Over the last ten years, Monash University has been building its significant investments in research infrastructure and expertise into a single brand and business unit:

**The Monash Technology Research Platforms (MTRPs).**

By providing easy access to cutting-edge research infrastructure and supporting expertise in the form of professionally run platforms, we have taken our research to a whole new level. As a consequence, continuing support and development of the MTRPs has become a key pillar of the ‘Focus Monash’ research strategy.

Platform ISO 9001 certification gives industry great confidence and sets Monash apart from other universities in terms of supporting and enabling research and industry engagement. In this context, the platform strategy is proving to be a vital conduit to link Monash researchers and our research collaborators from both academia and industry.

Leading researchers are attracted to the platforms because of their proven quality, networks and focus. Industry is attracted because it can access a professional one-stop technology shop and a seamless, uniform research service across the university. Access to this high quality network of platforms has been a game-changer for how the university collaborates with industry. Commercial partners now have a central point to initiate collaboration in any particular area and the university has the capacity to deliver a high-quality, timely and responsive service.

Finally, the MTRPs are ideally located in a vibrant environment of technology and research at Clayton. The Monash precinct, also houses CSIRO, the Australian Synchrotron (ANSTO), the Melbourne Centre for Nanofabrication (MCN), Monash Health, one of Victoria’s largest teaching hospitals, and a specialist heart hospital currently under construction. In addition, there are many R&D focussed large, medium and small companies located in the area. Therefore, the MTRPs are well placed to support the vibrant research at Monash as well as that of our local and increasingly, national and international partners and collaborators.

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Monash University is the largest university in Australia, and amongst the most highly regarded in the world. In just 50 years, we have built a reputation for quality teaching, an inspiring learning culture, and world-leading research. We believe great research, properly applied, can lead to lasting and positive change in people’s lives. From health and sustainability, to new industries and productivity, we’re working towards new discoveries that transform lives for the better.
Our platforms work together to generate unique workflows that deliver seamless integration within different pipelines.

Whether your research is related to therapeutics, advanced manufacturing, food innovation, medtech or areas of the energy sector, we have capabilities to take your project from discovery right through to commercialisation.

The beauty of our platforms lies in the ability to access them at different stages of your R&D project, or move from one to the next for the lifespan of your project.
Micromon is a research driven platform that provides cutting edge services in DNA and RNA technologies, including Next-generation sequencing (NGS) and Sanger sequencing to the broader research community. These services are supported by the provision of DNA and RNA sizing, quantitation and QC, custom oligonucleotide synthesis, Real-time PCR, Covaris shearing, and microarray scanning.

Micromon also runs skills training courses and workshops including its highly reputed six-day molecular biology course that provides training in the essential skills of recombinant DNA technology, as well as specialist data analysis and NGS workshops. Micromon staff are recognised for their expertise in project management, guidance and technical troubleshooting.

KEY INSTRUMENTATION

- Applied Biosystems 3730 genetic analyser
- Illumina NextSeq 500 Next-Generation sequencer
- Illumina MiSeq V2 Next-Generation sequencer
- 10X Genomics Chromium System (incorporates single cell and long-range genomics)
- Agilent AriaMx Real-Time PCR System
- Airstream PCR vertical laminar flow cabinet
- Eppendorf epMotion automated liquid handling system
- Covaris S2 focussed acoustic shearing device
- AATI Fragment Analyser for DNA/RNA sizing and quantitation
- Invitrogen Qubit Fluorometer for DNA and RNA quantitation
- DeNovix Fluorometer and Spectrophotometer
- Agilent Bioanalyser 2100
- GenePix 4000B microarray scanner

EXPERTISE

Micromon staff are recognised for their expertise in project management and guidance. Long read DNA sequencing is a core service at Micromon and has been in operation since 1993. Great pride is taken to offer the highest possible quality, long reads and very fast turnaround. Our objective is to provide a fully personalised and custom service. Client support is a hallmark of our facility and staff are always available to assist you with comprehensive troubleshooting and technical advice. Samples are individually monitored from receipt to data despatch and all results are extensively assessed during data processing so that you achieve the best possible outcomes from your sequencing.

WORKING WITH US

- Fee for service
- Consultancies
- Collaborative research
- Training
SPECIALIST SERVICES

Our platform provides researchers with genomics data, products and training. Our skilled and dedicated team offer outstanding, professional and personalised services. We specialise in DNA and RNA technologies with expertise in fast turnaround long-read DNA sequencing and most Illumina Next-Generation sequencing applications.

**Illumina Next-Generation sequencing (NGS)**

Our Next-Generation sequencing service provides a complete sequencing and data analysis solution based on Illumina technology. The instruments are capable of producing hundreds of gigabases of sequence data per run. In addition to standard DNA sequencing, the instruments can be used for a wide range of applications including amplicon sequencing, genome sequencing, transcriptomics and expression profiling (RNA-seq/transcriptomics), small RNA discovery and quantitation, discovery of protein-DNA/protein-RNA binding sites (ChIP-seq, etc.), microbial population profiling (16S surveys and metagenomics), single cell analysis and much more.

Our standard NGS service includes project scoping and consultation, sample reception, library construction and quality control, as well as sequencing and electronic delivery of results via our dedicated next-generation sequencing website. We also offer grant writing assistance and ongoing project management.

**Other services and activities include**

- DNA, RNA and Protein Quantitation (Bioanalyser and Fragment Analyser)
- Closed-tube focussed acoustic shearing of DNA, cells and tissues (Covaris)
- Oligonucleotide Synthesis specialising in fast turnaround
- Molecular biology techniques training course with a nationwide reputation for excellence
- GenePix microarray scanner access
- Materials testing for microbial content and activity using defined Australian Standards
- Microbial growth media and bacterial cultures

**Sanger DNA sequencing**

Micromon has built a reputation for providing reliable and customer-focused services capable of producing long sequence reads, in excess of 1000 bp (QV20+). We pride ourselves on having very fast, sample turnaround times and the ability to successfully troubleshoot technical issues.
Our platform can fulfill all your requirements for genome modification in today’s experimental organisms, including mouse, rat and other species. Working together with the Australian Phenomics Network (APN) node at Monash and the Monash Animal Research Platform, we deliver a comprehensive service in whole animal genome modification using CRISPR, embryonic stem cell, and transgenic technologies.

### SPECIALIST SERVICES

**CRISPR-mediated mutagenesis**
Using the latest in CRISPR technology, we make null mutations, defined point mutations, epitope and reporter tags, and Cre/loxP conditional mutations in mice. We also make null mutations in rats.

**Gene targeting in mouse embryonic stem cells**
We make sophisticated genetic modifications in mice using traditional gene targeting strategies in mouse embryonic stem cells, involving the production of chimaeras for obtaining germ line transmission of the genetic modification.

**Production of genetically modified mice, rats and other species**
Production of transgenic mice, rats and other species by injecting fertilised eggs with DNA for random integration into the genome. Applications include BAC transgenes for faithful gene expression, and smaller plasmid constructs for various purposes.

**DNA construct design and production**
We can design and make your construct for CRISPR mutagenesis, gene targeting or transgenic animal production. With our BAC recombineering expertise, there is no limit to the type and range of constructs we can make – quickly and cost effectively.
OTHER CAPABILITIES

- Importation of selected genetic resources from international repositories (embryonic stem cells, mice, rats).
- Cryopreservation and recovery of genetically modified lines (embryos, sperm). Supply of protocols for genotyping your new genetically modified lines (PCR, Southern blot).

EXPERTISE

We can take your project from start to finish, from DNA construct design to delivery of your new genetically modified animals. We have a long and established track record in all aspects of the technology, including design and production of all kinds of DNA constructs, CRISPR-mediated gene modifications, gene targeting in embryonic stem cells, and transgenesis. Over the last decade we have produced more than 150 lines of genetically modified animals. Our reputation for excellence sees our services requested Australia-wide and internationally.

WORKING WITH US

- Fee for service
The MHTP Medical Genomics Facility provides a comprehensive range of technologies and expertise to accelerate research and clinical diagnosis. Our facility is used by numerous organisations and we have important collaborations with Monash Health’s Pathology departments and the Monash Technology Research Platforms network. We offer consultative genomics service to pioneer innovative research, leading to improved healthcare and are committed to client support and translational outcomes.

KEY INSTRUMENTATION

We have kept pace with the ever-accelerating rate of genomics and host the latest technologies for discovery research, screening, validation and routine testing:

- 3130xl Genetic Analysers – 16 capillary
- 7900HT Fast Real-Time PCR systems
- 384-well and TLDA formats
- Qiagility/CAS 1200 liquid handling systems
- Fluidigm C1™ Single Cell Auto Prep
- Fluidigm Biomark™ HD system
- Fluidigm MX, HX, RX and Access Array controllers
- Tecan Freedom Evo 100 liquid handling system
- Agilent Bioanalyser
- Agilent TapeStation
- Agilent Microarray Scanner
- Illumina MiSeq, HiSeq 1500 and HiSeq 3000 systems
- Ion PGM and Proton systems
- Covaris Adaptive Focussed acoustics system
- ThermoFisher (Cellomics) ArrayScan Vti high content instrument
- Caliper Zephyr liquid handling robot
- Integrated Twister II plate handling robot

EXPERTISE

Our dedicated team is committed to provision of professional and comprehensive support. We have all had long standing careers in genomics extending over 20 years.

WORKING WITH US

- Fee for service
- Consultancies
SPECIALIST SERVICES

We provide a broad range of specialist genomic services based upon a fee for service model including:

- Sanger Sequencing (ISO 15189 NATA accredited)
- Quantitative real-time PCR
- Fragment analysis
- High content screening
- Microarray
- Next-Generation Sequencing
- Fluidigm single cell genomics
- Cell line identification
- Bioinformatics
Mass spectrometry is one of the leading technologies to comprehensively identify and quantify proteins and other biomolecules in virtually every biological sample and environment. Due to its unparalleled sensitivity and accuracy, mass spectrometry is the method of choice for a plethora of applications ranging from biomarker discovery to absolute quantifications of biomolecules. Equipped with the latest mass spectrometric instrumentation, the Monash Proteomics and Metabolomics Facility combines cutting-edge technology with state-of-the-art methodology to provide the best possible results and expertise to customers and collaborators.

**KEY INSTRUMENTATION**

**Mass spectrometer**
- Orbitrap Fusion Tribrid (Thermo Scientific)
- 2x Q-Exactive Hybrid Quadrupole-Orbitrap (Thermo Scientific)
- 2x Q-Exactive Plus Hybrid Quadrupole-Orbitrap (Thermo Scientific)
- 2x TripleTOF 6600 (SCIEX)
- QTrap 6500 (SCIEX)
- MicroTOFq (Bruker)
- UltrafleXtreme MALDI TOF/TOF (Bruker)

**HPLC Systems and ion sources**
- LC 1100 Analytical System (Agilent Technologies)
- LC 1200 Series Nano and Capillary (Agilent Technologies)
- Ultimate 3000 Nano Systems (Thermo Scientific)
- Ultimate 3000 Rapid Separation UHPLC Systems (Thermo Scientific)
- Dionex ICS-4000 Capillary High Performance Ion Chromatography (Thermo Scientific)
- AP/MALDI (ng) UHR (MassTech)

**N-terminal sequencers**
- PPSQ-53A Protein Sequencer (Shimadzu)
- Procise Protein Sequencer (Applied Biosystems)

**EXPERTISE**

Our team provides academic and commercial researchers access to state-of-the-art proteomics, metabolomics and lipidomics technologies, as well as expertise to answer questions surrounding the identification, characterisation and quantification of proteins and other biomolecules.

**WORKING WITH US**
- Fee for service
- Consultancies
- Collaborative research
- Instrument access
SPECIALIST SERVICES

Qualitative proteomics/shot-gun proteomics
Isolated proteins or even entire proteomes are analyzed by LC-MS/MS. This methodology can be used to (i) identify interaction partners, (ii) verify polymorphisms and other mutations, (iii) analyze secreted proteins, (iv) reveal novel proteomes and (v) confirm the identity of purified proteins, synthesized peptides or gel bands.

Quantitative proteomics
We are mostly using Label-Free Quantification (LFQ) as well as Data-Independent Acquisition Mass Spectrometry (DIA-MS, often referred as SWATH-MS) to analyze global proteomic changes between any number of biological samples. More targeted methods such as Multiple Reaction Monitoring (MRM) or Parallel Reaction Monitoring (PRM) are also in place to quantify selected proteins with unprecedented sensitivity and accuracy.

Cross-linking mass spectrometry (CX-MS)
Chemical cross-linker agents can be used to covalently link adjacent domains within proteins and protein complexes. Identifying the cross-linked domains/peptides by high-resolution mass spectrometry provides a powerful tool to reveal interacting regions of protein complexes and to model or verify the structure of proteins and their complexes. CX-MS can also be used to analyze naturally occurring crosslinks such as disulphide bridges.

Analysis of post-translational modifications (PTMs)
The vast majority of proteins are post-translationally modified (e.g. phosphorylation or glycosylation). Mass spectrometry is one of the few techniques that allow the precise identification and quantification of virtually every PTM on a global proteomics scale. Intact mass determination/top-down proteomics The determination of intact protein masses and their top-down fragments enables us to (i) analyze the exact size of proteins, (ii) confirm the presence of polymorphisms, PTMs, truncations or other mutations, and (iii) distinguish between protein isoforms and splice forms.

Other specialist services metabolomics
Our LC-MS-based metabolomics platform provides comparative measurements of metabolites involved in central metabolic pathways (such as amino acid, carbohydrate, lipid, nucleotide and cofactor metabolism), as well as untargeted detection and identification of significant molecular features that may represent novel biomarkers or biochemical phenotypes in cell cultures, tissues, biofluids or other sample types. We also have expertise in (i) stable isotope labelled workflows that enable functional studies of metabolic pathways, (ii) targeted analyses for quantitative metabolite measurements, and (iii) identification of protein-bound ligands.

Lipidomics
Lipidomics methods based on high resolution, accurate mass LC-MS are available for untargeted analysis of all hydrophobic metabolites, or semi-targeted analysis of specific lipid classes such as steroids or sphingolipids. These analyses are suited for investigation of lipid biochemistry in cell or animal models, and for biomarker discovery in clinical samples.

N-terminal sequencing
N-terminal sequencing is an unequivocal analytical method based on Edman degradation chemistry, which will sequence the N-terminus of a protein to confirm its identity or to determine its purity.

CONTACT
platforms.monash.edu/proteomics

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The Monash Bioinformatics Platform exists to create a hub for bioinformatics activities at Monash. We have a core group of bioinformaticians with broad expertise and are building a loosely linked community of bioinformaticians across all of Monash. We are always available to help with specialist advice on experimental design or analysis. We also collaborate with groups around Monash on specific research projects. And, we teach scientists bioinformatics analysis skills through our hands-on training workshops.

**ANALYSIS CAPABILITIES**

- **Differential Gene Expression** – statistical analysis of differential gene expression from transcriptomics data (microarray, RNAseq).
- **Variant Identification** – identification of genetic variants (SNPs and InDels) from large scale genomics data.
- **Methylation and ChIPseq** – exploration of epigenetics and post-transcriptional modifications of the genome and its expression.
- **Interactive visualisations of genomic and proteomic datasets.**

**EXPERTISE**

The Monash Bioinformatics Platform assists researchers to make sense of the huge data sets now generated in the biological sciences. We are a hub for the bioinformatics community at Monash and affiliated organisations.

We encourage researchers to meet with us before starting an experiment. Come and present your research to our group, so we can give you ideas and insight into where advanced bioinformatics capabilities may help. Over the last few years we have collaborated with research groups to provide analysis for various projects.

We also facilitate hands-on training seminars over a wide range of technical topics.

**WORKING WITH US**

- Consultancies
- Collaborative research
- Training
SPECIALIST SERVICES

Bioinformatics describes a variety of computational, mathematical and statistical capabilities that assist the analysis and interpretation of biological information. This often takes place at the DNA, RNA and protein levels.

Bioinformatics support
A bioinformatician within the platform can partner with researchers to provide an in depth understanding and expertise over the length of a research project. A basic level of service is also available, with bioinformaticians available to consult over experimental design or by providing preliminary data processing and analysis.

Training
Hands-on training is provided to researchers in conjunction with partners such as Bioplatforms Australia. Topics include various bioinformatics analysis techniques (e.g. RNAseq) as well as programming languages such as R and Python.

Technology
Bioinformaticians at Monash University have access to a wealth of high performance compute, cloud compute, storage and data visualisation technologies. A range of bioinformatic tools are maintained by the platform and are freely available.
Monash Antibody Technologies Facility (MATF) services include mouse and rat hybridoma sequencing, antibody protein expression and purification, cell line banking as well as humanisation and detailed affinity analysis by SPR of purified reagents.

We pride ourselves in being a global source of cost-effective high quality, high affinity custom monoclonal antibodies. Under ISO9001 certification operating procedures, our team can deliver monoclonal antibodies in 20 weeks whilst project deliverables are flexible and designed around the needs of our clients.

**KEY INSTRUMENTATION**

- Multiple Tecan EVO liquid handling robotics platforms
- Tecan Fluent 1080 Laboratory Automation Solution
- Array Jet microarray spotter
- ThermoFisher Cytomat robotic incubators
- Genetix ClonePixFL and CloneSelect Imager
- BioRad ProteOn™ Protein and GE BiaCore™ T200 SPR instruments

**EXPERTISE**

Our team of highly skilled scientists employ a range of best practice operating procedures, along with the latest robotic techniques, to deliver successful monoclonal antibody projects to customers. Known for our ability to succeed at challenging projects, we strive to be the best at producing monoclonal antibodies where others have failed.

We have a wealth of experience in areas such as antigen design and expression, antibody characterisation and sequencing, robotics, high-throughput screening and antibody purification techniques.

We offer sophisticated “humanisation” service by CDR grafting coupled with affinity maturation if required. We also are able to provide recombinant antibody expression, purification and affinity assessment.

**WORKING WITH US**

- Fee for service and milestone based
- Consultancies and advisory service for bioassay development
- Research collaborations for functional antibody screening
- Automation training
SPECIALIST SERVICES

Custom monoclonal antibody production
Our platform produces hybridoma cell lines expressing monoclonal antibodies against a custom target protein or peptide. The proprietary antigen microarray screening technology selects for large numbers of specific, high affinity, IgG secreting clones. We can perform these services with as little as 0.4mg of protein or 1mg of peptide and deliver up to five individual clones and antibody supernatants with a typical production time of 12–16 weeks. Additional services and clones can be supplied on request.

Phospho-specific antibody production
Antibodies directed at phosphorylation sites are critical tools for understanding regulatory mechanisms that control cell signaling, transcription and enzyme activation. We can design and produce a phosphorylated and non-phosphorylated peptide and, using our proprietary screening, find binders that specifically recognise the phosphorylation site of interest.

Antibody sequencing
We can isotype and sequence mouse or rat antibodies from hybridoma cell-lines generated at the facility as well as cell-lines from outside the facility. Knowing the sequence of your mAb is required for humanisation of an antibody or for IP protection. The service includes the cloning and sequencing of the light and heavy chain variable regions.

Custom ELISA development
Using Surface Plasmon Resonance Imaging (SPRI) technology, our team can identify monoclonal antibodies that bind in a non-competing manner with an antigen suitable for sandwich ELISA development. We can optimise the concentration of each antibody using our high-throughput robotic ELISA platforms. Using the ELISA platform ensures accurate and consistent assessment of the antibody pairs every time.

If you don’t have complementary pairs of antibodies for your ELISA project, we can employ the custom antibody service to generate one or both of the antibodies needed.

Custom automated applications
We have the expertise and facilities to offer a custom service to automate the manually intensive processes in your laboratory through the automation facility RoboCore. Maybe you have thousands of tubes to label? Or hundreds of plates to fill with media? Using robotic platforms, RoboCore can help you achieve your goals with automation in a fast, efficient and cost effective way.

Cell banking and long-term storage
Our team can generate a bank of your hybridoma cell lines and cryopreserve them in liquid nitrogen to give you peace of mind that your valuable cell-line is well looked after. We also routinely test our cell lines for mycoplasma.

Antibody humanisation and affinity maturation
We have extensive experience in the humanisation of monoclonal antibodies by grafting onto the closest human germline frameworks. This involves custom designing of 2-3 humanised VH and 2-3 VK constructs, subcloning into proprietary human IgG vectors, CHO cell expression and small-scale purification of 9 different versions. Clones are tested for affinity by ELISA/SPR or flow cytometry and can be coupled with proprietary affinity maturation techniques if needed. This takes approximately 4-6 months.
RoboCore has significant expertise and state-of-the-art robotic instrumentation to offer automation solutions for a variety of liquid and plate handling applications. There are many benefits of automation, from saving time and money, through to increased assay reproducibility, 24/7 operation, reduced contamination risk and increased lab productivity.

**KEY INSTRUMENTATION**

- Tecan Fluent™ cell-based screening platform
  - 96 and 384 pipette head
  - Fully integrated CO₂ incubator and plate washer
  - Absorbance, fluorescence, luminescence and alphaLISA™ endpoints

- Tecan Freedom Evo™ liquid handling robotics platform
  - 96-pipette head
  - 4, 8 and 16 pipette channels
  - CO₂ incubators
  - Plate washers and readers
  - Cell counter
  - Centrifuge

- ArrayJet Super Marathon Antigen microarray SPOTTER
SPECIALIST SERVICES

Our team can apply automation to your currently labour-intensive laboratory processes. Some applications we have automated are:

**ELISA**
Fully customised systems to run any ELISA protocol in high throughput mode to save time, money and increase assay reproducibility.

**Cell-based studies**
Automated liquid handling in fully contained biosafety cabinets. These cabinets contain 96 and 384-head pipetting into 6/24/96/384-well plates as well as integrated CO₂ incubators, plate washers and readers (absorbance, fluorescence, luminescence and alphaLISA™) with >500 plate capacity.

**Automated sample preparation**
Perform flexible liquid handling in a variety of formats: 96/384-well plate, microarray slides and tubes or vials.

**Solid phase extraction (SPE) of biological samples**
Automated SPE of analytes from plasma, urine, saliva etc. in 96-well plate format.

**Compound library management**
Plate replication, sample dilution and custom arrays with your compound library.

**Automated tube labelling**
Custom labels for a variety of tubes. Labels can include barcodes, text, logos and images.

**Automated cell expansion and cryopreservation**
A variety of plate formats available, an automated cell culture approach can significantly reduce the risk of contamination.

EXPERTISE

Our team has a wealth of experience in areas such as assay automation, high-throughput screening and sample management in an academic and industry setting. We work with customers to get the best automated solution.

WORKING WITH US

- Collaborative research
- Fee for service
- Consultancies
- Training

CONTACT

platforms.monash.edu/robocore

ROBCORE
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The Protein Production Unit has the capacity to purify large numbers of recombinant proteins for a variety of research purposes in a high-throughput manner. Our platform offers expertise in optimising the expression and purification of recombinant proteins (E. coli, yeast, insect cell and mammalian).

**KEY INSTRUMENTATION**
- AKTA Express units (12 units)
- Liquid handling robot: Tecan Evo
- RT-PCR machine
- AKTA Avant
- Bacterial insect/mammalian suspension growth facilities

**EXPERTISE**
Our experience allows us to develop novel purification protocols with tagged and non-tagged proteins. We have extensive experience in refolding proteins from inclusion bodies and characterising the resulting proteins. We are capable of producing proteins for all research and development needs.

**WORKING WITH US**
- Fee for service
- Consultancies
- Collaborative research
SPECIALIST SERVICES

Automated high-throughput protein purification
Our automated protein purification can purify up to 48 individual proteins at any one time. The scheme can be set at a variety of temperatures depending on the sensitivity of the proteins involved.

Custom purification of general research tools
We specialise in the purification of individual proteins to be used as general research tools. Many of these proteins have an established purification protocol and so, we use commercially available chromatography resins. With these protocols we are able to automate the procedure and generate up to 100 mg of protein on request.

Purification protocol development
We can develop purification protocols for specific proteins using our AKTA avant unit as a scouting tool. The procedures developed using this unit can be directly translated to a more traditional FPLC process or for larger scale industrial processes.

Protein expression optimisation
Using our liquid handling robot, up to 96 individual expression conditions can be analysed in a high-throughput manner. This allows for the effects of the expression media, time, temperature and solubility tags on the levels of recombinant soluble protein to be analysed.

Refolding screens/thermal melt analysis
Using customised buffer conditions, we are able to investigate the effect different buffers, inhibitors and pH conditions can have on the stability of a particular recombinant protein. Customised refolding trays allow us to optimise the refolding conditions for a particular protein to be established.

Antibody purification
We can purify antibodies from hybridoma cell lines.

CONTACT

platforms.monash.edu/ppu

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The Monash Macromolecular Crystallisation Facility is an automated platform for the high-throughput crystallisation of biological macromolecules.

Macromolecular crystallography provides unparalleled details of the 3D structures of biological macromolecules, it forms the basis for the rational design of therapeutics.

Our facility helps to overcome the common bottleneck in crystallographic structure determination.

KEY INSTRUMENTATION

- Four liquid handling robots (three for crystallisation drop dispensing and one for making optimisation screens).
- NT8 (Formulatrix) – nanoliter-volume liquid handler for dispensing all crystallisation drops, including LCP.
- Mosquito LCP (TTP Labtech) – using positive displacement technology and LCP.
- Crystal Phoenix (Art Robbins) – featuring nano-dispensing capability and 96 syringe head for simultaneous transfer of screen solutions.
- Formulator (Formulatrix) – liquid handler that uses microfluidic technology – for dispensing optimisation screens.

- Four automated imaging systems: four Rock Imagers 1000 (Formulatrix): with combined capacity to handle and automatically inspect 4000 crystallisation plates, providing visible, UV and SONICCC technology imaging at either 20°C or 4°C.

WORKING WITH US

- Fee for service
SPECIALIST SERVICES

To increase the probability of growing crystals suitable for X-ray diffraction studies our team uses many well-known optimisation techniques. The use of robotics allows for miniaturisation of crystallisation experiments, enabling us to screen a wide range of conditions from limited sample volumes.

Crystallisation of macromolecules

- Drop dispensing
- Vapour diffusion
- Lipid cubic phase (LCP)
- Hit optimisation
- Custom (fine) screen making
- Additive screening
- Seeding
- Drop imaging (automated: visible, polarised, UV and SONICC; and manual)
- Remote access to images via web interface
Based at the Monash Institute of Pharmaceutical Sciences in Parkville, the HMSTrust Laboratory is an open access analytical laboratory which offers sophisticated physical and chemical characterisation techniques to complement research and overcome challenges faced in modern drug development.

EXPERTISE

The HMSTrust Laboratory features a comprehensive suite of instruments including advanced FTIR, Raman, XRD, GC/MS/MS and LC/MS/MS capability for stability assessment, complete API characterisation or identification of unknown components in pharmaceutical packaging and formulations. Under our flexible open access arrangements, researchers are able to choose an access model to suit their individual needs. All instruments are maintained under a Quality Management System with regular verification of performance.

WORKING WITH US

■ Direct lab access
■ Fee for service
■ Analytical consultancies
■ Training
CONTACT
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SPECIALIST SERVICES
Using our extensive array of instrumentation and analytical expertise, the HMSTrust Laboratory is able to provide tailored solutions for your analysis needs. We can:
- advise on appropriate analytical techniques and methodologies
- assist your staff to develop and validate an analytical method
- have an HMSTLab analyst take care of your analysis from start to finish

KEY INSTRUMENTATION
Chromatography and mass spectrometry
Our triple quadrupole LC/MS/MS instruments are the most sensitive in the Shimadzu range. The 8030 and 8050 mass spectrometers are linked to UHPLC systems for optimum chromatography and reduced run times. Our HPLC systems offer a variety of detection options including multi-angle light scattering, radiometric, UV-visible, photodiode array, fluorescence and refractive index.

MALDI TOF TOF
Characterisation of macromolecules such as proteins and polymers can be performed on the Shimadzu 7000 MALDI-TOF-TOF. The MALDI is also capable of imaging without the need for drug labelling, providing opportunities for assessing drug disposition, metabolism and targeting directly in organs and tissues.

Microscopy, spectroscopy, thermal, XRD and moisture analysis
PerkinElmer DSC and TGA instruments are available for the thermal analysis of materials. These instruments are complemented by a Raman probe and microscope. The TGA can be coupled with an FTIR spectrometer for greater molecular insight, and can be further connected with a GC-TOF-MS for compound identification against a spectral library. The FTIR is also coupled with an FTIR microscope to produce infra-red images of heterogenous surfaces.

A Shimadzu XRD-7000L X-ray powder diffractometer is available for crystallographic characterisation and assessment. A polycapillary parallel X-ray optics system allows examination of complex systems with irregular geometry, including intact pharmaceutical tablets, with markedly improved signal-to-noise ratios.

Our Metrohm Karl Fischer moisture analyser is capable of volumetric and coulometric titration to determine any water content from 0.001 to 100 per cent.

Automated liquid handling
We make sample preparation easy with the Janus Integrator robotic liquid handler. Liquid transfers can be performed in a multi-tipped mode from any combination of laboratory containers including 384 and 1536-well formats for complete assay automation.
Our Fragment Based Drug Design (FBDD) platform provides academic and commercial researchers with access to fragment-based drug discovery technologies for their therapeutic targets. The facilities are located at the Monash Institute for Pharmaceutical Sciences (MIPS) – Australia’s largest and most successful pharmaceutical institute. FBDD screening uses our high-quality, in-house fragment library designed to maximise chemical space coverage and enable rapid hit optimisation. Screening cascades are tailored for each target and can be performed using a variety of techniques including NMR spectroscopy and our surface plasmon resonance (SPR) facility.

**KEY INSTRUMENTATION**
- Bruker 600 MHz NMR spectrometer with CryoProbe
- SPR facility
  - One Biacore™ S200
  - Two Biacore™ T200s
  - Two SensiQ Pioneer Fragment Editions
- MicroCal ITC200 isothermal calorimeter
- Janus liquid handling robot
- Revelers X2 flash chromatography system
- Genevac EZ2 parallel evaporator
- Shimadzu NexaraX2 liquid chromatography mass spectrometer

**EXPERTISE**
We provide fragment screening technologies and hit-to-lead drug development expertise for academic and commercial researchers. Our structural biology and medicinal chemistry expertise uses our standardised REFIL strategy enables the rapid elaboration of fragments into leads without the requirement for a large chemistry program.

**WORKING WITH US**
- Collaborative research
- Fee for service
- Consultancies
SPECIALIST SERVICES

Library design
Our platform provides high quality screening sets designed to maximise chemical space coverage while maintaining chemical tractability for hit optimisation. Physiochemical, size and PAINS filters eliminate undesirable attributes prior to compound selection. Importantly, we validated all compounds in our screening sets for solubility and identity by NMR spectroscopy, thereby greatly reducing the incidence of false positives. In addition to our standard screening sets we have more than 6000 compounds available for selection. This enables libraries to be tailored for specific classes of targets if desired. The extended collection also includes many analogues of primary screening compounds to enable rapid hit follow-up.

Assay development
Screening cascades are tailored for each target. We work with you to determine which primary and secondary screens best suit your target, considering such factors as protein size, stability and production yields and the availability of natural substrates or inhibitors. SPR assay development can be provided as an independent service or to establish conditions prior to fragment screening. MFP can assist with protein production, including isotope labelling for protein-detect NMR. Fluorine NMR is available as an additional detection method. Selective protein labelling strategies can be designed for protein-detect NMR of large proteins.

Fragment screening
Multiple screening formats are available including ligand-detect NMR and SPR. HSQC NMR can be used to validate hits and identify binding sites. Crystallography services are available to initiate a structure-based drug design program.

Hit optimisation
We offer structure-activity relationships (SAR) by catalog compound sourcing. And our library is designed such that all compounds in our screening sets have at least 10 analogues available for immediate purchase. This enables us to establish SAR in a rapid and cost-effective manner prior to commencing a chemistry program.

Lead development
Our platform is in the medicinal chemistry department of MIPS and considerable expertise is available to expand your hits into leads. The department uses our highly efficient REFIL strategy, enabling rapid exploration of chemical space without the need for a large chemistry program. By combining the efficiency of parallel chemical synthesis with off-rate screening by SPR we can rapidly synthesise 96-well screening plates of compounds to explore SAR along an expansion vector to look for new binding interactions.
The Centre for Drug Candidate Optimisation (CDCO) is a collaborative research centre based within the Monash Institute of Pharmaceutical Sciences that provides biopharmaceutical lead optimisation expertise to academic, commercial and not-for-profit drug discovery programs.

Drug candidate optimisation is a key component of modern drug discovery, playing a critical role in compound design, selection and progression. Optimising physicochemical, metabolism and pharmacokinetic properties of drug candidates is essential in guiding medicinal chemistry, developing formulation and delivery strategies, and informing dosing regimens to ensure safety and efficacy.

**KEY INSTRUMENTATION**
- Six LC/MS instruments coupled with UPLC (triple quadrupole MS and time of flight MS)
- Automated small animal in vivo blood sampling using BASi Culex™
- Automated in vitro assays using a Hamilton MICROLAB® STAR liquid handling robot
- In silico and in vitro methods for profiling physicochemical properties
- Plate based assays for CYP450 metabolic stability, metabolite profiling and metabolic drug interactions
- Cell culture facilities for permeability assessment (Caco-2 or MDCK)

**EXPERTISE**
The CDCO is led by Professor Susan Charman, who has more than 20 years’ experience working and consulting on ADME lead optimisation in collaborative drug discovery programs. Our team is comprised of experienced staff with expertise spanning the five major functional areas responsible for physicochemical profiling, drug metabolism, in vitro biopharmaceutics, in vivo pharmacokinetics and bioanalysis using mass spectrometry. We utilise fully validated scientific platforms to help researchers enhance their chemistry and biology programs. Rather than a one-size-fits-all model, we work with our collaborators to tailor our study designs to the needs of each specific project and ensure we are running the right study at the right time. Our focus is on the timely delivery of high impact, decision-quality data to inform and enhance drug discovery projects, leading to an enhanced IP position for improved commercial attractiveness of the program.

**WORKING WITH US**
- Collaborative research
- Fee for service
- Consultancies
SPECIALIST SERVICES

The CDCO fosters scientific innovation in drug discovery through multidisciplinary collaborations. We provide translational expertise in drug absorption, distribution, metabolism and excretion (ADME) properties of drug candidates.

Physicochemical profiling

The physicochemical properties of drug candidates, including solubility, partitioning, ionisation and stability, underpin all aspects of drug formulation, delivery and disposition. Poor physicochemical properties can contribute to low bioavailability and unfavourable distribution.

Drug metabolism, metabolite identification and metabolic drug-drug interactions

Rapid metabolism is a major limiting feature of many drug candidates and can lead to low oral bioavailability, a short half-life or the production of potentially toxic metabolites. Serious adverse events can also arise through metabolic drug-drug interactions. Understanding metabolic liabilities by identifying metabolites and elucidating metabolic pathways provides a rationale for structural modifications to reduce associated risks.

Bioavailability and pharmacokinetics

Pharmacokinetic (PK) properties dictate the route and frequency of administration, how extensively a drug is distributed throughout the body and how long efficacious concentrations are maintained. An appropriate PK profile is essential in achieving the desired therapeutic response. Defining drug absorption, distribution and clearance processes and mechanisms in preclinical models provides insight into dose and dosage from selection, optimisation of dosing regimens, and prediction of human PK properties.

Bioanalysis

Rapid, specific and quantitative analysis is required to support all aspects of ADME lead optimisation. Specialised LC-MS/MS instrumentation enables the rapid development of specific methods for the analysis of candidate drugs and their metabolites in complex biological matrices.
The Monash Animal Research Platform provides laboratory animal services from several facilities across the Clayton and Parkville campuses as well as the Gippsland Field Station. MARP supports approved research projects through the high quality supply and care of laboratory animals, specialised rodent reproductive services and through the provision of advanced technical and veterinary services across a range of species. The platform exceeds the standards specified in the relevant Codes of Practice and industry regulations. And, is committed to maintaining the health and welfare of animals under its care.

EXPERTISE
- Rodent supply, agistment and customised breeding programs
- Rodent reproductive services including embryo re-derivation, cryopreservation and reanimation
- Access to surgical facilities, imaging and diagnostic equipment and services
- Specialised veterinary services and surgical support
- Supply of animal blood products and antibody production from various animal species
- Rodent import and export services in AQIS accredited facilities
- Supply, agistment, technical and surgical assistance in other species including sheep, mini-pigs, rabbits and guinea pigs

KEY INSTRUMENTATION
- Biosafety hoods
- Laminar flow hoods
- Fume hoods
- Anaesthetic machine

WORKING WITH US
- Fee for service
- Consultancies
- Collaborative research
SPECIALIST SERVICES

Our platform facilities supply and maintain a wide range of animal models including rodents, sheep, mini-pigs, non-human primates as well as other species. Specialist equipment and facilities include a digital X-ray, surgeries and an irradiation suite.

MARP Rodent Reproduction Unit (MRRU)

- The MRRU generates new genetically modified mice lines through the ES cell to mouse process in collaboration with the Australian Phenomics Network. MRRU also conducts sperm cryopreservation and reanimation projects in collaboration with the Australian Phenome Bank.
- MRRU independently offers a wide range of rodent reproduction and GM services including embryo transfer, ES cell, ICSI and pronuclear microinjection techniques, sperm and embryo cryopreservation and IVF.

National non-human primate breeding and research facility

- The national non-human primate Breeding and Research Facility is managed by MARP. This centre was established through NHMRC support, to breed colonies of marmosets and macaques for research use in Australia. The facility provides animals, care and technical support.

Importing and exporting animals

- Importing and exporting animals into and out of Australia can be stressful and can include a lot of administrative paperwork. Our experienced staff process hundreds of imports every year and can manage this process for you including receipt of animals into our quarantine approved premises.
AQUACORE

AquaCore is housed at the Australian Regenerative Medicine Institute (ARMI) and consists of facilities that host diverse fresh and marine water species.

FISHCORE

FishCore is the largest zebrafish facility of its kind in the southern hemisphere. FishCore has 1000 quarantine tanks and 5200 main facility tanks (non-quarantine) and holds more than 100,000 zebrafish. The facility is fully PC2 certified and we house genetically modified and mutant strains of zebrafish to model a variety of human diseases and conditions. Zebrafish are the rising stars of biomedical research and have become a key tool in regenerative medicine research and human disease modelling.

Additional services include phenotyping, micro-injections and a sperm freezing and re-derivation service for any long term storage requirements. The facility has capacity and expertise to house other fresh water species.

SPECIALIST SERVICES

We supply and house genetically modified zebrafish used by researchers to model a variety of human diseases and conditions. Zebrafish are used to improve our understanding of how the body regenerates.

Zebrafish

We provide wild type zebrafish as well as genetically modified and mutant strains. Our facility is the largest of its kind in the southern hemisphere, with 1000 quarantine and 5200 non-quarantine tanks and has the capacity to meet the needs of ARMI, Monash University and the external biomedical research community.

Medaka

In the near future, we will host a small medaka breeding colony. Medaka is a small fresh water species that is used similarly to zebrafish. The availability of inbred strains, compact genome and large evolutionary distance to zebrafish makes medaka a powerful complimentary model to zebrafish.

Phenotyping

In addition to the aquarium facilities, we have a phenotyping laboratory with the infrastructure necessary for phenotypic analyses, embryonic and adult fish manipulation, and the generation of transgenic animals.

Microscopes

Our platform also has microscopes with microinjection apparatus, dedicated confocal microscopy for time-lapse analysis of live animals, and the equipment for laser ablation and single-cell labelling.

Water quality

We have filtration and disinfectant systems in place to ensure the zebrafish are receiving optimal care. These systems provide an environment ideal for the zebrafish and removes harmful pathogenic microorganisms.

Training

Our dedicated team provides training in the use of zebrafish as research models, as well as, in the use of the microscopes within the facility. We also provide advice and contact information for collaborative projects with expert groups using the zebrafish model.
OTHER AQUATIC MODELS

MarineCore
MarineCore has capacity to house diverse marine species and currently hosts a breeding colony of epaulette sharks (*Hemiscyllium ocellatum*) for embryo production. The epaulette shark colony provides researchers with valuable material for embryological, evolutionary and genetic studies.

Axlotl
FishCore hosts a breeding colony of salamanders (axolotl) including genetically modified animals. Salamanders are important model organisms in evolutionary and regenerative biology because of their remarkable capacity to regenerate tissues and organs.

EXPERTISE
FishCore is certified to a PC2 by the Office of the Gene Technology Regulator. It has a large AQIS-approved zebrafish quarantine facility and provides infrastructure and knowhow for imports of zebrafish for laboratories in Australia and overseas.

WORKING WITH US
- Collaborative research
- Fee for service
- Training
FlowCore provides flow cytometry services to researchers within Monash University and the wider scientific community. Flow cytometry is a high speed laser based technology enabling users to generate multiparametric data about the size and shape of the proteins associated with cells or particles of interest. It is a powerful tool in many fields including immunology, stem cell science, cancer research, aquatic biology and plant biology.

**KEY INSTRUMENTATION**

**Cell sorters**
- BD Influx – five lasers (in a biohazard containment unit)
- BD Influx – five lasers
- BD Influx – four lasers
- BD FACS ARIA sorter – five lasers (in a biohazard containment unit)

**Analysers**
- BD LSRII – four lasers
- BD LSRII – seven lasers
- BD Fortessa – four lasers
- Two BD Fortessa – five lasers

**EXPERTISE**

Our platform is run by five dedicated full-time staff with more than 50 years combined experience in flow cytometry. Services provided by our team include operation of the sorters, provision of training and assistance for the analysers and consultation for researchers requiring help with experimental design.

**WORKING WITH US**

- Fee for service
- Training
SPECIALIST SERVICES

Cell sorting
Cell sorting, or separation is provided as a service, where each sort is personally set up and supervised by a dedicated staff member. As a result, researchers can be confident in the pure populations of cells that are isolated for them, which they are able to use in subsequent in vitro or in vivo assays.

Flow cytometric analysis
Users are trained to run their samples on the analysis cytometers and are able to generate large amounts of data in a short time. The cytometers can be fitted with a high-throughput sampler allowing researchers to analyse samples in 96-well plates, further speeding up the analysis process. High level sorting biocontainment available.

Data analysis
Our platform holds the site licence for FlowJo (Treestar), a specialised flow cytometry data analysis software. This provides researchers with access to high end software with which to dissect their acquired data.

Training
We provide training to researchers on the analysis cytometers on a regular basis. We also hold educational seminars and user group meetings which allow researchers from different fields, who are conducting flow cytometry experiments, to come together and learn about developments in the field.
Monash Histology Platform (MHP) is a world class, full service histology laboratory operating to international quality standards and certified to ISO 9001. MHP supports the local and national research community, providing specialised services, training and consultation.

We provide all paraffin, frozen section, methacrylate and epoxy resin processing, sectioning and staining services, in addition to slide scanning and digital imaging, tissue microarray generation and automated immunohistochemical staining. Our delivery of consistent, high quality and timely outputs assists researchers in the delivery of highly innovative, cutting edge research outputs in all aspects of histology.

**KEY INSTRUMENTATION**

- Tissue processors – Leica Peloris II and Leica ASP300s
- Cassette writer – Thermo Fisher Printmate
- Slide writers – Thermo Fisher SlideMates
- Tissue embedding centres – Leica and Medite Tes Valida embedding units
- Rotary microtomes – Microtec, Microm and Leica Mikrotomes
- Cryostats – Leica 3050S / CM1850
- Autostainer and coverslipper – Leica ST5010 Autostainer and CV5030 Coverslipper
- Immunohistochemistry Autostainers – Dako Autostainer Plus and Dako Autostainer Link 48
- Immunohistochemistry antigen retrieval – Dako PT Links
- Multi-header microscope – Olympus BX50
- Fluorescent microscope/Polarizer/DP12/ digital camera – Olympus BX41 2x, Leica DFC450C, Olympus polariser U-ANT, Olympus DP12
- Micro tissue arrayer – Beecher MTA-1
- Slide scanners – Aperio AT Scanscope Turbo, Aperio FL Scanscope, Olympus VT120

**EXPERTISE**

The demand for access to quality histology services across Monash University’s precinct and partners, has initiated the development of two further histology nodes operating under the direction of MHP. The AMREP and MHTP Histology nodes have contributed to, and assisted in, improving histological research outputs and outcomes for both local and external researchers. The nodes, together with the centralised MHP facility, deliver quality processes and services to researchers, as well as providing expert training and regular contact with our highly experienced team.

Our team have a wealth of experience in routine histology, immunofluorescence and microscopy techniques, specialised immunohistochemistry, multi-label immunofluorescence and confocal microscopy. We also have resident experts in resin section cutting for both light and electron microscopy. The team are qualified to assist in any histological project from design and implementation through to troubleshooting.

**WORKING WITH US**

- Fee for service
- Consultancies
- Collaborative research
SPECIALIST SERVICES

Our platform has two service streams: a full end-to-end service provided by specialist staff, and self-service providing access to specialised laboratory equipment and staining reagents. In addition, our team provide advice, training and research assistance. We operate on a fee for service basis for all services and laboratory access.

Both the paraffin and resin laboratories are vital components of our service provision. The areas have been developed to meet the demand, quality and high-throughput needs of researchers, academic staff and students. Our team is well known for their ability to produce high quality, accurate results in an efficient, timely manner, together with provision of advanced training programs.

Paraffin laboratories

The paraffin laboratories are equipped with a range of equipment to tackle the most demanding of processing requirements including:

- Fully equipped dissection areas and a cassette writer
- Rapid, dual processing Peloris and ASP300™ tissue processors providing efficient, reliable and timely processing to paraffin wax
- Embedding units for high quality paraffin blocking
- Modern microtomes for specimen sectioning
- Fully equipped staining areas including an automated staining unit with coverslipper, together with manual options for self-staining and coverslipping
- Cryostats for frozen section generation
- Automated immunostaining units providing high-throughput and consistency for immunohistochemical and immunofluorescent staining

Resin laboratory

The resin laboratory (located at the Clayton campus) provides specialised processing, sectioning and staining services for projects requiring resin sections. The laboratory is well equipped with Leica RM2165 microtomes and Leica Ultra microtomes for cutting both methacrylate (GMA) and epoxy resins for light and electron microscopy. A Leica RM2265 microtome with a stereomicroscope is available for visualisation of small specimens. A fully equipped staining area includes an automated staining unit with coverslipper, together with manual options for DIY staining and coverslipping.

Other services

Other specialised equipment includes a state-of-the-art vibratome, digital camera for imaging and a multi-header microscope. A tissue microarray (TMA) unit enables development of uniquely designed multi-core TMA blocks, while access to brightfield and fluorescent slide scanning bring your digitalised histology sections direct to your screen.
Monash Micro Imaging (MMI) is world class in optical imaging. We have core facilities at the Clayton campus and specialised nodes at the Monash Health Translation Precinct and the Alfred Medical Research and Education Precinct. MMI technologies include advanced light microscopy, fluorescence and confocal microscopy, multiphoton microscopy, super-resolution microscopy, lightsheet microscopy, which cater for a diverse range of morphological and functional characterisation in the life sciences. All technologies are underpinned by bioimage analysis, and research training.

KEY INSTRUMENTATION

Our instrumentation is sourced from major innovative microscope companies, including Leica, Zeiss, Olympus, Nikon, Abberior, Lavision [bullet] Biotec, and Intelligent Imaging Innovations (3i).

- Widefield fluorescence microscopy
- Polarisation microscopy
- Confocal microscopy
- Multiphoton microscopy
- Deconvolution microscopy
- Stereology (at MHTP)
- Super-resolution Microscopy: dSTORM, N-STORM/N-SIM, and STED
- Lightsheet microscopy: including Lattice Lightsheet, OpenSPIM and Ultramicroscopy
- Dynamic Fluorescence analysis: FRAP, FLIM, FCS, photoactivation, ratiometric approaches
- Image analysis: ImageJ/FIJI, Metamorph, CellSens, LASAF, NIS elements, SymPhoTime (FLIM), Imaris Suite, Huygens Core/Professional, Drishti

EXPERTISE

Our team provide expertise and training across a wide range of analytical microscopes and microscopy modalities in the biomedical and life sciences. Our services range in complexity from sample preparation and labelling for fluorescence analysis to performing live cell experiments for cell signalling and organ/organism development. We provide guidance and training to allow scientists and students to undertake cutting edge analytical research with confidence.

Our platform works closely with other MTRPs, such as Histology, Cryo-EM and eResearch, to provide integrated microscopy support to a large research community.

WORKING WITH US

- Fee for access
- Training
- Collaborative research
SPECIALIST SERVICES

Our team provides advanced microscopy instrumentation and analytical techniques to a large research community. Ranging in complexity from the simple labelling and mounting of slides for immuno-fluorescence microscopy, to live imaging in multiwell plates or sophisticated perfusion chambers, we will guide and train you to perform experiments, produce high quality images and extract analytical data.

Advanced light and fluorescence microscopy

Our instrumentation provides a solid platform of advanced light and fluorescence microscopy techniques, including automation, high-speed imaging, time lapse, slide scanning (in conjunction with our Histology Platform) and image tiling, and live cell imaging on slides, chambers or microplates. Both upright and inverted instruments are available, and all systems are supported by a comprehensive range of professional software for bioimage analysis to provide quantitative results.

Live cell imaging is one of our specialities

Most of our instruments are equipped with live cell incubators, specialised cell chambers or multiwell plates that support live and long term imaging experiments. We have extensive knowledge in experimental design, labelling and analysis.

Optical sectioning and 3D analysis

Our range of instrument modalities include confocal (laser scanning and spinning disk) and multiphoton microscopes. For high speed imaging, we have resonant scanning confocal and lightsheet microscopes. Imaging deeper into tissue can also be done by multiphoton imaging in live, fixed or cleared tissue microscopy which is capable of imaging to a depth of 2-6mm with specialised objectives.

Special methods and emerging technologies

Our expert staff offer extensive collaborative support for the more novel or complex instruments and applications, including Fluorescence Lifetime Imaging Microscopy (FLIM), Lattice Lightsheet Microscopy, single molecule localisation microscopy (dSTORM, N- STORM), Stimulated Emission Depletion Microscopy (STED), Structured Illumination Microscopy (N-SIM), birefringence microscopy and, in conjunction with the Cryo-EM platform, correlative light and electron microscopy.

Image analytics and data handling

Extracting and understanding bioimaging data is crucial, and handling big datasets is often a bottleneck in research. Our bioimage analysis team is available to train scientists and students in the analytical software we licence (ImageJ/ FIJI, Imaris, Huygens, Metamorph), and they are also able to develop workflows and new analytical methods. In conjunction with eResearch, we are also building data handling and analysis pipelines to facilitate the flow of (big)data from instrument to computational workspaces and ultimately to publication.
The Monash Ramaciotti Centre for Cryo-Electron Microscopy (cryo-EM) is a leading research facility for biological electron microscopy.

Our platform provides expertise in advanced electron microscopy for biomedical discoveries at the molecular and cellular level. We offer a range of bio EM techniques from scanning electron microscopy (SEM) and transmission electron microscopy (TEM) to immuno electron microscopy, correlative light and electron microscopy, cryo-tomography and structure determination using single particle cryo-EM.

We maintain a suite of advanced electron microscopes, including Australia’s first Titan Krios – currently the most powerful microscope for bio EM.

SPECIALIST SERVICES
- Single particle analysis
- Immuno electron microscopy
- Scanning electron microscopy
- Structural cryo-EM
- Correlative microscopy
- Transmission electron microscopy
- Tomography

EXPERTISE
Our platform supports Australian researchers by developing and applying advanced imaging techniques to study the life sciences.

We conduct research into advanced bio EM techniques. The team also provides training and expertise to Australian and international collaborators on advanced EM projects.

WORKING WITH US
- Fee for facility access
- Consultancies
- Collaborative research
- Training
KEY INSTRUMENTATION

Transmission electron microscopes (TEM)
Our platform houses four TEMs, including a FEI Titan Krios: Australia’s most powerful biological TEM. The Krios is a 300kV cryo-TEM designed for automatic data collection. It is equipped with a highly sensitive Falcon III direct electron detector, an energy filter, phase plate and a K2 Summit direct electron detector. The Krios also has a robotic autoloader capable of holding 12 EM grids under liquid nitrogen conditions. Software packages, EPU for single particle and Tomo 4 for tomography, are available for data collection.

The facility also houses a Talos Arctica, a 200kV cryo-TEM dedicated to structural cryo-EM, a Tecnai G2 Spirit (120kV) used for cryo applications and a Jeol JEM-1400Flash for standard TEM.

Focused ion beam scanning electron microscope (FIBSEM) and scanning electron microscope (SEM)
The Ramaciotti Centre houses Australia’s first dedicated cryo-FIBSEM, a Helios G4 UX with a Leica VCT500 cryostage. The Helios G4 UX is also equipped with an EasyLift NanoManipulator, and Oxford EDS system, and software for Slice & View, CLEM, TEM lamellae preparation, and 3D EDS analysis. The platform also has a FEI Nova NanoSEM, capable of imaging life science structures in the nanometer range.

Sample preparation suite
The facility has dedicated equipment to prepare proteins, viruses, bacteria, cells, tissues and small organisms for life sciences EM. The facility houses dedicated cryopreservation and sample preparation equipment. We have an FEI Vitrobot Mark IV freeze plunger, Leica EMPact2 high pressure freezer, Leica UC7/FC7 cryo-ultramicrotomes and a Leica cryo high vacuum coating unit EM ACE600.
At Monash Biomedical Imaging (MBI), our full suite of multimodal and simultaneous imaging equipment alongside human testing facilities, support researchers from various disciplines to conduct their pre-clinical and clinical research.

Our expert research support teams and administrative staff provide valuable guidance to enhance research project outcomes with the imaging data obtained using our range of technologies.

Located next to the Australian Synchrotron and as part of the Monash Technology Research Platforms group, MBI is uniquely positioned to offer researchers access to a centrally located and managed suite of biomedical imaging facilities.

EXPERTISE

MBI offers a broad range of experts available to assist researchers from various fields.

Our dedicated team includes electrical engineers, biomedical engineers, radiologists, psychologists, medical imaging technologists, MRI physicists, cognitive neuroscientists and applied mathematicians.

Our team can also help you to coordinate access across our facilities, as well as provide training and technique and methods development if required.

Researchers from Monash University and other Australian and international universities benefit from our full suite of imaging technologies and experts across three coordinated Melbourne locations.

WORKING WITH US

- Collaborative research
- Fee for service
- Consultancies
IMAGING TECHNOLOGIES

Clinical research imaging

MBI’s magnetic resonance imaging (MRI) scanners are all located within one centre at Clayton. In addition to a 3 Tesla MRI scanner, we also house Australia’s only research-dedicated simultaneous MR-PET scanner.

Our primary research applications for MRI include neurocognitive, neurovascular, cardiovascular, respiratory and oncology imaging, and novel techniques and expertise in advanced imaging protocols.

Magnetic Resonance Imaging

The Siemens 3T Skyra is equipped with the latest hardware and software tools that allow regional and head-to-toe imaging. The scanner has a 70cm wide bore, multi-transmit capabilities and a full range of imaging coils including an advanced 32-channel head coil, and the latest head and neck, spine and body array coils. The scanner console includes advanced reconstruction and analysis software, and multinuclear capabilities for functional and diffusion neuroimaging, perfusion imaging, flow quantification, and cardiovascular and musculoskeletal imaging.

Simultaneous MR-PET

The Siemens Biograph mMR scanner is capable of simultaneous magnetic resonance and positron emission tomography (MR-PET) imaging, allowing concurrent acquisition of anatomy, function and metabolism. Using this advanced technology, researchers are now able to obtain simultaneous information about the anatomy, function and metabolic processes in the body.

PRE-CLINICAL IMAGING

Multimodal imaging

MBI operates imaging technologies across three Melbourne locations in Clayton, Prahran and Parkville. The Clayton campus is ideally situated next to the Australian Synchrotron to further enhance MBI’s multimodal imaging capabilities.

Molecular imaging

MBI offers state-of-the-art small animal molecular imaging at all three locations. Our technologies include imaging metabolic disease, tumour progression and neurodegenerative conditions.

Computer tomography

MBI operates high-resolution small animal 3D X-ray imaging computer tomography (CT) alongside our molecular imaging capabilities at all our locations. This versatile technology is ideal for in vivo imaging of live small animal bones, lungs and implanted medical devices. MBI’s large and small bore CT scanners offer a wide capacity for imaging, including digital archiving of museum specimens, mapping contrast enhanced soft tissue and investigating 3D structures.

Soft tissue imaging

MBI’s small animal MRI scanners at two Melbourne locations are capable of high-definition in vivo structural and functional imaging of internal organs and pathology. We also offer MRI scanning of large animals using our Siemens 3T Skyra. The primary research applications for MRI include stroke, oncology, neural tracing, oedema and fibrosis. Our small animal high-frequency ultrasound also offers excellent imaging and measurement of cardiac and blood vessel function, and tissue perfusion.

Other stand alone and MR-compatible technologies:

- Electroencephalography (EEG) is a non-invasive method of measuring brain activity and is extensively used in cognitive research.
- Ocular Motor/Eye Tracking systems are either stand alone or MR-compatible to measure ocular motor function.
- Transcranial Magnetic Stimulation (TMS) is a non-invasive method used to manipulate neuronal activity.
- Various auxiliary sensors to measure EMG, ECG, respiration rate and skin conductance, both inside and outside of the scanner.
- Hyperpolarised Xenon Gas Imaging to measure the structure and function of the respiratory system.
The Monash Centre for Electron Microscopy performs research in the development and application of electron microscopy methods and provides advanced instrumentation, expertise and teaching in electron microscopy. By enabling the determination of the composition, structure and bonding of materials down to the atomic scale, we can provide solutions to key problems across the non-biological sciences and engineering.

**CENTRE FOR ELECTRON MICROSCOPY**

**KEY INSTRUMENTATION**

Our platform houses four transmission electron microscopes, three scanning electron microscopes and a dual beam focused ion beam microscope, as well as a broad range of instrumentation for sample preparation and data analysis.

These microscopes are housed in an award-winning building designed to provide exceptional mechanical, thermal and electromagnetic stability to optimise instrument performance: one of the most stable buildings in the world.

We also have Australia’s only double-aberration-corrected transmission electron microscope: the highest resolution microscope in Australia and one of a small number worldwide.

**TEM**
- Double-corrected FEI Titan² 80-300 FEGTEM
- JEOL JEM 2100F FEGTEM
- FEI Tecnai G2 F20 S-TWIN FEGTEM
- FEI Tecnai G2 T20 TWIN TEM

**SEM/FIB**
- FEI Magellan 400 FEGSEM
- FEI Nova NanoSEM 450 FEGSEM
- JEOL JSM-7001F FEGSEM
- FEI Quanta 3D FIB/FEGSEM

**EXPERTISE**

Our team conduct research and provide expertise in the development and application of electron microscopy methods. This includes all forms of electron diffraction, imaging and spectroscopy in transmission and scanning modes.

**WORKING WITH US**
- Training
- Expertise and instrumentation
- Collaborative research
- Fee for access
SPECIALIST SERVICES

We conduct specialist research in advanced electron microscopy and provide advanced instrumentation, expertise and training in scanning and transmission electron microscopy.

We support and collaborate with researchers from Monash University, other universities, government research agencies and industry. Our staff and equipment provide a complementary facility to the Monash Ramaciotti Centre for Cryo-Electron Microscopy and the Australian Synchrotron – located adjacent to Monash University’s Clayton campus.

Transmission electron microscopy (TEM)

Our centre houses four advanced TEMs capable of examining materials at the atomic scale. These range from conventional microscopes for routine applications, through to the world-class ‘double-corrected FEI Titan3 80-300 FEGTEM’. This instrument is capable of imaging atomic structures with a resolution of less than one-tenth of a nanometre and acquiring chemical information selectively from just one or two atomic columns.

- Quantitative Atomic Resolution and Aberration Corrected Electron Microscopy
  - Scanning Transmission Electron Microscopy (STEM): Pixelated, BF, ABF, ADF, DPC,
  - Phase Contrast High Resolution Electron Microscopy
- Electron Diffraction: selected area, convergent beam, large angle, scanning (4D STEM)
- Quantitative Analytical Spectroscopy and Mapping
  - Electron Energy Loss Spectroscopy
  - Energy Dispersive X-ray Spectroscopy
  - ALCHEMI
- Electron Tomography via STEM and TEM
- Scanning Confocal Electron Microscopy
- Electron scattering theory and computation; elastic and inelastic
- In situ heating, biasing and cooling close to liquid nitrogen and helium temperatures

Scanning electron microscopy (SEM) and focused ion beam (FIB)

We have three SEMs and one FIB/SEM system capable of imaging surface features down to 2nm in size. All SEMs are fitted with equipment allowing the chemical composition and crystal structure of materials to be studied. The FIB can be used to prepare site specific cross sections at the sub-micron scale.

Specimen Preparation

A suite of specimen preparation techniques, including:

- Etching, dimpling, sawing, polishing and coating
- Electropolishing
- Precision Ion Polishing
- Tripod Polishing
- Ultramicrotomy of hard and composite materials
- Plasma cleaning

Data analysis

Specialist expertise plus a suite of commercial, public domain and in-house computer programs for data analysis and interpretation:

- Crystallography programs and data bases
- High energy electron scattering calculations, elastic and inelastic
- Low energy electron trajectory and X-ray production calculations
- Electron Back Scatter Diffraction analysis
- Energy Dispersive X-ray Spectroscopy analysis
- Electron Energy Loss Spectroscopy analysis
- Pixelated (4D) STEM analysis
- Tomographic reconstruction, visualisation and analysis
eResearch is 21st century discovery through the application of advanced computing, data informatics and IT. The Monash eResearch Centre partners with research groups to accelerate and transform research by connecting them to the most appropriate hardware, environments, software and skills. It leads a number of national and international eResearch initiatives and has links with: AuScope, MASSIVE and the Monash Bioinformatics and Immersive Visualisation platforms.

**KEY INSTRUMENTATION**
- High performance computing – MASSIVE and Monash Campus Cluster MonARCH
- Research data management – Store.Monash, FigShare and MyTardis
- Research data storage – VicNODE, Monash RDS
- Research Cloud – R@CMon NeCTAR research cloud
- Virtual laboratories – characterisation virtual laboratory
- Research visualisation – immersive visualisation and CAVE2

**EXPERTISE**
Our eResearch team are specialists in advanced computing, informatics and IT. They work in collaboration with researchers and in partnership with service providers, such as the Faculty of IT, eSolutions and the library, to mobilise tools infrastructure and expertise as required.

**WORKING WITH US**
- Fee for service
- Consultancies
- Collaborative research
SPECIALIST SERVICES

Our platform is a partnership between the Vice-Provost (Research and Research Infrastructure), eSolutions, the library and faculties. We provide services to the Monash community and beyond.

Collect – capture, store and manage research data
To ensure research data availability, researchers need to effectively manage and securely store and backup their data. This capability provides researchers with solutions for capturing data from instruments and experiments, managing and sharing it for reuse.

Compute – HPC facilities and expertise for data processing, modelling, simulation and visualisation
Researchers at Monash can access a variety of High Performance Computing (HPC) facilities including MASSIVE, NCI National Facility, the local Monash Campus Cluster (MonARCH) and Research @ Cloud Monash (R@CMon). We provide specialist expertise in all aspects of scientific computing, including simulation, data processing, visualisation, and cloud computing.

Comprehend – immersive visualisation
Visualisation facilitates the comprehension of research data and can lead to new research discoveries. The Monash Immersive Visualisation Platform (MIVP) supports and accelerates collaborative, visualisation-led discovery in the Big Data era, with applications in academic and commercial research, and translation of research. MIVP offers state-of-the-art immersive 2D/3D visualisation environments including the CAVE2.

Collaborate – virtual labs and collaborative research platforms
Researchers often need to collaborate with colleagues in other research institutions around the world and across research disciplines. This service provides researchers with various solutions to foster and enhance their research collaborations.

Communicate – disseminate and promote discovery of research outcomes and artefacts
This capability facilitates discovery, access and reuse of research data. This can support research outcomes, enhance research impact and assist researchers to comply with funding rules.

Customise – resources for planning and building research hardware and software
This capability allows researchers to easily access highly-skilled software and web developers to create innovative and customised research hardware and software.

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MASSIVE

MASSIVE is an integrative high performance computing (HPC) facility that underpins a wide selection of next-generation Australian instruments and their users. Our capabilities are applied across a range of research disciplines, including biomedical science, materials research, engineering and geosciences. We underpin a range of scientific instruments, including synchrotron X-ray and infrared imaging, functional and structural magnetic resonance imaging (MRI), X-ray computer tomography (CT), electron microscopy and optical microscopy. Our team develops environments and runs facilities to process, analyse and visualise scientific data.

MASSIVE is a collaboration between Monash University, CSIRO, ANSTO and University of Wollongong.

KEY INSTRUMENTATION

M2 at Monash University
- 1720 CPU-cores
- NVIDIA M2070 and K20 GPUs
- 4x QDR Infiniband interconnect
- 500TB parallel file system

M3 at Monash University
- 4000 CPU-cores
- 136 NVIDIA K80, P100 and V100 GPUs
- 100Gb/s Mellanox Spectrum interconnect
- 3PT parallel file system

CVL on the NeCTAR Research Cloud
- 350 CPU-cores across several configurations

EXPERTISE

Our team provides support and programs to on-board new researchers from fields of science that have not traditionally used HPC. We focus on applied data science and applied artificial intelligence, to address the data challenges faced by a broad spectrum of researchers. Our capabilities are used by a range of research disciplines, including biomedical science, materials research, engineering and geosciences.

WORKING WITH US
- Collaborative research
- Fee for service
- Training
SPECIALIST SERVICES

Our services and capabilities are delivered through the combination of computing hardware, software and expertise located at the Australian Synchrotron and Monash University. MASSIVE also provides services to users on the cloud as the lead developer and operator of the Characterisation Virtual Laboratory (CVL).

We run a dedicated program to integrate instruments with HPC, this provides scientists with the ability to perform fast and sophisticated analysis of captured data. Our HPC facility supports large-scale analysis for in-experiment data processing, this increases the return-on-investment by ensuring resources are used efficiently and researchers can make decisions faster.

MASSIVE provides support and programs to on-board new researchers from fields of science new to HPC. The uptake of advanced instrumentation by scientific communities is driving demand for computing services by fields of science that are new to the problems associated with big data. We have remote desktop access for the wide cohort of experimental or wet-lab scientists who are increasingly collecting large data sets.

Our data science tools and hardware help a broad spectrum of researchers address their data challenges. The confluence of big data, deep neural networks and tightly coupled parallel computing is enabling researchers to gain insight previously impossible.

High performance computing hardware

The MASSIVE computers, M1, M2 and most recently M3, were designed specifically with several features to fulfill core data processing and visualisation requirements.

Our computers are underpinned by three high performance parallel file systems with over 1.8 petabytes (PB) of storage. Fast reading and writing of data is essential to enable image processing as required by several facilities in the Clayton precinct including, the Imaging and Medical Beamline (IMBL) and the Ramaciotti Centre for Cryo-Electron Microscopy. All three computers are equipped with NVIDIA GPUs for fast rendering, remote visualisation, data processing and simulation problems.
Monash Immersive Visualisation Platform (MIVP) operates Monash University’s advanced visualisation systems. We are a team of highly skilled scientific and graphics programmers, who support users by applying established and emerging data visualisation and processing techniques and technologies to contemporary research and industry challenges. It is our vision to enable new understanding, and bring forward the greatest discoveries, by capitalising on advanced immersive visualisation and accelerated computing capabilities.

KEY INSTRUMENTATION

Display systems
Monash CAVE2
- 84 million pixel, HD displays
- 22.2 channel audio
- 4TB RAM
- 240GB graphics memory
- Tracked glasses and wand
- Five video capture inputs

Monash TRIO
- 24 million pixels, UHD displays

Monash ‘Big Windows’
- 32 million pixels
- Lectern, keyboard and mouse

Software
- LavaVU (Monash)
- Omegalib (UIC EVL)
- CalVR (UCSD Calit2)
- S2PLOT (Swinburne, Monash)
- SAGE (UIC EVL)
- Unity

EXPERTISE

Our team of programmers have experience in many disciplines, including geoscience, biomedical imaging, scientific visualisation, radioastronomy, computer vision, virtual reality and more. Our expertise extends across computer graphics, parallel supercomputing, GPU-accelerated computation and visualisation, cross-platform and web-based 3D visualisation as well as, methods for publishing 3D figures and images.

WORKING WITH US

- Fee for service
- Consultancies
- Collaborative research
- Training
SPECIALIST SERVICES

The Monash CAVE2™ is an ultrascale 2D and 3D display system featuring Virtual Reality (VR) aspects. However, our platform is suited to collaborative visualisation activities as 12 people can view the VR at the same time. CAVE2 leverages Monash’s expertise in high performance computing, computer graphics and networks, to render terascale datasets in unparalleled clarity. CAVE2 plays many roles in the 21st century microscope:

Viewfinder
CAVE2 enables the immersive visualisation of very large images from sources including the Australian Synchrotron, electron microscopes and medical imaging instruments. All 2D, 3D and 4D images are easily examined in the CAVE2.

Virtual fieldwork space
CAVE2 enables the interactive exploration and characterisation of mapped or imaged environments, such as mines, farms and archaeological sites. Meshes computed via photogrammetry and LIDAR point clouds – even those approaching one billion points in number – are simple to study in the CAVE2.

Virtual retail environment
CAVE2 enables the simulation and assessment of retail spaces and shelving, as well as real-time integration of inventory level information.

Decision theatre
CAVE2 enables the collaborative, surround review of design models, building plans, architectural spaces, and more. Three dimensional models, rendered fly-throughs, and BIMs can be loaded and displayed in CAVE2.
Helix, a health data ecosystem operated by expert staff and underpinned by world-class research infrastructure, spearheads a new era in healthcare research that will drive personalised medicine and significantly accelerate progress towards a healthier society. This capability is an initiative of Monash University working collaboratively with key health partners, including Alfred, Eastern, Monash and Peninsula Health.

HEALTH DATA CAPABILITIES

- Secure data management – REDCap
- Governed environments for data sharing – Monash SeRP
- Secure virtual environments for statistical data analysis
- High performance computing, Research Cloud and
- Research data storage – eResearch Centre and MASSIVE

EXPERTISE

The combination of the sheer scale of Monash University’s health datasets – which collate hundreds of thousands of data points within clinical trials, medical and population studies – underpinned by high-performance and specialised IT infrastructure will enable use of the latest developments in technologies like artificial intelligence (AI), offering researchers a ground-breaking new research environment that incorporates privacy by design.

WORKING WITH US

- Fee for service
- Consultancies
- Collaborative research
SPECIALIST SERVICES

Health research software development
We have staff with expertise in software development who can work with researchers to co-design solutions that leverage Monash University’s high performance and specialised IT infrastructure. We also design systems around the principles of privacy to ensure a secure and controlled platform.

Health database hosting/maintenance
Database hosting and maintenance services are provided to safeguard patient data and implement best practice methodologies to support health research.

Collaborative platforms
Data is the foundation for all health research. Helix provides best practice in managing, sharing and analysing data with secure and monitored access.

Data linkage
Linking data from health services and community partners enable the prediction and prevention of adverse health outcomes with greater accuracy. We have the expertise and infrastructure to link research datasets.
The Monash South East Asia Community Observatory (SEACO) is a research platform in population health and wellbeing in regional Malaysia – a high middle-income country. We launched the platform in late 2011. The primary purpose in Segamat is to collect salient and high-quality data to gain insights into the factors that affect health in a whole of life context.

**SERVICE MODELS**

We offer our partners and collaborators access to unique data as well as the capability to research specific health and social issues on an existing platform. All primary data collection is governed by strict ethics protocols to protect the privacy of the participants, regardless of the service model.

**Industry funded trials**

These range across health promotion technologies, diagnostics, drugs and vaccines. They can be used from sampling frames to the complete implementation of community-based clinical trials.

**Inclusion of specific questions**

Have your research questions included in our routine surveys.

**Data collection**

We can help with undertaking your data collection on a sample independent of our routine update rounds.

**High degree placements**

We can place higher degree by research students who would use SEACO infrastructure to undertake their primary data collection.

**EXPERTISE**

We are not a traditional cohort study. Our expertise lies in us being a partner with the community of Segamat. People from the community work with us, work for us and we have many volunteers who dedicate their time and efforts because they are passionate about improving their community. We are supported by high-profile researchers nationally and internationally. SEACO is cross-faculty, cross-disciplinary and multi-institutional. Our major supporters are the Faculty of Arts (Monash) and the Jeffrey Cheah School of Medicine and Health Sciences.

**WORKING WITH US**

- Collaborative research
- Fee for service
- Training
SPECIALIST SERVICES

By collecting salient, high-quality data, we are able to provide the medical research community, government and industry with a solid understanding of the health and social issues facing middle-income communities. This, in turn, allows greater insight into the impact of policy and commercial decisions on the health and wellbeing within these populations.

Data collection
The strength in our data is its relevance to the community. We work in partnership with all levels of the Segamat community through activities such as family days, health clinics, professional seminars and medical education programs.

Research
Our platform provides an ideal setting for higher degree by research students, including masters and PhDs. We also support research students from other institutions who are interested in: undertaking research through primary data collection; taking advantage of the research infrastructure; or; through the analysis of secondary data collected by our platform.
The Monash Instrumentation facility provides electronic and mechanical engineering services for the design and development of custom instrumentation and laboratory equipment to meet specialised research needs. The team of engineers and technicians are experienced in all aspects of design and construction.

KEY INSTRUMENTATION

CNC machining
- Okuma vertical machining centre (45VA)
- Okuma Genos L300MY lathe with milling function
- Bridgeport Interact 1 MK2 toolmaker milling machine

Electric Discharge Machine (EDM)
- Sodick AQ300L Wire EDM machine

Metal fabrication
- TIG, MIG and oxyacetylene welding
- Silver soldering, brazing and guillotining

EXPERTISE

Our team can provide you with whole instrument design and/or bespoke construction services. Much outstanding research requires instrumentation which is not available commercially. We have been working with the research community to ensure researchers are limited only by their imagination and ingenuity, rather than being limited by what has been commercialised by others.

WORKING WITH US

- Fee for service
- Consultancies
SPECIALIST SERVICES

We provide bespoke services to the research community. Our team has a broad range of skills including CAD design and electronic and mechanical engineering.

Machining
We have the capability to machine and manufacture components and systems from a variety of materials including plastics, metal and wood. Our team is equipped with Computer Numeric Controlled (CNC) machines as well as Electric Discharge Machines (EDM).

Design
We work with you to get the design right. The products we produce nearly always start from back of the envelope sketches. When we are 100 per cent sure of the requirements we provide full CAD drawings and 3D models for you to review.

Electronics
We design and develop the necessary electronic components for your research needs. Some of our projects are realised using sophisticated simulation software, while others are produced with professional CAD and CAM software. We also provide a repair service – our team can fix most electronic equipment and test it using novel tools and equipment.

EDM wire cutting
Our facility houses a Sodick AQ300L Wire electric discharge machining machine.
We use this to cut plates, make punches, tools and dies from any conductive material including hard metals that are too difficult to machine using other methods. Our machine produces products with smooth surfaces that do not require further finishing or polishing.

Metal fabrication
The metal fabrication area can produce delicate instrumentation as well as large robust mechanical structures. No job is too big or too small. We can work with aluminium, stainless/mild steel, copper, brass and most other metals. We can perform welding, silver soldering, brazing and guillotining services.
The Monash X-Ray Platform (MXP) provides advanced X-ray diffraction (XRD) and scattering equipment, expertise and training to Monash, the wider research community and industry.

Utilising a range of X-ray based techniques, we enable the structural characterisation of engineered, synthesised and geological crystalline materials through identification and characterisation of compounds based on their diffraction and scattering patterns.

**KEY INSTRUMENTATION**

The MXP houses five X-ray diffractometers and one small angle scattering system:
- Bruker D8 Advance Diffractometer
- Bruker D8 Discover Diffractometer
- Bruker N8 Horizon Small Angle X-ray Scattering (SAXS) System
- Bruker D8 Advance Eco (Copper radiation source)
- Bruker D8 Advance Eco (Cobalt radiation source)
- Bruker D2 Phaser

**EXPERTISE**

The MXP supports innovation across multiple disciplines, including in the design of materials for industrial, environmental and biomedical applications and development of green technologies and processes for energy production and mining.

We are experts in providing custom training, advice and services to the research community on X-ray based capabilities. We enjoy solving complex materials characterisation challenges, often providing a holistic approach through close links with other platforms at Monash.

**WORKING WITH US**

- Training
- Fee for service
- Consultancies
- Research support
SPECIALIST SERVICES

Structural characterisation
X-ray diffraction can provide information such as phase identification, quantification, crystallinity, crystallite size and lattice parameters on samples including powders, thin films and bulk materials.

Texture and residual stress analysis in metals and alloys
Investigating the distribution of crystallographic orientations of a polycrystalline sample. Non-destructive measurement and mapping of residual stress for bulk samples with a 1D or 2D detector.

In-situ, powder X-ray diffraction
In-situ, powder X-ray diffraction as a function of temperature and atmosphere using two variable temperature stages.

Transmission mode X-ray diffraction
Capillary or thin film transmission setup for samples with preferred orientation and/or low X-ray absorption (e.g. organics).

Small angle X-ray scattering (SAXS)
Small angle X-ray scattering is a transmission technique where the beam passes through the sample to provide information about the shapes, sizes and distributions of particles and pores and the nanometre-range structure of materials.

Grazing incidence X-ray diffraction (GIXD)
Identification of crystalline materials on surfaces or in thin films down to 10 nm.
The Monash Centre for Additive Manufacturing takes fundamental research from a broad range of disciplines and applies them to manufacturing challenges. These disciplines include materials science, alloy design and processing, mechanical and aerospace engineering, structure design and simulation, surface engineering, corrosion and hybrid materials. We work with our partners to invent bespoke solutions to unique manufacturing challenges. Using networks within the Clayton precinct and beyond, we draw on a number of different cutting-edge capabilities and expertise, we then apply them in novel and innovative ways to provide new opportunities for manufacturers.

**KEY INSTRUMENTATION**

Our platform houses powder bed and deposition 3D printers, as well as, other tools for post and pre-printing needs.

**Selective Laser Melting (SLM)**
- Concept Laser XLine 2000R (800 x 400 x 500mm)
- Concept Laser XLine 1000R (600 x 400 x 500mm)
- EOS M290 (250 x 250 x 300mm)
- EOS M280 (250 x 250 x 300mm)

**Laser Metal Deposition (LMD)**
- Trumpf TruLaser Cell 7040 (work area 4.0 x 1.5 x 0.75m)

**Hot Isostatic Press (HIP)**
- Avure GH-9 (working volume 150mm diameter x 300mm, maximum temperature of 2000°C and pressure of 300MPa)

**EXPERTISE**

Our team have extensive knowledge in aerospace materials and manufacturing, component design, alloy design and understand the needs of aerospace applications. We can produce components through efficient and cheaper manufacturing processes that provide equivalent or better performance and reduced weight. We are also able to design and produce bespoke biomedical implants with outstanding performance based on customer specification within days. We work with several partners across a broad range of industries locally and internationally. These include leading organisations and corporations in the aerospace, rail, hospitals and advanced manufacturing industries.

**WORKING WITH US**

- Collaborative research
- Fee for service
- Consultancies
SPECIALIST SERVICES

Additive manufacturing is the next revolution in manufacturing, making it possible to answer age old challenges and create innovative solutions. The process of additive manufacturing prints new components layer by layer, these layers are made from metal and alloy powders and each layer is not much wider than a human hair. The technology allows us to create components with complex geometries from their computer drawings in one step, without the need of a mould – near impossible to make using traditional techniques.

Building possibilities

Our team will work with you to develop bespoke solutions to unique manufacturing challenges. We have an extensive network of researchers in the Clayton precinct and beyond. This network allows us to draw on a different cutting edge capabilities and specific expertise. We then apply them in novel and innovative ways to provide new opportunities for manufacturers.

Components of opportunity

We have a facility that houses the latest technology for manufacturing specialised and complex components from a wide range of metal powder – titanium, nickel, lithium and aluminium and steel alloys.

To produce high precision and complex, structured parts we use selective and direct laser deposition. We have the largest concept laser in the southern hemisphere: it allows us to push the boundaries of additive manufacturing. We can perform rapid materials development and large scale parts manufacturing and repair using our direct laser deposition machine. Also, the hot isostatic press adds to the platform with its unique high temperature and pressure combinations.

In collaboration with other platforms — particularly the Centre for Electron Microscopy and Instrumentation Design and Technology Development — we are able to apply fundamental materials science through a variety of post treatment processes to deliver mechanical properties and other requirements of components.
Monash Wind Tunnel is the leading low speed automotive aerodynamic test facility in Australia. We support aerodynamic and wind noise research and the development of full-scale production vehicles for Australian and international markets. The facility also provides research and development capabilities for many other industries. These include ground transportation (trains and trucks), wind energy siting and turbines, aerospace (particularly unmanned air vehicles and microflight technologies), as well as, sports aerodynamics and fundamental aerodynamic research.

KEY INSTRUMENTATION

1.4MW Wind Tunnel
- Fans: 2.0 x 5.0m diameter variable speed fans, total power output: 1.4MW
- Speed range: up to 50m/s
- Working sections (LxWxH):
  - Standard open jet configuration: 12.0 x 4.0 x 2.6m
  - Large model open jet configuration: 12.0 x 4.5 x 4.5m
  - Closed jet configuration: 12.0 x 4.0 x 2.6m
  - Environmental testing section: 40.0 x 12.0 x 4.0m
- Turntable
- Dynamometer
- Adjustable nozzle and collector positions for varied flow conditions

450kW Wind Tunnel
- Fan: 450kW constant speed, variable pitch axial flow fan
- Speed range: up to 50m/s
- Working sections: 2.0 x 2.0m
- Turntable

WORKING WITH US
- Collaborative research
- Fee for service
- Consultancies
SPECIALIST SERVICES

Our platform serves as the aerodynamic knowledge hub of Victoria. We support and facilitate research and development for industrial solutions. And, we foster academic achievement, by students and researchers, in fundamental discoveries in aerodynamics.

Automotive aerodynamics and acoustics
Our primary capability is R&D in aerodynamic and aeroacoustic behaviour of road vehicles. By combining aerodynamic force measurements with flow regime data, obtained from surface or probe measurements, our team can optimise the aerodynamic design of vehicles throughout the entire development pipeline.

TESTING

Wind turbines
We have a large closed-jet wind engineering section — approximately 12 meters wide and 50 meters long — to facilitate testing of scale topographical models of wind turbine farms. By investigating the wind distribution at a wind farm we can gain better insights into how turbulent and high velocities add gains to the output of the turbine. This then allows us to improve the micro-siting of the turbines and optimise the farm for power production.

Building façades
Exposure to high wind speeds coupled with the ever increasing complexity of building façades creates a significant risk of wind driven vibration and acoustic problems. In our wind tunnels we can identify, test and measure the impact that particular components and façades may have. Doing this prior to installation helps minimise and eliminate effects, and the risks associated with some of the effects.

Turbine aerodynamic performance
Our team can help design, validate and evaluate different turbine performances ranging across a variety of project requirements. Measuring power outputs and aerodynamic coefficients facilitates optimisation of power coefficient curves and helps us identify performance characteristics, such as start up speed and breaking capability.

Sports aerodynamics
The overall goal of sports research is to improve performance within the rules. This means we need to understand all aspects that contribute to performance at any given time, and their interwoven relationship. Aerodynamics is crucial in many sports, our platform can help athletes, professional teams and equipment designers and manufacturers evaluate, understand and ultimately improve their performance.
PARKVILLE CAMPUS
Monash Institute for Pharmaceutical Sciences

MONASH MEDICAL CENTRE
Monash Health Translation Precinct

Drug Candidate Optimisation
Fragment Based Drug Design
HMSTrust Analytical

MHTP Medical Genomics
Cellular Therapies

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