**PAL INSTRUMENTATION**

**Molecular Characterization:**

* **THF-GPC-MALS** 
  + FLO-M Vacuum degasser
  + Agilent 1100 Pump
  + Agilent 1100 autosampler
  + Wyatt Dawn-EOS LS Detector
  + Agilent 1200 DRI detector
* **Aqueous-GPC-MALS**
  + FLO-M Vacuum degasser
  + Isco Syringe Pumps (500mL)
  + Manual Injector
  + Wyatt Dawn-DSP LS Detector
  + Waters 410 DRI Detector
* **Toluene-GPC-MALS**
  + FLO-M Vacuum degasser
  + 2 Isco Syringe Pumps (500mL)
  + Manual Injector
  + Wyatt Dawn-EOS LS Detector
  + Hitachi DRI detector
* **Mixed GPC (aqueous or Organic)**
  + FLO-M Vacuum degasser
  + 2 Isco Syringe Pumps (500mL)
  + Manual Injector
  + Viscotek Viscosity detector
  + Water 410 DRI Detector
* **Viscotek TDA-302 Triple detector**
* **Asymmetric Flow Field Flow Fractionation (AF4) (can be used as GPC)**
  + Wyatt Eclipse 2 (Organic and Aqueous capability)
  + FLO-M Vacuum degasser
  + Agilent 1100 Pump
  + Agilent 1100 autosampler
  + Wyatt Heleos LS detector with DLS Capability and Temp. Control (0 to 60C)
  + Wyatt rEX DRI detector
  + Wyatt Viscostar viscosity detector

**Thermal Analysis**

* **TA 2920 Modulated Differential Scanning Calorimeter (DSC) with Refrigerated System Cooling (RSC)**
* **TA 2920 Modulated Differential Scanning Calorimeter (DSC) with Liquid Nitrogen Cooling**
* **TA 2920 High Pressure Differential Scanning Calorimeter (DSC)**
* **TA 2950 Modulated High Sensitivity Thermogravimetric Analyzer (TGA)**
* **TA 2970 Dielectric Thermal Analysis (DEA)**
* **TA Q800 Dynamic Mechanical Analyzer (DMA) with:**
  + NPC (Nitrogen Purge Cooling)
  + Compression clamp
  + Submersion compression clamp
  + Dual surface film clamp
  + Single/dual Cantilever Clamp

**Scattering**

* **Malvern Zetasizer Nano ZS with Titrator**
  + One angle Backscattering (173)
  + Zeta Potential
  + Titrator
* **Multiangle Dynamic/Static Light Scattering System**
  + Crystal Laser CL-2000 Diode Pumped Laser (532nm, 500mW)
  + Melles Griot He-Ne Laser (632.8nm, 15mW)
  + Coherent Innova 90 Ion Laser (488, 514.5, 657 nm, 500mW)
  + Oriel 77341 PMT
  + EMI 9863 PMT
  + Pacific Industries AD-126 Amplifier Discriminator and 126 Lab Photometer
  + ALV Correlator
  + Neslab RTE 111 Circulating Bath
* **Thorn EMI Photon Counting System** *( Not in Use***)**
* **Beckman Coulter LS-200 Laser Diffraction Particle Size Analyze**r
  + Micro Cell Accessory
  + Dry Powder sampler
  + Standard Flow sampler

**Microscopy**

* **Olympus BH Polarized Optical Microscope (POM).**
  + AmScope MD1900 Digital Camera
* **Olympus BX50 Microscope** 
  + Mettler FP82 Hot Stage
  + Mettler FP80 Central Processing unit
  + Mettler Photodetector
* **Leitz Metallux 3 Fluorescence Microscope.**
  + MTI SIT 66 CCD Camera

**Balances**

* **Sartorius A 120 S Analytical Balance (4 decimal)**
* **Sartorius A160 P Analytical Balance (5 decimal)**
* **Cahn C-31 Microbalance (6 decimal)**

**Other Instruments/ Capabilities**

* **Barnstead Nanopure Water System**
  + With Ultrafilter (0.005µm)
* **Perkin Elmer LS50B Luminescence Spectrometer**
  + Temperature Control (VWR 1167 Circulating Bath)
* **Agilent 8453 DAD Spectrophotometer**
  + 7 Multicell Accessory
  + Temperature Control (VWR 1167 Circulating Bath)
* **Thermo Orion 420 pH Meter**
* **Beckman Microfuge E Micro Centrifuge**
* **IEC Clinical centrifuge**
* **American Scientific BT-23 Thermostated Shaking Bath**
* **Fisher Isotemp Oven (up to ~ 200C)**
* **National Appliance Company 5831 Vacuum Oven (up to ~ 200C)**
  + Welch Duo-Seal Vacuum pump, Trap
* **VWR Vacuum Oven (up to ~ 200C) (Not in Use)**
* **Sonic VibraCell VC-750 Sonicator**
  + Several Probes
  + Sound Proof Cabinet
* **Branson 2210 Sonicator**
* **Solvent Filtering Station**
  + 1L Organic Flask
  + 1L Aqueous Flask
  + GAST Diaphragm Pump
* **Buchi RE-121 Rotovap**
  + Buchi B-480 Water Bath
  + Neslab RTE-110 Cooling Circulator
* **NIMA Langmuir Blodgett trough ((Not in use)**
* **HP 5890 Series II GC (Not in use)**
  + FID
  + ECD
  + Antel Nitrogen Detector
* **HP 1090 HPLC (Not in use)**
  + DAD Detector
  + ESA Coulochem Electrochemical Detector

**Other Instruments (NOT PAL)**

* **Bruker EMX 10/2.7 Electron Paramagnetic Resonance (EPR) spectrometer**
  + 10” magnet
  + 2.7 kV power supply
  + Microwave X band solid state bridge
  + microwave frequency counter
  + ER 4119HS high sensitivity Resonator
  + ER 4105DR double resonator
  + Aquax aqueous solution cell accessory
  + Liquid nitrogen Cryostat (Not in use)
* **OLIS-RSM-1000 RSM Stopped Flow**
  + Temperature Control (VWR 1167 Circulating Bath)
* **TSI Differential Mobility Analyzer (DMA)**
  + Aerosol Generator
  + 3076 Constant Output Atomizer
  + 3074B Filtered Air Supply With HEPA filters
  + Lindberg/ BlueM Tube Furnace (up to 1100C)
  + 3080 Electrostatic Classifier (2)
  + 308100 Classifier (2)
  + 308500 Classifier
  + 3776 Ultrafine Condensation Particle Counter