

St George's University of London

Image Resource Facility Annual Report

2019-2020

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Introduction

Housing high-end Light Microscopy (LM) imaging equipment as well as industry standardised Electron Microscopy (EM) and Histology (Hist.) equipment and facilities, the Image Resource Facility (IRF) is a self-contained unit servicing the research and teaching community in these three areas of technology.

The unit is staffed by the University funded technical staff who provide support and service in the three areas of Light Microscopy, Electron Microscopy and Histology. Situated within the Research Operations directorate, technical staff within the facility have operational line management report to the IRF Manager. The IRF Manager reports directly to the Director of Research Operations (Dr Anna Dulic-Sills) and all IRF staff have intellectual reporting structure to the Academic Director of IRF (Dr Ferran Valderrama).

The IRF is a St George's University of London (St George's) sponsored enterprise, developed by the Research Operations directorate to provide analytical support to our research community, teaching resources for our educational programmes and clinical imaging for our NHS partners in the St George's Hospital Trust. Staff and students can access equipment, support and resources that will maximise their research output and increase educational value. We have a stable relationship with industry in the form of a partnership agreement with Nikon, who provide technical and repair support for a number of our technologies as well as engagement with our teaching activities.

Specialist technical support in the areas of cell biology and tissue morphology by the use of LM and EM equipment and techniques is provided. Our staff have knowledge and training in the following areas:

- Cell Sample Preparation
- Tissue Sample Preparation
- Cell Culture
- Histology
- Immunohistochemistry
- Live Cell Imaging
- Confocal Microscopy
- Widefield and Light-sheet Microscopy
- Image Analysis
- Digital Slide Scanning
- Transmission Electron Microscopy

NHS Trust Biopsy Service

The IRF provides an EM pre-diagnostic tissue processing service to St. George's University Hospitals NHS Foundation Trust – South West London Pathology Department. Table 1 below provides service description.

Table 1: Description of service level provision to St. George's University Hospitals NHS Foundation Trust – South West London Pathology Department
<p>Service Level 1 – Process to resin block / archive (muscle biopsies)</p> <p><u>Service includes:</u> Tissue fixation Processing and embedding to resin block Box and storage archive</p> <p>Services level 1 charge: Total charge £90.00 – per case sample</p>
<p>Service Level 2 – Process to resin block, semi-thin section / archive (nerve biopsies)</p> <p><u>Service includes:</u> Tissue fixation Processing and embedding to resin block High quality slide of routine toluidine blue stained semi-thin sections/per tissue block Box and storage archive</p> <p>Services level 2: Additional: £35.00 on completion after service level 1 Total charge £125.00 – per case sample</p>
<p>Service Level 3 – Process to resin block, semi-thin section, TEM analysis / archive (muscle / nerve)</p> <p><u>Service includes:</u> Tissue fixation Processing and embedding to resin block High quality slide of routine toluidine blue stained semi-thin sections/per tissue block Ultra-thin sectioning onto prepared TEM grids</p> <p>Post staining technique (Uranyl acetate and lead citrate)</p> <p>TEM ultrastructural analysis, high resolution digital images and observational report of tissue biopsy/ per case request</p> <p>Services level 3: Additional: £100.00 on completion after service level 2 Total charge £225.00 – per case sample</p>

The images reported allow NHS Trust consultants (Table 2) to make clinical diagnosis for patients both living and deceased.

Name	Department	Position	Extension number	Email address
Robin Whitakker	SWLP Cellular Pathology	Discipline Manager	2840	robin.whittaker@stgeorges.nhs.uk
Joanne Lam Wong	SWLP Cellular Pathology	Histology Manager	4943	Joanne.LamWong@stgeorges.nhs.uk
Carmeta McHayle	SWLP Cellular Pathology	Lead MBS Neuropathology	5256/7	carmeta.mchayle@stgeorges.nhs.uk
Stuart Bendall	SWLP Cellular Pathology	Advanced BMS Training Officer	5256/7	Stuart.Bednall@stgeorges.nhs.uk
Dr Leslie Bridges	Neuropathology	Consultant Neuropathologist	4983	leslie.bridges@stgeorges.nhs.uk
Dr Paul Johns	Neuropathology	Consultant Neuropathologist	5271	paul.johns1@nhs.net
Dr Abel Devadass	Neuropathology	Consultant Neuropathologist		Abel.Devadass@stgeorges.nhs.uk
Dr Jeremy Price	Pediatrics	Consultant Neuropathologist	0651	Jeremy.Pryce@stgeorges.nhs.uk

IRF Comparison with other London Facilities

In November 2019 a gap analysis of the Facility was undertaken, the outcome of which identified that the Facility is providing a strong service per capita to its community – 14 different services / 6300 staff and students. The '3 in 1' concept of the unit enables researchers and teaching staff to access different technologies quickly and puts the University in a solid position for growth and support for its community. A tally of the variety of services offered by other London Imaging Facilities / units compared to size of organisation (as determined by published Key Facts data

from organisational websites) was undertaken. The results have highlighted the strength of St George’s Imaging Facility and are evident in Figure 1 and 2, below:

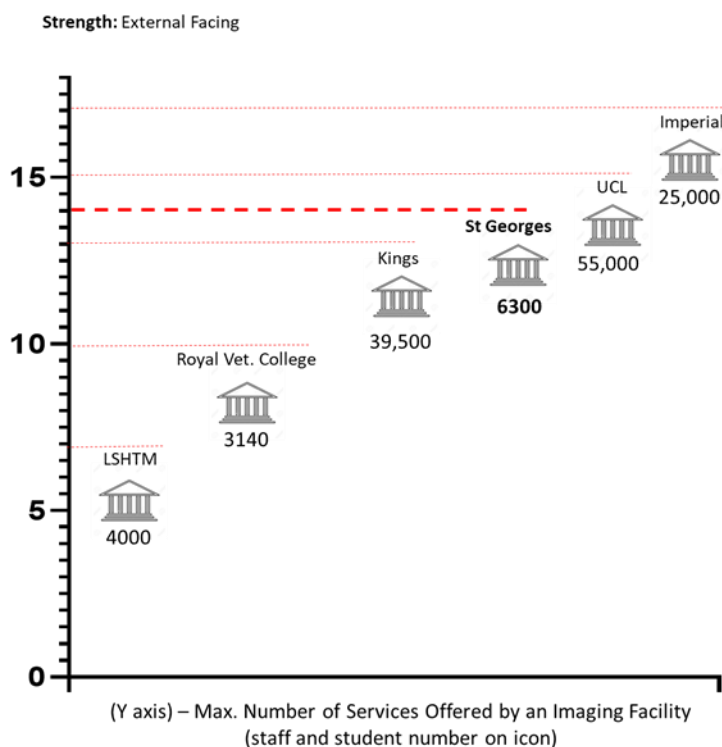


Fig. 1. Benchmarking exercise: Facility services capability per capita . Comparison to other London based Imaging Facilities

	Research Support Provision			
	LM	EM	Hist.	FACS
LSHTM	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
RVC	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
St George’s	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Kings	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
UCL	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Imperial	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Fig. 2. Benchmarking exercise: Technology stream availability to researchers. Comparison to other London based Imaging Facilities. Red cross (x) indicates possible room for development within the IRF

Income

Income is generated in the Facility by the provision of services or equipment access to researchers via recharges to research grants. Given this, the relationship between the Facility and the Joint Research and Enterprise Service (JRES) must be strengthened to allow better inclusion for imaging costs in grant applications. Currently, there is insufficient proactive engagement concerning inclusion within the grant application process and researchers may be unaware of the benefits to be gained by early engagement with the IRF. Support and provision of services to our teaching community, whilst important to the organisation as yet does not yield much income. The value of the IRF must therefore be considered not only in monetary terms; the enrichment of the student experience through interactions with Facility equipment, participation in IRF staff teaching sessions as well as specialist technology training can be viewed as adding to the reputational standing of the University and therefore an indirect source of income generation. Teaching participation will be documented during 2020-2021 academic year and will contribute to accurate designation of income and reflection of the Facility worth. This will be reported on in 2020-2021 Annual report.

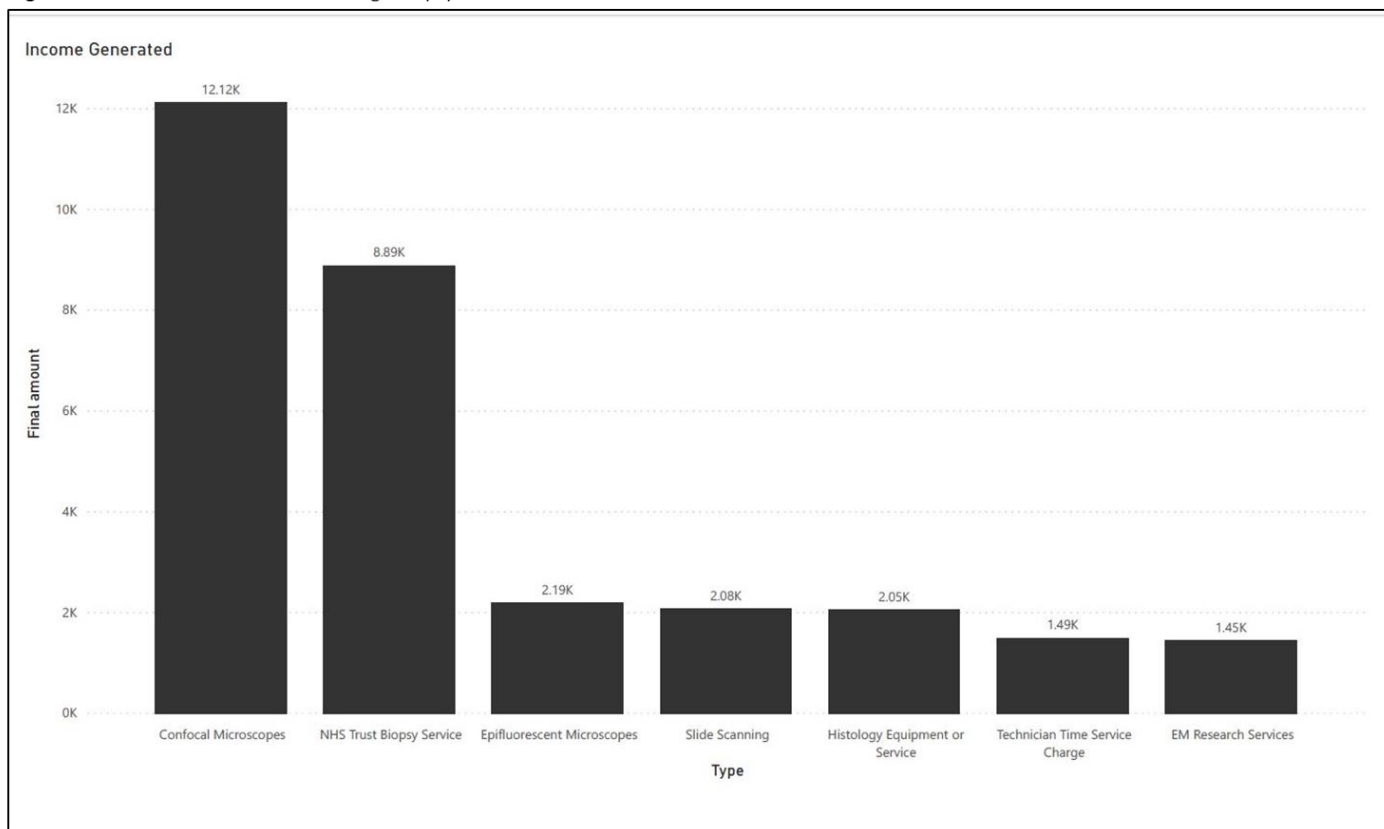
Table 3: Breakdown of income: data source Agresso subproject code	
	Amount (£)
EM (Clinical)	
Service level 1 Processed to resin block - 6 cases, Service level 2 Process to resin block, semi- thin	-1,790.00
Service level 1 Processed to resin block - 1 case, Service level 3 Process to resin block, semi & u	-1,215.00
Service level 1 Processed to resin block - 2 cases, Service level 3 Historic request (2018), semi & ultra-thin	-765.00
Service level 1 Processed to resin block - 5 cases, Service level 2 Process to resin block, semi- thin	-800.00
Service level 1 Processed to resin block - 6 cases, Service level 3 Process to resin block, semi & ultra-thin	-990.00
Service level 1 Processed to resin block - 1 case	-90.00
Service level 1 Processed to resin block - 4 cases, Service level 3 Process to resin block, semi & ultra-thin	-1,035.00
Service level 1: Processed to resin block - 3 cases	-270.00
Service level 1: Processed to resin block - 9 cases, Service level 2: Process to resin block, semi	-1,060.00
3 cases total for Electron Microscopy services: Service level 1: Processed to resin block - 2 cases,	-510.00
LM	
STA Gregory Perry Leeds	-46.500
STA Gregory Perry Manchester Piccadilly	-393.00
IRF recharges August 19	-1,635.50
IRF recharges September 19	-3,181.57
IRF recharges October 19	-1,646.64
November 2019 internal recharges	-1,980.00
IRF recharges December 19	-2,502.19
IRF recharges January 20	-1,051.82
IRF recharges February 20	-2,724.68
IRF recharges March 20	-1,230.00
IRF recharges June 20	-1,170.00
IRF recharges July 20	-1,761.00

Digitization and online hosting of histology slides	-3,840.00
Histology	
Approx.	-
Facility	£2,050.00*
Nil to report	

* This figure is taken from a different data source – Stratocore Pasteur Platform Management System (PPMS) – a core facility management software.

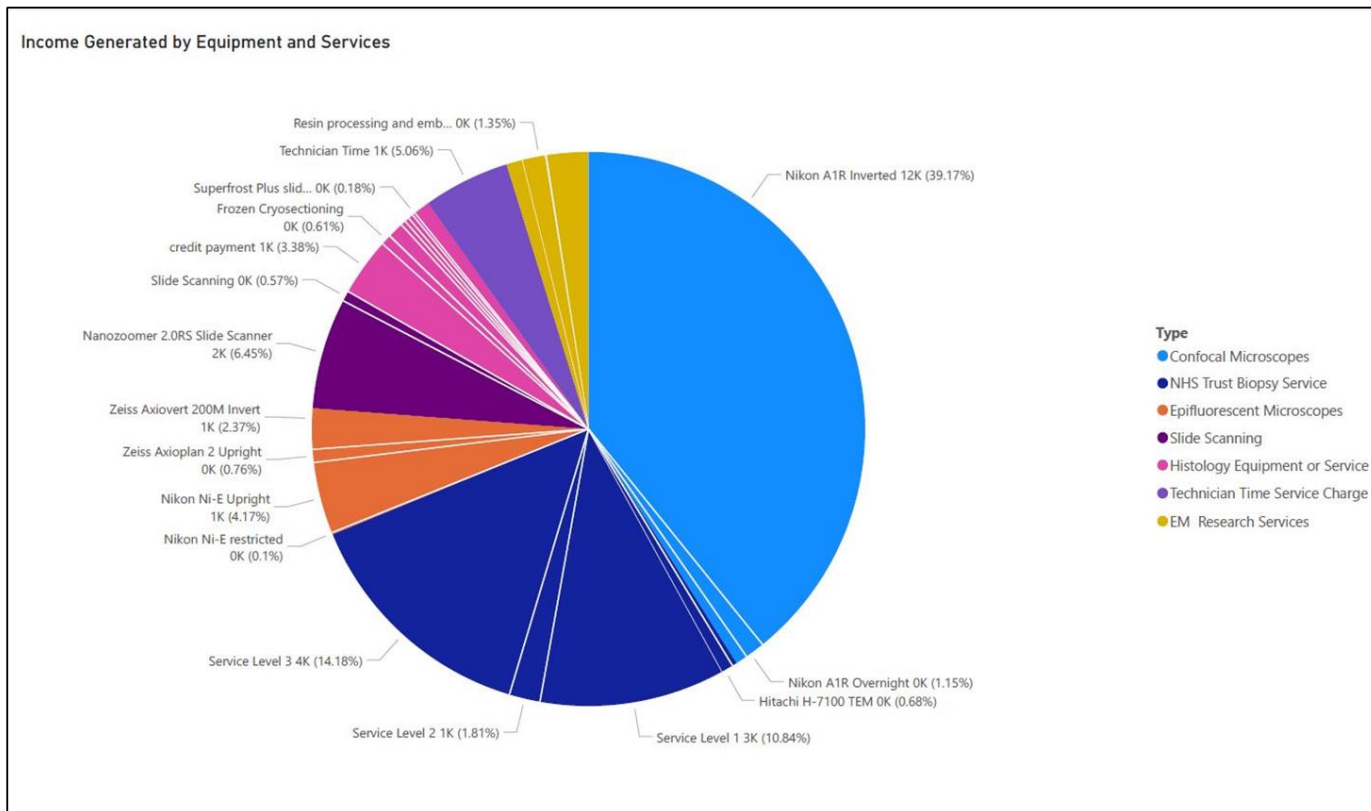
The Facility houses multiple types of equipment and service provision, a useful metric would be to establish what types of equipment are frequently used and paid for.

Figure 3. Distribution of income according to equipment or service



[data source – facility generated PPMS booking system + NHS invoice]

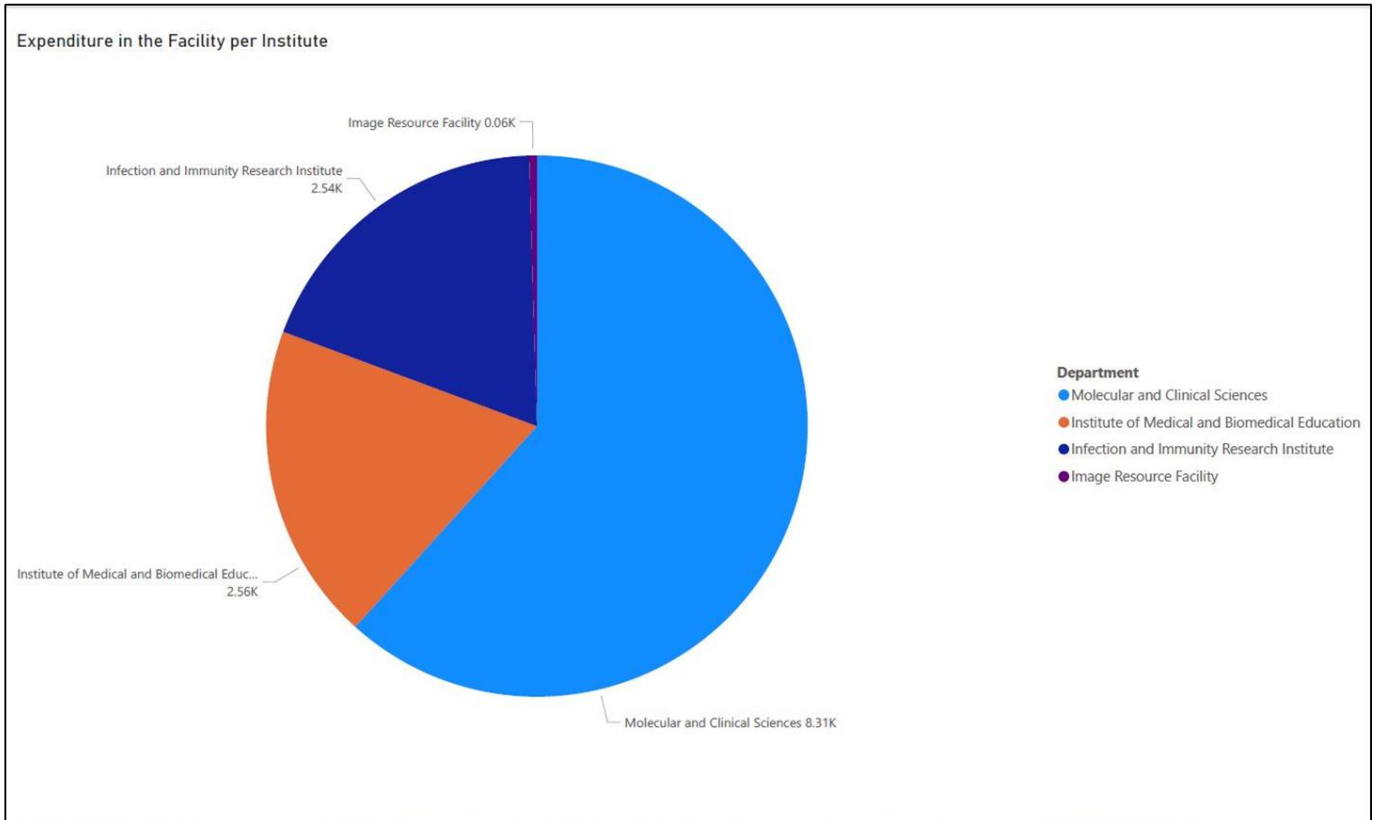
Figure 4. Income generated by equipment and services (%)



The data in Figure 3 suggests that confocal microscope use provides the largest source of income for the IRF (£12,100.00), with the NHS Biopsy Service also providing a major source of income (£8886.00). Use of Histology equipment and service generated £2050.00. Figure 4 demonstrates further breakdown of income generation expressed as percentage of whole income.

It is an ambition of the Facility to ensure strong provision across the organisation, where appropriate, the data in the Figure 5 below suggests that currently the Molecular & Clinical Sciences Institute (MCSI) has the highest expenditure within the facility (£8,310.00), with Infection and Immunity Research Institute (IIRI) and Institute of Medical and Biomedical Education (IMBE) both showing comparative expenditure over 2019-2020 (£2,540.00 and £2,560.00, respectively). Figure 6 identifies specific equipment use according to institute or external organisation.

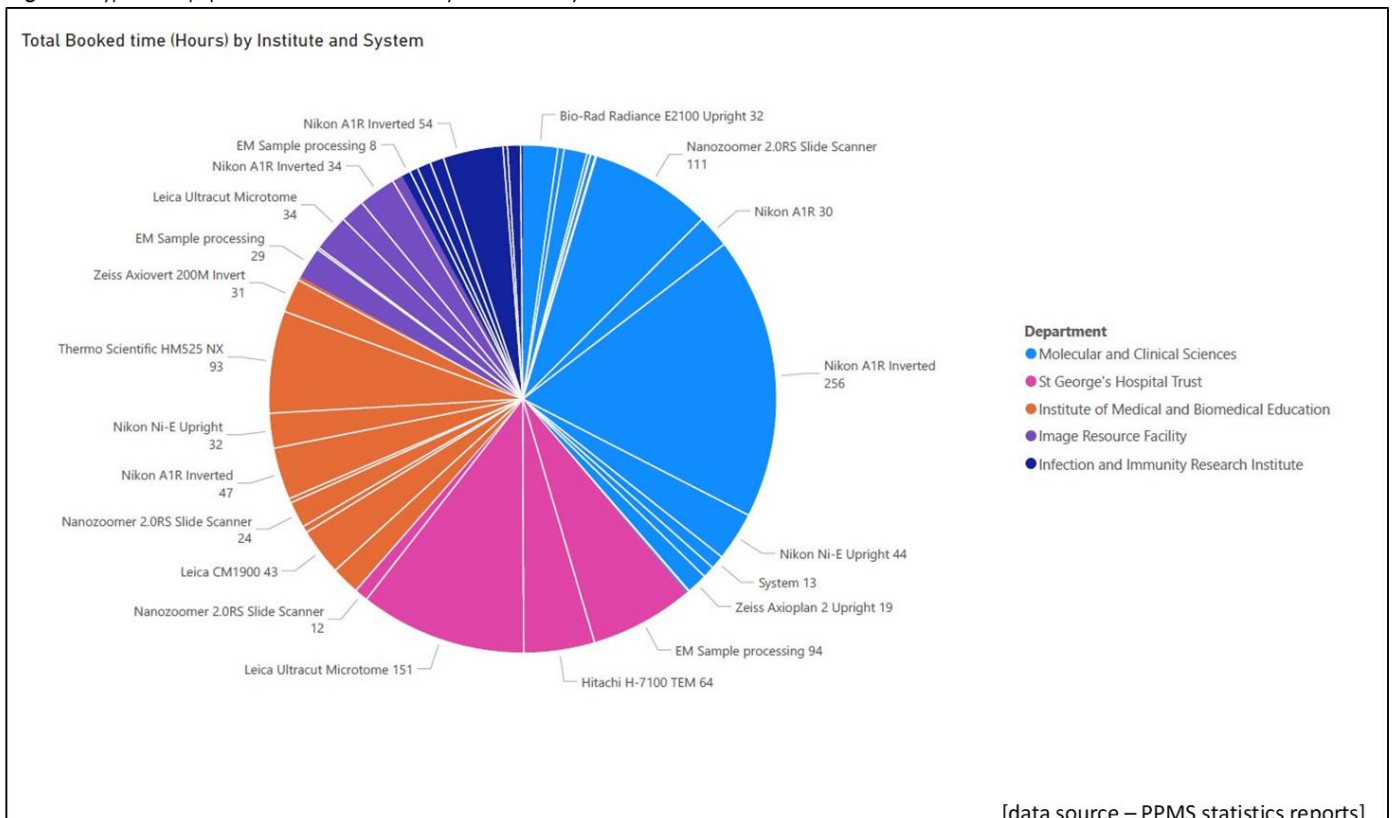
Figure 5. Expenditure in the Facility: Institute data



[data source – PPMS statistics reports]

The type of equipment and services used by different parts of the organisation is also a useful metric to explore.

Figure 6. Types of equipment and Services used by the university and external users



[data source – PPMS statistics reports]

The equipment in our LM suite is used in the majority by MCSI staff with confocal microscope and slide scanning (image digitisation) being most popular. Our own Facility staff make the most use of the EM equipment, and this should be viewed as a direct result of the service provision to the NHS Trust – South West London Pathology Department. There has also been activity from IIRI and IMBE, however IIRI were the only institute to make use of EM Technologies during 2019 -2020. Understanding the relationship between research interests and projects proposed will have a beneficial effect on determining where the facility positions itself with regard to future acquisitions and expenditure.

In addition, understanding our client base is helpful, the Table 4 and 5, and Figure 7 and 8 below show the University based users of the Facility.

Table 4: University users of equipment - list 2019-2020	
Facility users	Sum of total booked time (hours)
Cardiology Clinical Academic Group	2.75
Dr Alexis Bailey	135
Dr Angeliki Asimaki	119.25
Dr Anthony Albert	19
Dr Atticus Hainsworth	65.25
Dr Ben Taiwo	33.5
Dr Blair Strang	13.75
Dr Clara Cieza-Borrella	20
Dr Daniel Meijles	21.75
Dr Daniel Osborn	5.25
Dr Elena Sviderskaya	44
Dr Ferran Valderrama	32.5
Dr Florencia Cavodeassi	16.25
Dr Francesc Miralles	1.5
Dr Paris Ataliotis	24.25
Dr Soo- Kim	23.25
Dr Suman Rice	7.25
Dr Veronica Carroll	2
Image Resource Facility	129.5
Mr Phillip Adds	33.5
NHS Trust Biopsy Service	315.75
NHS Trust Teaching Support	6.75
Professor Debbie Baines	58
Professor Guy Whitley & Professor Judith Cartwright	87.5
Professor Iain Greenwood	37.75
Professor Jon Friedland	15.25
Professor Mary Sheppard	82.5
Professor Nidhi Sofat	11.25
Professor Pia Ostergaard	12.25
Professor Tom Carter	31.5
The Hilpert Laboratory	14

Figure 7. Types of equipment booked by facility users

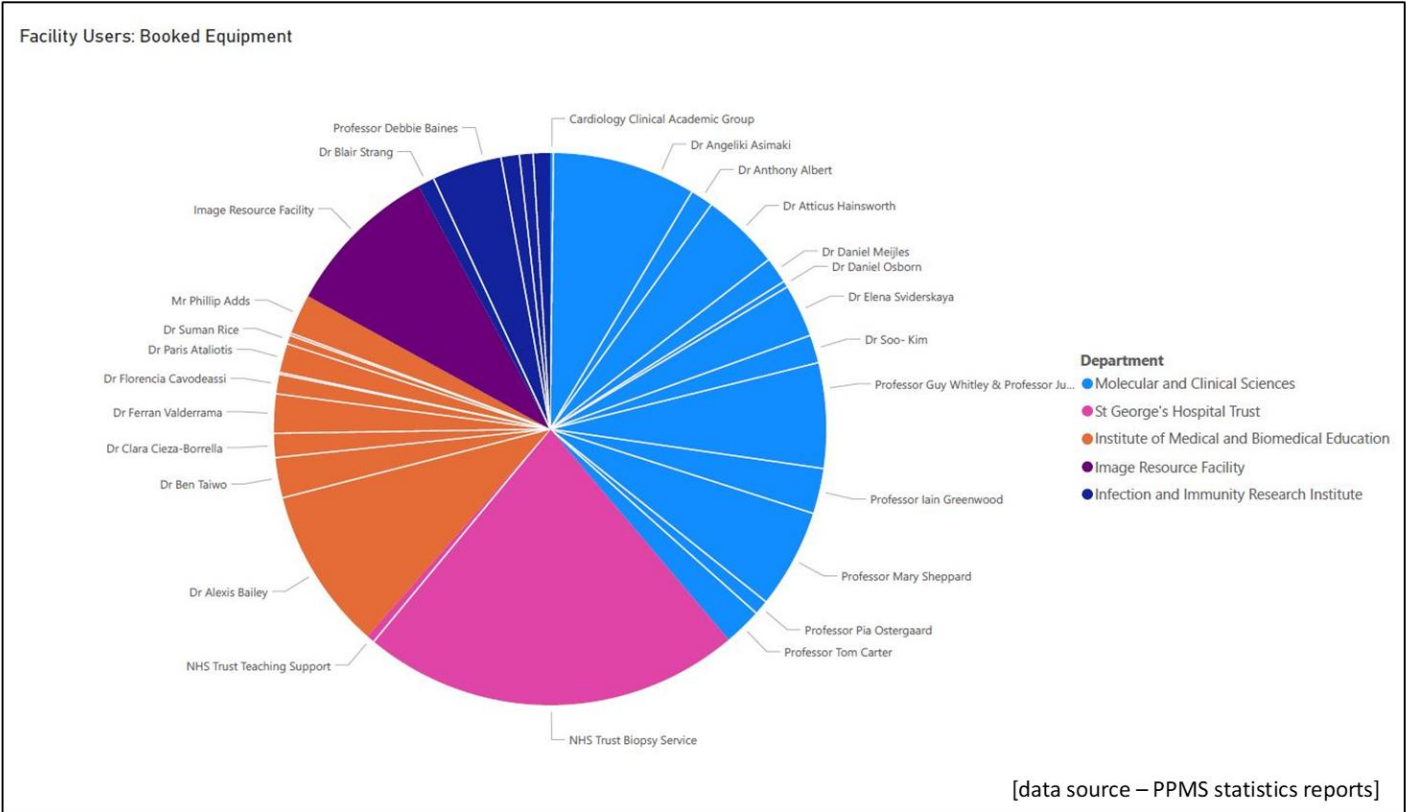


Figure 8. Types of service booked by facility users

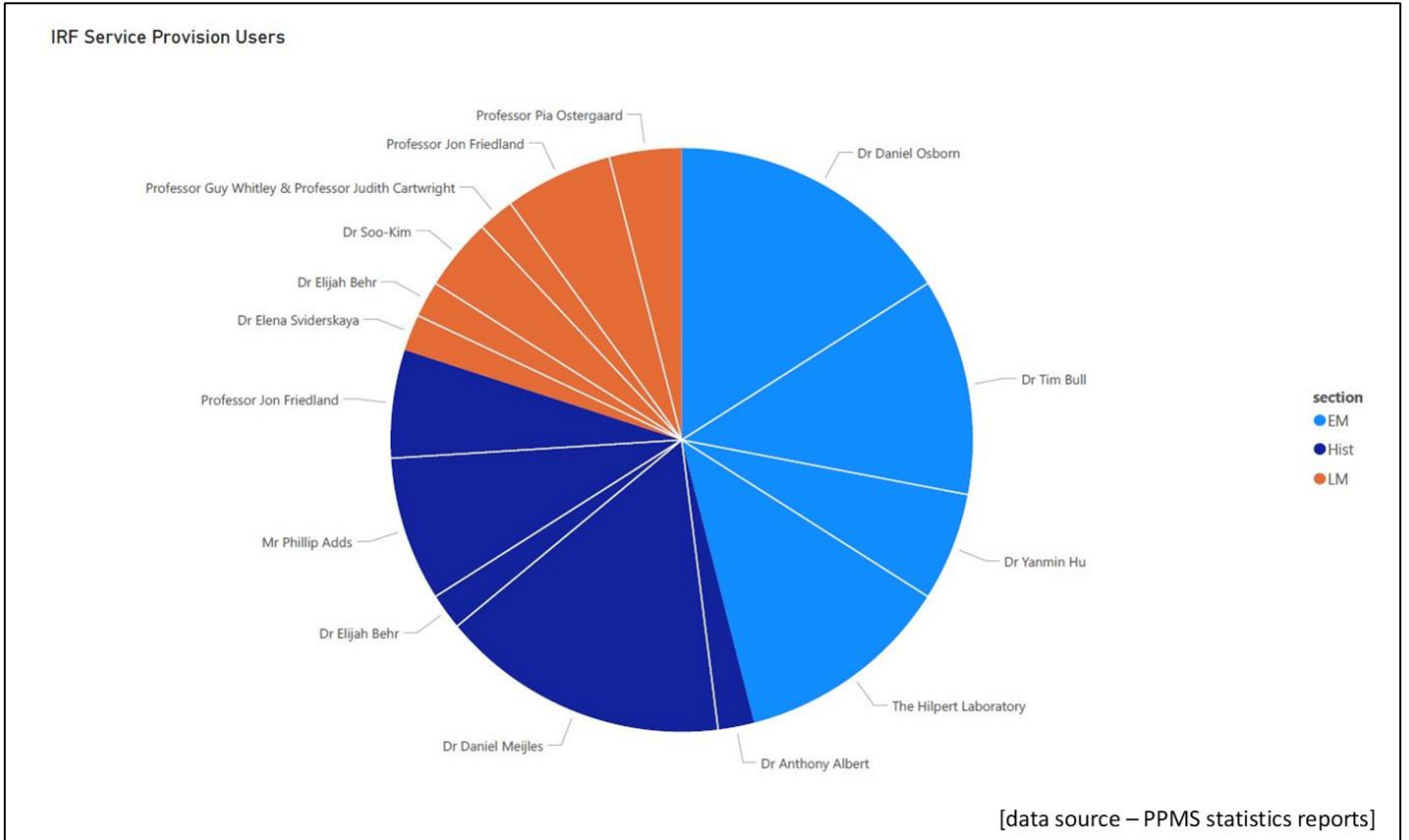


Table 5: University users of service – list 2019-2020		
Service user	Service used	Quantity of service
Dr Anthony Albert	Superfrost Plus slides (box)	1
Dr Daniel Meijles	Immunohistochemistry (single slide) - Gold	32
	Superfrost Plus slides (box)	5
	Wax Embedding: Blocks (with microtome booking)	116
Dr Daniel Osborn	EM Research: Technician time	2
	Microtome: Ultra-thin sectioning and post staining (staff)	10
	Resin processing and embedding (staff)	2
	Semi-thin sectioning (inc. of toluidine blue staining)	4
Dr Elena Sviderskaya	Nikon A1R Overnight	2
Dr Elijah Behr	Immunohistochemistry (single slide) – Silver	30
	Slide Scanning	338
Dr Soo-Kim	Nikon A1R Overnight	2
Dr Tim Bull	EM Research: Technician Time	16
	Microtome: Ultra-thin sectioning and post staining (staff)	16
	Resin processing and embedding (staff)	4
Dr Yanmin Hu	EM Research: Technician time	6
	Microtome: Ultra-thin sectioning and post staining (staff)	4
	Resin processing and embedding (staff)	2
Mr Phillip Addis	APES-coated slides	96
	Hist. Research: Technician time	23.75
	Immunohistochemistry (single slide) - Gold	56
	Lillie's Trichrome Stain	34
Professor Guy Whitley & Professor Judith Cartwright	Nikon A1R Overnight	1
Professor Jon Friedland	Haematoxylin and Eosin (H&E) Stain	2
	Immunohistochemistry (single slide) - Gold	8
	Immunohistochemistry (single slide) - Silver	8
	Nikon A1R Overnight	2
	Technician Time	1

Professor Pia Ostergaard	Nikon A1R Overnight	2
The Hilpert Laboratory	EM Research: Technician time	36
	Microtome: Ultra-thin sectioning and post staining (staff)	24
	Resin processing and embedding (staff)	6

Expenditure

The expenditure for 2019-2020 was £22,538.57 (Table 6):

Table 6: Expenditure within the IRF					
	EM	Facility	Hist.	LM	Grand Total
Expenditure (£)	15634.41	3303.8	2669.5	975.86	22583.57
Expenditure (%)	69.23%	14.63%	11.82%	4.32%	

[data source – IRF Agresso subproject code used for all transactions and income]

Breakdown of costs:

Table 7: Agresso export of expenditure from the IRF		Amount (£)
EM		
	1701903 Tychem 2000 C CHA5 Coverall Yell S	671.81
	O005 - Osmium Tetroxide 2% Aqueous Solution 100ml	93.61
	Uplift and Dispose - domestic fridge C/W Osmimum tetroxide vapours	1,290.00
	U001/S/2/25 Uranyl Acetate 2% Solution - 25ml	75.00
	O005 - Osmium Tetroxide 2% Aqueous Solution 100ml	25.00
	IntOrd - Red top Sharpsafe 11.5 litre (human tissue only) , MMCGLYNN , 40006495	4.22
	IntOrd - S/safe gen.yellow 7L , MMCGLYNN , 40006533	2.70
	IntOrd - S/safe gen.yellow24L , MMCGLYNN , 40006582	9.54
	2019-20 CPT Scheme - Transmission Electron Microscopy (TEM)	429.00
	PETRI DISH 100X15MM SODA LIME GLASS	25.20
	PETRI DISH 100X15MM SODA LIME GLASS	25.20
	Silver service contract Hitachi H-7100 TEM Serial no: 6524-05 Maintenance	11,290.00
	Millex 4mm Durapore PVDF .22um Sterile 1	115.01
	Account code correction	828.89
	Kenley Self Adhesive Carpet Floor Stairs Protection Film - Heavy Duty Puncture & Water Resistant - 60cm x 50m Roll	57.89
	TRAY FOR SAMPLE COLLECTION AND STORAGE	64.70
	U001/S/2/25 Uranyl Acetate 2% Solution - 25ml	118.25
	O005 - Osmium Tetroxide 2% Aqueous Solution 100ml	325.08
	WHATMAN QUANTITATIVE FILTER PAPER, DIAM.	72.65
	Microtome drive belt	42.00
	2SundstromSR597 A1B2E2K1CombFiltH02-7212	51.90
	Deflecto Flat Back Literature Holder A4 DE76401	9.22
	1ml Syringe, disposable, sterile, Terumo	6.90
	[]Banner Magnetic 1200x900mm Drywipe Board 9180004	0.64

LM	
PAL W600110 Medipal Alcohol Wipes Pack of 10 Tubs of 200 Wipes	48.64
PAYROLL Feb20	14.05
Accommodation at UK Light Microscopy Facilities Meeting 2020 as per invoice 12989	105.00
4189138 London to Manchester Piccadilly 01Jul19	153.00
4167874 London to Leeds 17Jun19	46.50
travel	240.00
PAYROLL Feb20	20.00
Gas cylinder rentals recharges August 2019	20.01
Cylinder rental recharges September 19	20.01
Cylinder rentals Oct 19	20.01
Gas cylinder recharges November 2019	20.01
Cylinder rental recharges January 2020	20.01
Cylinder rental journal FEB 20	20.01
Cylinder rental journal APR 20	20.9
Cylinder rental journal MAY 20	20.9
Cylinder rental journal JUN 20	20.9
Cylinder rental template JUL 20	20.9
Cylinder rental journal DEC 19	20.01
SSD and Ram	125.00
Histology	
Lab Consumables & Sundries Misc.	43.00
N FayersHobbyCraft	25.00
N FayersReally Useful Products Ltd	32.29
BOTTLE PROTECT 500ML PLASTIC WIDE GLS80	173.46
12 Months Silver service contract for HM 525 cryostat serial S17030594, as per quote reference 43685-S17030594-v7.6	1771.60
Lab Consumables & Sundries Misc.	253.00
125 ML OCT embedding cryoembedding Matrix 125mL	37.50
PHOSPHOMOLYBDIC ACID HYDRATE,100G	52.07
XYLENE MIXT. OF ISOMERS ANALAR ACS/R.PE	34.40
IntOrd - Ethanol 99.7 -100% , MMCGLYNN , 40006561	28.98
IntOrd - Ethanol 99.7 -100% , GPERRY , 40006783	19.68
[]Really Useful 42L Recycled Plastic Storage Box Black 42Black R	18.34
Nunc Serological Pipets, 10mL, shortie-Case of 200	45.23
[]ND-Bisley 10 Drawer Home 29 Series Steel-Chalk White H29/10NLC/W-ND	134.98
Facility	
Wolf special offer - Glass washer cleaning agent Miele Procure Lab 10 AP is phosphate free, requires dosing pump, liquid, 1 x 5 litres pack size. N.B. for UK sales, VAT is always chargeable on this product OFFER ENDS 31-01-2020	165.61
[]Wallace Cameron Green Small First Aid Kit BSI-8599 1002655	12.65
Handyman recharges October 19	30
Print/Graphics Dec 2019 Recharge	112.88
Single Gas monitor calibration	36.00
White Wall Clock	5.94
Joanna NolanDHL 1481795604 LHR3140920	8.62
White Wall Clock	13.93

Exacompta Magnetic Perpetual Year Planner (Comes with magnets, magnet strips, pens and box) 56153E	38.89
[]Manuscript A5 Book Ruled Feint (Pack of 10) WX01061	5.80
IntOrd - Yellow bags for Incineration only (roll of 25) , MMCGLYNN , 40006643	3.92
PROGOTOS2 - Progard TS2	479.00
Supreno, Blue Nitrile Glove, Medium	332.10
Supreno, Blue Nitrile Glove, Medium	66.42
PROGOTOS2 - Progard TS2	796.80
ZLXOEDI03 - ELIX 3 LPH EDI MODULE	870.00
Single Gas monitor calibration	204.00
Millipak express 40 filter (0.22um membrane filter for bacteria-free water cat.no. MPPG04001	98.00
[]Banner Magnetic 1200x900mm Drywipe Board 9180004	23.21

Review of the data (Table 6 and 7) indicates that for EM the greater portion of spend was on service contract for the Hitachi H-7100 TEM Serial no: 6524-05, as was the case for the Histology section; Silver service contract for HM 525 cryostat serial S17030594. For the LM section, the spend mostly consists of gas cylinder use. Operational costs of the Facility cover the maintenance of dishwashing equipment, purified water system maintenance and fume monitoring equipment calibration. Due to the location of the IRF being next to the University's dissection room and mortuary, fume emanation (Formaldehyde and Volatile organic compounds – VOC) must be monitored to avoid harm to IRF Facility users and staff. All expenditure within the facility will be subject to scrutiny and evidenced requirement by management.

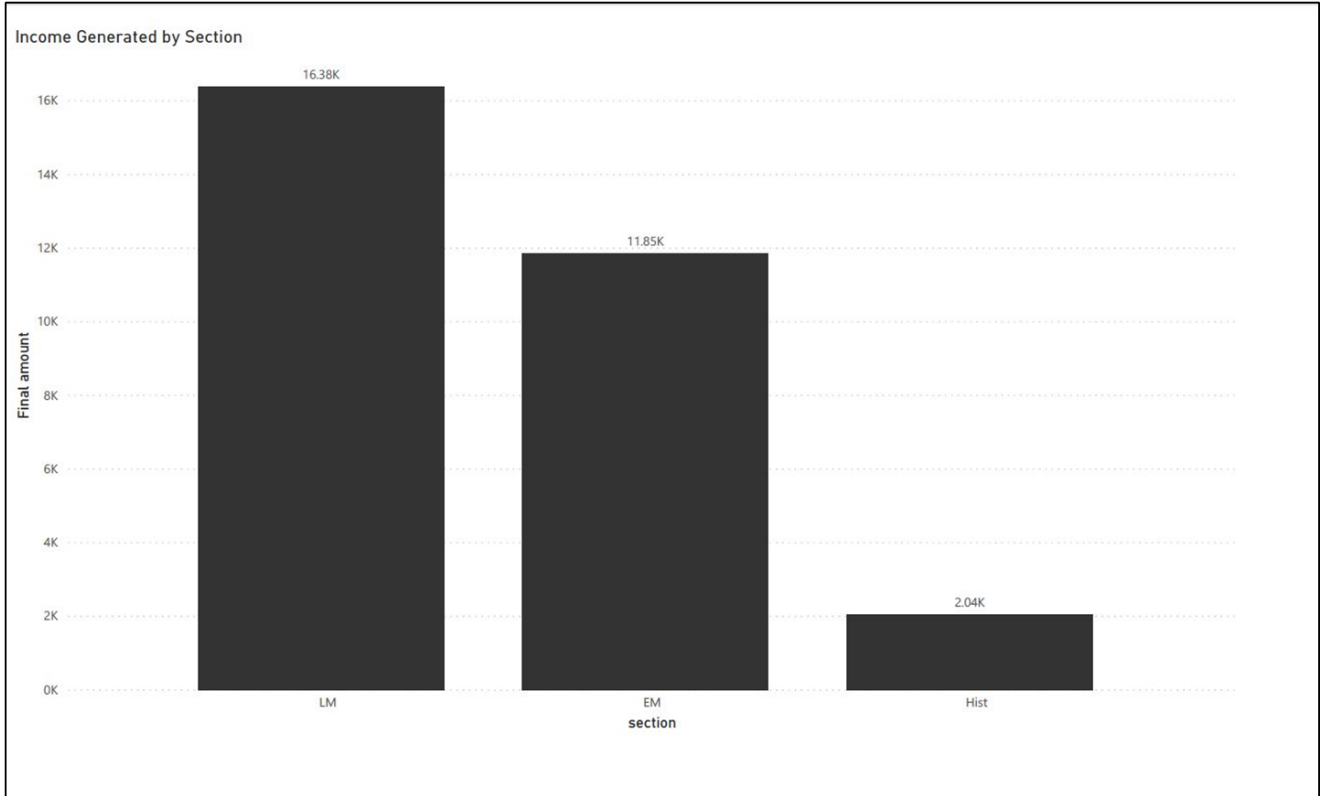
Whole values of income and expenditure for 2019 -2020 are shown in table 8:

	EM	Facility	Hist.	LM	Grand Total
Expenditure (£)	15,634.41	3,303.77	2,669.53	975.86	22,583.57
Income (£)	-8,525.00			-23,162.90*	-31,687.90
Expenditure (%)	69.23%	14.63%	11.82%	4.32%	
Income (%)	26.90%	0.00%	0.00%	73.10%	

[data source – IRF Agresso subproject code used for all transactions and income]

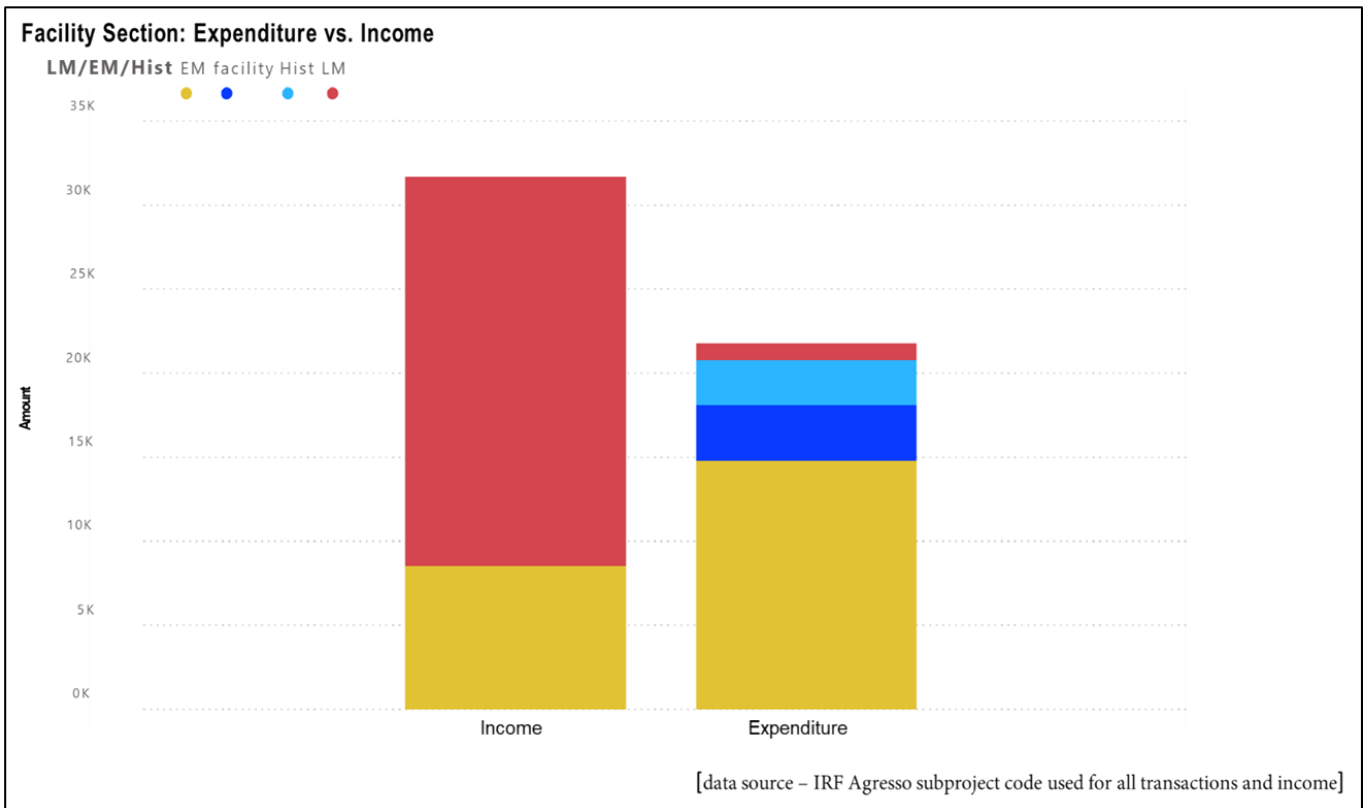
* Approx. £2,100 and £1,450 of LM income in table 8 is generated by the Histology section and EM research services respectively. The Agresso subproject code data source is unable to differentiate monthly income between the Facility sections in the internal recharge system currently used. A clearer picture emerges when the data source used is the Stratocore PPMS system (Figure 9).

Figure 9. Income according to Stratocore PPMS online booking system



An overall picture of income versus expenditure is shown in the Figure 10 below:

Figure 10. Types of service booked by facility users



Pricing

Since its inception, the IRF has provided pricing as a result of benchmarking with other organisations. Table 9 shows the current price list.

Table 9: Price list 2019-2020			
Equipment or Service Provision	Category	Periods	Price (£)
Antibody premium	Histology Consumables	all	0.60
APES-coated microscope slides	Histology Consumables	all	0.11
Cryostat sample preparation (inclusive of staff time)	Histology Services	all	4.39
Cryostat: Leica CM1850	Histology Equipment	all	12.00
Cryostat: Leica CM1900	Histology Equipment	all	12.00
Cryostat: Thermo Scientific HM525 NX	Histology Equipment	all	12.00
EM Hitachi H-7100 TEM (per hour)	Electron Microscopy Equipment	all	25.00
EM Microtome: Semi-thin sectioning (inc. of toluidine blue staining) (per hour)	Electron Microscopy Equipment	all	10.00
EM Microtome: Ultra-thin sectioning and post staining (per block)	Electron Microscopy Equipment	all	25.00
EM Resin processing and embedding (per block)	Electron Microscopy Equipment	all	10.00
Haematoxylin and Eosin (H&E) Stain (per slide)	Histology Equipment / Service	all	2.00
Immunohistochemistry (single slide) - Bronze	Histology Equipment	all	1.65
Immunohistochemistry (single slide) - Gold	Histology Equipment / Service	all	2.82
Immunohistochemistry (single slide) - Silver	Histology Equipment / Service	all	2.28
Lillies Trichrome Stain (per slide)	Histology Equipment / Service	all	2.50
LM: Bio-Rad Radiance E2100 Upright	LM: Confocal Microscopes	all	20.00
LM: Nikon A1R Inverted	LM: Confocal Microscopes	Outside peak hours	15.00
LM: Nikon A1R Inverted	LM: Confocal Microscopes	all	40.00
LM: Nikon A1R Overnight	LM: Confocal Microscopes	all	100.00
LM: Nikon Ni-E Upright	LM: Epifluorescent Microscopes	all	15.00
LM: Zeiss Axioplan 2 Upright	LM: Epifluorescent Microscopes	all	12.00
LM: Zeiss Axiovert 200M Invert	LM: Epifluorescent Microscopes	all	15.00
LM: Zeiss LSM510 META Inverted	LM: Confocal Microscopes	Outside peak hours	11.50
LM: Zeiss LSM510 META Inverted	LM: Confocal Microscopes	Peak hours	15.00
LM: Zeiss LSM510 Overnight Imaging	LM: Confocal Microscopes	all	200.00
Nanozoomer 2.0RS Slide Scanner (per hour)	LM: Slide Scanning	all	20.00
Paraffin Wax Embedding: per block	Histology Equipment	all	10.00
Paraffin Wax Embedding: per block (inclusive of staff time)	Histology Service	all	16.25
Paraffin Wax sectioning: Leica RM2255 Automatic Microtome (per block)	Histology Equipment	all	10.00
Superfrost Plus microscope slide (single)	Histology Consumables	all	0.08
Superfrost Plus microscope slides (box)	Histology Consumables	all	13.32
Technician Time (per hour)	Facility Services	all	25.00

We are currently undertaking a full Economic Costing (fEC) Review in collaboration with the Finance directorate. The intention is to generate a model whereby the Facility can recover appropriate costs for equipment or services, maximise pricing for commercial enterprise initiatives whilst ensuring that our internal users are charged appropriately and in line with funding requirements. The intention is to role this model out across our research facilities and services, this will have a positive impact on the current audit capabilities of those areas and will work in support of recommendations coming from the Finance and JRES directorates. The implementation of this will be reported on in 2020-2021 Annual report.

SWOT Analysis

Table 10: SWOT analysis 2019-2020	
INTERNAL FACTORS	
STRENGTHS (+)	WEAKNESSES (-)
<ul style="list-style-type: none"> ● Three streams of technologies – EM, LM, Hist. ● Potential for addition of 4th stream of technology –FACS. ● Good service provision per capita. ● Technical support staff in-house and available for support. ● Only Imaging Center in the South West of London. 	<ul style="list-style-type: none"> ● Technical staff – research project support experience (EM). ● Facility is not proactive, informed or responsive to the needs of the university community – Teaching and Research. ● Histology service – range of methodologies limited. Can be expanded. ● Facility operations, processes and documentation require strengthening.
EXTERNAL FACTORS	
OPPORTUNITIES (+)	THREATS (-)
<ul style="list-style-type: none"> ● Growth of relationship with Nikon to achieve Reference Centre status. Reference Centre status will bring: <ul style="list-style-type: none"> - Prestige - External clients - Teaching material support - Access to Nikon marketing and promotional activities ● Creation of a South London hub for imaging – collaboration with Kingston University and Roehampton University. ● Engagement with local community schools and colleges for Public Engagement (PE) and widening participation activities – in support of the St George’s university PE strategy. 	<ul style="list-style-type: none"> ● Hitachi H-7100 TEM Serial no: 6524-05 is old (> 20 yrs) and requires extensive engineer support. Manufacturers refuse to extend service contract due to age of equipment. ● NHS Trust Biopsy Service – at risk due to TEM microscope failure.

Recommendations

The IRF must consolidate its responsiveness to the needs of the University. A proactive approach would be to engage in regular discussion with our colleagues to see how we can enterprise or support activities both on and off campus, or online. To this end we are looking to progress with an Imaging Advisory Group where a representative group of individuals across the research and teaching community of St George's can meet to drive activity and decision making within the IRF.

The IRF welcomes the planned initiative to incorporate the already established FACS service of the Research Operations directorate into the IRF brand. This will enable the facility to boast a full spectrum of technology areas and offer stronger support to the development of the FACS service across the University and to external clients leading to potential increases in income.

The TEM microscope vulnerability must be addressed now as a matter of urgency. The recommendation is that the University supports the procurement of a second-hand microscope from Hitachi or other manufacturers.

Future Objectives

IRF will work with the university PE officer to incorporate such activities that will promote STEM outreach and broaden the impact of our research community success. Some potential areas for development are:

- Expansion of service provision amongst the research community, increase income from grants as well as seeking commercial income.
- Introduction of yr 10 / yr 11 work experience placements (2 weeks). Local schools.
- Collaboration with the University STEM ambassadors and partner Nikon to facilitate workshops both on and off site.
- Introduction of technical support apprenticeships within the streams of the facility – investigate collaboration with technical education providers and government apprenticeship schemes.
- Provide regular work / industry placements for our Biomedical science degree students and Clinical Pharmacology degree students. Involvement with the Professional Training Year (PTY) scheme and the Skills and Recognition Award at St George's.
- 'Specimen of the month' – Twitter feed and news post on the St George's webpages.
- On-line Imaging quiz – participants will look at an image and try to guess what it is. Multiple choice <https://www.crick.ac.uk/whats-on/public-events/family-zone>
- Research Blog on university webpages – where Facility users can discuss and share their experience of using the facility and share how it enhanced their research capability.