Building new microscopes to study life

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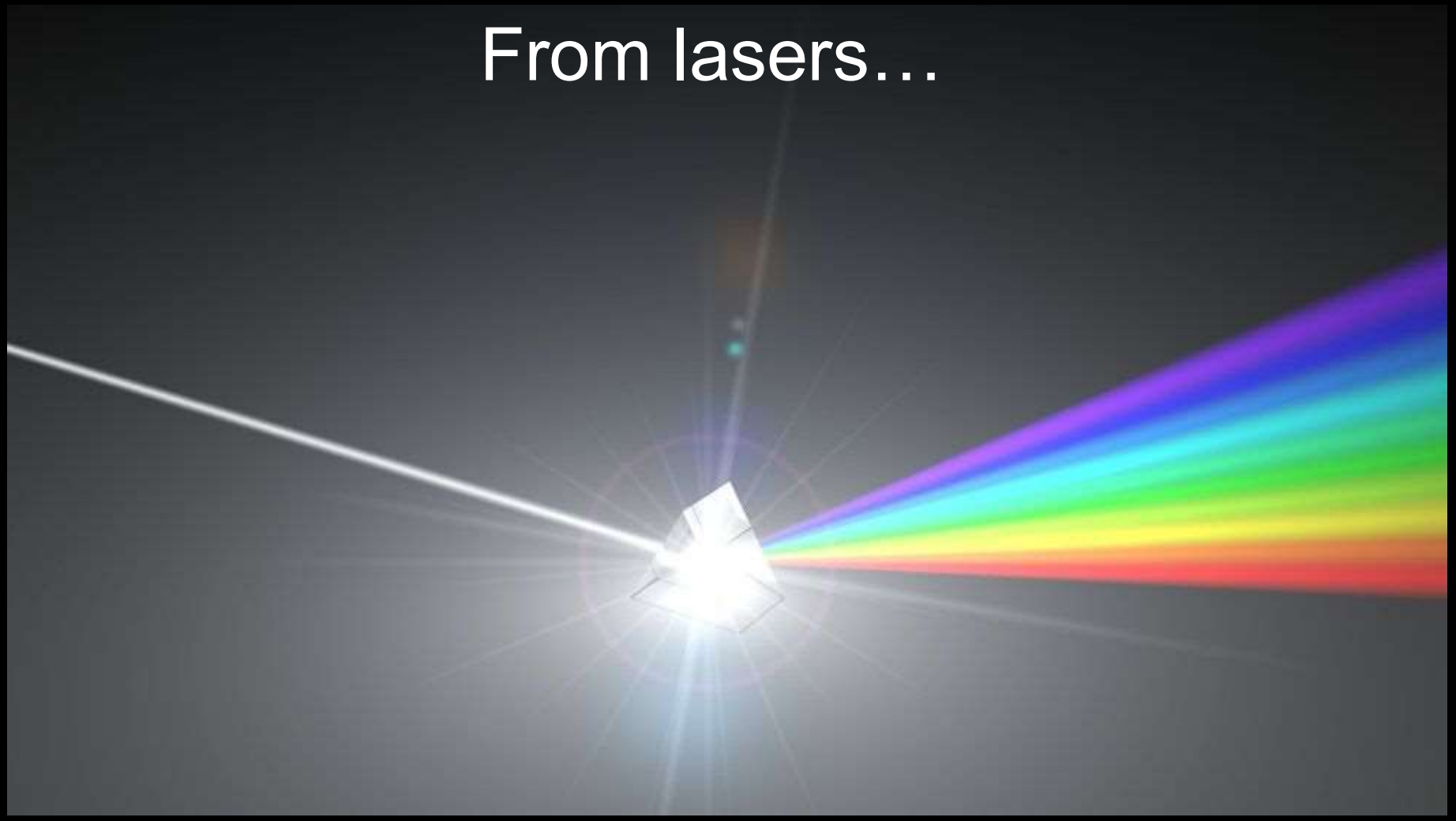
Stewarton Academy
20 February 2024

University of Strathclyde Glasgow

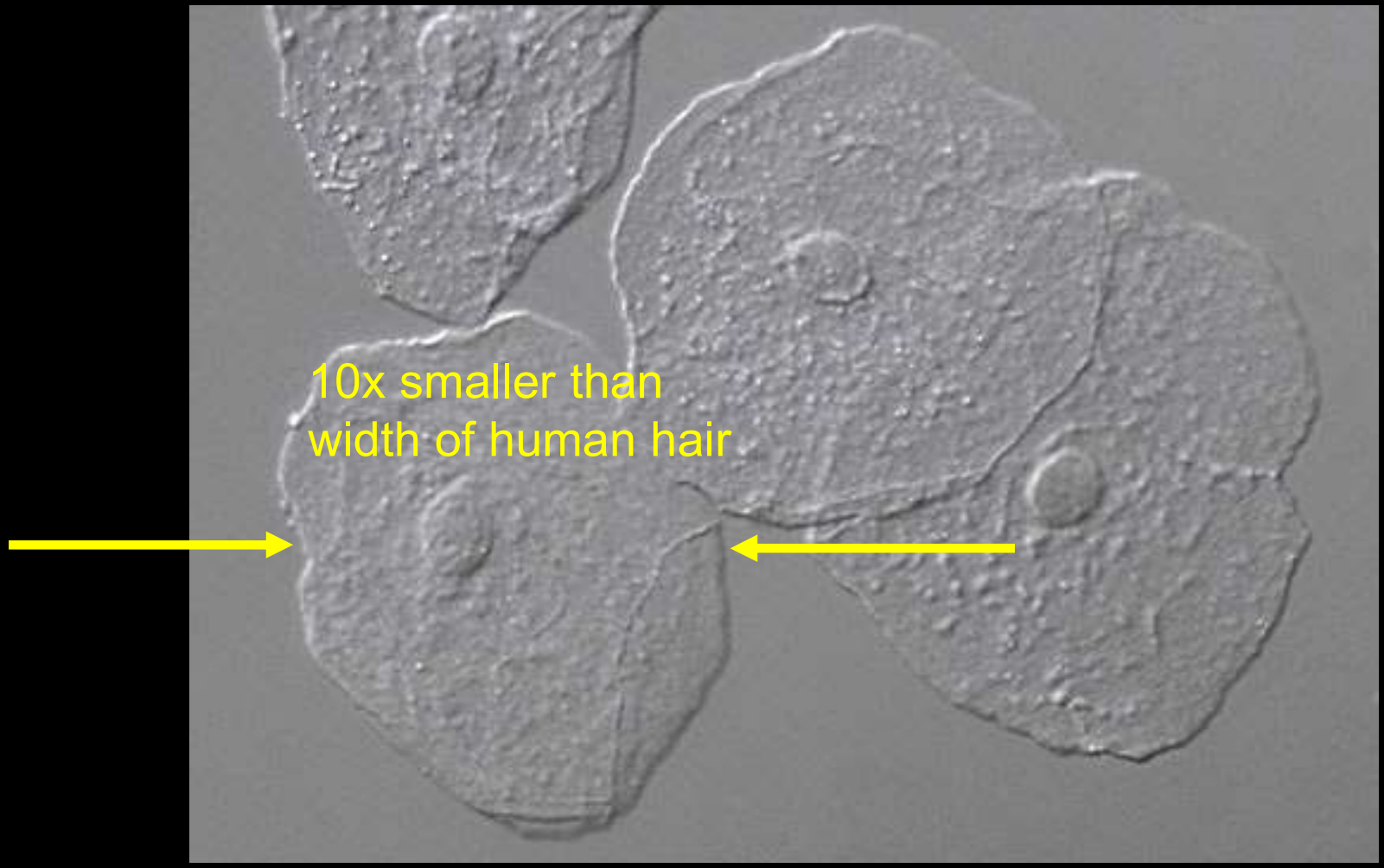
School (Burnhead Primary, Uddingston Grammar)	1994
BSc Hons Laser Physics and Optoelectronics	1994-1998
PhD Physics and Applied Physics	1998-2001
Postdoc(ish)	2002-2004
Fellowship	2004-2007
RCUK Academic Fellowship	2005-2010
Reader	2009
Professor (Biomedical Sciences)	2012
Professor (Physics)	2017
Professor (Biomedical Sciences)	2022

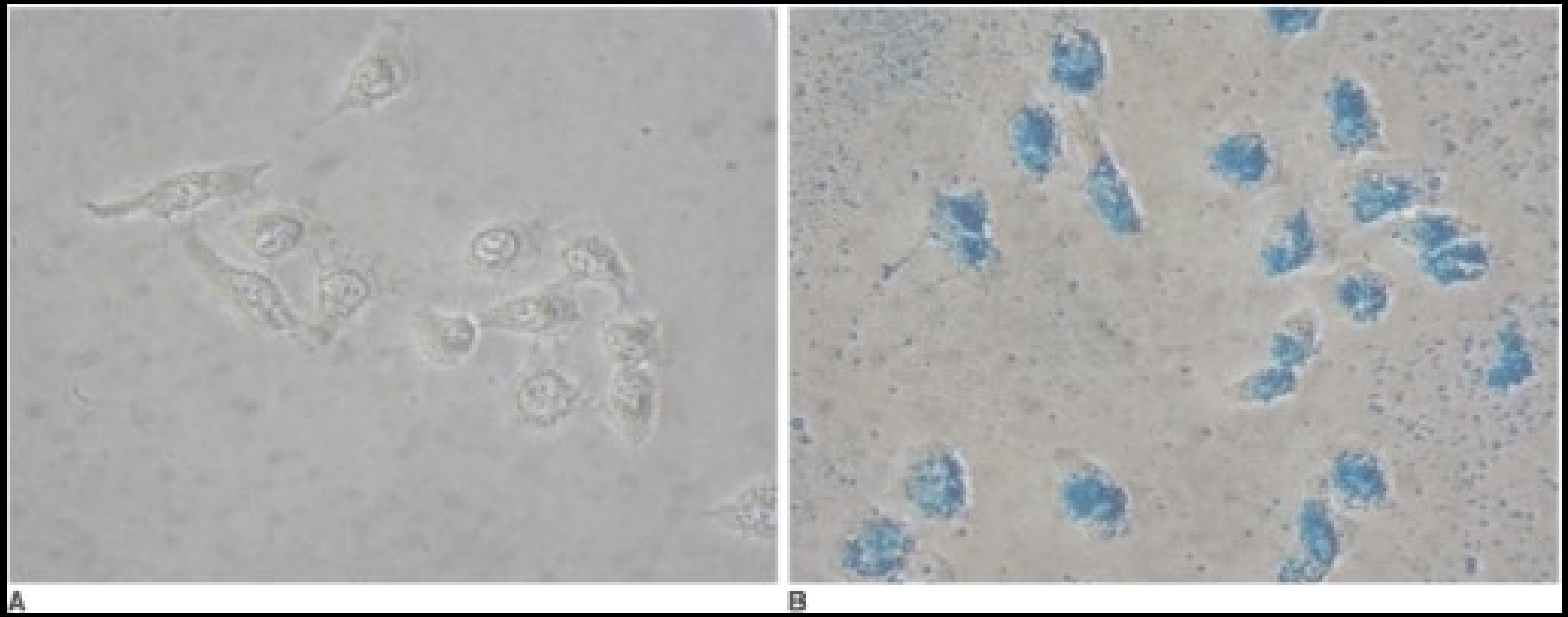
From lasers…

From lasers…

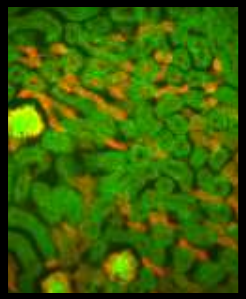


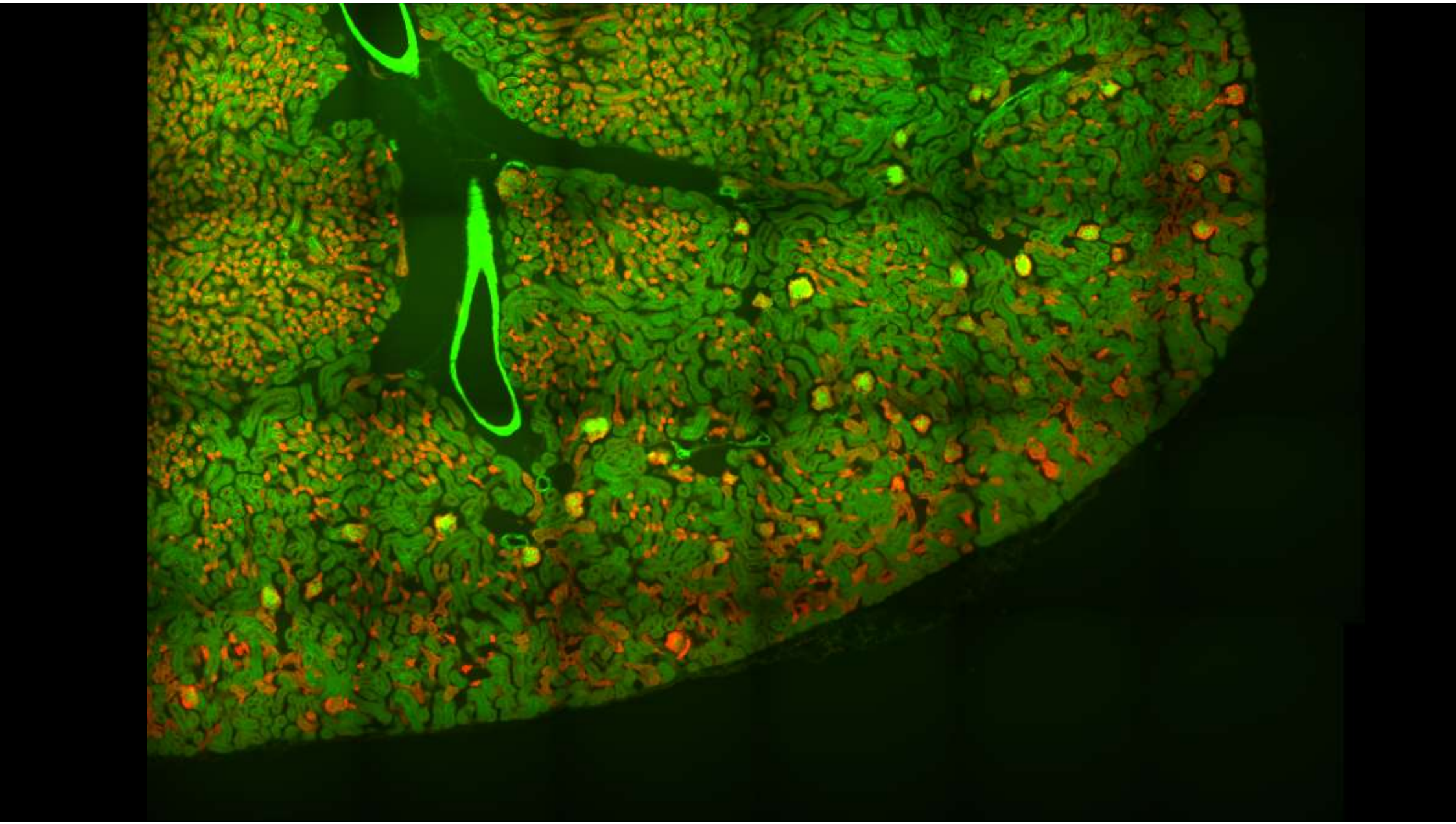
… to microscopes




A
B

CELESTRON
LABS





Making wider-field high quality objective lenses by 3D printing
Liam Rooney

Deep learning in microscopy Image restoration
Lisa Kölln

Mesoscale imaging of whole mouse pancreas
Katrina Wesencraft

Lightsheet mesoscopy with the Mesolens
Eliana Battistella

MesoTIRF & standing wave mesoscopy
Shannan Foylan

Structure and behaviour of mature colony biofilms
Beatrice Bottura

Biofilms in acute recurrent tonsillitis
Megan Clapperton

The effects of flow on biofilm structure
Sara Drais

Fluorescence correlation spectroscopy in GLUT4 reception
Mollie Brown

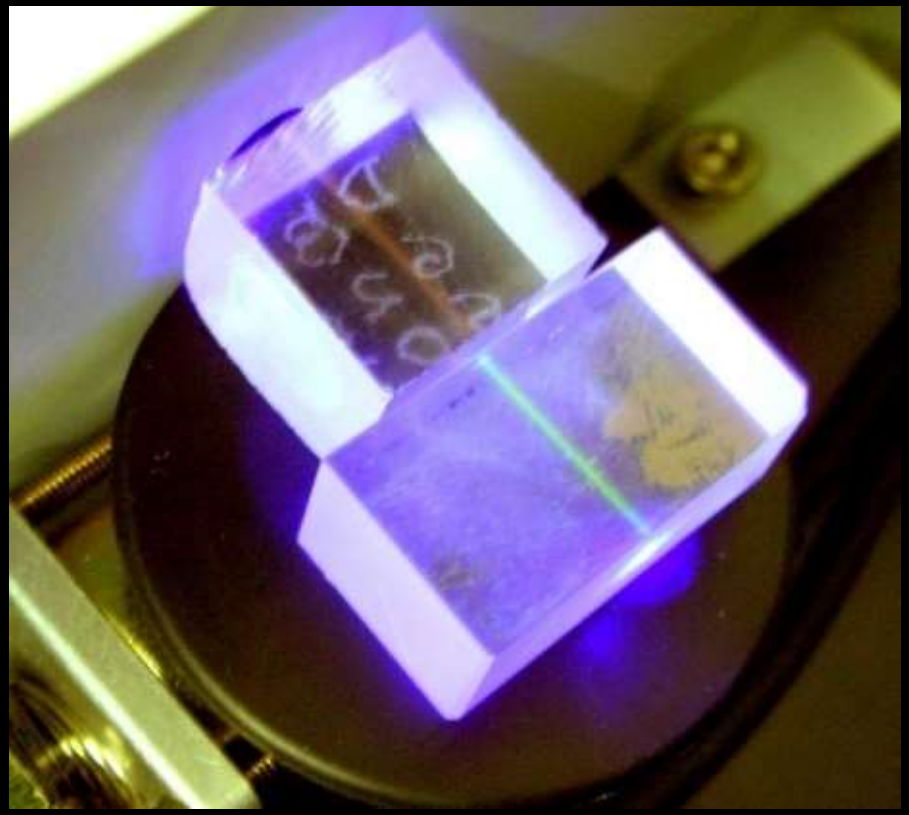
Multiphoton imaging of inflammation in tonsillitis
Kay Polland

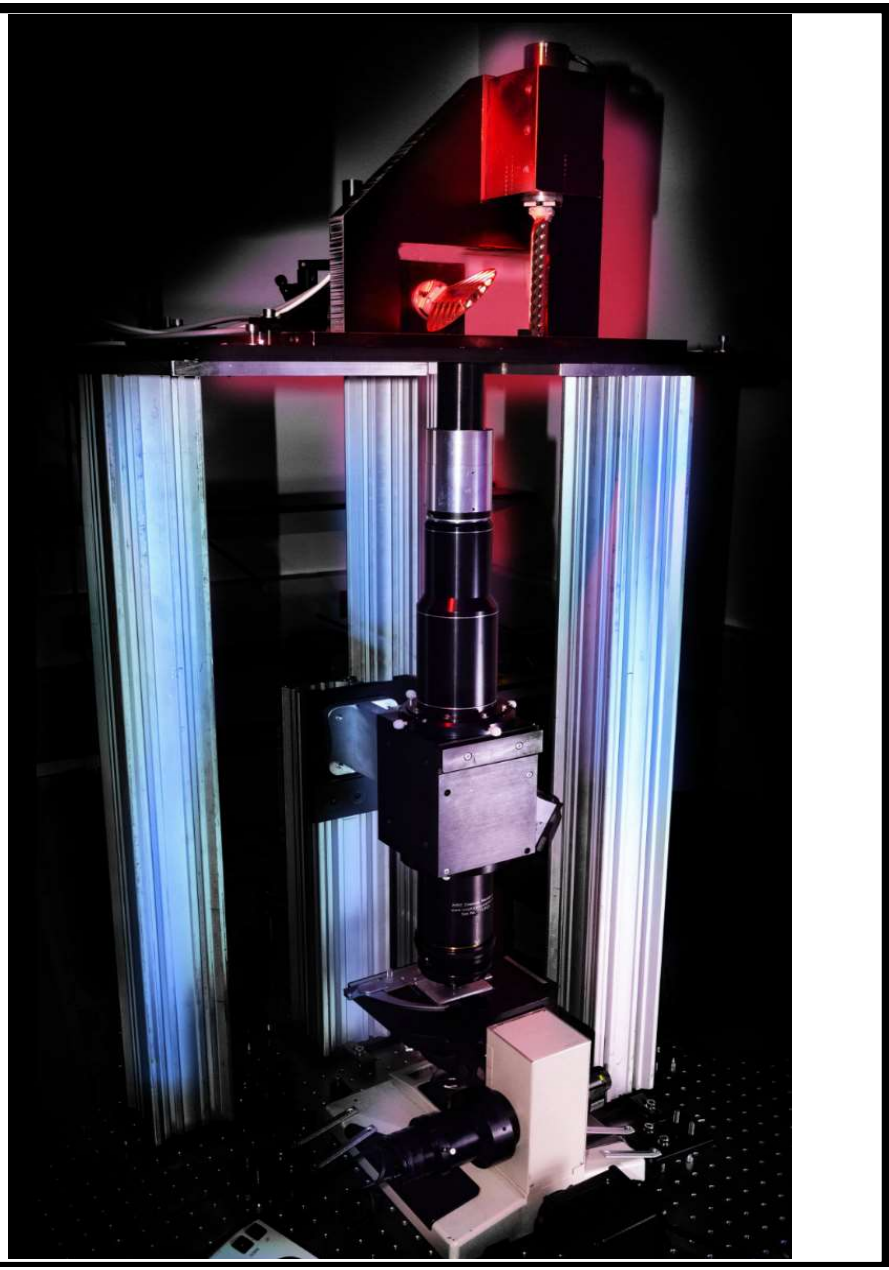
Mesoscale Fourier Plane Ptychography
Laura Copeland

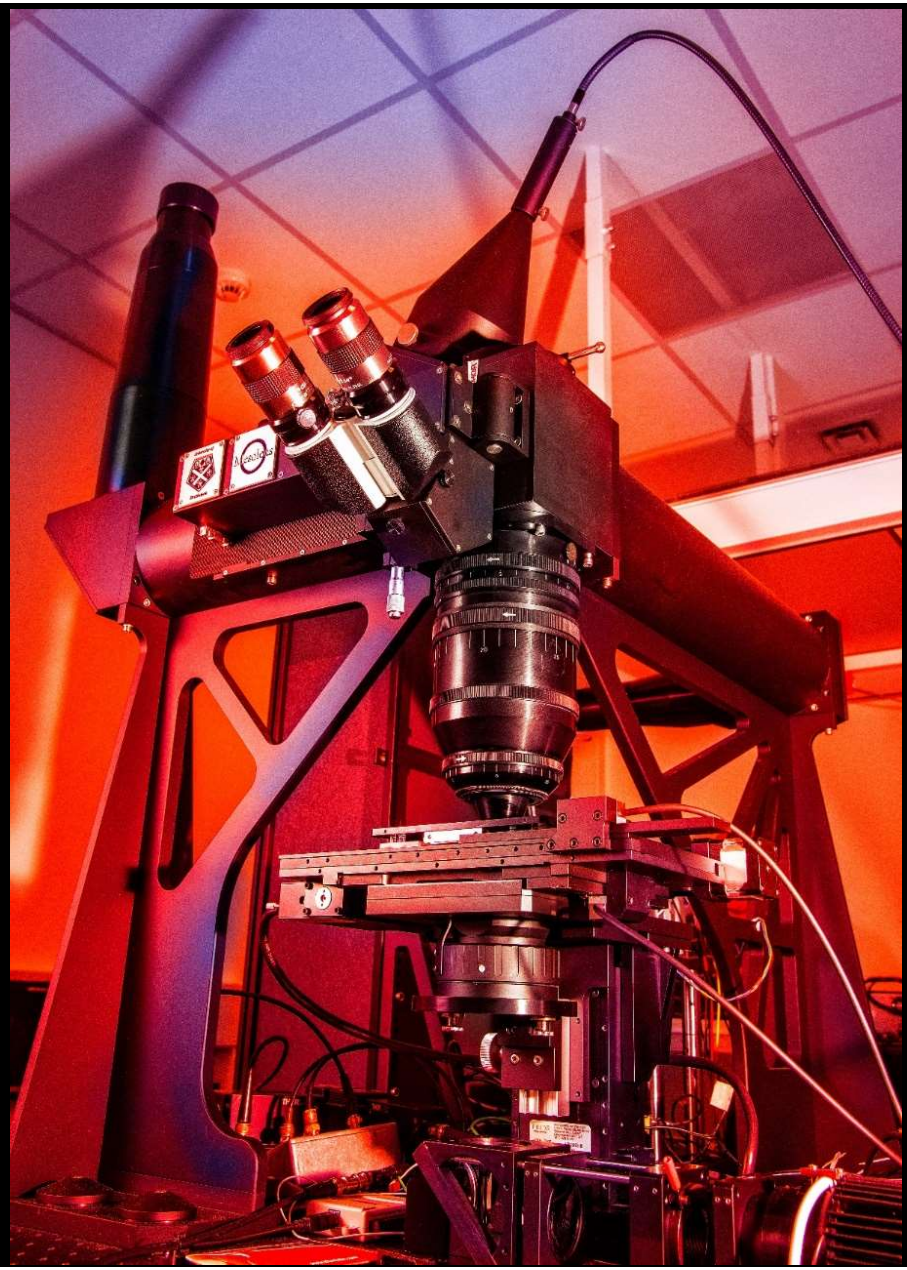
Mesoscale virtual histology
Lewis Walker

Biofilms in voice prosthetic devices
Louise Bolton

Molecular patterns In ageing
Katriona Temple-Atkinson





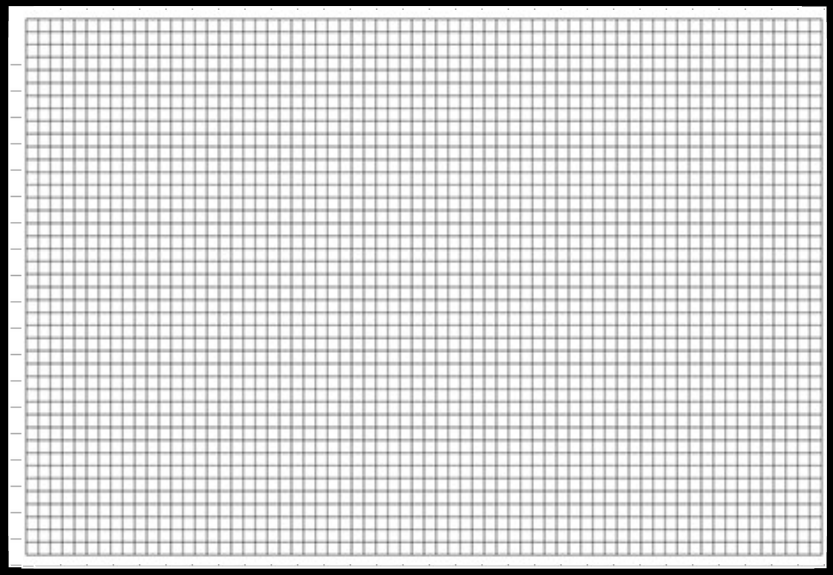


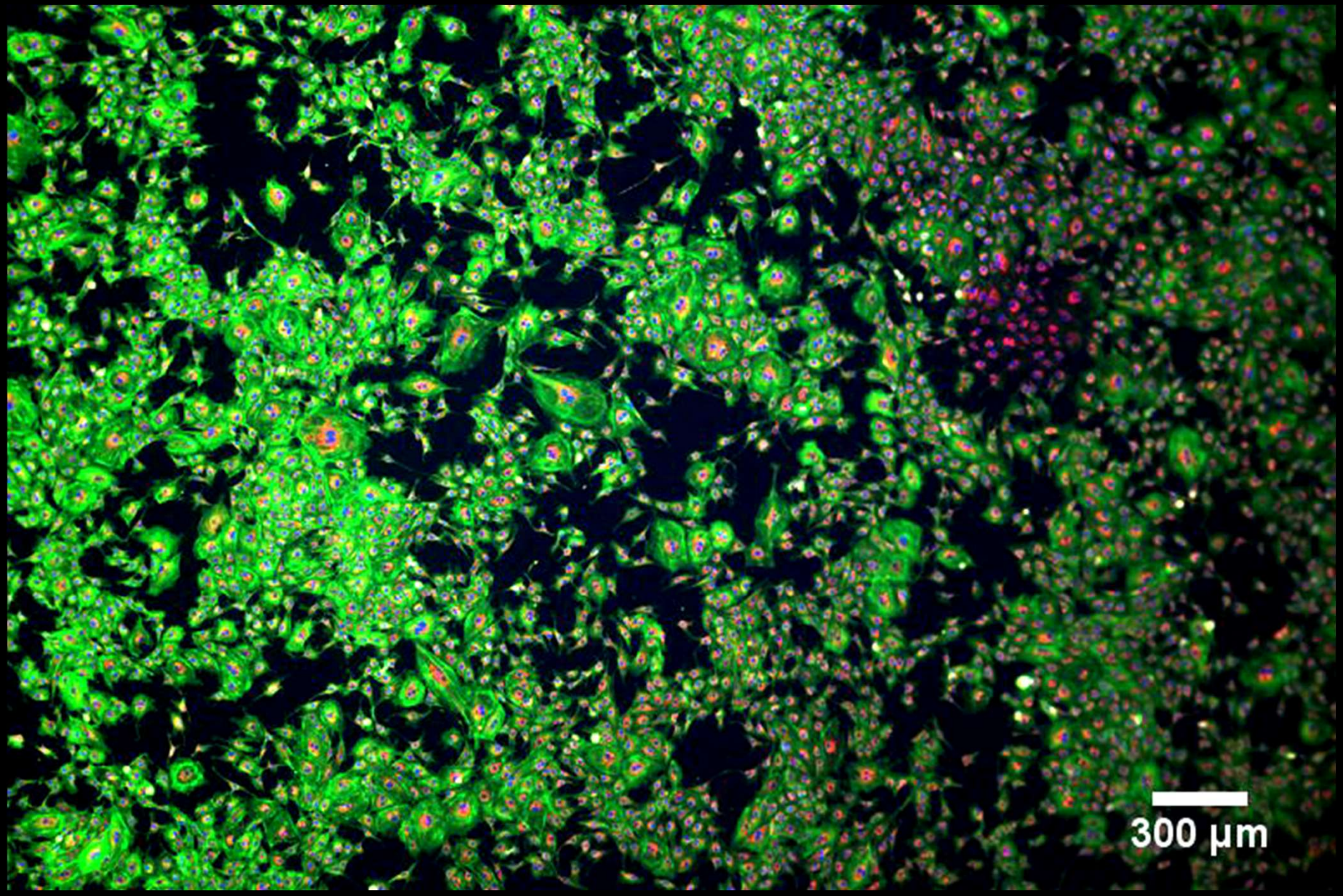
28 Megapixel sensor
3 x 3 pixel shift

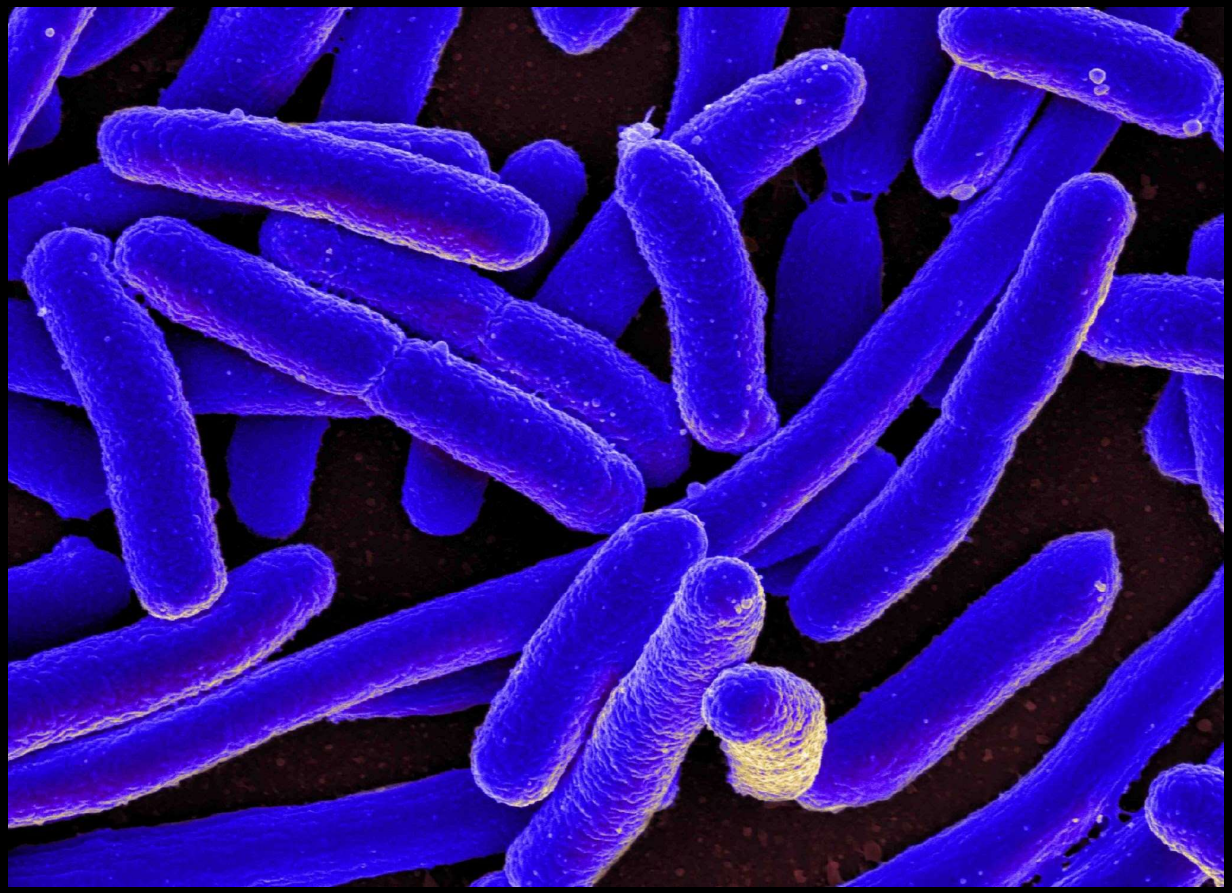
PZT

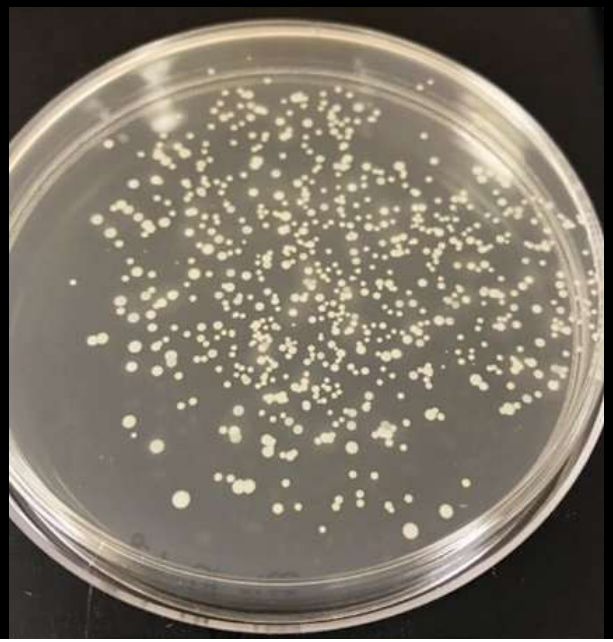
~250 Megapixel image

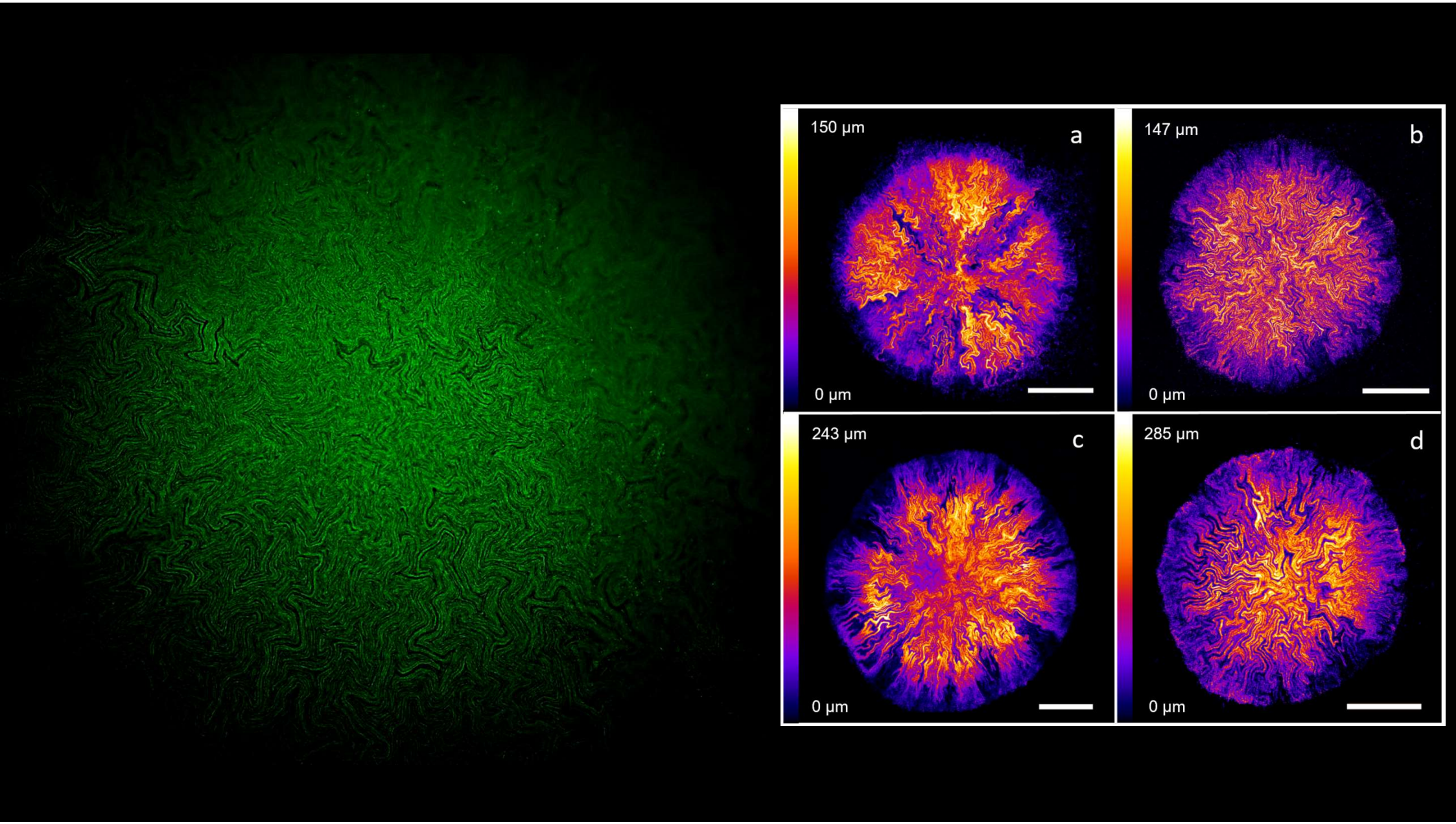
PZT



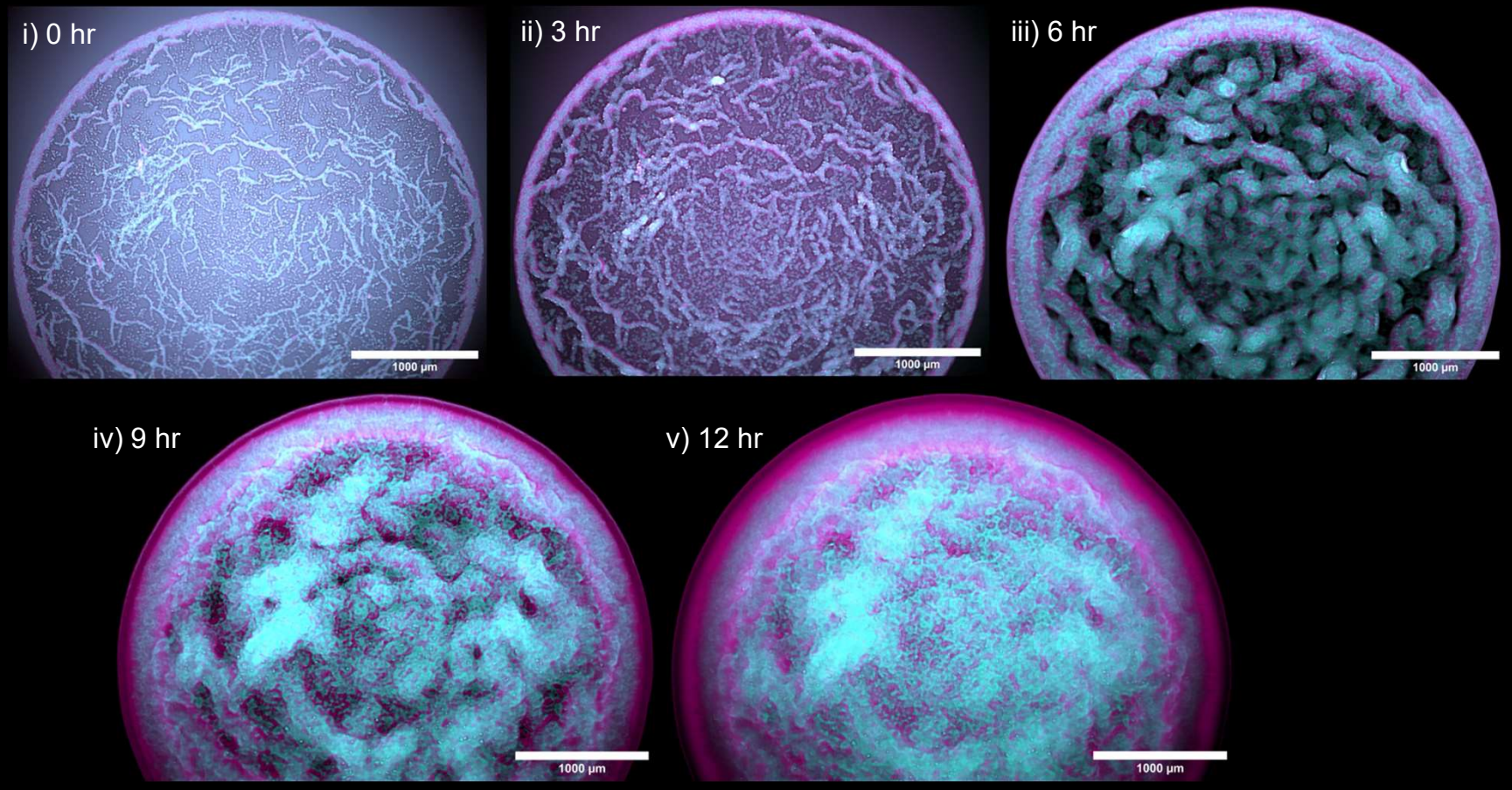

300 µm

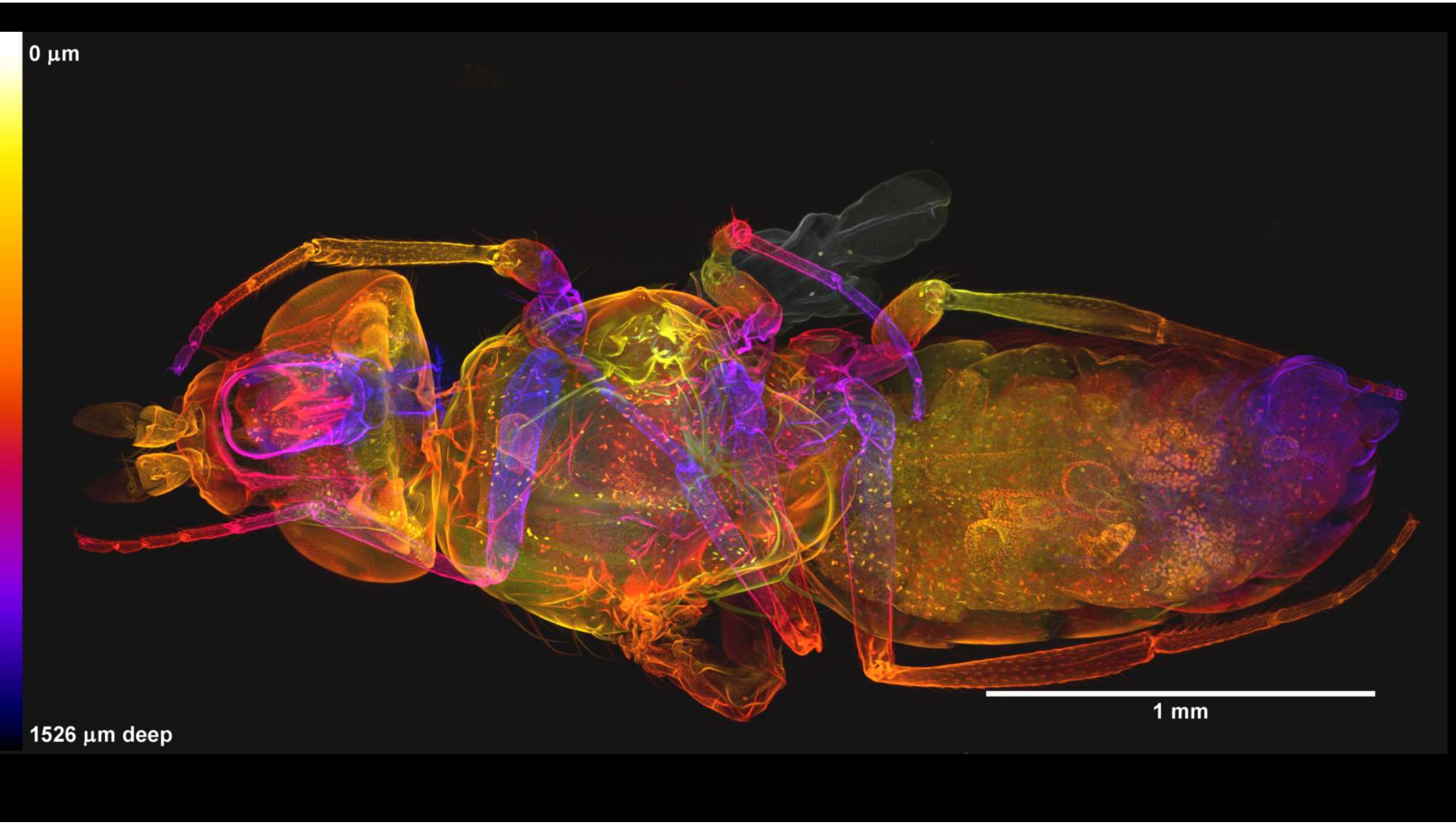


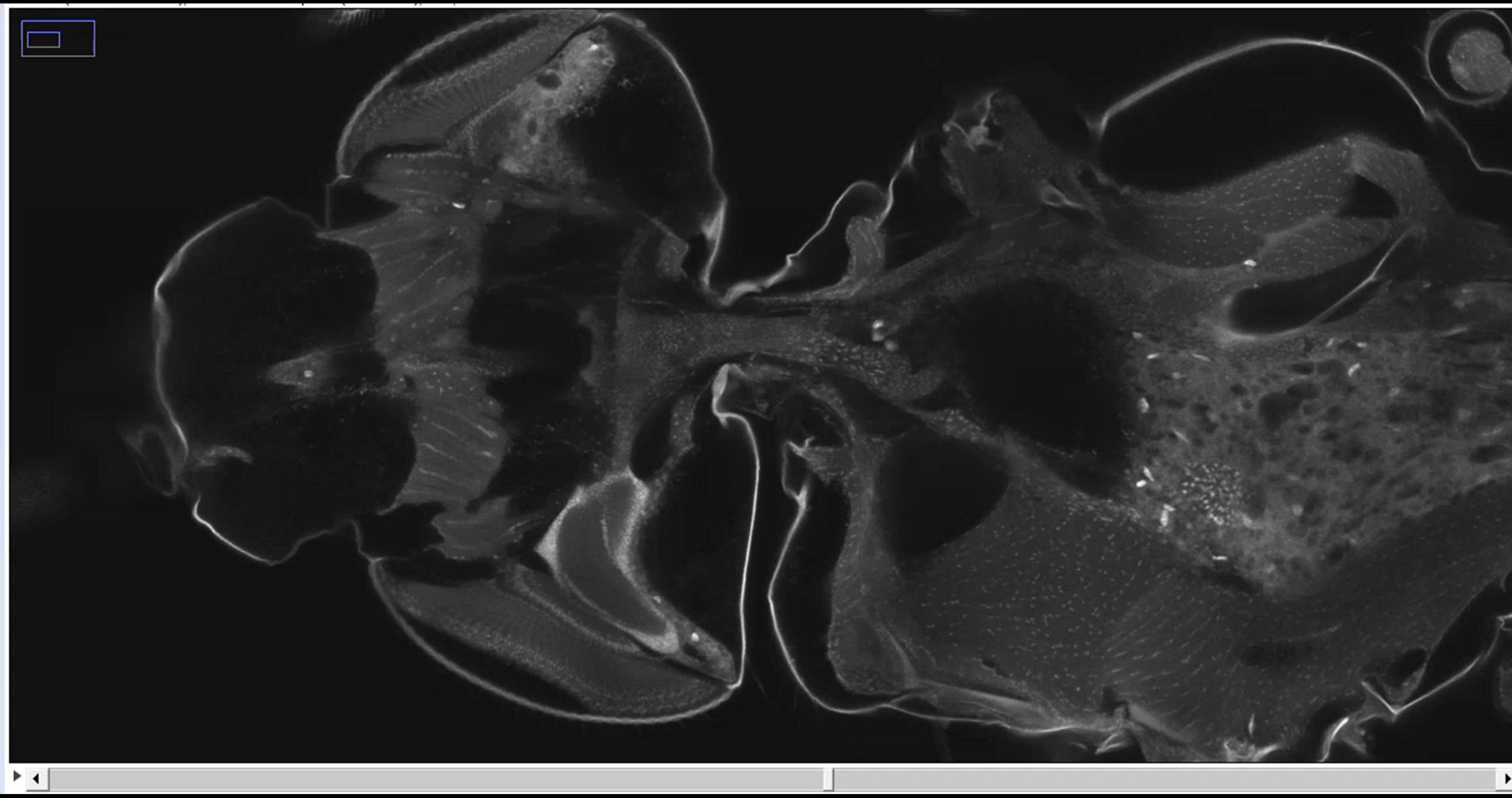


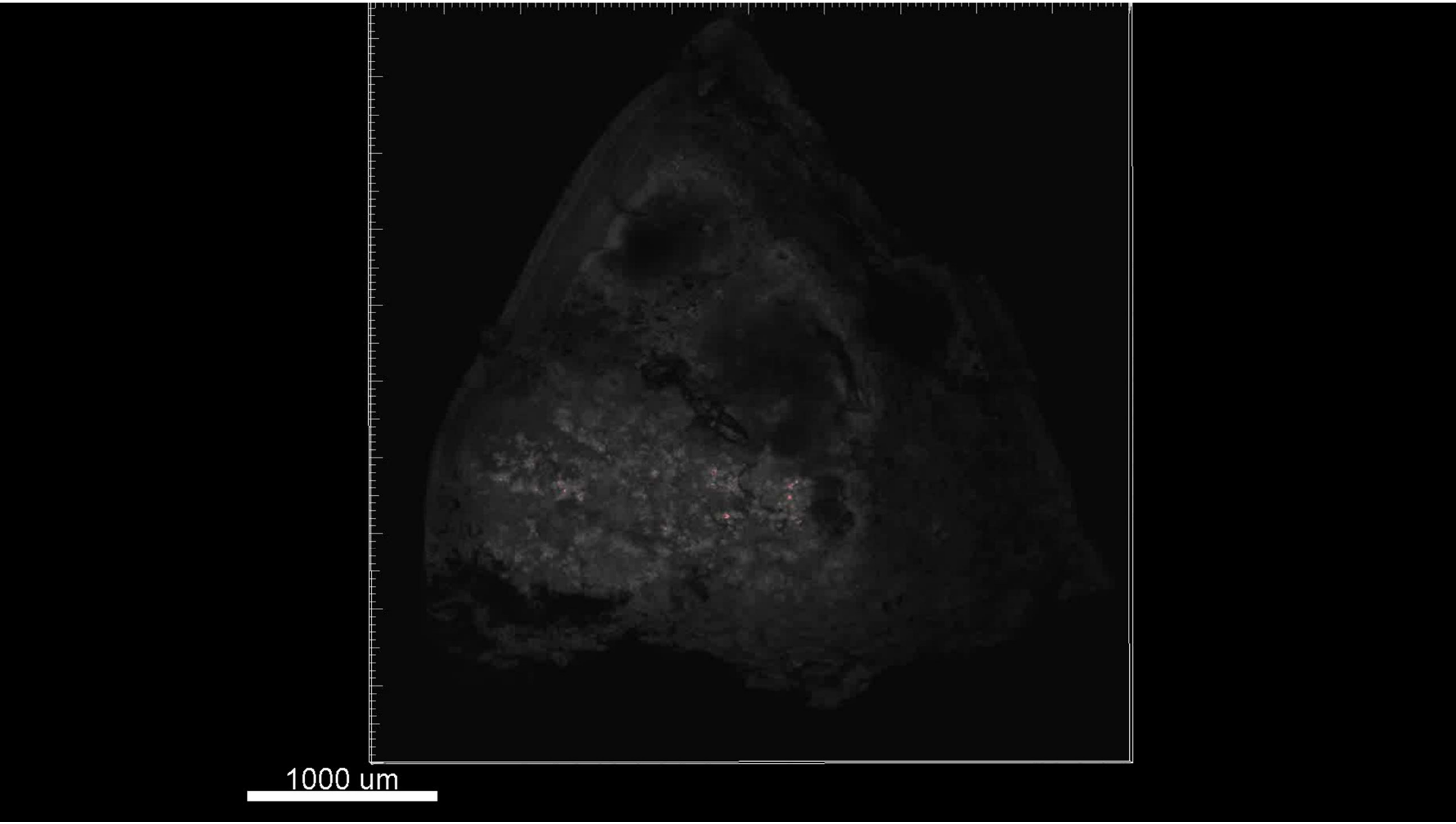

150 µm
a
0 µm
147 µm
b
0 µm
243 µm
c
0 µm
285 µm
d
0 µm

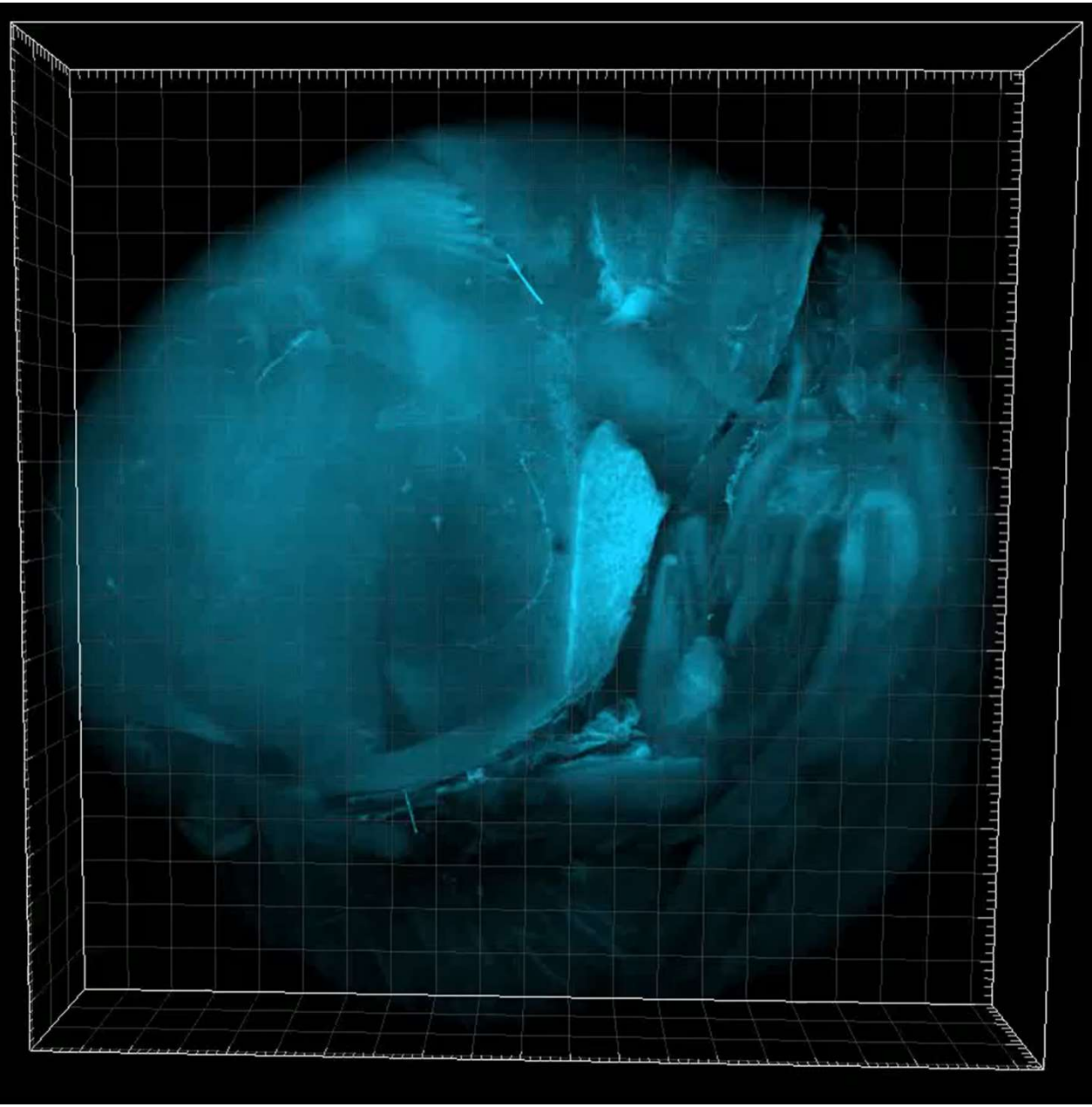
Fungus
Bacteria

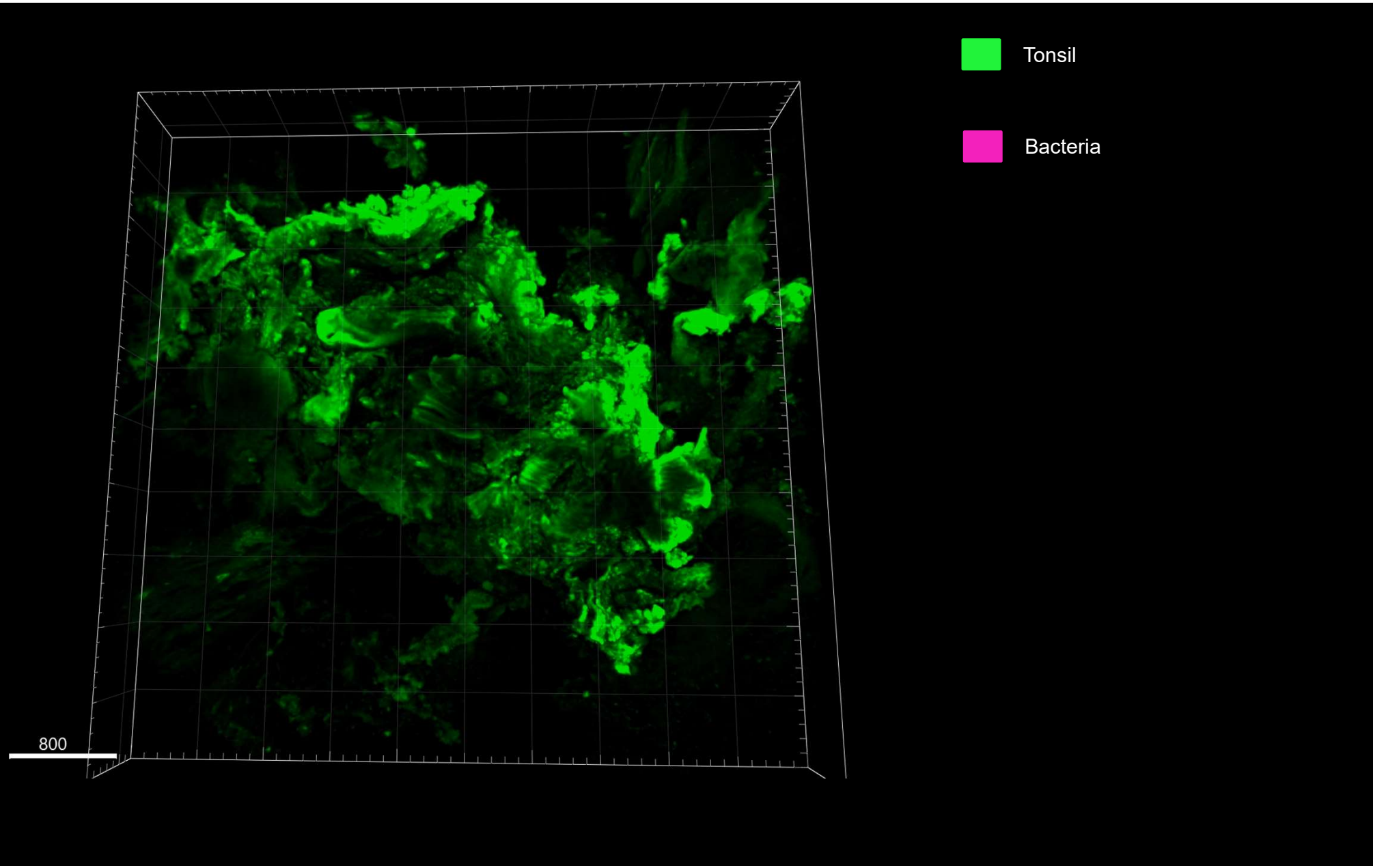


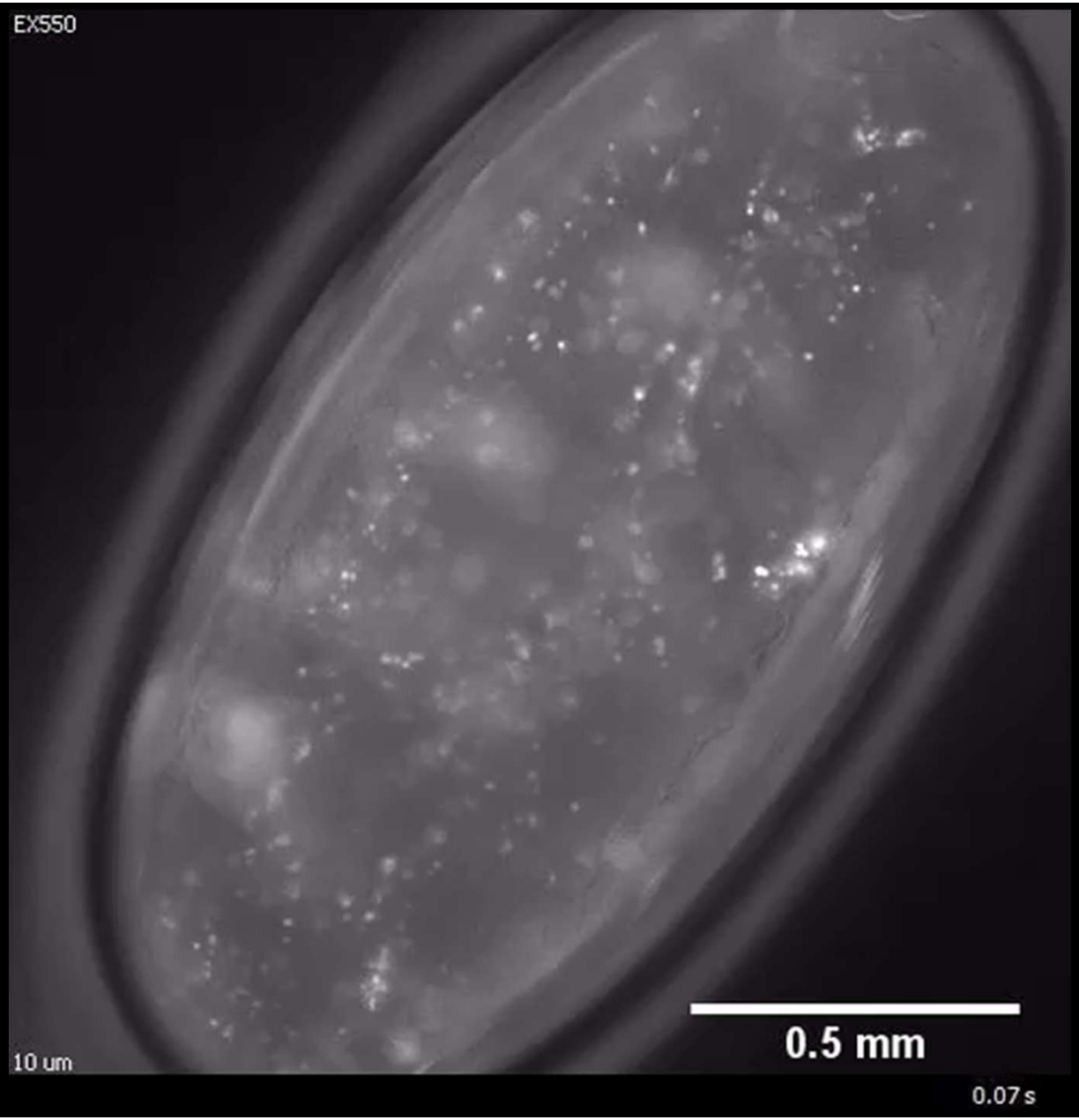

0 µm
1526 µm deep
1 mm

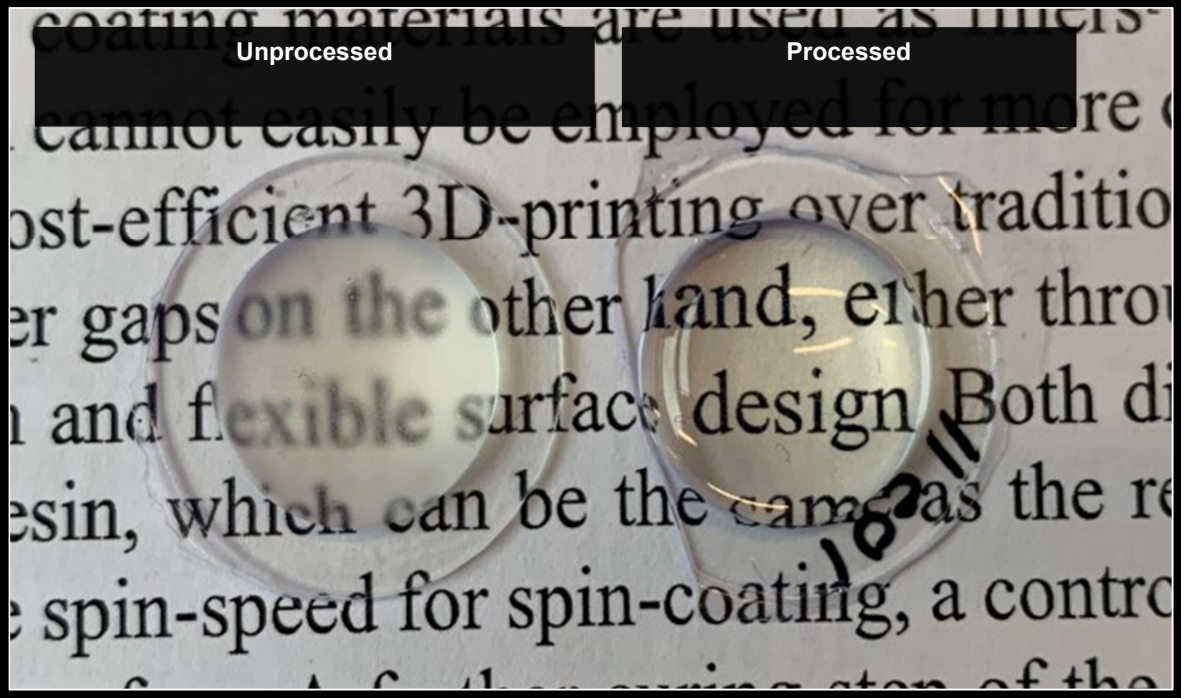


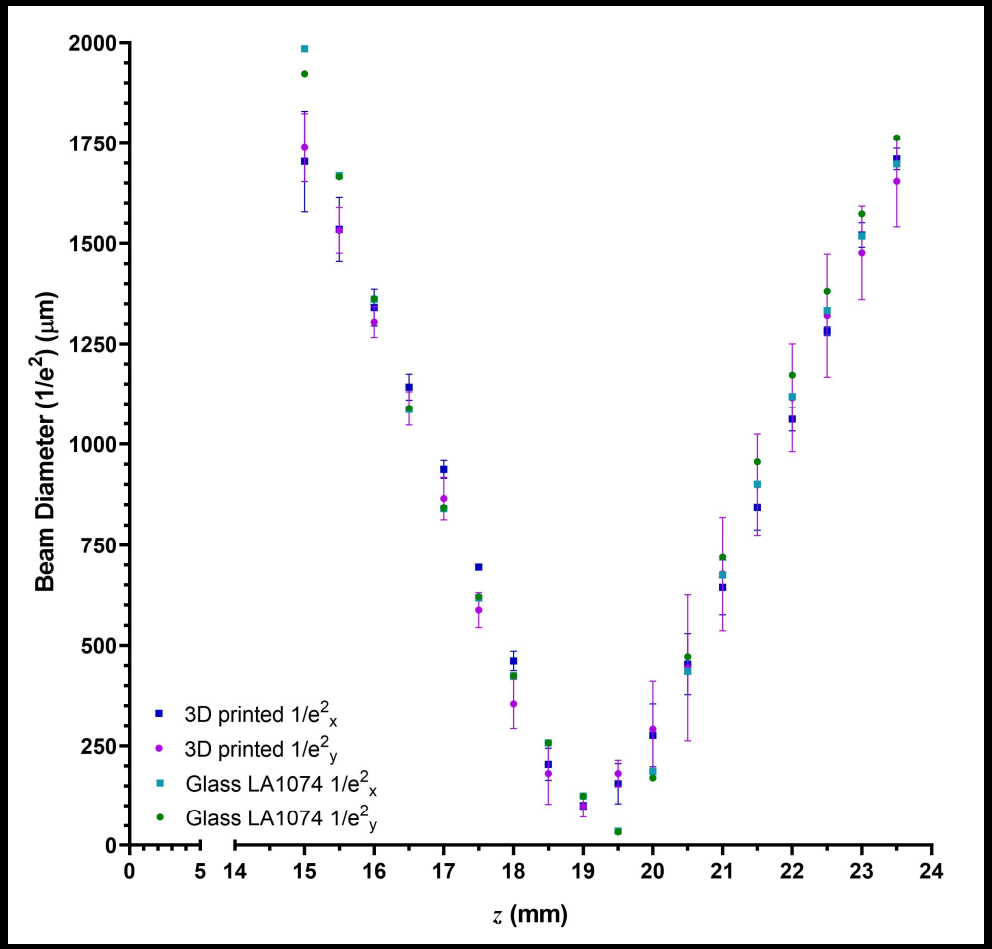

1000 um

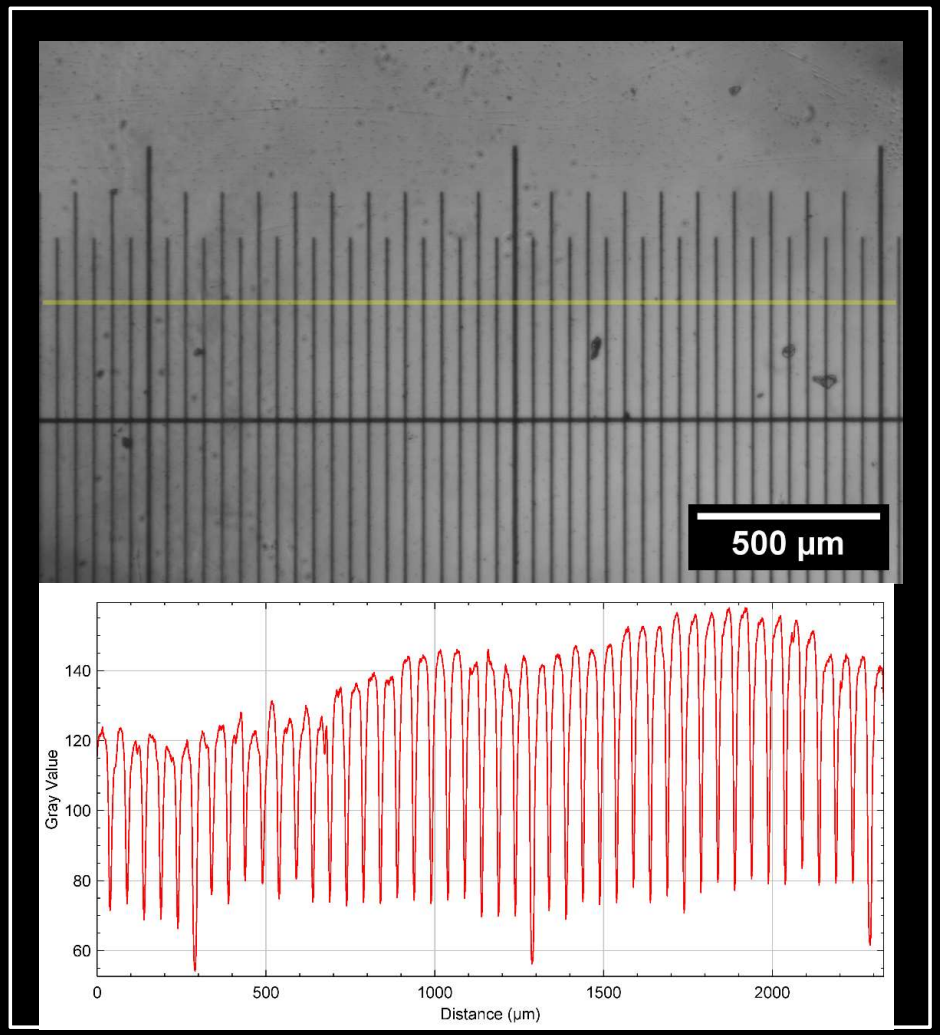


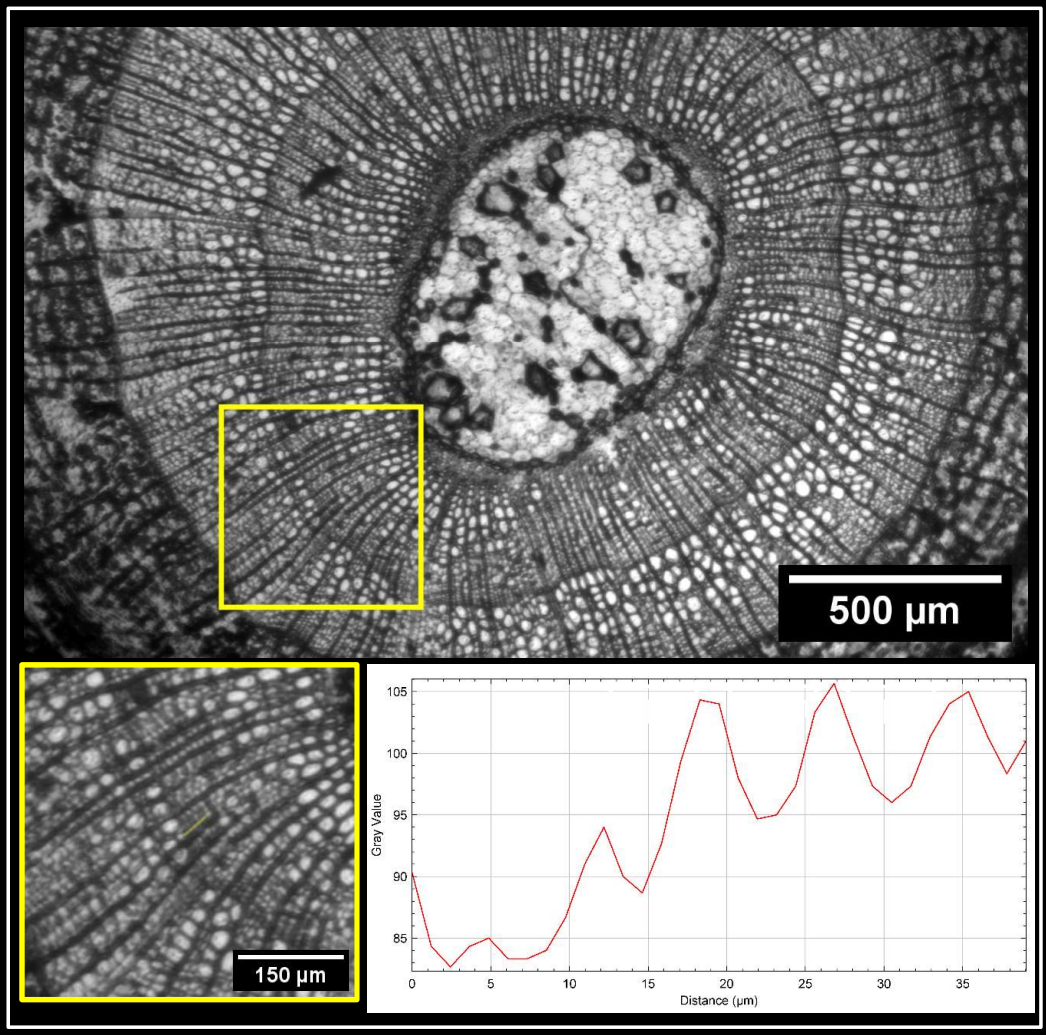

Tonsil
Bacteria
800


EX550
0.5 mm
10 um
0.07 s


Unprocessed
Processed
cannot easily be employed for more
ost-efficient 3D-printing over traditio
er gaps on the other hand, either throu
and flexible surface design. Both di
esin, which can be the same as the re
spin-speed for spin-coating, a contro


Beam Diameter (1/e²) (µm)
z (mm)
3D printed 1/e²x
3D printed 1/e²y
Glass LA1074 1/e²x
Glass LA1074 1/e²y
0
250
500
750
1000
1250
1500
1750
2000
0
5
14
15
16
17
18
19
20
21
22
23
24





Rooney et al, unpublished

Acknowledgements

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Louise Bolton
Beatrice Bottura
Mollie Brown
Meg Clapperton
Laura Copeland
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Shannan Foylan
Lisa Kölln
Kay Polland
Liam Rooney
Jana Schniete
Jan Schniete
Ross Scrimgeour
Katriona Temple-Atkinson
Peter Tinning
Johanna Trägårdh, ISI Brno, Czechia
Lewis Walker
Katrina Wesencraft

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