

# MMI CLAYTON

15 Innovation Walk, Monash University, Clayton

2020

Microscopy Instrumentation & Software







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[www.monash.edu/researchinfrastructure/mmi/key-instrumentation](http://www.monash.edu/researchinfrastructure/mmi/key-instrumentation)





## 1. Optical Microscopes

<p><b>Abrio polarisation Microscope</b></p> 	<ul style="list-style-type: none"> <li>• Leica DMI inverted base</li> <li>• 360 degree polarisation/birefringence in one image</li> <li>• Quantitative polarisation data</li> <li>• Download pdf for more specific details (objective/filter list and SOP)</li> </ul> <p style="text-align: right;"><i>Abrio (CRI/PerkinElmer, Woburn, MA, USA) Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G52</p>
<p><b>Open PolScope</b> (Backup/Replacement for Abrio)</p>	<p style="text-align: center;"><b>Coming to MMI soon</b> <b>ETA 4<sup>st</sup> quarter 2020</b></p> <ul style="list-style-type: none"> <li>• LC-PolScope on a Leica DMI600 inverted base</li> <li>• Quantitative polarisation and birefringence, suitable for label free imaging of cell division, vesicle trafficking, collagen, cellulose, etc.</li> <li>• Open source imaging platforms driven by ImageJ and Micro-Manager.</li> </ul> <p style="text-align: right;"><i>MMI &amp; Marine Biological Laboratory, Woods Hole</i></p>	
<p><b>Leica AF6000LX</b></p> 	<ul style="list-style-type: none"> <li>• Live cell chamber with CO<sub>2</sub> and adjustable Temp (RT to 37°C)</li> <li>• Multiple adaptors for various plates, chamber and slides</li> <li>• Fully motorised system using new LASX software with Navigator license for more advanced 5D imaging (Plate tile scanning etc)</li> <li>• DFC9000 camera with up to 50fps reading speed</li> </ul> <p style="text-align: right;"><i>Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G57</p>
<p><b>Leica DMI8</b> <b>(2 instruments)</b></p> 	<ul style="list-style-type: none"> <li>• Leica DMI8 base</li> <li>• Same features as AF6000LX</li> <li>• Dedicated Phase contrast (5x, 10x, 20x) and DIC (40x and 63x)</li> <li>• Additional Fast filter wheels (Dapi, FITC, TRITC, Cy5) for excitation and emission to speed up multichannel acquisition</li> <li>• DFC9000GTC camera with up to 90fps reading speed</li> </ul> <p style="text-align: right;"><i>Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G57</p>

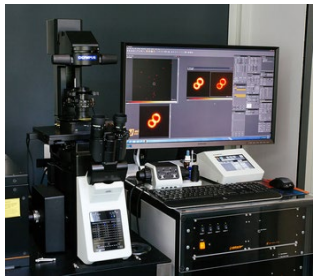
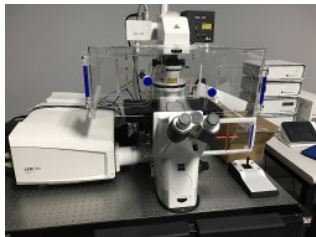
<p><b>Olympus Cell-R</b></p> 	<ul style="list-style-type: none"> <li>• IX81 inverted base, with motorised system with software to suit acquisition of 3D and multidimensional microscopy.</li> <li>• Multi-tile scanning ability</li> <li>• Live cell chamber with CO<sub>2</sub> and adjustable Temp (RT to 37°C)</li> <li>• Multiple adaptors for various plates, chamber and slides</li> <li>• Zero Drift Control (objective/sample specific)</li> <li>• DP73 colour camera (colour and fluorescence) and XM10 B&amp;W camera.</li> </ul> <p style="text-align: right;"><i>Olympus, Tokyo, Japan</i></p>	<p>Room G57</p>
<p><b>Olympus dotSlide</b></p> 	<ul style="list-style-type: none"> <li>• Motorized Upright BX51 base slide scanning (not for high throughput)</li> <li>• 4 regular slides or large format slide (6x8 cm)</li> <li>• brightfield and fluorescence (Dapi/FITC/TRITC and Far Red)</li> </ul> <p style="text-align: right;"><i>Olympus, Tokyo, Japan</i></p>	<p>Room G57</p>
<p><b>Olympus SZX16</b></p> 	<ul style="list-style-type: none"> <li>• Stereo dissecting microscope for brightfield and fluorescence (UV, GFP and RFP)</li> <li>• Link for <a href="#">calibration files</a></li> </ul> <p style="text-align: right;"><i>Olympus, Tokyo, Japan</i></p>	<p>Room G57</p>
<p><b>Olympus MVX10</b></p> 	<ul style="list-style-type: none"> <li>• Stereo dissecting microscope for brightfield and fluorescence (UV, GFP, RFP, CFP, YFP, DsRed)</li> <li>• Link for <a href="#">calibration files</a></li> </ul> <p style="text-align: right;"><i>Olympus, Tokyo, Japan</i></p>	<p>Room G57</p>

## 2. Confocal Microscopes

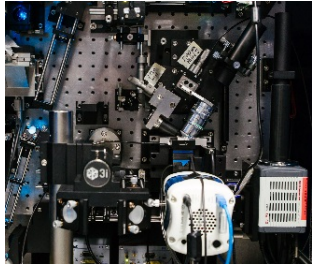
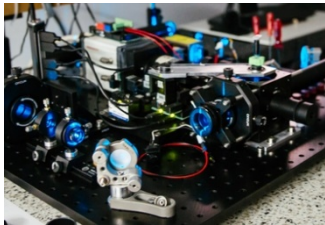
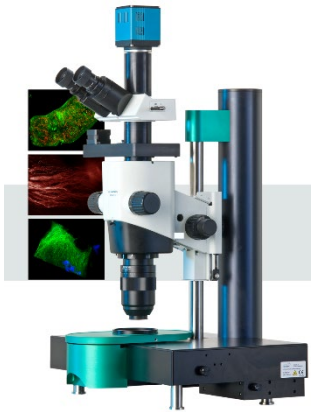
<p><b>Leica SP5 5-Channel</b></p> 	<ul style="list-style-type: none"> <li>• 5 PMT detectors + 1 transmitted light detector, with AOBS (fast channel switching)</li> <li>• Full suite of laser lines (405, Multiline Argon laser (458,476, 488, 496, 514), 561, 633 nm)</li> <li>• Fully motorised with a fast galvo stage and high speed 8kHz resonant scanner available</li> <li>• environment chamber ( CO<sub>2</sub> and temperature RT to 37°C )</li> </ul> <p><i>Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G55</p>
<p><b>Leica SP8 Invert</b></p> 	<ul style="list-style-type: none"> <li>• 2 PMT detectors, 1 x HyD detector + 1 transmitted light detector</li> <li>• Laser lines include 405, 488, 552, 638nm</li> <li>• Fully motorised stage (x,y,z)</li> <li>• environment chamber ( CO<sub>2</sub> and temperature RT to 37°C )</li> </ul> <p><i>Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G55</p>
<p><b>Leica SP5 Upright</b></p> 	<ul style="list-style-type: none"> <li>• 3 PMT detectors + 1 transmitted light detector, with AOBS (fast channel switching)</li> <li>• Suite of laser lines include Multiline Argon laser (458,476, 488, 496, 514), 561 and 633 nm. Does not have 405nm</li> <li>• Fully motorised fixed stage with high speed 8kHz resonant scanner available</li> <li>• environment chamber (temperature ONLY)</li> <li>• Access to a specialise large field of view 20x 1.0 NA, 2 mm W.D. Water dipping objective</li> </ul> <p><i>Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G55</p>
<p><b>Leica SP8 Multiphoton Confocal Microscope</b></p> 	<ul style="list-style-type: none"> <li>• Multiphoton MaiTai DeepSee (3W TiSa pulsed laser, 690-1040nm tuning range), with a full suite of laser lines (405, 488, 552, 633 nm)</li> <li>• Internal detectors (2 PMT, 1 x HyD + 1 transmitted light) and external detectors (2 HyD Non-descanned) with AOBS (fast channel switching)</li> <li>• 8kHz resonant scanner available</li> <li>• Fully motorised large fixed stage (Scientifica) with adaptors, suitable for small animal and tissue imaging</li> <li>• environment chamber (temperature ONLY)</li> <li>• Access to a specialise large field of view 20x 1.0 NA, 2 mm W.D. Water dipping and 20 x 0.95 N.A. 2 mm W.D. BABB dipping objective</li> </ul> <p><i>Leica Microsystems. Mannheim, Germany</i></p>	<p>Room G55</p>

<p><b>Nikon C1 Upright</b></p> 	<ul style="list-style-type: none"> <li>• Upright 90i, with fully motorised stage (x,y,z)</li> <li>• 3 PMT detectors + 1 transmitted light detector</li> <li>• Laser lines include 405, 488, 561, 638 nm</li> <li>• Range of dipping objectives</li> </ul> <p style="text-align: right;"><i>Nikon, Tokyo, Japan</i></p>	<p>Room G52</p>
<p><b>Olympus FV1000</b></p> 	<ul style="list-style-type: none"> <li>• IX81 inverted base, motorized Z only</li> <li>• 3 PMT (with spectral) detectors + 1 transmitted light detector</li> <li>• Laser lines include 405, 488, 543, 633</li> <li>• environment chamber ( CO<sub>2</sub> and temperature RT to 37°C )</li> </ul> <p><b>SPECIALITY</b></p> <ul style="list-style-type: none"> <li>• PicoQuant setup for FLIM/FCS attached (see specialised microscope list)</li> <li>• FRAP experiments</li> </ul> <p style="text-align: right;"><i>Olympus, Tokyo, Japan</i></p>	<p>Room G54</p>
<p><b>Zeiss LSM780</b></p> 	<ul style="list-style-type: none"> <li>• Inverted LSM780 NLO base</li> <li>• Multiphoton Chameleon II TiSAP laser, with a full suite of laser lines (405, Multiline Argon laser (458,476, 488, 496, 514), 561, 633 nm)</li> <li>• Confocor 3</li> <li>• Detectors include GAsP linear array plus two flanking PMT's, external GAsP NDD's (for NLO), T-PMT and APD's in the Confocor</li> <li>• Fully motorised stage (x,y,z)</li> <li>• environment chamber ( CO<sub>2</sub> and temperature RT to 37°C )</li> </ul> <p style="text-align: right;"><i>Carl Zeiss Microscopy GmbH (Jena, Germany)</i></p>	<p>Room G54</p>
<p><b>Zeiss LSM980 Airyscan2</b></p> 	<ul style="list-style-type: none"> <li>• Axio Observer Inverted base</li> <li>• Laser lines include 405, 445, 488, 514, 561 and 639nm</li> <li>• Detectors include GaAsP linear 32 array PMTs plus two flanking GaAsP PMT's and Airyscan 2 detector.</li> <li>• Fully motorised stage (x,y,z), with Z-piezo drive combined with a Definite Focus system.</li> <li>• environment chamber ( CO<sub>2</sub> and temperature RT to 37°C )</li> <li>• Airyscan 2 (AS2) includes AS2 super-res, AS2 multiplexing for fast scanning.</li> </ul> <p style="text-align: right;"><i>Carl Zeiss Microscopy GmbH (Jena, Germany)</i></p>	<p>Room G54</p>
<p><b>Spinning Disc Confocal</b></p>	<p style="text-align: center;"><b>Coming to MMI soon</b> ETA 4<sup>th</sup> Q 2020</p>	



### 3. Super-Resolution Microscopes

<p><b>Abberior STED</b></p> 	<ul style="list-style-type: none"> <li>• Stimulated Emission Depletion instrument based on an Olympus IX83 body, with x60W/1.2NA (UPLSApo, 0.28mm WD) and x100 oil/1.4NA (UPlanSApo, 0.17mm WD). 2 Channel detector unit (APD's), pulsed lasers for 488, 560, 640nm excitation, with STED lasers at 595 and 775nm. 775 STED optics have 3D capability.</li> <li>• Software control: IMSpector, including RESCue module for optimising live cell STED.</li> <li>• <u>Suitable dyes:</u> <ul style="list-style-type: none"> <li>○ 488nm ex/595nm depletion: GFP, STAR520SXP, Oregon Green 488, Alexa Fluor 532, TMR etc</li> <li>○ 561nm ex/775nm depletion: STAR600, Atto 590, Alexa 594</li> <li>○ 640nm ex/775nm depletion: STAR635P, Atto647N</li> </ul> </li> <li>• Live Imaging is supported by live cell incubation, RESCue software, and <u>suitable dyes</u> including <ul style="list-style-type: none"> <li>○ SNAP, CLIP and HALO tags</li> <li>○ Silicon Rhodamine dyes.</li> </ul> </li> </ul> <p><i>Abberior Instruments GmbH (Gottingen, Germany)</i></p>	<p>Room G52</p>
<p><b>Zeiss LSM980 Airyscan2</b></p> 	<ul style="list-style-type: none"> <li>• Axio Observer Inverted base</li> <li>• Laser lines include 405, 445, 488, 514, 561 and 639nm</li> <li>• Detectors include GaAsP linear 32 array PMTs plus two flanking GaAsP PMT's and Airyscan 2 detector.</li> <li>• Fully motorised stage (x,y,z), with Z-piezo drive combined with a Definite Focus system.</li> <li>• environment chamber ( CO<sub>2</sub> and temperature RT to 37°C )</li> <li>• Airyscan 2 (AS2) includes AS2 super-res, AS2 multiplexing for fast scanning.</li> </ul> <p><i>Carl Zeiss Microscopy GmbH (Jena, Germany)</i></p>	<p>Room G54</p>
	<p>Super-Res Instruments available at our other Nodes include:</p> <ul style="list-style-type: none"> <li>• Multi-modal Super Resolution (multiSR) with Lightsheet and SIM. Contact MHTP Manager, Sarah Creed.</li> <li>• Nikon N-SIM / N-STORM. Contact Betty Kouskousis.</li> </ul>	<p>MHTP, Clayton Burnet Inst., ARA</p>

## 4. Light Sheet Instruments

<p><b>Lattice Light Sheet</b></p> 	<p>Lattice light sheet microscope, based on the Betzig (Janelia Farms) instrument.</p> <p>Images sub-cellular events in living cells at confocal resolution yet with much higher temporal resolution and much lower photo toxicity. Some restrictions on sample mounting and sample size.</p> <ul style="list-style-type: none"> <li>• Imaging volume space typically restricted to 100 x 100 x 50 microns (imaged by x40 WI objective).</li> <li>• 250 x 250 x 400 nm XYZ resolution possible.</li> <li>• Long term imaging possible. See manager for details.</li> <li>• Laser lines: 405, 488, 560 and 640nm.</li> <li>• ORCA FLASH 4 camera.</li> </ul> <p>Custom LabView software. Custom FIJI sample staging and deskew post processing.</p> <p>Please discuss all applications with Instrument Manager. <i>Intelligent Imaging Innovations (Denver, Colorado), as described by Chen et al. (Science 346, 1257998, 2014).</i></p>	<p>Room G58A</p>
<p><b>D2-SPIM</b></p> 	<p>Dual laser dual illumination axis SPIM (Selective Plane Illumination Microscope). Built in-house for in vivo live imaging of embryo scale samples. Long duration imaging possible. Samples typically mounted in low density agarose cylinders immersed in culture medium. Multi-view imaging possible. ~ 650 nm lateral resolution with GFP label. See manager for details. Olympus 10x 0.3 NA illumination objective. Olympus 20x 0.5 NA detection objective. Cube 488 (50mW) and Obis 594 (65 mW) laser lines. Orca Flash 4 camera. MicroManager operating system.</p> <p><i>Monash Micro Imaging, Melbourne, Australia</i></p>	<p>Room G58</p>
<p><b>UltraMicroscope II</b></p> 	<p>Bidirectional lightsheet based on upright Olympus MVX-10 Macro-Zoom microscope with several objective options up to 20x, allowing in vivo imaging or small animals/embryos as well as cleared samples, up to max 10mm in size. All optical and mechanical components are compatible to most clearing solutions [BABB, DBE, Clarity, SeeDB etc] and water.</p> <p>Lasers: 405, 488, 561, 639 and 785nm, producing a lightsheet of 4 - 40µm thickness. Andor Neo sCMOS camera (2560 x 2160 pixels, max frame rate - 100 fps @ full frame). Filter switching via 8 stage filterwheel.</p> <p>Motorized xyz- stage with 10x10x10mm travel range.</p> <p>Lenses: LVMI-Fluor 1.3X/0.1 multi-immersion with 9mm WD, LVMI-Fluor 4X/0.3 multi-immersion with 5.6-6mmWD. MVX Body accepts conventional objectives such as the Leica 20x BABB and WI lenses, etc.</p> <p><i>LaVision BioTec GmbH, Bielefeld, Germany</i></p>	<p>Room G57</p>

## 5. FLIM/FCS/RICS

<p><b>PicoQuant FLIM/FCS</b></p> 	<p><b>Olympus FV1000</b> IX81 invert confocal microscope, with a Picoquant PicoHarp300 (TCSPC) running SymPhoTime 64 to enable Time-resolved Single Photon Counting Fluorescence Lifetime Imaging (FLIM/FCS). The laser setup is a 440nm and 485nm pulsed laser. Cells maintained in temperature controlled cell chamber accepting 35mm dishes and ATTO chambers. System is RICS capable</p> <p style="text-align: right;"><i>PicoQant (Berlin, Germany)</i></p>	<p>Room G54</p>
<p><b>Zeiss LSM780</b></p> 	<ul style="list-style-type: none"> <li>• Inverted LSM780 NLO base with motorised stage</li> <li>• Multiphoton Chameleon II TiSAF laser, plus suite of laser lines (405, Multiline Argon laser (458,476, 488, 496, 514), 561, 633 nm)</li> <li>• Detectors include GAsP linear array plus two flanking PMT's, external GAsP NDD's (for NLO), T-PMT and APD's in the Confocor</li> <li>• environment chamber ( CO<sub>2</sub> , and RT to 37°C )</li> <li>• Confocor 3 FCS module, RICS capable</li> </ul> <p style="text-align: right;"><i>Carl Zeiss Microscopy GmbH (Jena, Germany)</i></p>	<p>Room G54</p>

## 6. Other Specialised Microscopes

### *High Speed Microscopy*

<p><b>HS-Provis</b> (Brightfield, Darkfield, Phase)</p>	<p>In-house built modified Olympus Provis tailored to imaging very fast biological events such as sperm tail beat, swimming bacteria or blood flow at very high temporal resolution. 400 frames a second typical at 512 x 512 x 16 bit pixel resolution (100 FPS at 2048 x 2048). Fluorescent imaging possible. Some restrictions on sample types. See manager for details. 4x, 10x, 20x 0.7 NA &amp; 40x 0.9 NA. Higher magnification objectives available. ORCA FLASH 4 camera. Control Software: MicroManager.</p>	<p>Room G57</p>
<p><b>Leica SP5 5-Channel</b></p>	<p>Fast scanning invert confocal microscope, with conventional galvo (5fps at 512x512 resolution) or 8k resonant scanners (25fps full frame rate for 512 x 512, faster with reduced field size).</p>	<p>Room G55</p>
<p><b>Leica SP5 Upright</b></p>	<p>Fast scanning upright confocal microscope, with tandem 2.5k conventional (and 8k resonant scanners (25fps full frame rate for 512 x 512, faster with reduced field size).</p>	<p>Room G55</p>
<p><b>Leica SP8 Multiphoton/Confocal Microscope</b></p>	<p>Fast scanning upright confocal microscope, with tandem 2.5k conventional (and 8k resonant scanners (25fps full frame rate for 512 x 512, faster with reduced field size).</p>	<p>Room G55</p>



<i>Deep tissue Imaging For Intravital or Clearing Applications</i>		
<b>Leica SP8 Multiphoton</b>	<b>Leica SP8 Multiphoton/Upright Confocal Microscope</b> (fixed stage) with MaiTai DeepSee (3W TiSa pulsed laser, 690-1040nm) for live animal and tissue imaging. Special features are 20x WI or 20x BABB objectives (2mm WD). <i>See Confocal section for further detail.</i>	Room G55
<b>UltraMicroscope II</b>	Bidirectional lightsheet based on upright Olympus MVX-10 Macro-Zoom microscope with several objective options up to 20x, allowing in vivo imaging or small animals/embryos as well as cleared samples, up to max 10mm in size. All optical and mechanical components are compatible to most clearing solutions [BABB, DBE, Clarity, SeeDB etc] and water. <i>See Lightsheet section for further detail</i>	Room G57
<i>Slide Scanning</i>		
<b>Olympus dotSlide</b>	<ul style="list-style-type: none"> <li>• Not high-throughput</li> <li>• Motorized Upright BX51 base slide scanning</li> <li>• 4 regular slides or large format slide (6x8 cm)</li> <li>• brightfield and fluorescence (Dapi/FITC/TRITC/FarRed)</li> </ul> <i>See Optical Microscopy section for further details.</i>	Room G57
7. Software		
<b>Licenced Software</b>	CellSens (Olympus) Imaris (Bitplane) Huygens (SVI) LASAF (Leica) Metamorph (Molecular Devices) RICS (Gratton lab) SymPhoTime (Picoquant) Zen (Zeiss)	
<b>Public Domain &amp; Free/Lite</b> (incl. Image Viewers, and limited life/demo versions)	Source	MMI
	Axiovision (Zeiss)	- n/a      enquire
	FIJI Image Analysis, FIJI software	- <a href="#">download</a> <a href="#">local DL</a>
	FIJI Image Analysis: V6 (Handbook) (courtesy of Cameron Nowell, MIPS, Monash)	<a href="#">MANUAL, DEMO Images</a>
	FV1000 Viewer (Olympus)	- <a href="#">download</a> <a href="#">local DL</a>
	FV3000 (incl FV1200 & MP) <b>NEW</b>	- <a href="#">download</a> <a href="#">local DL</a>
	Huygens software (SVI), trial/demo	- <a href="#">download</a>
	Imaris 30 day trial (Bitplane), ver 9.5	- <a href="#">download</a>
	Imaris Viewer (3D/4D viewer), ver 9.5 <b>NEW</b>	- <a href="#">download</a> <a href="#">Local DL</a>
	Irfanview (image viewer, file conv.) ver .454	- <a href="#">download</a> <a href="#">local DL</a>
	Leica LAS X Core (Offline) <b>Updated</b>	- <a href="#">download</a>
	Leica LAS X Mobile app for iOS <b>NEW</b>	- <a href="#">app DL</a>
	NIS elements Viewer (Nikon) <b>Updated</b>	- <a href="#">download</a>
	OlyVia for DotSlide (Olympus)	- <a href="#">download</a> <a href="#">local DL</a>
	Zen Blue/Black Lite (Zeiss) <b>Updated</b>	- <a href="#">download</a>
<b>Related Resources</b>	Computational Resources: MASSIVE	<a href="https://www.massive.org.au/">https://www.massive.org.au/</a>