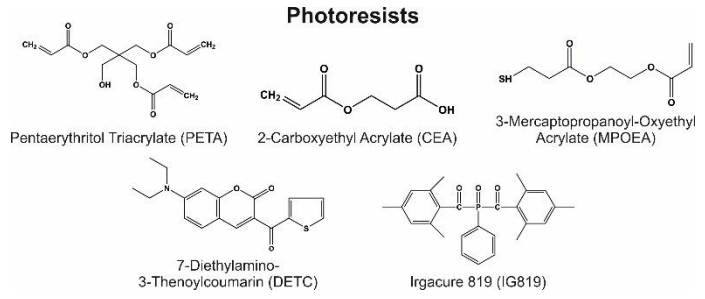
- Anregung (Rot)
- Donut-PSF für STED (Grün)



Wollhofen et al., *Opt Express*, 21, 10831-10840, 2013  
Wiesbauer et al., *Nano Letters*, 13, 5672, 2013  
Klar et al, *Physica Scripta*, 162, 14049, 2014

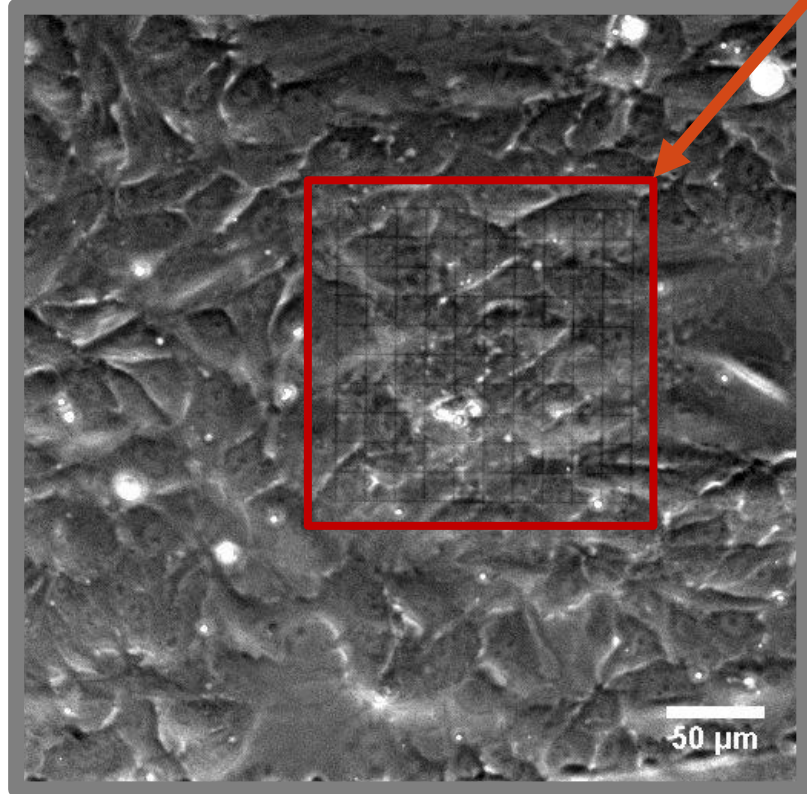
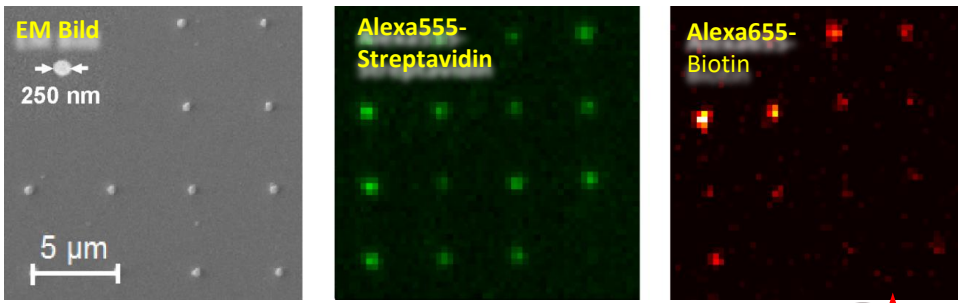
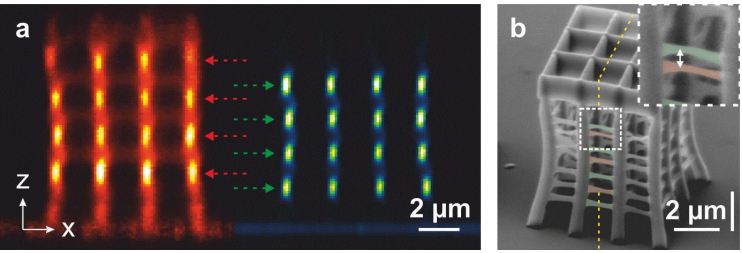


# FUNKTIONALE & BIOKOMPATIBLE POLYMERE



Wiesbauer et al., *Nano Letters*, 13, 5672, 2013  
 Wolfesberger et al., *Journal of Nanobiotechnology* 13, 27, 2015  
 Wollhofen, *Optical Materials Express*; 7; 7; 2538, 2017  
 Buchegger et al., *ACS Nano*, 10 (2), 1954-1959, 2016

Polymer  
Zellträgerstruktur

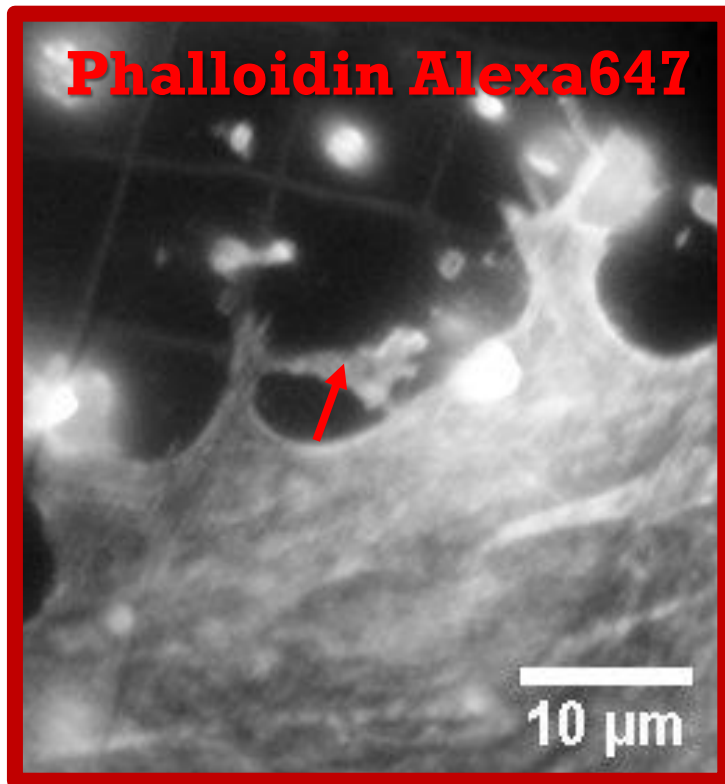


24 h nach der Besiedlung mit HUVEC-Zelle (100.000 cells/slide)



# 3D STRUKTUREN / ZELLWACHSTUM UND MIKROFLUIDIK

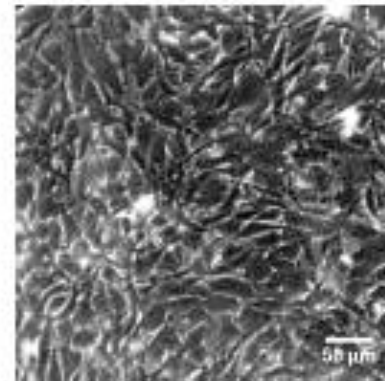
Aktin-Zytoskellet einer Endothelzelle  
Auf einer Polymerstruktur



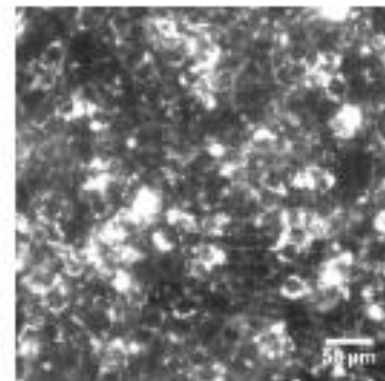
100x100x15μm Gitterkonstante:10μm

## CELLS ON POLYMER STRUCTURES

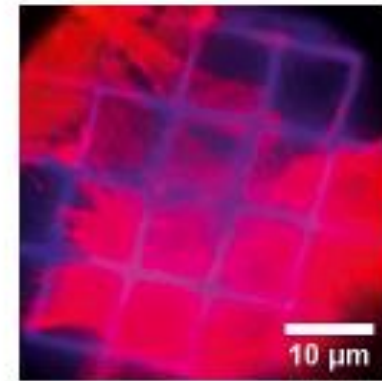
Human umbilical vein endothelial cells (HUVEC) on nanostructures



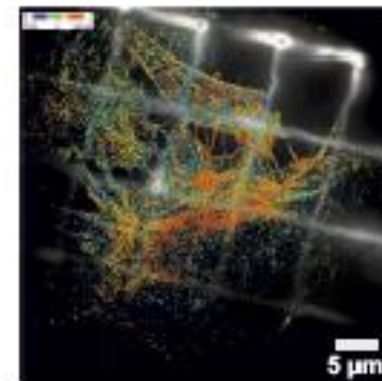
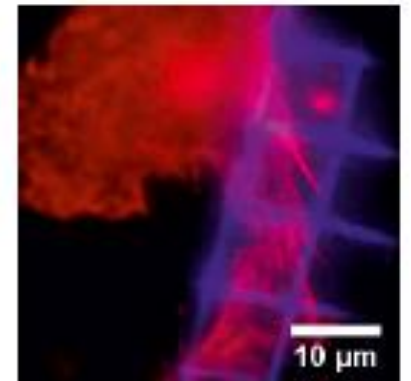
Bright-field image



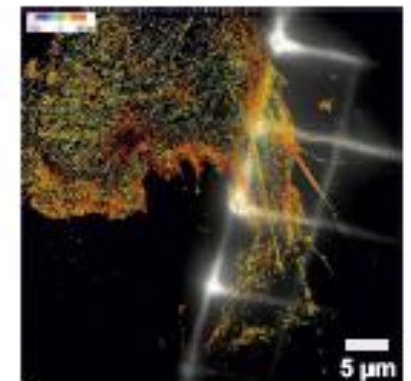
Dark-field image



Phalloidin Alexa488 labeled actin cytoskeleton



Reconstructed dSTORM images

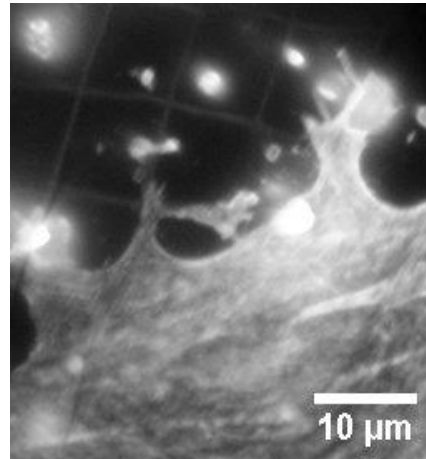


# ZUSAMMENFASSUNG

## Nanolithographie



## Zellträgerstrukturen / Tissue Engineering



## Funktionalen Polymere

