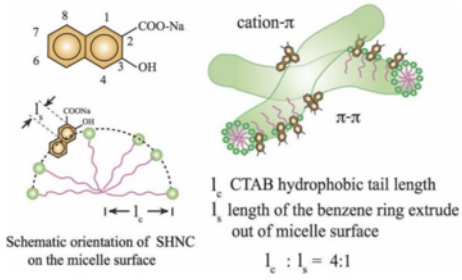
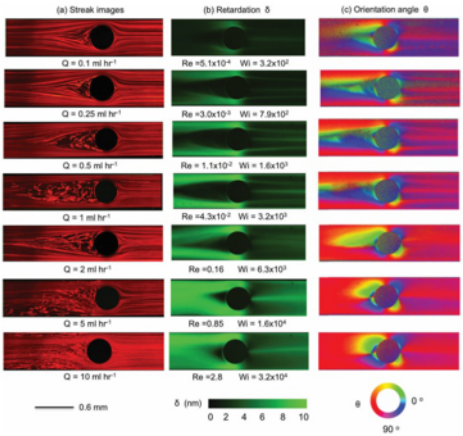
Flow of wormlike micellar solutions around confined microfluidic cylinders. Simon J Haward et al, Soft Matter 12: 8666 (2016)

The Micro/Bio/Nanofluidics Unit at the Okinawa Institute of Science and Technology was established in July 2014. The two core research areas in the unit are: the fundamental aspects of micro- and nano-fluidic flows (including fluid mechanics, soft matter physics and rheology) and related biotechnology, nanotechnology and healthcare applications (e.g. bioassays, biosensing, bio- and nano-materials synthesis). The unit members have unique and complementary expertises in fluid mechanics, soft matter physics, biomedical and chemical engineering, materials science and polymer/physical chemistry.

Wormlike micellar (WLM) solutions are frequently used in enhanced oil and gas recovery applications in porous rock beds where complex microscopic geometries result in mixed flow kinematics with strong shear and extensional components. In this study, the flow behaviour of an aqueous WLM solution consisting of cationic surfactant and a stable hydrotropic salt were studied in microfluidic devices with three different cylinder blockage ratios.



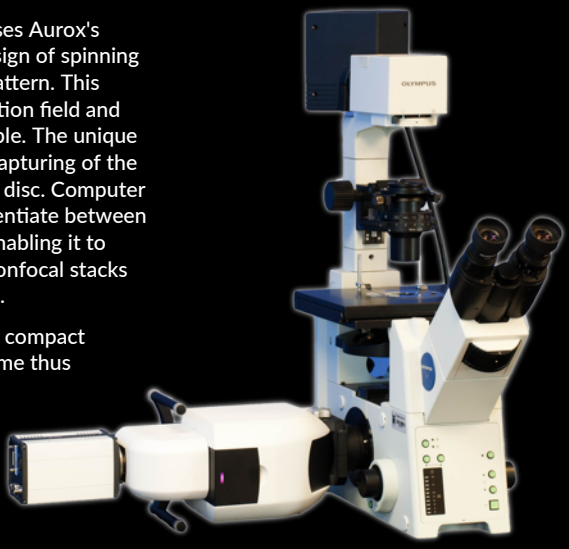


Flow pattern visualisations were performed by capturing streak images with an inverted epi-fluorescence spinning disk confocal microscope (Aurox/Andor DSD2), equipped with an Andor iXon camera and a Nikon 4x 0.13 NA objective lens. The fluids were seeded with fluorescent polystyrene particles with excitation and emission wavelengths of 530 nm and 607 nm respectively. Streak images were recorded with frame rates ranging from 0.3 to 10 frames per second and streak imaging videos were recorded over time periods of several seconds in order to observe the time dependent nature of the generated flow fields. The imaging system allowed high contrast and in-focus visualisation of the flow in a 100 µm thick optical section at the centre of the flow chamber.

AUROX

CLARITY LFC

The Aurox Clarity Laser Free Confocal unit uses Aurox's patented optical system based on a novel design of spinning disc with a grid-like structured illumination pattern. This pattern is used to both modulate the illumination field and demodulate the light emerging from the sample. The unique optical system inside the Clarity LFC allows capturing of the images both transmitted and reflected by the disc. Computer processing of these images allows it to differentiate between in-focus and out-of-focus information thus enabling it to extract optically-sectioned images, capture confocal stacks and render 3D images of fluorescent samples.



The Clarity product has been engineered as a compact attachment to a conventional microscope frame thus allowing for flexible, highly cost-effective upgrade solutions. All major microscope frames are supported, as well as sCMOS cameras from PCO and Andor, light sources from CoolLED and Excelitas, Solent incubators and Prior translation stages. The system ships with Aurox Visionary, a dedicated image acquisition software package designed for ease of use, streamlined hardware control and multi-dimensional data acquisition.

KEY SPECIFICATIONS

Confocality:	0.6 µm (FWHM) with 1.4 NA oil objective
Min exposure:	20 ms
Max frame rate:	22 fps (12-bit confocal, 2.3 MP, no binning) 50 fps (with 2x2 binning)
Imaging channels:	4 user-replaceable filter cubes on an internal turret
Channel switching:	<200 ms
Excitation range:	370 - 700 nm
Emission range:	410 - 750 nm
Data format:	OME TIFF with full image metadata

THE COMPANY

Aurox Ltd was established in 2004 to commercialise and build upon pioneering work from the Scanning Optical Microscopy Group at the University of Oxford. A leader in the design and manufacture of innovative optical equipment, the company has won multiple business and technology accolades such as the Queen's Award for Enterprise and the Institute of Physics Innovation Award. Aurox's product line includes stand-alone instruments for fluorescence microscopy as well as imaging engines used in slide scanners (in collaboration with 3DHistech) and materials microscopes (with Carl Zeiss).