

Core Facilities Annual Report FY2015

Dr. Charles Delwiche and Amy Beaven

Table of Contents

Executive Summary	1
Introduction.....	2
Mission of the Facility.....	3
Organization Structure and Governance	3
Personnel.....	3
History of the Facility.....	3
Current Equipment.....	4-5
Summary of Imaging Core Usage.....	6-9
Publications	10-16
Outreach Activities	17
Operating Cost Analysis.....	18-19
Rates at Other Institutions.....	20-21
Proposed Rate Schedules	22

Executive Summary

The Imaging Core's (IC) two confocal laser scanning microscopes, the Leica SP5X and the Zeiss LSM710, saw a combined average use of 42 hours per week in FY15, which is a 5.1% increase from FY14. Between FY09 and FY14, the Zeiss consistently saw more use than the Leica, but in FY15, the Leica was used more than the Zeiss (1206.25 hours vs. 963.5 hours, respectively). The increase in use is due in part to the installation of a new HyD detector and time-gating technology in FY14. Overall, the facility saw a 21.6% increase in the total number of microscope hours used (Zeiss LSM 710, Leica SP5 X, DeltaVision, Axiophot, AxioObserver and PerkinElmer spinning disk confocal).

Though the facility saw an increase in use, consumable and service contract expenses for all facility microscopes in FY15 exceeded the total income collected via charge-backs by \$10,802.20. It should be noted that the department offered 15 free hours of Leica SP5 X use per week to a new professor as part of a startup agreement. If the professor had been billed for his microscope use, the facility would have lost only \$3,033.75. The microscope with the largest disparity in income versus expenses was the DeltaVision; expenses exceeded chargeback income by \$10,096.99, in part due to the extension of an introductory rate of \$10 an hour through April 2015. If all hours had been charged at the regular rate, the DeltaVision's expenses would have exceeded income by \$6,294.49. One goal of the coming year will be to try and increase usage of this instrument.

From FY05 through the end of FY15, 581 individual researchers were trained to independently operate the confocals and DeltaVision microscopes, including students taking the 2-credit course, BSCI427/CBMG688W, Principles of Microscopy. Use of the facilities microscopes has resulted in at least 116 publications (detailed below, under "Publications").

The IC implemented a new variable rate system for the confocal microscopes and DeltaVision in FY13, where "peak" times (M-F, 8am-6pm, weekends/holidays) were charged at a slightly higher rate than the "off-peak times" (all other times). In FY15, ~20% of all microscope use occurred during off-peak hours. The director of the IC recommends we continue offering the variable rate system rate system through FY16.

A PerkinElmer confocal spinning disk was installed in room B0118 of the Physical Sciences Complex (PSC) building in December 2014. Thus far, this instrument has been used only by Biophysics faculty members because the basement of the PSC building is still under construction, and no incubator, card lock, or BSC is available at this time. The instrument is part of a new Satellite Core, and is managed by the director of the IC.

A thorough investigation of microscope hourly rates at other institutions (Tables 13-17) shows the IC's confocal, DeltaVision and widefield rates are well below the average charged at similar institutions (\$36/hr, \$33/hr and \$19/hr respectively). Because facility expenses exceeded income by over \$10,000 in FY15, the director of the IC recommends increasing confocal "peak" rates by \$4/hr (from \$28/hr to \$32/hr). Conversely, all off-peak rates will be decreased by \$2/hr (from \$24/hr to \$22/hr). Please see Table 19 for a complete list of all proposed rates.

Introduction

Established in the year 2000 by the Department of Cell Biology and Molecular Genetics, the Imaging Core (IC) was designed to enhance research and education at the University by providing students and faculty with access to sophisticated light microscopes and imaging instrumentation whose purchase and maintenance costs far exceed the budgets of individual investigators. Serving as the primary resource for advanced light microscopy in the Biological Sciences at the University of Maryland, the IC carries the mission of providing state of the art light microscopy instrumentation, training users in basic and advanced light microscopy techniques and introducing the latest technology and innovations in light microscopy.

Located in room 0107 Microbiology Building, the IC facility contains 9 rooms, five of which are dedicated microscope space, a working darkroom, office space for the Director and a wet-bench lab space with fume hood. When first established, the IC contained a single confocal microscope and a deconvolution microscope. Over the years, demand for time on the instruments increased dramatically, necessitating the purchase of a second confocal in 2008. At present, the IC contains 2 state-of-the-art confocal microscopes (a Zeiss LSM710 and Leica SP5X), a DeltaVision deconvolution/TIRF microscope (installed in March FY14), a Zeiss AxioObserver fluorescence microscope (available for use in February FY14), a Zeiss AxioPhot brightfield microscope and an automatic film processor. In December 2014, a PerkinElmer spinning disk confocal microscope was purchased and installed in the Physical Sciences Complex. This microscope will be part of the new Satellite Core, and will be managed by the director of the IC.

The Director of the IC, Amy Beaven, oversees the routine operation of the laboratory and is available during normal business hours to provide training on all equipment, guidance on experimental design, assistance with image analysis and technician-assisted microscope operation. Since taking over the IC operation in November 2005, Ms. Beaven has trained over 581 researchers from at least ten different departments in six colleges and three different campuses of the University of Maryland.

The IC is used by a diverse group of investigators, including undergraduates, graduate students, post-docs, technicians and faculty. Students enrolled in the annual 2-credit class CBMG688W/BSCI427, Principles of Microscopy, gain hands-on experience in the operation of the IC's brightfield, DeltaVision and Leica SP5X confocal microscopes. This course has trained an average of fifteen students each year for the past ten years.

In the past, funding for the IC came from a combination of user fees and support from the University of Maryland. In an effort to become self-sustaining, trends in facility income, expenses and instrument usage were analyzed over time (the details of which are published in IC's FY10-14 Annual Reports). The analysis showed that a gradual increase in hourly instrument rates were necessary in order for the facility to become financially independent. As such, user fees were incrementally increased over several years in the hopes that the IC would be able to cover all maintenance and service contract costs through user fees alone. With additional rate increases, this may soon be possible. It should be noted that current instrument fees are priced competitively and still well below the average rates charged at similar institutions with equivalent instrumentation.

Facility Mission

The mission of the Imaging Core (IC), located in 0107 Microbiology Building, is to enhance research and education within the College by:

1. Providing access to state-of-the-art light microscopy and imaging instrumentation.
2. Offering detailed training opportunities and support in basic and advanced light microscopy techniques.
3. Keeping researchers up to date with the latest technology and innovations in light microscopy.

Organizational Structure and Governance

- Director of the Facility: Amy Beaven
- Faculty supervisor: Dr. Charles Delwiche, Professor
- Advisory Committee: Dr. Charles Delwiche, Professor (CBMG) Dr. Jose Feijo, Professor (CBMG), Dr. Iqbal Hamza, Professor (ANSC), Dr. Wolfgang Losert, Professor (PHYS), and Dr. Stephen Wolniak, Professor (CBMG)

Personnel

The Director of the Facility, Amy Beaven, is the only full-time staff member within the facility. She was hired in 2005 to manage the Imaging and Genomics Core facilities and was promoted to Director in 2010. Ms. Beaven received her Master's degree in Biology in 1999 and has over 13 years intensive experience in confocal imaging techniques. She is available during the hours of 8am-4:30pm to provide guidance in experimental design, training on all equipment, technician-assisted confocal operation and assistance with image analysis.

History of the Facility

Amy Beaven was hired to manage the Imaging Core Facility in November 2005. She took over for the previous director of the facility, Dr. Robert Brown, who had left the University several months previously. At this time, the facility contained both Imaging and Genomics related equipment. Instrumentation included a Zeiss LSM 510 confocal microscope (0107E), a DeltaVision deconvolution microscope (0107F), an Olympus fluorescence microscope (0107), a Bio-Rad FX Pro Plus Imager, a Konica film processor (0107A), an ABI 3730xl DNA sequencer (0107H), two ABI 3100 DNA Sequencers (0107H) and an ABI 7700 Sequence Detector Real-Time PCR machine (0107H).

Summary of changes in instrumentation since November 2005

- August 2006: A Mini Med 90 Film Processor (cost: \$3,588.00) replaced the old Konica processor. The department paid \$2,500.00 of the total cost and each of the following PIs contributed \$109: Jonathan Dinman, Jeffrey DeStefano, Kenneth Frauwirth, David Mosser, Anne Simon, Wenxia Song, Richard Stewart and Elizabeth Gantt. The developer is serviced monthly by United Medical.
- October 2006: Dr. Steve Wolniak (Interim Chair of CBMG) procured a Zeiss Axiophot fluorescence microscope for the facility following Dr. Ron Weiner's retirement. A CoolSnap EZ monochrome camera, computer workstation and Nikon Elements software (total cost: \$13,400.00) were purchased in 2007 for the microscope using CBMG funds.
- April 2007: The 7700 Sequencer Detector was replaced with a Roche LightCycler 480 Real-Time PCR machine, which was purchased through CBMG using the Bioscience Research Building capital equipment funds (and is housed in BRB; see below).
- August 2007: Due to a drop in usage, the 3100 "North" DNA sequencer was taken out of operation.
- December 2008: The instruments in 0107H MICB (two ABI 3100 DNA sequencers, the ABI 3730xl DNA Sequencer and the Roche LightCycler 480 Real-Time PCR machines) were moved to the new Genomics Core, room 2229 Bioscience Research Building.
- December 2008: The Leica SP5 X confocal microscope was installed in room 0107H MICB. This microscope was obtained by Drs. Ian Mather and Steve Wolniak via an NSF MRI grant.
- October 2009: The LSM510 confocal microscope was dismantled to make way for the new LSM710 confocal microscope. The LSM710 was purchased using college funds, authorized by Dean Norma Allewell.
- January 2009: Genomics Core Equipment: Bio-Rad CFX 96 Real-time PCR machine was purchased and placed in room 2229 BRB.
- April 2010: Genomics Core Equipment: Due to a drop in usage, the 3100 "West" DNA sequencer was taken out of operation.
- July 2011: Genomics Core Equipment: July 2011: Both the 3100 "West" and 3100 "North" DNA sequencers were sold through Terrapin Trader.
- November 2011: A Thermo Scientific Midi 40 CO2 incubator was purchased using Imaging Core funds (\$3,194.00).
- February 2014: a Zeiss AxioObserver widefield fluorescence microscope was relocated from room 3207 Bioscience Research Building. The microscope was installed in room 0107K and upgraded with a new computer, new software (Zen 2012) and a new power supply, using a combination of departmental and IC funds.
- March 2014: A DeltaVision Deconvolution/TIRF microscope was installed in room 0107F MICB. The microscope was purchased with departmental and college funds.
- April 2014: Financial responsibility for the DNA sequencer was transferred to the Biology Department.
- August 2014: The Leica SP5 X was upgraded with a new HyD detector and time-gating technology.
- October 2014: The Zeiss LSM 710 computer was replaced (free upgrade due to computer issues with the old operating system) with a Windows 7 computer and the software was upgraded to the latest version of Zen.
- December 2014: A PerkinElmer spinning disk confocal microscope was installed in the Satellite Core, room B0118 Physical Sciences Complex.
- January 2015: As a result of increased instruments and Imaging Core responsibilities, management of the Genomics Core was transferred from Amy Beaven to Dr. Yan Wang.

Table 1: Current Imaging Core Equipment

Equipment	Location	Description	Purchase Date	In-College Rate History (Academic Year)
Zeiss LSM 710 Confocal Microscope	0107E MICB	405 diode, argon (458, 488, 514nm), 561, 633. 3 PMTs, manual stage	October 2009	2009/2010: \$15.00/hr 2010/2011: \$18.60/hr 2011/2012: \$22.00/hr 2012/2013: \$26.00/hr Peak 2012/2013: \$23.00/hr Off-Peak 2013/2014: \$26.00/hr Peak 2013/2014: \$23.00/hr Off-Peak 2014/2015: \$28.00/hr Peak 2014/2015: \$24.00/hr Off-Peak
Leica SP5X Confocal Microscope	0107H MICB	405 diode, argon (458, 488, 514), WLL. 5 PMTs, automated stage, resonance scanner, environmental chamber	December 2008	2008/2009: \$15.00/hr 2009/2010: \$15.75/hr 2010/2011: \$18.60/hr 2011/2012: \$22.00/hr 2012/2013: \$26.00/hr Peak 2012/2013: \$23.00/hr Off-Peak 2013/2014: \$26.00/hr Peak 2013/2014: \$23.00/hr Off-Peak 2014/2015: \$28.00/hr Peak 2014/2015: \$24.00/hr Off-Peak
Deltavision Deconvolution/ TIRF Microscope	0107F MICB	Standard DAPI, FITC, TRITC, mCherry, CY5, CFP, YFP filters, automated stage	March 2014	2013/2014: \$10/hr 2014/2015: \$10/hr thru 3/15 2014/2015: \$28.00/hr Peak 2014/2015: \$24.00/hr Off-Peak
Zeiss AxioObserver Fluorescence	0107K	Standard DAPI, FITC, TRITC filters	February 2014	2012/2013: \$5/hr 2013/2014: \$5/hr
Axiophot Fluorescence Microscope	Main lab	CoolSnap B&W camera, workstation with Nikon Elements	CoolSnap, Elements: July 2007	\$2.00/hr since installation
Olympus Fluorescence Microscope	0107 MICB	Standard DAPI, FITC, Rhodamine filters	Unknown	\$2.00/hr since 2005
Mini Med 90 Film Processor	0107A MICB	Standard film processor	August 2006	\$0.00/hr since purchase
Thermo Scientific Midi 40	0107L MICB	CO2 incubator	November 2011	\$0.00/hr since purchase
PerkinElmer confocal spinning disk	B0118 PSC	Spinning disk with all standard laser lines	December 2014	2014/2015: \$28.00/hr Peak 2014/2015: \$24.00/hr Off-Peak

Summary of Facility Usage

During FY15, use of the Zeiss LSM710 averaged 18.5 hours per week and Leica SP5X use averaged 23.1 hours per week. The combined average usage of 41.6 hours per week is a 5.1 % increase from FY14. Overall, the facility saw a 21.6% increase in the total number of microscope hours used (Zeiss LSM 710, Leica SP5 X, DeltaVision, Axiophot, AxioObserver and PerkinElmer spinning disk confocal).

Though the facility saw a 21.6% increase in use, consumable and service contract expenses for all facility microscopes in FY15 exceeded the total income collected via charge-backs by \$10,802.20. It should be noted that the department offered 15 free hours of Leica SP5 X use per week to a new professor as part of a startup agreement. If the professor had been billed for his microscope use, the facility would have lost only \$3,033.75. The microscope with the largest disparity in use versus expenses was the DeltaVision; expenses exceeded chargeback income by \$10,096.99, in part due to the extension of an introductory rate of \$10 an hour through April 2015. If all hours had been charged at the regular rate, the DeltaVision's expenses would have exceeded income by \$6,294.49. One goal of the coming year will be to try and increase usage of this instrument.

Table 2: FY15 Income and Expenses

Instrument/ Source Income	Service contract cost	Consumable Cost	Total Expenses	Income	Income - Expenses
Zeiss LSM 710	\$19,755.00	\$51.49	\$19,806.49	\$27,654.50	\$7843.71
Leica SP5 X	\$37,743.00	\$51.49	\$37,794.49	\$25,576.25	\$-(12,218.24)
DeltaVision	\$16,200.00	\$51.49	\$16,251.49	\$6154.50	\$-(10,096.99)
Zeiss Observer	\$0.0	\$51.49	\$790.00	\$738.51	\$738.51
Axiophot	\$0.0	\$51.49	\$128.00	\$76.51	\$76.51
LSM700 training	N/A	\$0.0	\$1350.00	\$1350.00	\$1350.00
CBMG688W	N/A	\$0.0	\$1500.00	\$1500.00	\$1500.00
Total	\$73,698.00	\$257.45	\$73,955.45	\$63,153.25	\$-(10,806.50)

Table 3: Combined LSM 710, SP5 X and DeltaVision Microscope Data by Fiscal Year:

Fiscal Year	Income from User Fees	Total # Hours Used	Total hours used for UMCP courses	Total # Training Sessions
2009	\$5,090.75	345.78	0.00	39
2010	\$30,732.93	2086.19	70.96	87
2011	\$57,738.83	3087.55	55.50	68
2012	\$49,777.56	2265.25	62.751	49
2013	\$55,810.80	2180.00	90.75	61
2014	\$56,948.80	2091.80	72.75	63
2015	\$59,385.25	2545.25	63	62
Total	\$315,484.92	13,467.77	450.96	429

Table 4: Leica SP5X Summary Data:

Fiscal Year	Income from User Fees	Total # Hours Used	Total hours used for UMCP courses	Total # Training Sessions
2009	\$5,090.75	345.78	0	39
2010	\$18,362.80	1282.517	70.96	43
2011	\$24,290.48	1325.3	55.5	35
2012	\$21,882.08	1021.25	62.75	29
2013	\$21,922.00	932.25	90.75	35
2014	\$25,160.55	886.3	71.25	34
2015	\$25,576.25	1206.25	38.75	27
Total	\$142,284.91	6999.65	389.96	242

Table 5: Zeiss LSM710 Summary Data:

Fiscal Year	Income from User Fees	Total # Hours Used	Total hours used for UMCP courses	Total # Training Sessions
2010	\$12,370.13	803.675	0	44
2011	\$33,448.35	1762.25	0	33
2012	\$27,895.48	1244.00	0	20
2013	\$33,888.80	1247.75	0	26
2014	\$31,470.75	1173.75	1.5	17
2015	\$27,654.50	963.5	6.5	22
Total	\$166,728.01	7194.93	8	162

Table 6: DeltaVision Summary Data:

Fiscal Year	Income from User Fees	Total # Hours Used	Total hours used for UMCP courses	Total # Training Sessions
2014	\$317.50	31.75	0.0	12
2015	\$6472.00	375.5	24.25	13
Total	\$6472.00	407.25	24.25	25

During FY15, 53 different laboratories from 10 different departments (AGNR, BioENGR, Biology, CBMG, Chem/Biochem, ENGR, ENT, IBBR, Psychology, Physics) and 2 off-campus laboratories (USGS and Howard University) made use of the facility's confocal microscopes. CBMG accounted for 49% of the total microscope use (Figure 3).

Figure 1: Top Microscope Users by Department FY15

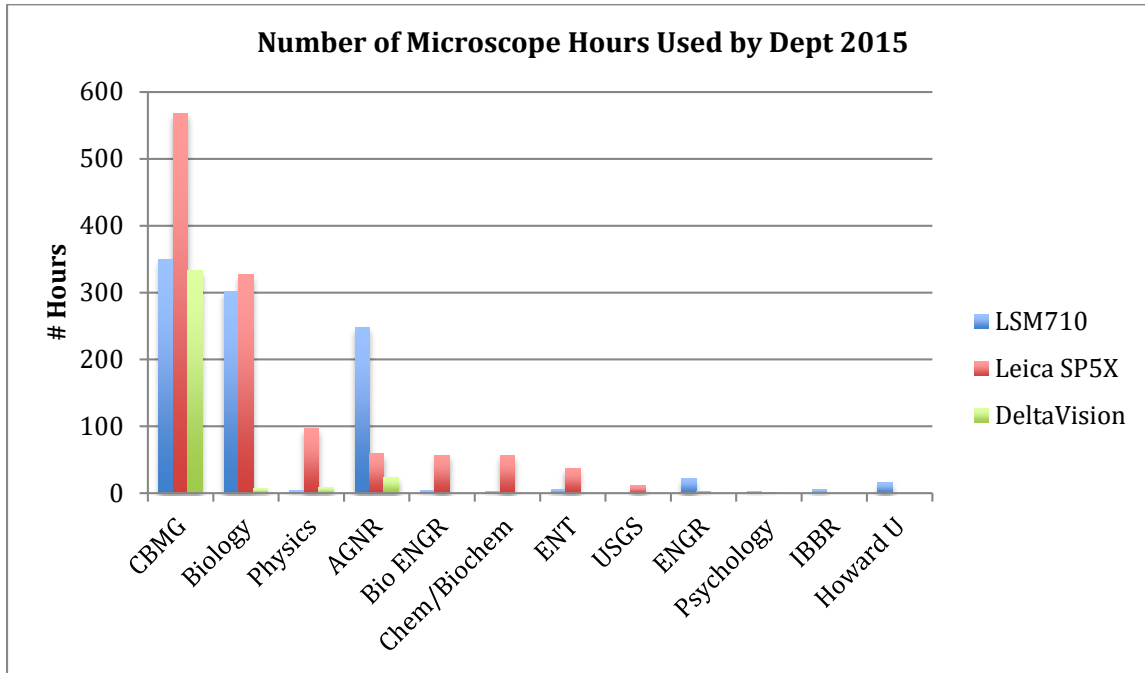


Figure 2: Top Microscope Users FY15

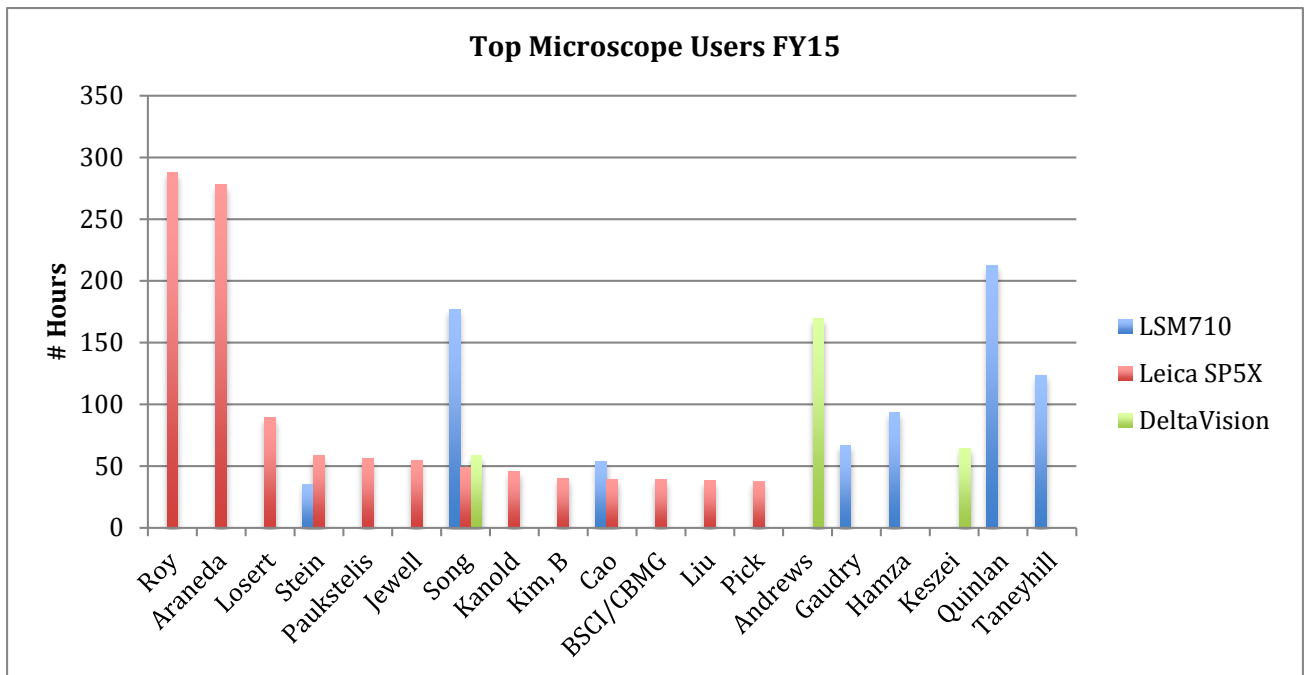
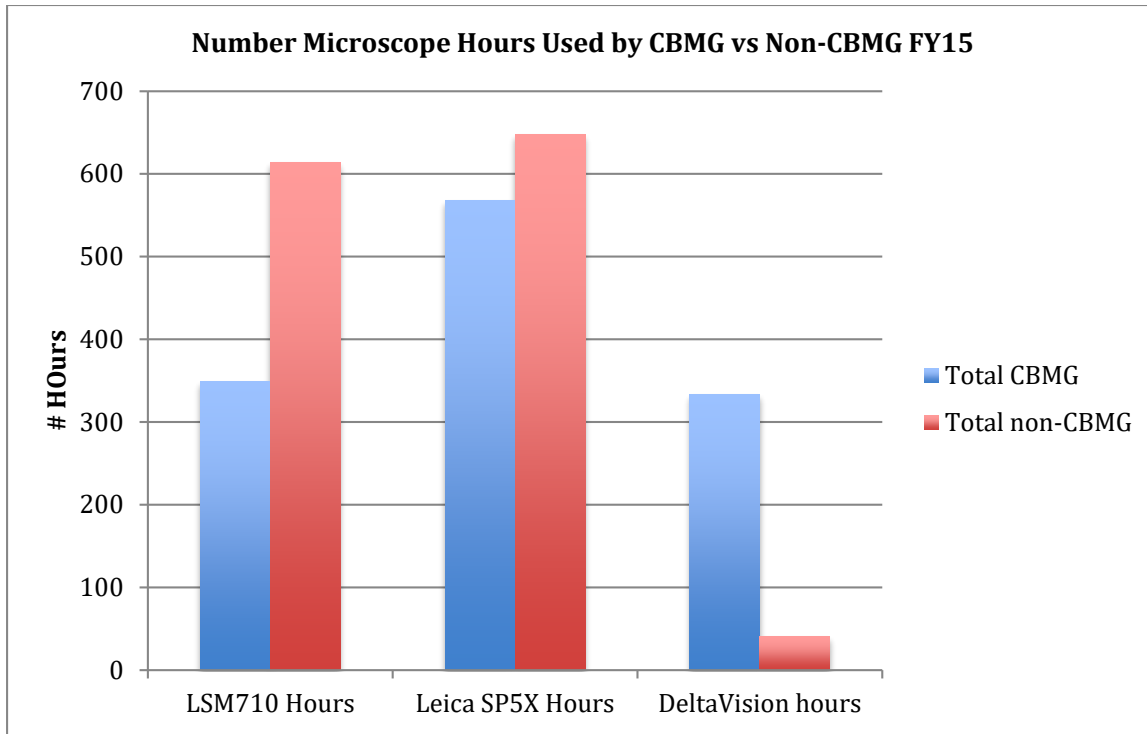


Figure 3: CBMG versus non-CBMG Use of Microscopes FY15



Publications that entailed the use of the Zeiss LSM 510:

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2. Sikes, J. M. & Bely, A. E. Radical modification of the A-P axis and the evolution of asexual reproduction in *Convolutriloba* acoels. *Evolution and Development* 10, 619-631 (2008).
3. The MHC class II-associated invariant chain interacts with the neonatal Fc gamma receptor and modulates its trafficking to endosomal/lysosomal compartments. Ye L, Liu X, Rout SN, Li Z, Yan Y, Lu L, Kamala T, Nanda NK, Song W, Samal SK, Zhu X. *J Immunol.* 2008 Aug 15;181(4):2572-85
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Publications that entailed the use of the DeltaVision (to date):

1. Renberg R., Yuan X., Samuel T., Miguel D., Hamza I., Andrews N., Flannery A. (2015) The heme transport capacity of LHR1 determines the extent of virulence in *Leishmania amazonensis*. *PlosOne*.

Outreach Activities During FY15

1. June 28-July 13, 2014: Amy Beaven attended the EMBO course on 3-D Developmental Imaging at the Instituto Gulbenkian de Ciencia, Oeiras, Portugal.
2. August 2014: the Leica SP5 X confocal microscope was upgraded with a HyD detector and time gating technology, and all users were trained to use the new detector.
3. August 27, 2014: The IC hosted a DeltaVision seminar and training workshop.
4. 2014 Fall Semester: Amy Beaven trained members of the class CBMG688W/BSCI 427, principles of microscopy, to use the Axiophot microscope, the DeltaVision Deconvolution microscope and the Leica SP5X confocal microscope.
5. 2014 fall semester: Amy Beaven assisted members of BSCI 415 with the acquisition of confocal images.
6. December 2014: The PerkinElmer confocal spinning disk microscope was installed and users were trained to use the system. Amy Beaven worked with DES to ensure the new lab in the PSC is a BSL-2 laboratory.
7. May 6-7, 2015: Amy Beaven attended a two-day training course on the software program Image-Pro Plus from Media Cybernetics.
8. May 22-30, 2015: Amy Beaven and Dr. Charles Delwiche imaged Dr. Delwiche's samples on the aberration corrected multi-focus microscope (MFM) at Janelia Research Campus, Howard Hughes Medical Institute.
9. June 2-5, 2015: Amy Beaven traveled to the Mid-Atlantic Directors of Scientific Cores conference and attended a two-day preconference workshop on business skills. Travel funds were obtained through an internal departmental proposal.

Operating Cost Analysis

At the end of FY15, the Imaging Core account held a balance of XXX.

Table 7: Total Imaging Core Facility Income and Expenses from FY09-FY15

Year	Total Income (including subsidies)	Total Imaging Core Expenses	Net Balance
FY2009	\$5,090.75	\$6,113.25	\$-(1,022.50)
FY2010	\$68,232.80	\$29,563.70	\$38,669.10
FY2011	\$95,238.48	\$55,524.75	\$39,713.73
FY2012	\$87,277.66	\$76,562.12	\$10,715.54
FY2013	\$55,810.80	\$59,672.67	\$-(3,861.87)
FY2014	\$56,351.50	\$59,365.43	\$-(3,691.40)
FY2015*	\$63,153.25	\$73,955.45	\$-(10,802.20)
Total*	\$431,987.77	\$361,268.42	\$70,719.35

*2015 total includes all facility microscopes. Previous totals included the LSM 710 and SP5X only.

Table 8: Cost Breakdown: Leica SP5X

Year	Service Contract Cost	Expenses	Income	Income (subsidies)	Income - Expenses
FY2009	0	\$6,113.25	\$5,090.75	0	\$-(1,022.55)
FY2010	\$26,000.00	\$2,375.80	\$18,362.80	\$37,500.00	\$27,487.00
FY2011	\$36,075.00	\$488.25	\$24,290.00	\$37,500.00	\$25,226.75
FY2012	\$52,296.00	\$2,055.56	\$21,882.08	\$37,500.00	\$5,030.52
FY2013	\$37,091.50	\$1,886.66	\$21,922.00	0	\$(-17,057.16)
FY2014	\$37,091.50	\$359.92	\$25,160.55	0	\$(-12,290.87)
FY2015	\$37,743.00	\$51.49	\$25,576.25	0	\$(-12,218.24)
Total	\$226,297.00	\$240,283.93	\$142,284.91	\$112,500.00	\$14,500.98

Table 9: Cost Breakdown: LSM 710

Year	Service Contract Cost	Expenses	Income	Income (subsidies)	Income - Expenses
FY2009	0	0	0	0	0
FY2010	0	\$1,187.90	\$12,370.00	0	\$11,182.10
FY2011	\$17,730.00	\$1,231.50	\$33,448.00	0	\$14,486.50
FY2012	\$19,260.00	\$2,950.56	\$27,895.58	0	\$5,685.02
FY2013	\$19,260.00	\$1,433.51	\$33,888.80	0	\$13,195.29
FY2014	\$19,260.00	\$359.92	\$31,470.75	0	\$12,210.75
FY2015	\$19,755.00	\$51.49	\$27,654.50	0	\$7,848.01
Total	\$95,265.00	\$7,204.88	\$166,727.63	0	\$64,607.67

Table 10: Cost Breakdown: DeltaVision

Year	Service Contract Cost	Expenses	Income	Income (subsidies)	Income - Expenses
FY2014	\$0.0	\$739.22	\$370.50	0	\$(421.72)
FY2015	\$16,200.00	\$51.49	\$6134.50	0	\$(10,096.99)
Total	\$16,200.00	\$16,990.71	\$6472.00	0	\$(10,518.71)

Projected Cost Analysis:

If rates, service contract costs and instrument usage remain unchanged, the Imaging Core will lose \$10,802.20 each year (Table 7). However total expenses in FY16 are expected to increase because the facility is being converted to a BSL-2 facility, which will require the purchase of personal protective equipment and other materials, such as biohazard containers and bags. If "peak" confocal rates are increased by \$4/hr, peak DeltaVision rates remain the same, and "off-peak" rates for the confocals and the DeltaVision are decreased by \$2/hr, the net loss will decrease from \$7,428.00 to \$2,225.00 (Table 11 and 12).

Table 11: Yearly projected Income and Expenses if rates remain unchanged

Microscope	Projected Expenses (consumables & service contracts)	Projected Income	Income-Expenses
LSM710	\$20,755	\$28,228	\$7473
SP5X	\$38,743	\$29,167	\$(9,576)
DeltaVision	\$17,200	\$11,457	\$(5,743)
Other	\$500	\$918	\$418
Total	\$77,198*	\$59,770	\$(7,428)

*Total expenses in FY16 are expected to increase because the facility is being converted to a BSL-2 facility, which will require the purchase of personal protective equipment and other materials, such as biohazard containers and bags.

Table 12: Projected Account Balance Through FY20: If "peak" confocal rates are raised \$4 and all off-peak rates are lowered by \$2/hr (Peak rates: \$32/hr; Off-peak: \$22/hr)

Microscope	Projected Expenses (consumables & service contracts)	Projected Income	Income-Expenses
LSM710	\$20,755	\$30,815	\$10,060
SP5X	\$38,743	\$31,521	\$(7,222)
DeltaVision	\$17,200	\$11,719	\$(5,481)
Other	\$500	\$918	\$418
Total	\$77,198	\$74,973	\$(2,225)

Table 13: Example Confocal Rates (updated 2015)

Facility	Instrument	Hourly rate	Additional information
Berkeley Biological Imaging Facility	Zeiss LSM 710	\$35	Training is \$147.50
Berkeley Biological Imaging Facility	Zeiss LSM 510	\$29	Training is \$147.50
Cornell University Life Sciences Imaging Core	Zeiss LSM 710	\$35	Training is \$85 per hour
Cornell University Life Sciences Imaging Core	Leica SP2	\$20	
University of Virginia School of Medicine	Zeiss LSM 510	\$34	Rate for 25-42 hours per month
University of Virginia School of Medicine	Zeiss LSM 510	\$38	Rate for 6-25 hours per month
University of Virginia School of Medicine	Zeiss LSM 510	\$54	Rate for 1-5 hours per month
Northwestern University Biological Imaging	Leica SP5	\$38	\$3 increase over last year
Northwestern University Biological Imaging	Zeiss LSM 510	\$37	\$2 increase over last year
Arizona State Imaging Facility	Leica SP5	\$40	
Duke University Light Microscopy Core	Leica SP5	\$26.50	Scopes are heavily subsidized
Duke University Light Microscopy Core	Zeiss LSM 780	\$26.50	Scopes are heavily subsidized
Ohio State University	Olympus FV 1000	\$30	
Michigan State U Center Advanced Microscopy	Zeiss LSM 510	\$35	
Michigan State U Center Advanced Microscopy	Olympus FV 1000	\$35	
University of Washington Keck Facility	Zeiss LSM 510	\$42	
University of Washington Keck Facility	Leica SP2	\$42	
Oklahoma State University	Leica SP2	\$30	
UNC Chapel Hill Michael Hooker Facility	Leica SP2	\$39	
University of Connecticut	Leica SP8	\$15	
UVA Keck Center	Zeiss LSM 510	\$35	
UVA Keck Center	Leica SP5X	\$35	
Oregon State University	Zeiss LSM 780	\$21	Peak rate
Oregon State University	Zeiss LSM 780	\$18	Off-peak rate
Yale School of Medicine	Zeiss LSM 510	\$45	
Yale School of Medicine	Leica SP5	\$45	
Texas A&M	Olympus FV 1000	\$41	
University of Maryland School of Medicine	Zeiss LSM 510	\$40	Training is \$200 per user
Colorado State University	Zeiss LSM 510	\$40	
Boise State University	Zeiss LSM 510	\$43.12	
Rockefeller University	Leica SP5	\$49	
Notre Dame	Nikon A1	\$26	
Washington University in St. Louis	Nikon A1	\$32	
Washington University in St. Louis	Leica SP2	\$32	
Florida International University	Leica SP2	\$19.65	
Penn State College of Medicine	Leica SP eight	\$35	
Perlman School of Medicine	Zeiss LSM 710	\$85	\$200 per person training fee
Perlman School of Medicine	Leica STED	\$85	\$200 per person training fee
University of California, Davis	Olympus FV 1000	\$35	
UC Santa Cruz	Leica SP5	\$25	
Indiana University	Leica SP5	\$17.75	
U of Arizona, Env Health Sciences	Leica SP2	\$32	
Oregon Health and Science University	Zeiss LSM 780	\$39.60	
Oregon Health and Science University	Olympus FV 1000	\$33.00	
U of Georgia Biomedical Microscopy Core	Zeiss LSM 710	\$35	
University of Illinois at Chicago	Zeiss LSM 510	\$35	
University of Illinois at Chicago	Zeiss LSM 710	\$41	
UC San Diego	Olympus FV 1000	\$36	
UC San Diego	Zeiss LSM 510	\$36	
Baylor College of Medicine	Nikon A1	\$28	
University of Michigan Medical School	Zeiss LSM 510	\$43	
University of Michigan Medical School	Leica SP5X	\$30	
Average		\$36	

Table 14: Example DeltaVision Rates (updated 2015)

Facility	Instrument	Hourly rate
Berkeley Biological Imaging Facility	DeltaVision	\$40
Northwestern University Biological Imaging	DeltaVision	\$35
Duke University Light Microscopy Core	DeltaVision Elite	\$13.80
University of Washington Keck Facility	DeltaVision	\$84
Rockefeller University	DeltaVision	\$37
Notre Dame	DeltaVision	\$18
Washington University in St. Louis	DeltaVision	\$32
Florida International University	DeltaVision	\$8.49
Penn State College of Medicine	DeltaVision	\$20
Perlman School of Medicine	DeltaVision	\$75
University of California, Davis	DeltaVision	\$35
Indiana University	DeltaVision	\$17.75
U of Arizona, Env Health Sciences	DeltaVision	\$25
Oregon Health and Science University	DeltaVision	\$27.50
U of Georgia Biomedical Microscopy Core	DeltaVision	\$30
University of Arizona Microscopy Alliance	DeltaVision	\$35
University of Arizona Microscopy Alliance	DeltaVision	\$25
University of Illinois at Chicago	DeltaVision	\$25
UC San Diego	DeltaVision	\$28
Baylor College of Medicine	DeltaVision	\$28
University of Michigan Medical School	DeltaVision	\$43
Average		\$33

Table 16: Example Spinning Disk Rates (updated 2015)

Facility	Instrument	Hourly rate
Cornell University Life Sciences Imaging Core	Andor Spinning Disk	\$30
Northwestern University Biological Imaging	Leica Spinning Disk	\$37
Duke University Light Microscopy Core	Andor Spinning Disk	\$18.00
University of Connecticut	Andor Spinning Disk	\$15
Rockefeller University	PE Spinning Disk	\$37
Notre Dame	Andor Spinning Disk	\$16
Perlman School of Medicine	Olympus Spinning Disk	\$80
UC San Diego	Perkin Elmer Spinning Disk	\$36
Average		\$34

Table 17: Example Widefield Fluorescence Microscope Rates (updated 2015)

Facility	Instrument	Hourly rate
Cornell University Life Sciences Imaging Core	Olympus Widefield	\$15
University of Washington Keck Facility	Widefield	\$26
UVA Keck Center	Widefield	\$15
Average		\$19

Proposed Rate Schedule:

A thorough examination of confocal microscope rates at other institutions (Table 13-17) shows that the facility’s microscopes are priced below average. The average rate for similar confocal microscopes at 22 institutions was \$36/hour, and the average rate for a DeltaVision system was \$33/hr. Due to the projected facility shortfall of \$7,428 in FY16, and taking into consideration fees at other institutions, the following rate schedule is proposed for the 2015-2016 academic year (Table 19). Peak rates for both confocals will be raised to \$32 an hour; the DeltaVision peak rate will remain the same; all off-peak rates will be lowered to \$22 an hour.

Table 18: Current Imaging Core Rates

Instrument	Users within CMNS	Training fee within CMNS	On-campus users not affiliated with the College	Users not affiliated with the campus
Zeiss LSM710	Peak: \$28/hr Off-Peak: \$24/hr	\$150/person	\$40/hr	\$80/hr
Leica SP5 X	Peak: \$28/hr Off-Peak: \$24/hr	\$150/person	\$40/hr	\$80/hr
DeltaVision Deconvolution	Peak: \$28/hr Off-Peak: \$24/hr	\$150/person	\$40/hr	\$80/hr
PerkinElmer spinning disk	Peak: \$28/hr Off-Peak: \$24/hr	\$150/person	\$40/hr	\$80/hr
Axiophot Fluorescence	\$2.00/hr	\$2/hr	\$2.00/hr	\$5.00/hr
Zeiss AxioObserver	\$5.00/hr	\$25/person	\$8.00/hr	\$20.00/hr

Table 19: Proposed Imaging Core Rates

Instrument	Users within CMNS	Training fee within CMNS	On-campus users not affiliated with the College	Users not affiliated with the campus
Zeiss LSM710	Peak: \$32/hr Off-Peak: \$22/hr	\$150/person	\$40/hr	\$80/hr
Leica SP5 X	Peak: \$32/hr Off-Peak: \$22/hr	\$150/person	\$40/hr	\$80/hr
DeltaVision Deconvolution	Peak: \$28/hr Off-Peak: \$22/hr	\$150/person	\$40/hr	\$80/hr
PerkinElmer spinning disk	Peak: \$32/hr Off-Peak: \$22/hr	\$150/person	\$40/hr	\$80/hr
Axiophot Fluorescence	\$2.00/hr	\$2.00/hr	\$2.00/hr	\$5.00/hr
Zeiss AxioObserver	\$5.00/hr	\$25/person	\$8.00/hr	\$20.00/hr