

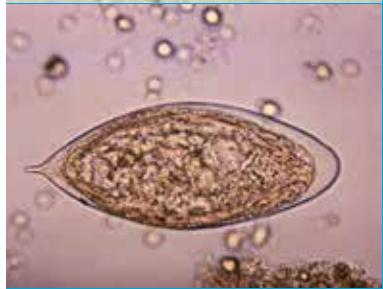
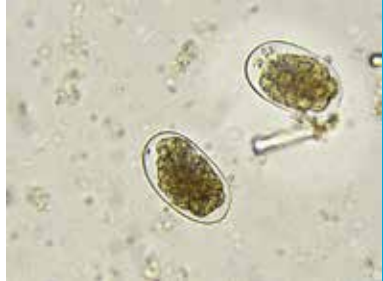
Smart Diagnostics for Smart parasites: An update from the INSPIRED project

Temitope Agbana
Delft University of Technology

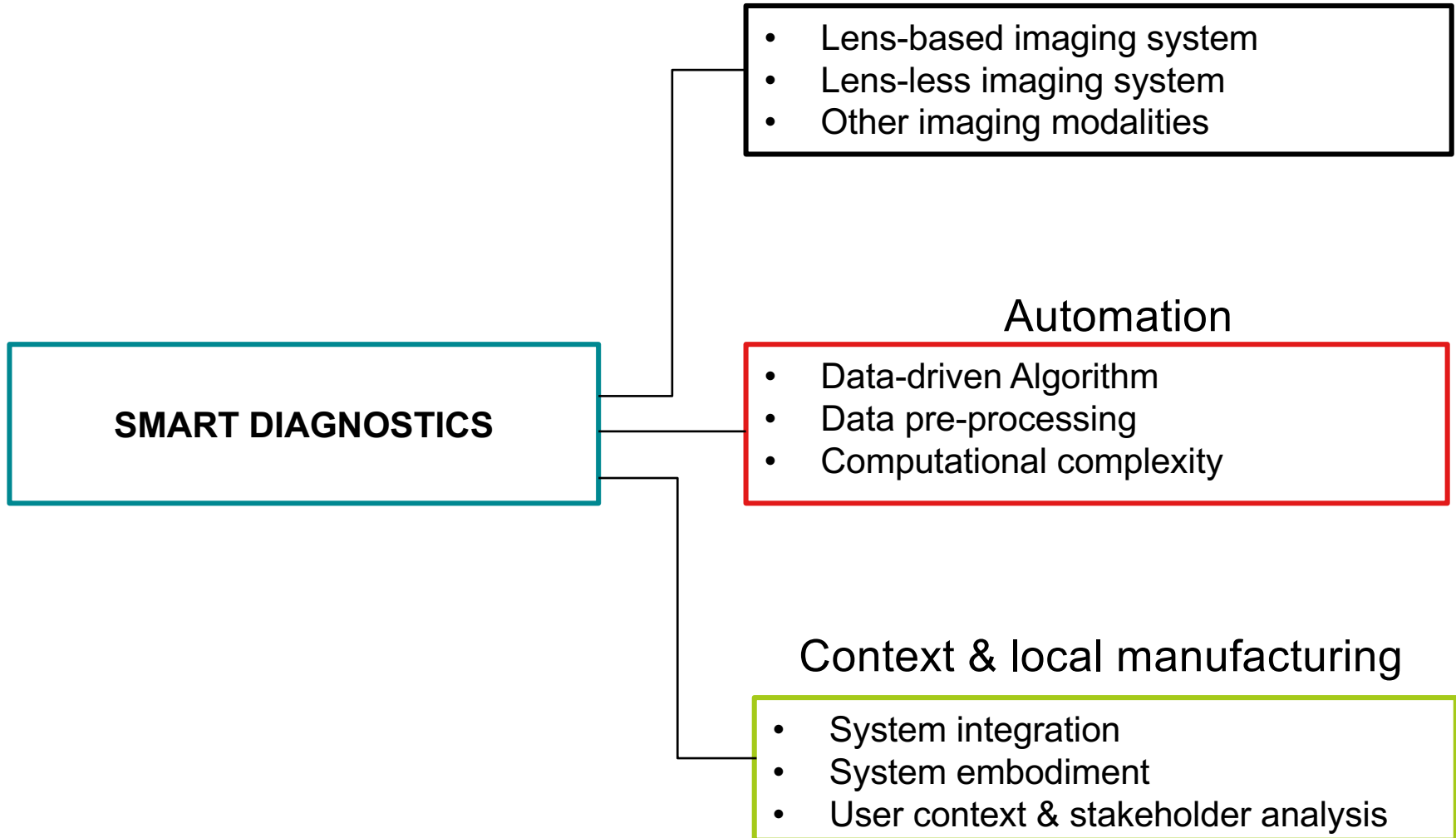
January 2021

INSPIRED PROJECT

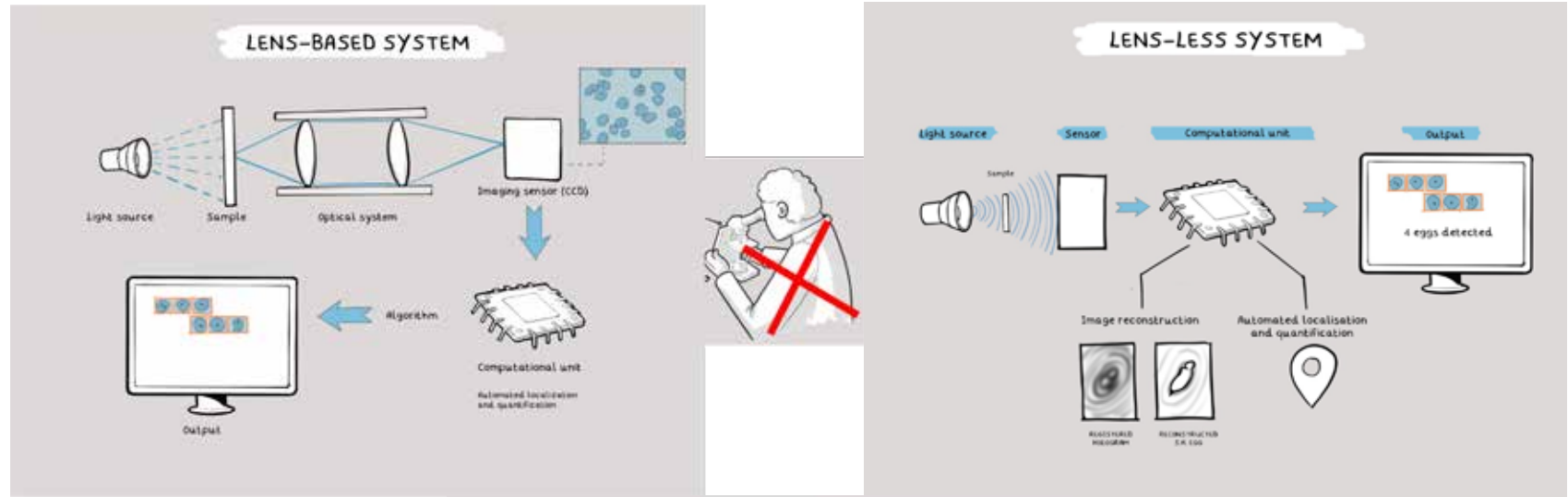
The objectives of the INSPIRED project are to reduce the burden of malaria, schistosomiasis and hookworm in Nigeria and Gabon through the development of optical diagnostic devices, to conduct laboratory and field validation of these devices, and to engage stakeholders for the uptake of these devices in the healthcare systems.



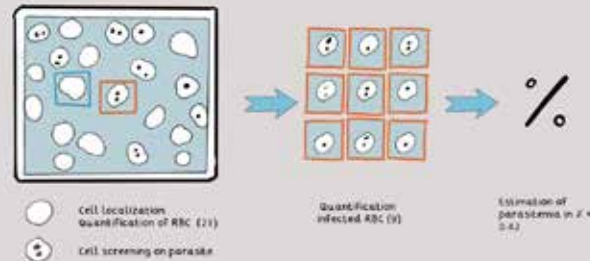
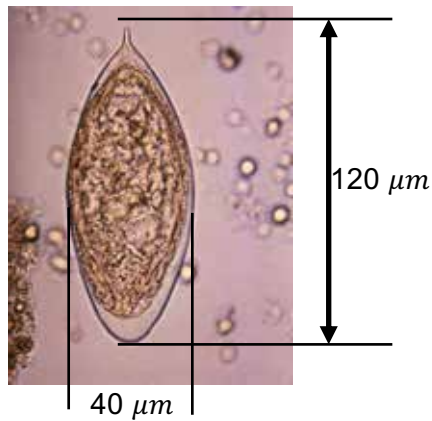
R & D in 3-Dimensions



Imaging techniques & algorithm

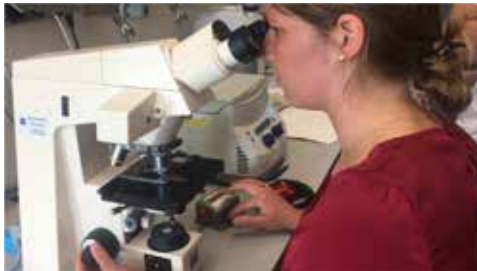


ALGORITHM



Lens-based imaging: Schistoscope

To develop a digital microscope which offers an integrated solution with the support of a smart algorithm for:

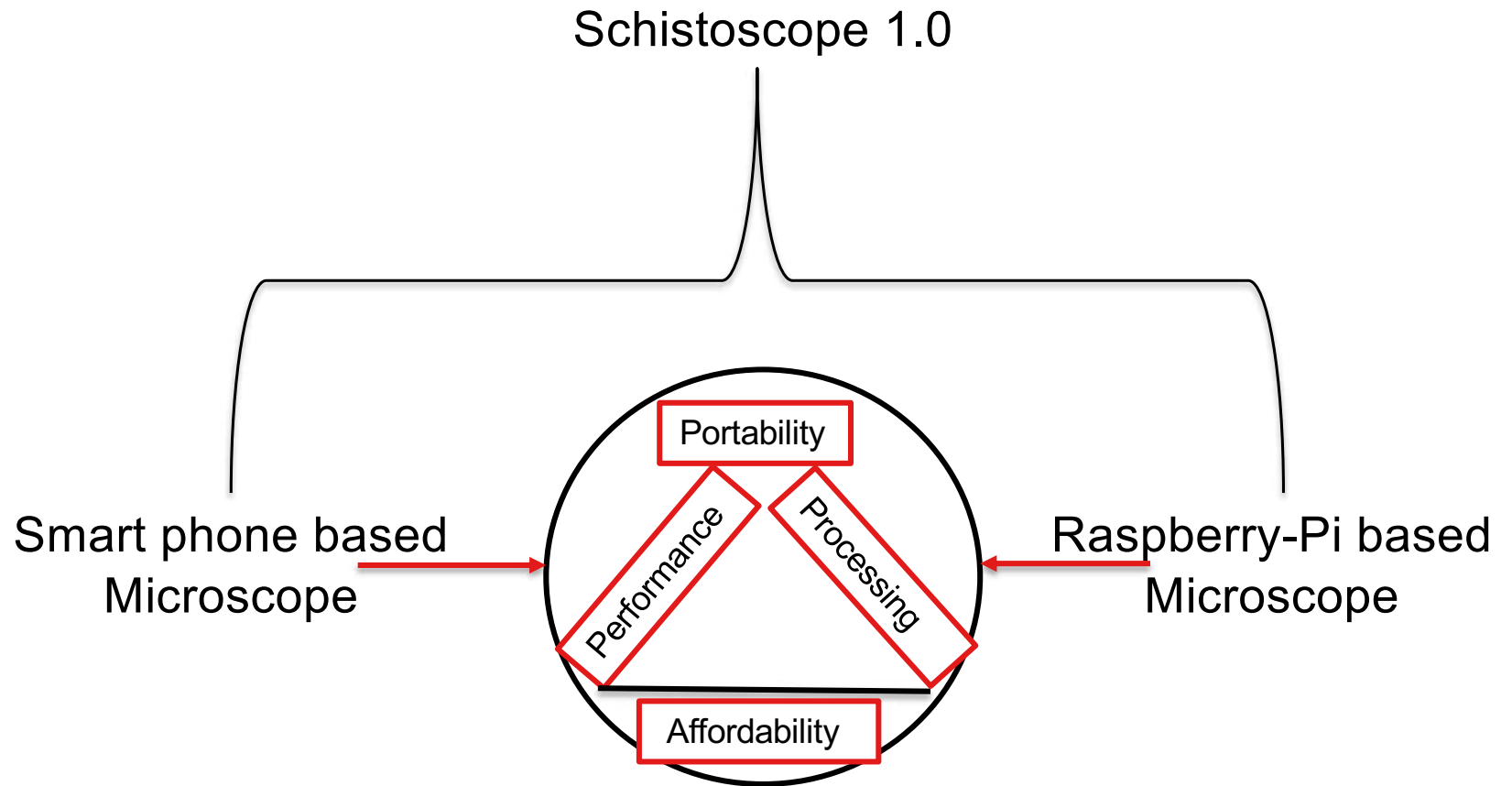


- **Detection**
- **Identification &**
- **Quantification**



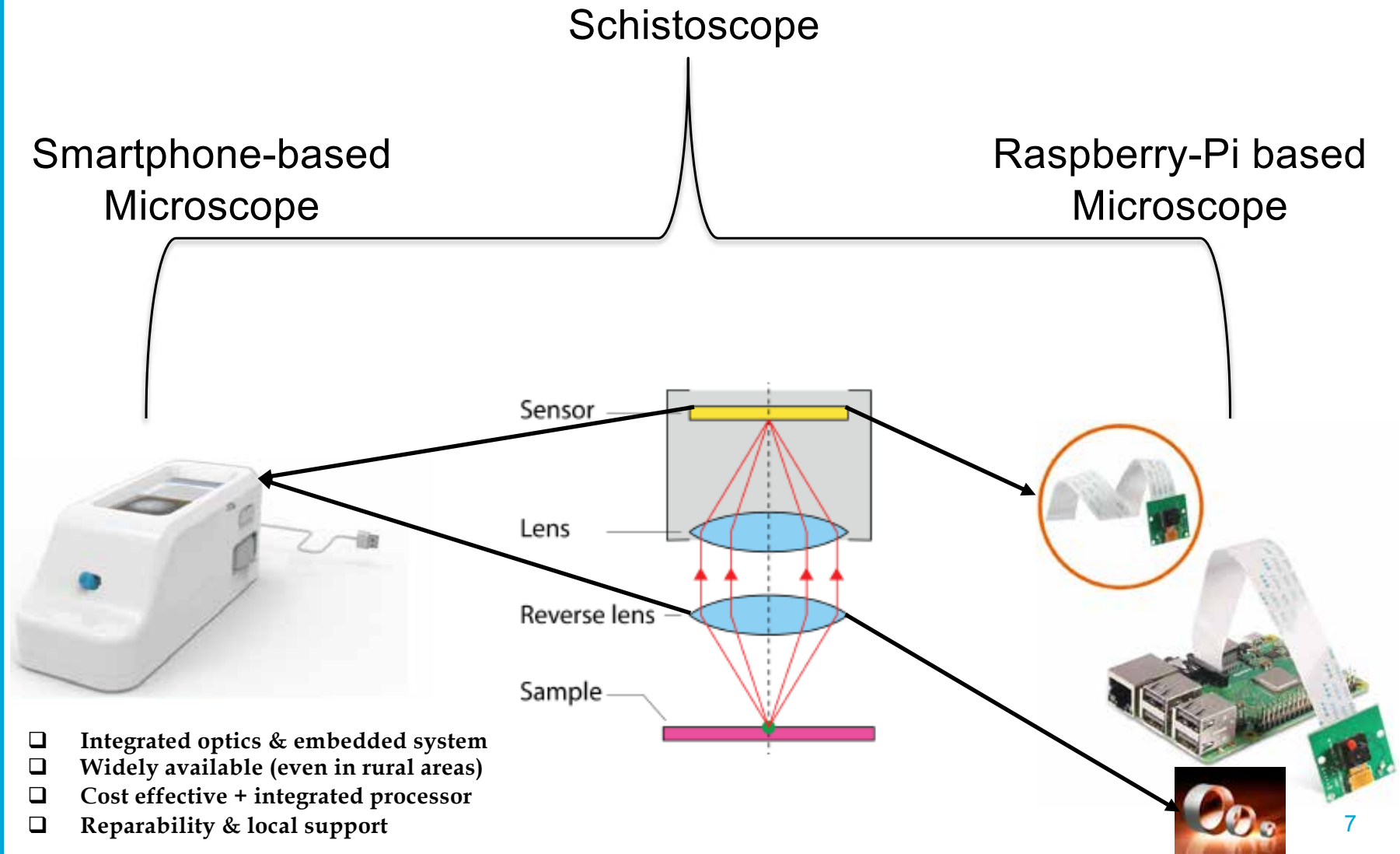
Schistosoma haemtobium eggs in urine samples

Lens-based Imaging platforms in 2-D



Robustness ● Local production ● Adoption & uptake

Lens-based Imaging platforms in 2-D



Practical design challenges & limitations

Technical Design Challenges

- Accurate optical system alignment
- *Sensor – micro-objective – samples*
- *Reduce aberrations in optical train*

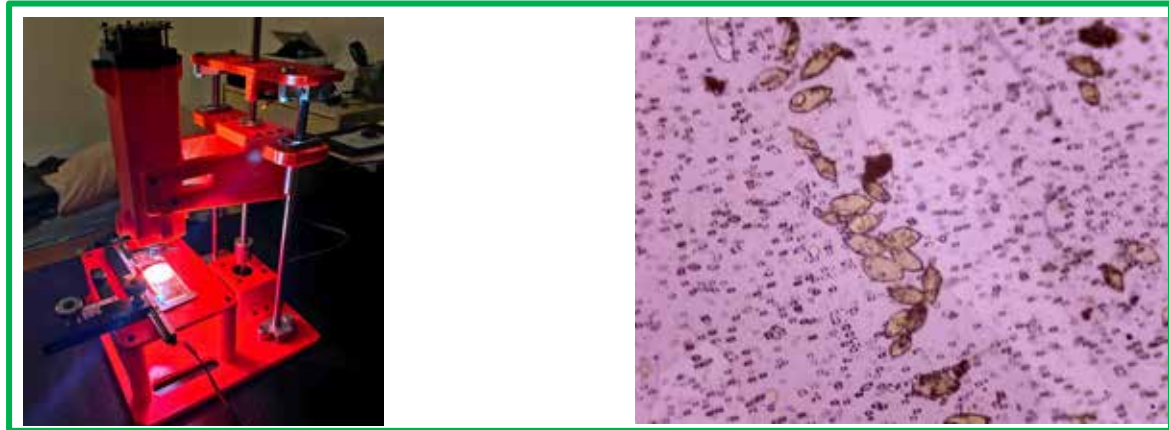
- Single Field-of-View (FOV)
- Optimal illumination
- Sufficient spatial resolution

- Robust design & material selection
- 3-D printing & off the shelf component

Schistoscope in 4-G

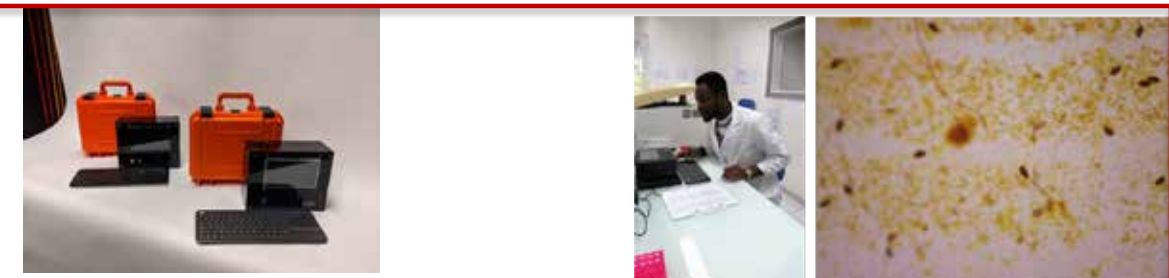
4th - Gen

Shipped to Nigeria – WP1
November . 2020



3rd - Gen

Shipped to Gabon – WP3
June . 2020



2nd - Gen



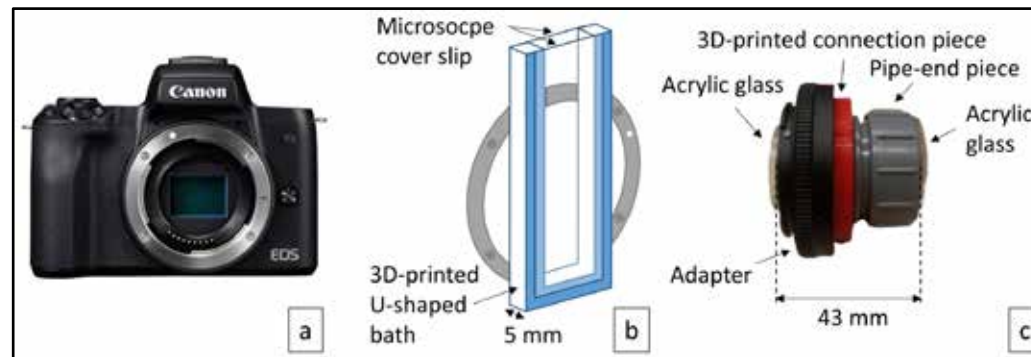
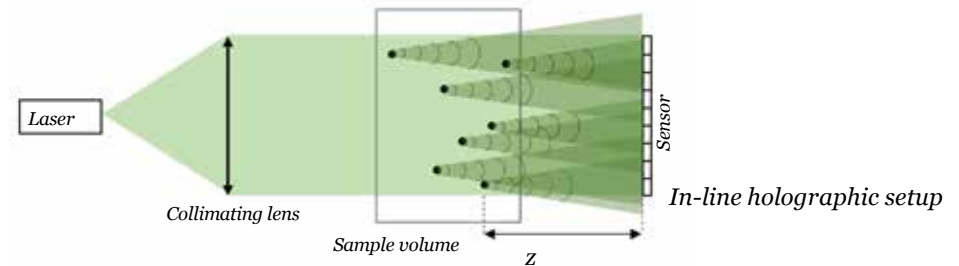
1st - Gen



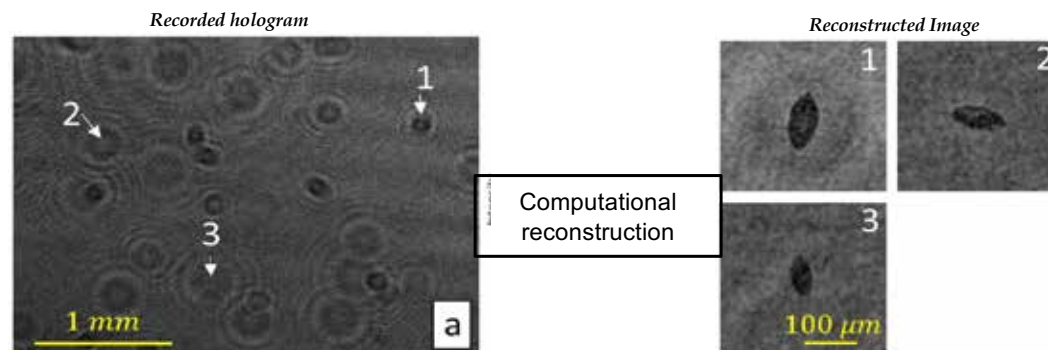
Lensless imaging

- Robust & Rugged (no lenses)
- Large volume analysis (one-time shot)
- Minimal computational complexity
- Easy repair

□ Label free possibilities

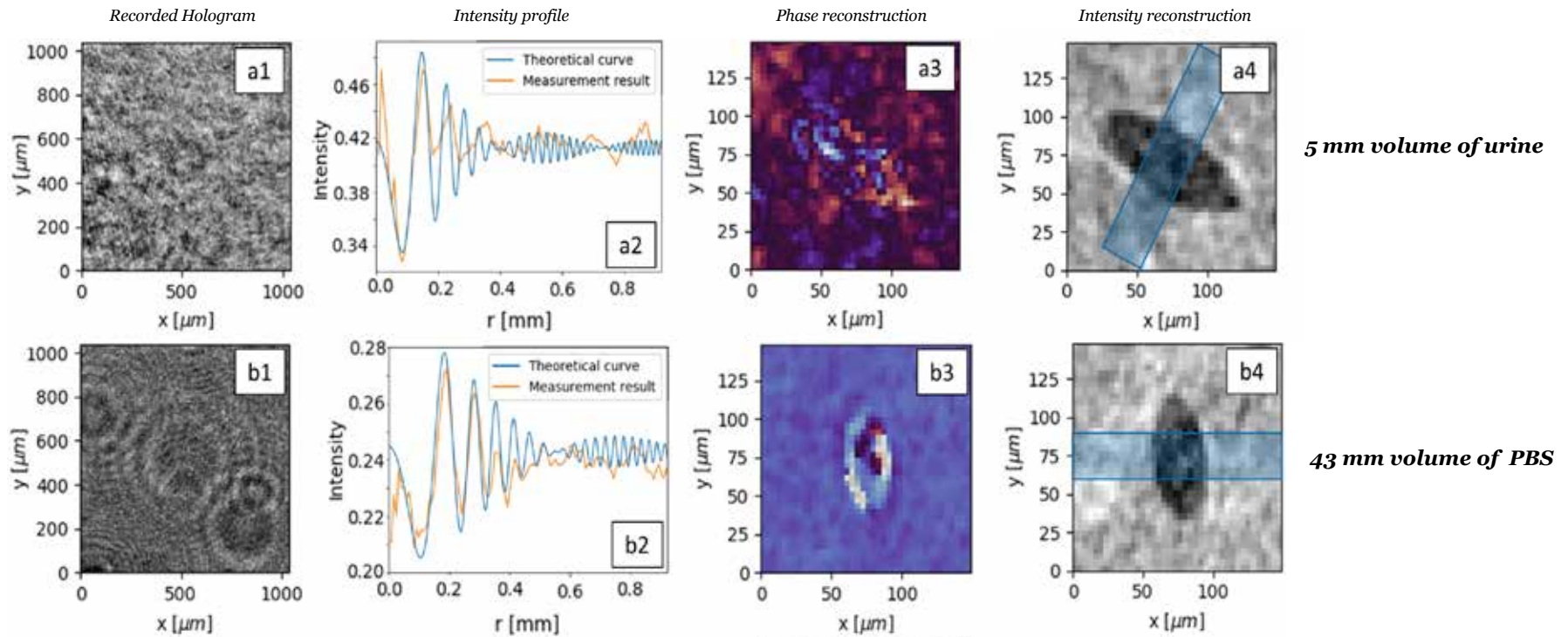


Experimental setup



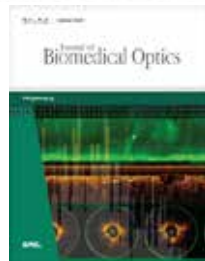
Recorded & reconstructed images

Testing the volume limit



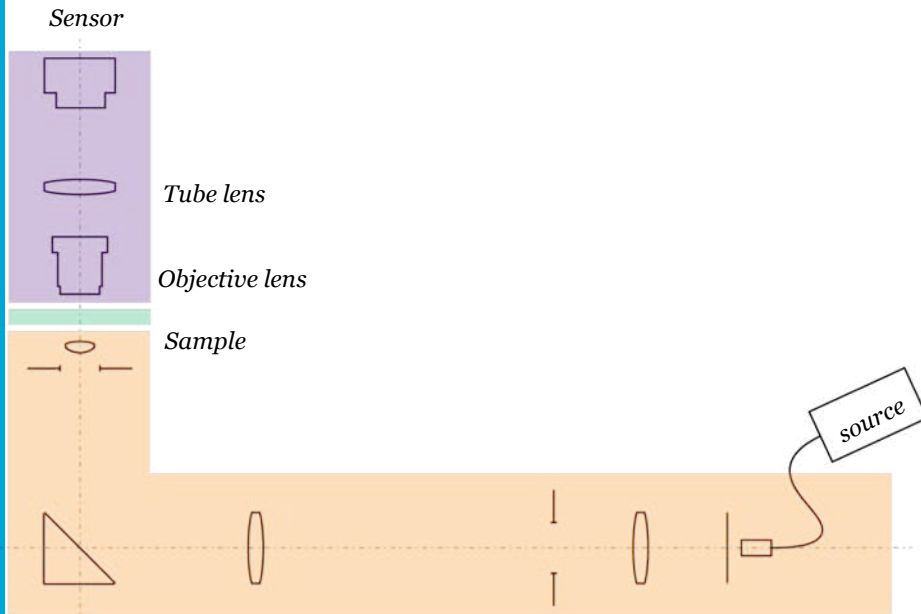
5 mm volume of urine

43 mm volume of PBS

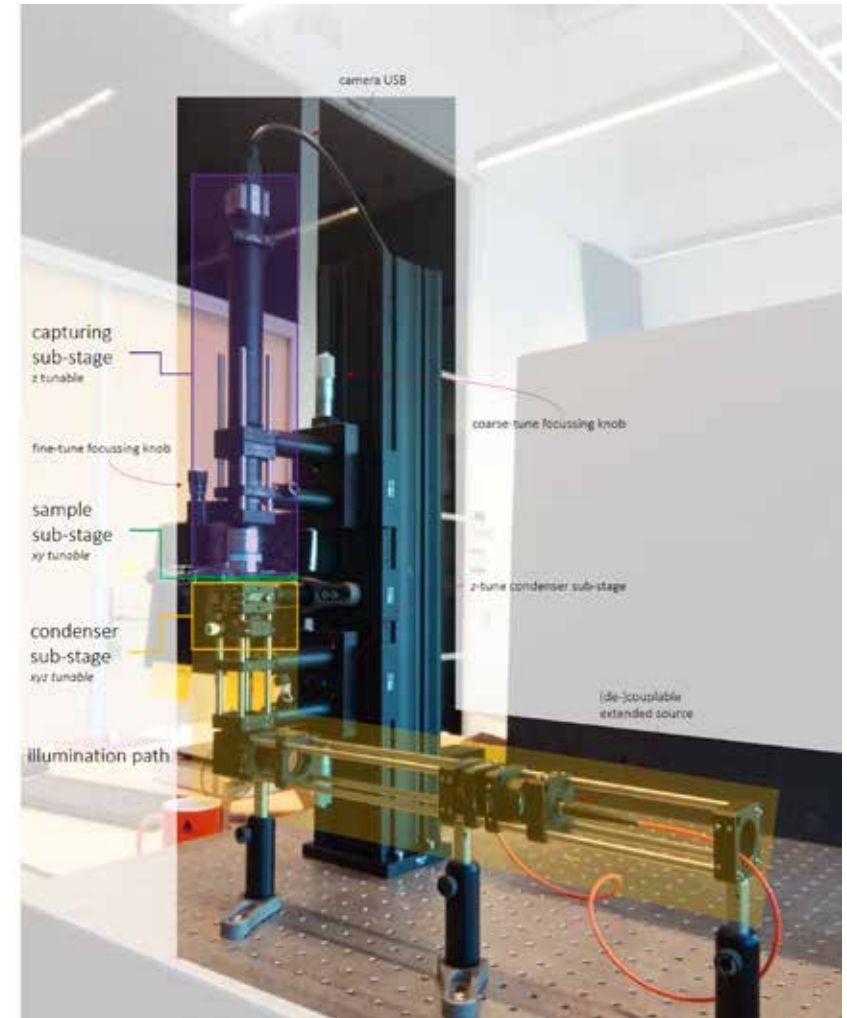
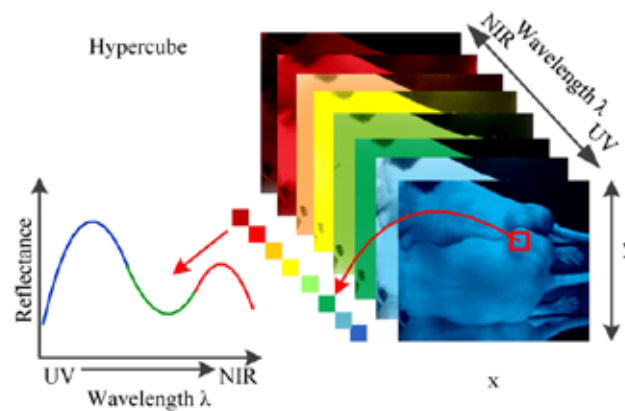


Derk van Grootheest, Temitope Agbana, Jan-Carel Diehl, Angela van Diepen, Vitaly Bezzubik, Gleb Vdovin, "Large volume holographic imaging for biological sample analysis," *J. Biomed. Opt.* **26**(1), 016502 (2021), doi: 10.1117/1.JBO.26.1.016502. (Published 09 Jan 2021)

Exploring additional imaging modalities



Schematic diagram of the Hyperspectral Imaging System



low-cost hyperspectral imaging set-up built with off-the-shelve components.

More information on project, and partners?
Please visit:

<http://inspired-diagnostics.info.transurl.nl/team/>



Global Initiative

