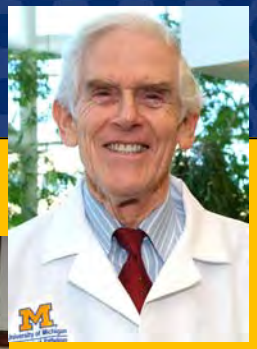


Department of Pathology

Annual Report 2010-2011

University of Michigan
Department of Pathology

University of Michigan Medical School Department of Pathology

Jay L. Hess, M.D., Ph.D.
Carl V. Weller Professor and Chair

It has been another eventful year for the Department of Pathology and the University of Michigan Health Care System (UMHS). Our faculty continue to be called upon to fill important leaderships positions. **Dr. Jeffrey Myers** was selected as President-Elect, United States and Canadian Society of Pathology and **Dr. Arul Chinnaiyan was** elected to the Board of Directors of the American Association for Cancer Research (AACR). Many members of our faculty were recognized with prestigious awards. **Thomas Annesley Ph.D.,** Professor of Clinical Chemistry, received the 2010 Outstanding Speaker Award from the American Association of Clinical Chemistry. **Dr. Henry Appelman** received the Harvey Goldman Master Teacher Award from the United States and Canadian Society of Pathology. **Dr. Alexey Nesvizhskii** was named a Teacher of the Year for his teaching in the Bioinformatics Graduate Program of the Center for Computational Medicine and Bioinformatics, **Dr Jeffrey L. Myers**, James French Professor of Diagnostic Pathology and Director of Anatomic Pathology, who was named as one of four Outstanding Clinicians in the 2010 Dean's Awards for Faculty. In addition, **Dr. Kojo Elenitoba-Johnson** was inducted into the American Society for Clinical Investigation.

Our faculty continues to grow with recruitment of outstanding individuals both junior and senior. The newest additions to our faculty include:

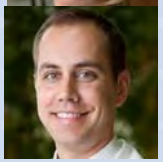
May Chan, M.D. recruited from Beth Israel Deaconess/Harvard Medical School (Dermatopathology)

Alexandra Hristov, M.D. from the University of California, San Francisco (Dermatopathology)

Sandra Camello-Piragua M.D. from Massachusetts General Hospital/Harvard Medical School (Neuropathology)

Scott Owens M.D. from the University of Pittsburgh, (GI and Surgical Pathology)

Julie Jorns M.D from the University of Michigan (Breast and Surgical Pathology)



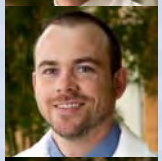
Michael Bachman M.D. Ph.D. from the University of Pennsylvania (Molecular Microbiology)

Department of Pathology

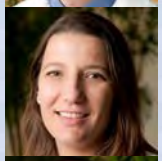
- **Anatomic Pathology**
- **Clinical Pathology**
- **Pathology Education**
- **Pathology Informatics**
- **Sponsored Programs**
- **Translational Research**
- **Michigan Center for Translational Pathology**
- **MLabs Outreach Programs**
- **Ann Arbor VA Health System Laboratories**
- **Finance and Administration**

Judy Pang M.D. from the University of California, San Francisco (Breast Pathology and Cytopathology)

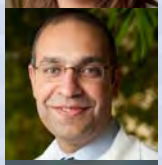
Amir Lagstein M.D. from the University of Michigan (Pulmonary Pathology and Surgical Pathology)



Jean-Francois Rual Ph.D., from Harvard Medical School. Dr. Rual's research focuses on application of high throughput proteomic approaches to defining protein-protein interactions important for development and carcinogenesis.



Maria "Ken" Figueroa M.D., from Weill Cornell Medical College. Dr. Figueroa's research focuses on the epigenetics of myelodysplasia and acute leukemia.



Amer Heider M.D. from the University of Pittsburgh (Pediatric Pathology)

David Keren M.D., currently Director of Warde Medical Laboratories and President of the American Board of Pathology

We also bid farewell to **Steven Mandell M.D.**, Director of MLabs, who lef for a position at Quest Diagnostics, **Steve Olsen M.D.** and **Linglei Ma M.D.**, both in Dermatopathology who moved on to positions in private practice. In addition, **David Gordon, M.D.** transitioned to the role of Dean of Health Sciences at the University of Michigan—Flint.

Two faculty members were invested with endowed Professorships. **Dr. Barbara McKenna**, newly appointed Director of the Division of Education become the Godfrey D. Stobbe Professor of Pathology Education. **Dr. Kojo Elenitoba-Johnson** became the Henry C. Bryant Professor of Pathology.

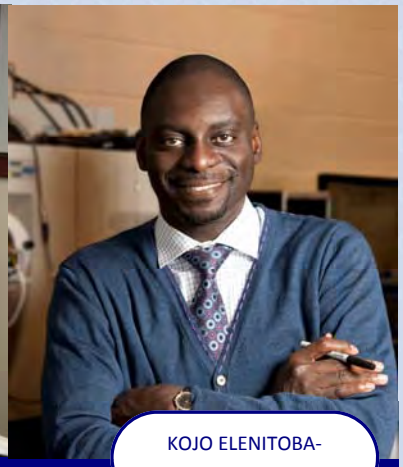
This was another extremely busy year for our clinical services, with work RVUs up over 11% for the fiscal year. We experienced especially strong growth in our consultation practice department-wide. In laboratory medicine, one of our areas of strongest growth was in the molecular molecular diagnostics, which experienced a 33% increase in charges.

By aggressive insourcing for the fourth year in a row, our send-out costs have actually decreased. **Dr. Jeffrey Myers** was named as our new Director of MLabs outreach services and has been very actively focusing our efforts in support of UMHS patients and expanding our capabilities and client base in molecular diagnostics. One major initiative in the coming year is to continue to develop our capabilities in high throughput sequencing. Continual improvement of the quality and safety of the patient services is an integral part of our mission. It takes engaged, satisfied employees in order to deliver world-class care. In addition, those employees need to embrace the expectations for world class service and be equipped with the tools to help them reach this vision. This year we launched our Service Excellence initiative led by **Dr. Duane Newton** to begin a journey on which we will work to raise the level of experience of both employees as well as those we in serve in the Department of Pathology.

As outlined in the section on Sponsored Research Programs, the Department's research programs continue to thrive with faculty in the Department publishing a number of papers in high impact journals. We are working to develop high throughput transcriptome sequencing as a clinical diagnostic test, which will position the Department well to be a leader in diag-

BARBARA MCKENNA, M.D.

Godfrey D. Stobbe Professor of Pathology Education



KOJO ELENITOBA-JOHNSON, M.D.

Henry Clay Bryant Professor of Pathology

nostic molecular pathology well into the 21st century. Toward this end, the Michigan Center for Translational Pathology embarked on a very exciting new initiative, MI-ONCOSEQ, in which tumors from cancer patients are comprehensively sequenced with next generation instruments, the results analyzed at multidisciplinary tumor boards and then reported back to patients. Overall, despite a challenging funding environment, our NIH funding grew by 16% to over $17 million.

Our Education Division has undergone extensive reorganization under the leadership of Dr. Barbara McKenna and her accomplished staff. A major focus will continue to be an emphasis on active learning, maximizing the educational value of rotations and better preparing residents for future responsibilities through more didactics focused on laboratory management, more involvement in the day-to-day management activities of the laboratories. In addition, an exciting initiative in underway to introduce residents to the rapidly evolving field of personalized medicine.

The Department continues to show very strong financial performance, with one of the highest all funds operating margins in the history of the Department. This profitability is essential if the Department is to continue to grow its academic programs as well as weather the storms that lie ahead in terms of reduced clinical reimbursement and flat external funding.

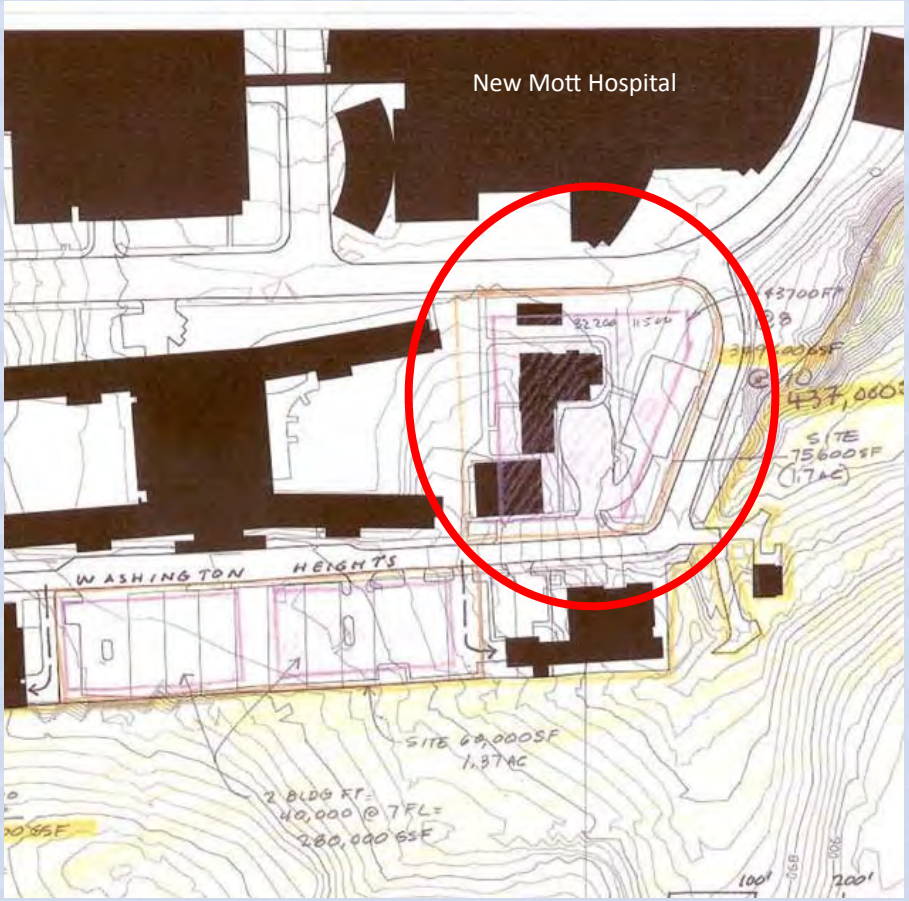
Finally this was a very exciting and important year for solving the space needs for the clinical laboratories. The UMHS leadership has endorsed moving ahead with a new pathology building on the Arbor Heights site, across the street from the new Mott Children's Hospital. This facility would house almost all of the Department's clinical laboratories. We are currently in the process of architect selection for this facility, which is slated to open in 2016.

It is a pleasure and an honor for me to serve as the Chair of Pathology. I hope that you find this Annual Report a valuable source of information about this outstanding Department.

Jay L. Hess M.D. Ph.D.

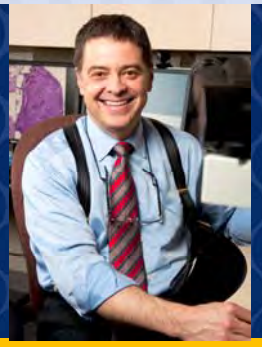
New Pathology Building Site

Scheduled to open in 2016



Division of Anatomic Pathology

Jeffrey L Myers, M.D.
A. James French Professor of Pathology
Director, Division of Anatomic Pathology
Interim Director, MLabs Outreach Program



Anatomic Pathology continues to experience significant growth in service matched by ongoing success in recruiting faculty. Education and research missions remain strong with sustained successes in, 1) recruiting to a growing portfolio of subspecialty fellowships, 2) funding research programs and collaborative projects, 3) peer-reviewed publications, and 4) expanding and maintaining a national and international presence as opinion leaders, educators, and clinician scientists.

Practice growth combined with attrition continues to drive faculty recruitment efforts. Amir Lagstein (Clinical Lecturer), Lindsay Schmidt (Assistant Professor) and Angela Wu (Assistant Professor) joined the faculty in July 2010 to meet needs in genitourinary, gynecologic, placental, and pulmonary pathology. Amir was reappointed as Assistant Professor effective July 2011. Judy Pang (Clinical Lecturer) joined the faculty in September 2010 to support the frozen section practice at East Ann Arbor while also participating in our surgical pathology (breast) and cytopathology practices, and was reappointed as Assistant Professor effective July 2011. Scott Owens (Assistant Professor) and Sandra Camelo-Piragua (Assistant Professor) joined the faculty in October 2010 to meet needs in gastrointestinal pathology and neuropathology, respectively. Scott also serves as Medical Director of Professional Practice Evaluation. Jeffrey Hodgin, previously a Clinical Lecturer, was appointed as Assistant Professor effective October 1.

Alexandra Hristov (Assistant Professor) joined the faculty in June 2011, filling an open position in our dermatopathology service. Additional faculty were recruited in the last two quarters of FY2011 and will join the faculty in the first and second quarters of FY2012 as listed below.

- May Chan (dermatopathology) July 2011
- Julie Jorns (breast, surgical pathology) July 2011
- Amer Heider (pediatric pathology) September 2011
- Aleodor Andea (dermatopathology) December 2011

Safety, quality, and service remain high priorities in anatomic pathology. Our All Faculty and Staff Quality Assurance meetings have emerged as an important vehicle for driving Lean principles and tools more deeply into our clinical operations. A new peer review program was created to meet Joint Commission and UMHS expectations for focused and ongoing professional practice evaluation (FPPE and OPPE).

The first quarter brought expansion into additional hospital space remodeled to accommodate a central accessioning area for all outside (*i.e.* consult and transfer) cases and new grossing space ("Room 3") with three incremental grossing stations.

Education programs remain strong as demonstrated by ongoing successes in existing fellowships, recruitment to a recently-

Anatomic Pathology

- Surgical Pathology
- Pediatric Pathology
- Dermatopathology
- Neuropathology
- Medical Renal Pathology
- Cytopathology
- Autopsy and Forensic Pathology

accredited fellowship in Pediatric Pathology, and applications for new fellowships in Neuropathology and Forensic Pathology. AP faculty continue to play key roles in support of our residency program and in Medical School teaching.

Success and vitality in our research activities remains very strong as evidenced by continued visibility in peer-reviewed journals considered high impact by the academic anatomic pathology community, an 18.8% increase in both direct (17.8%) and indirect (21.0%) research expenditures, and high visibility in national and international societies.

CLINICAL ACTIVITIES

Surgical Pathology

A total of 89,785 pathology specimens, including a combination of intramural and extramural cases, were processed in 2011 compared to 80,690 in 2010 and 80,120 in 2009. This represents an annual increase of 11.3% and a 31.5% increase over the last five years. Patient specimens acquired from procedural areas within the UMHHC accounted for 66.1% of cases, down from 72.4% in 2010. This shift in case mix reflects disproportionate growth in all areas of our extramural practice including transfer cases (11.1%) reviewed for patients referred to UMHS for care, MLabs surgicals (11.1%), and consultation cases (11.8%). The number of extramural consultation cases grew to 10,598 compared to 8,574 in FY10, a 23.6% increase. Among our "inside" practices only our gastrointestinal (GI), pediatric (IP), and placenta (PL) services saw substantial increases of 3.3% (561 cases), 8.4% (139 cases) and 26.4% (308 cases) respectively.

Growth in the practice combined with sustained funding for research resulted in increased productivity. Faculty generated an average of 5,217 (± 3,330) RVUs compared to 4,824 in FY2010, an 8.1% increase. Productivity increased despite addition of two incremental positions. This continues to reflect disproportionate growth in RVUs compared to case accession numbers (*i.e.* ↑RVUs/case) in several key surgical pathology services (Figure 1). Indeed, RVUs measured as a 12-month rolling average indicated an annual growth rate of 10.7%.

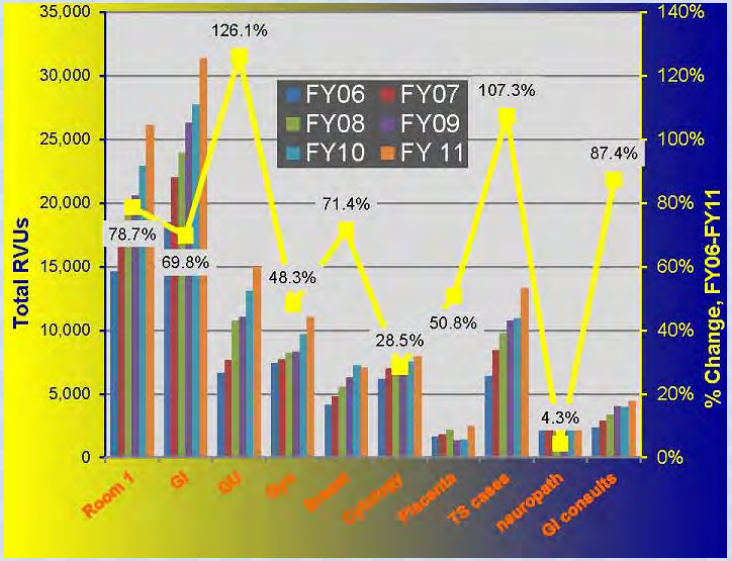


Figure 1—Growth in AP Services

Measured as RVUs rather than accession numbers, several services have nearly (room 1, GI, breast, GI consults) or more than (GU, TS cases) doubled since FY06.

Pediatric Pathology

The new pediatric pathology service continued to flourish under the leadership of Dr. Raja Rabah. As summarized in Table 1, the service grew at an annual rate of 8.4%, accessioning 1,794 cases from the Mott Hospital ORs as well as a number of transfer cases and staging bone marrows. In addition, the pediatric service absorbed the placentas effective November 2010 with a marked improvement in service delivery as evidenced by improved turnaround times despite a 26.4% increase in accessioned cases (see Figure 2). With migration to the pediatric service, the practice of archiving a subset of placentas was abandoned and all placentas received for examination include microscopic review.

	FY09	FY10	FY11	% change
Peds (IP)	1562	1655	1794	8.4%
Placentas (PL)	1212	1166	1474	26.4%

Table 1: Pediatric Pathology Clinical Activity, FY09 – FY11

Dermatopathology

The Dermatopathology Service receives diagnostic case material from four primary sources: (1) UMMC (ID) cases; (2) outside contractual (MD) cases; (3) personal consultation cases; and (4) outside cases reviewed for referred patients (TD).

The Dermatopathology Service continues to be a high volume service (see Table 2) and saw substantial growth in FY11 driven by nearly doubling of outside (MC) cases and a nearly 50% gain in transfer (TD) cases. Combined with modest growth in UMMC (ID) cases, this more than offset a minor dip in consultation cases to result in a 23.0% increase compared to FY10.

Doug Fullen and Lori Lowe continue as Co-Directors of Dermatopathology. In addition to his full-time dermatopathology service responsibilities, Rajiv Patel participates in the soft tissue and orthopedic pathology service. Linglei Ma and Steve Olsen left UMHS in the third quarter to pursue careers in commercial practices. A search committee under the leadership of Doug Fullen successfully recruited Drs. Alexandra Hristov (UCSF) and May Chan (Harvard) to fill the vacated positions. May Chan will also participate in the general surgical pathology ("Room 1") service upon her arrival in July 2011. In the last quarter of FY11, the same search committee successfully recruited Dr. Aleodor Andea to an incremental position intended to support practice growth and create a new Dermatopathology Molecular Research Laboratory (DMRL) as part of a strategy to establish our dermatopathology practice as a center of excellence for molecular diagnostics applied to cutaneous malignancies. Dr. Andea will join the practice in December 2011 as Director of the MPRL and as Director of our Dermatopathology Fellowship.

We continue our active involvement in the University of Michigan Multidisciplinary Melanoma Clinic (MDMC) and Tumor Board, Multidisciplinary Cutaneous Oncology Clinic (MCOC) and Tumor Board, Cutaneous Lymphoma Conference and Tumor Board, and the University of Michigan Cutaneous Oncology "Destination" Program. Dermatopathology plays an integral role in all of these programs.

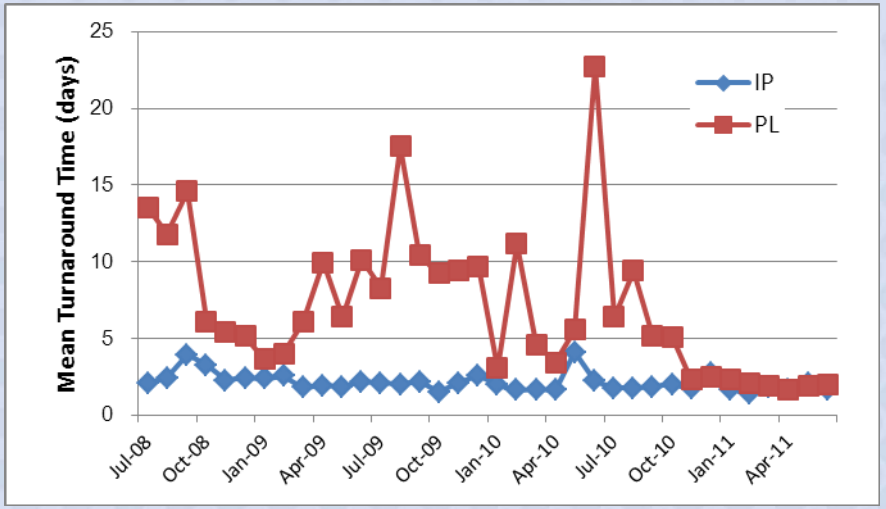


Figure 2: Turnaround times for placentas improved with integration into the Pediatric Pathology service while holding the gains on surgical (IP) pediatric pathology specimens.

	FY09	FY10	FY11	% change (FY10 - FY11)
ID	13,551	13,168	13,441	2.1%
MD	6,519	5,269	9,691	83.9%
TD	2,019	1,958	2,828	44.4%
Consults	2,280	2,440	2,130	-12.7%
TOTALS	24,369	22,835	28,090	23.0%

Table 2: Dermatopathology Clinical Activity, FY09-FY11

Neuropathology

Mila Blaivas, Sandra Camelo-Piragua, Constance D'Amato, Andrew Lieberman and Paul McKeever contributed to the Neuropathology Service. Ms. D'Amato is Active Emeritus. Sandra Camelo-Piragua was recruited to join the section in October 2010 in the wake of Dr. Blaivas' retirement in the 2nd quarter.

There were ~1200 neurosurgical cases examined this year, including 138 personal consultation cases (see Figure 3). The Brain Tumor Board of the University of Michigan Cancer Center and Hospitals, supported weekly by a neuropathologist, reviewed more than 150 neuro-oncology patients with challenging diagnostic evaluations. There were just over 400 muscle and nerve biopsies reflecting 34.8% and 27.0% increases, respectively, over the previous year and returning our practice to FY2009 case levels. The nerve and muscle biopsy service is now staffed by Drs. McKeever and Camelo-Piragua.

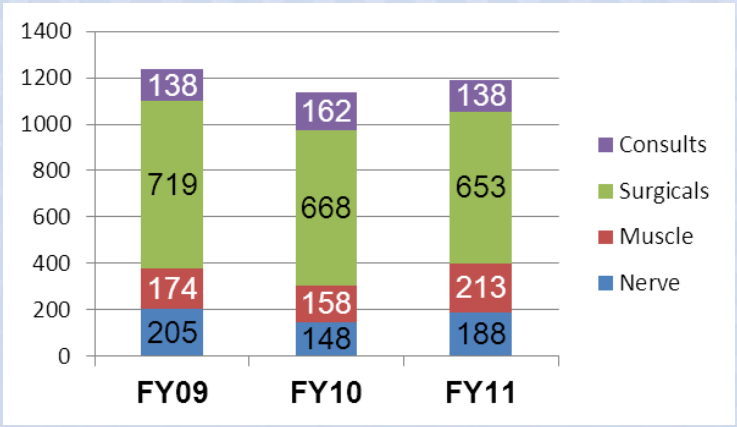


Figure 3 – Neuropathology Case Volumes, FY09-FY11

Neuropathology case volumes have remained relatively stable, with declines in surgical cases largely offset by growth in muscle and nerve biopsies.

There were 223 University Hospital brains examined at autopsy. About a quarter of the brains, including all abnormal and some normal specimens, were examined at formal Brain Cutting Conference. Beginning in June 2011, brain cutting will occur weekly and be staffed on a rotating basis by all three neuropathology faculty with the goal of shortened turnaround time for CNS autopsies.

Medical renal pathology

Our renal biopsy service showed a remarkable 59.2% growth in service, accessioning 984 biopsies in FY11 compared to 618 in FY10 (see Figure 4). Growth in practice was driven in large part by a change in protocol for managing UMHS renal transplant patients linked to the recently-designated Destination Program. Whole slide scanning was implemented as a method for archiving and virtual review of biopsies from renal transplant patients.

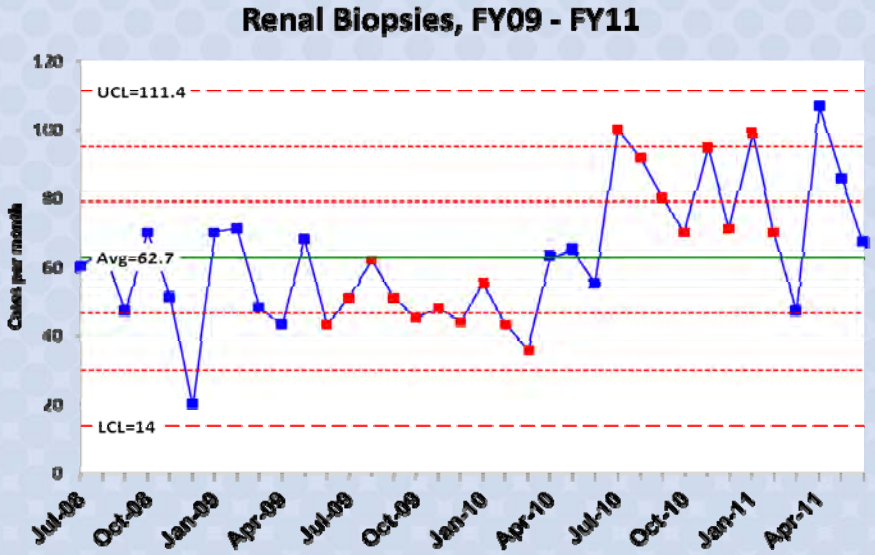


Figure 4. Renal biopsies showed sharp growth beginning in July 2010 as a consequence of a change in protocol for managing transplant patients.

There were 223 University Hospital brains examined at autopsy. About a quarter of the brains, including all abnormal and some normal specimens, were examined at formal Brain Cutting Conference. Beginning in June 2011, brain cutting will occur weekly and be staffed on a rotating basis by all three neuropathology faculty with the goal of shortened turnaround time for CNS autopsies.

Cytopathology

Total gynecologic specimens continued to decline as a consequence of changes in follow-up Pap test recommendations for HPV negative women, dropping 6.9% to 34,014 (see Table 3). This reflects Non-gynecologic specimens numbered 9,812, a 4.4% increase from last year. Fine needle aspirations (FNAs) totaled 2,604, a 2.9% increase. FNAs performed by pathologists at the Cancer Center (ASP3) numbered 219, representing a 21.2% decrease from last year. Assisted FNAs (ASP2) grew at an annual rate of 11.5% totaling 1,423, while aspirates performed by clinicians without our assistance (ASP1) dropped 1.5% to a total of 977. The increase in the assisted FNAs is fueled by our continuous communications with clinical colleagues reinforcing the value of on-site cytology assistance and its impact on patient outcomes. It also drives increased demand for laboratory personnel, cytotechnologists, fellows and faculty to provide the needed service across a geographically dispersed campus.

	FY2009	FY2010	FY2011	% change
Gyn Total	40,905	36,392	34,014	-6.5%
Non-Gyn Total	9,245	9,398	9,812	4.4%
ASP Total	2,415	2,531	2,604	2.9%
ASP 1	985	977	962	-1.5%
ASP 2	1,067	1,276	1,423	+11.5%
ASP 3	363	278	219	-21.2%

Table 3: Cytopathology Clinical Activity, FY09-FY11

Cytology continued to focus on maintaining high service delivery levels as summarized in Table 4 and invested in a number of Lean projects including deployment of an online, paperless inventory management tool. Cytotechnologists trained in use of the Ventana Image Analysis System (VIAS) for quantitative analysis of ER/PR and HER-2/neu immunostains and now regularly participate in this component of the breast service. In the second year of the program we continue to provide web-based virtual adequacy assessments for thyroid aspirates performed in the endocrinology unit at Domino's Farms.

Judy Pang joined the faculty in first quarter of FY2011 with joint responsibilities in cytopathology, the East Ann Arbor Ambulatory Surgical Center, and our breast pathology service.

	MEAN TAT (WKDAYS)	MEAN TAT	% ON-TIME COMPLETION
GYN	2.8	3.8	99.6 % (5 all days)
NGYN/FNA	1.1	1.6	99.0% (48 hours)

Table 4: Cytopathology Turnaround time

Autopsy and forensic services

FY2011 continued to be a time of change for our autopsy practice under the leadership of Dr. Jeffrey Jentzen, Director of Autopsy and Forensic Services. This section continues to provide faculty and resident support for both UMHS and the VA hospital, while also supporting forensic pathology, autopsy and death scene investigation for the Washtenaw County Medical Examiner (WCME). Effective October 2011, the Director of Autopsy and Forensic Services will also assume responsibilities as Chief Medical Examiner for Washtenaw County. Administrative support for the autopsy service and the investigative functions of WCME were co-located to the North Ingalls Building in FY2010, allowing for centralization of all medical examiner functions. Negotiations are underway to expand this model to other counties in southeast Michigan.

A total of 516 autopsies were performed in FY2011, a 5.1% increase over the 491 cases performed in FY2010 and a remarkable 76.7% increase over the 292 autopsies performed in FY2009. Growth is largely due to the impact of full integration of WCME cases in October 2009. The 516 autopsies included 186 in-house autopsies, a 21.5% decline from the 237 performed in FY2010. Most (161) were non-restricted while 13 were restricted and an additional 12 were limited to examination of the brain only. The UMHS hospital autopsy percentage rate declined from its previous level of 19% in FY2010 and 2009 to a new low of 15.8% of hospital deaths. Two hundred fifty four (52%) autopsies were performed for the WCME. We continue to make improvements in autopsy turnaround times.

The current director provides autopsy coverage for 30-40 percent of days and the remainder is distributed among eight other faculty. The coordinator of the autopsy service is assisted by two FTE autopsy assistants and on-call coverage. An autopsy assistant left the university in June 2011 and recruitment is underway to fill the vacated position. A dedicated Administrative Assistant provides clerical, administrative, and computer support.

Another member of the staff monitors the on-line death investigation software, MDlog, completes all death certificates, and provides administrative coverage for the medical examiner. This has facilitated centralization of all death certificates and provided additional support for the autopsy and forensic services. Improvement initiatives of the section continue to revolve around autopsy turnaround time and communication with the clinical staff. Gross pathological diagnoses are routinely communicated to the clinical staff immediately following completion of the autopsy. We continue to work with the office of Decedent Affairs to improve the autopsy service to the UM hospital patients.

Application for an ACGME accredited forensic fellowship is in process with the intent of recruiting for July 2012. The fellow will obtain training and experience in all aspects of forensic medicine including toxicology, criminology, forensic anthropology, forensic pathology, and courtroom testimony. The forensic autopsy experience will be augmented with cases from the office of the Wayne County medical examiner in nearby Detroit.

RESEARCH ACTIVITIES

The Anatomic Pathology faculty remains remarkably productive despite the demands of patient care (see Table 6). Despite an incomplete dataset, thirty three faculty reported an average of 5.1 (median 5) peer-reviewed publications for a total of 157 papers either in print or in press at the end of the fiscal year. This reflects a 10.8% drop compared to a year ago but is virtually unchanged from FY07 (157). In addition faculty reported the results of their work in abstract form on 90 occasions, a 12.5% increase over last year. Twenty-nine faculty served as invited lecturers, speakers or visiting professors on 120 occasions, for an overall average of 4.1 per participant. Clearly, our faculty remain top-of-mind when looking for cutting edge speakers in anatomic pathology. In addition, fifteen different faculty reported being members of 29 editorial boards, including a Senior Editor for Cancer Research (Dr. Kathleen Cho).

	FY2009	FY2010	FY2011	%
publications	172	176	157	-10.8%
abstracts	92	80	90	12.5%
invited lectures	121	108	120	11.1%
editorial boards	30	27	29	7.4%
FTEs funded	3.9	4.5	4.9	8.9%
research expenditures	$4,489,863	$3,473,969	$4,125,489	18.8%

Table 6: Academic Productivity in AP, FY09-FY11

Research expenditures increased nearly 19% compared to the previous year, reflecting 34.5% growth compared to FY2006 and nearly recovering to FY2009 levels (see Figure 5). The total number of funded FTEs rose from 4.5 to 4.9, an 8.9% annual increase and growth of 25.6% compared to FY2009. Maintaining this level of funding in today's environment reflects the remarkable success of our laboratory investigators, all of whom also have substantial commitments to patient care.

Research expenditures grew 18.8% in FY11 compared to FY10, and 34.5% in the five years since FY2006. Mean research expenditures over the same five year period is $3.6 million.

Funding for AP Projects diminished by over 50%, from $84,894 in FY2010 to $36,950 in FY2011.

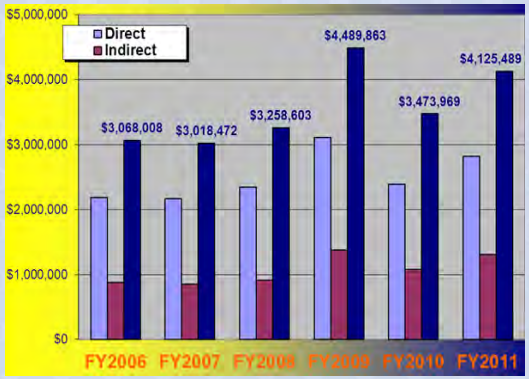
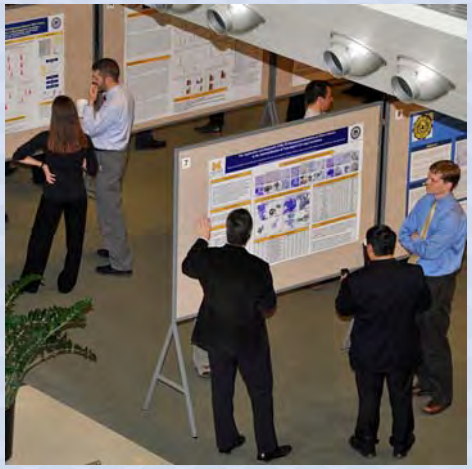


Figure 5 – AP Research Expenditures, FY06-FY11

Figure 6 – AP Project Funding, FY07-FY11

We hosted our second Annual Research Day on January 29, 2011, in collaboration with Hematopathology and Molecular Pathology. The day included 36 abstracts presented as posters (28) and platforms (8). Unfortunately, a winter storm prevented our invited keynote speaker, Dr. Boris Bastian, James Ewing Alumni Chair of Pathology at Memorial Sloan-Kettering Cancer Center, from reaching Ann Arbor but Dr. Tom Giordano stepped in on short notice and gave a great talk focusing on genomic investigations of adrenal neoplasms. The target audience was departmental trainees and faculty with the goal of increasing collaboration and projects. The Annual Research Day was launched in 2010 as a response to a substantial drop-off in FY2009 in the number of projects supported by the AP Projects Fund. A dramatic rebound occurred in FY2010 reflected by nearly $85,000 in allocations compared to $16,050 in FY09 but allocated funds dropped again in FY2011 by just over 56% to $36,950 (see Figure 6). The Molecular Pathology Research Laboratory (MPRL) continues to be an important asset for faculty in AP. Funded projects executed with support from the MPRL in which AP faculty were either Primary Investigators or collaborators were well represented at our Annual Research Day and also resulted in multiple abstract presentations at the 2011 Annual Meeting of the USCAP as well as manuscripts in press or in print in peer reviewed journals. Linglei Ma was promoted to Associate Professor of Pathology (clinical track) effective September 2010.



Second Annual Research Day

EDUCATIONAL ACTIVITIES

Education is an essential and vibrant component of our mission. Anatomic Pathology continues to provide a robust experience for trainees, including standard rotations in autopsy, surgical and cytopathology as well as required and elective rotations in various subspecialties. Fellowships in breast pathology (1), cytopathology (2), gastrointestinal pathology (1), dermatopathology (2), genitourinary (1), pediatric (1), pulmonary (1) and surgical pathology (3) were filled by competitive candidates in the 2010-2011academic year. Within the next two years, our portfolio of fellowships will expand to include forensic and neuropathology. Trainees continued to actively participate in various research projects during the course of the year and served as authors or co-authors for 20 different abstracts presented at the 2011 annual spring meeting of the USCAP in San Antonio.

Educational programs within our autopsy and forensic services continue to benefit from our integrated hospital and medical examiner service. Residents complete three one-month rotations on the autopsy service to comply with ACGME autopsy requirements. Medical students receive exposure to autopsies during their second year. A one-month rotation dedicated to forensic medicine is offered to senior medical students. Educational conferences in autopsy pathology include a weekly autopsy gross conference, a monthly extended gross conference emphasizing clinico-pathological correlations, and presentations in mortality conferences serving the clinical services within the hospital. A monthly didactic forensic pathology conference along with multidisiplinary forensic sign-out conference is also provided by the faculty.

Faculty in Anatomic Pathology continue to play significant roles in the Medical School, including primary responsibility for first and second year courses in pathology as lecturers, laboratory instructors, advisers and mentors. Electives for senior students remain popular and are supported by a number of faculty including Drs. Dave Lucas, Jonathan McHugh and Stewart Knoepp. Multiple faculty also participate in teaching dental students.

Nearly all faculty in Anatomic Pathology participate in supporting an impressive array of interdisciplinary conferences including Tumor Boards for bone and soft tissue (weekly), brain (weekly), breast (weekly), endocrine oncology (weekly), gastrointestinal (weekly), genito-urinary (weekly), gynecologic (weekly), liver (monthly), pediatric (semi-monthly), and lung (weekly) tumors. Faculty also regularly participate in various other conferences including brain cutting, dementia brain cases (quarterly), diagnostic dermatology, cutaneous T-cell lymphoma, nephrology, nerve and muscle (weekly and monthly), multiple pediatric subspecialties (GI, hematology-oncology, lung, surgery) and adult non-neoplastic lung disease (semi-monthly). Educational conferences targeting primarily pathology trainees in which faculty participate include weekly slide (Monday) and didactic (Tuesday) teaching sessions, weekly autopsy gross conferences (Tuesday and Friday), a semimonthly cytology conference (every other Thursday), and a monthly "extended" gross conference.

Multiple faculty participated in our fourth on-campus CME workshop entitled *New Frontiers in Pathology* presented in collaboration with the A. James French Society. Dr. Dwayne Lawrence served as guest faculty and the A. James French Lecturer. We attracted over 100 attendees whose evaluations reflected high praise for the world-class quality of this annual event. Proceedings of the 2009 meeting were published in the October 2010 issue of Archives of Pathology and Laboratory Medicine. The 2011 meeting will feature Dr. Elaine Jaffe as the A. James French Lecturer.

Dr. Dwayne Lawrence
The A. James French Lecturer presents at *New Frontiers in Pathology*

Our CME offerings included the second year of *Advances in Forensic Medicine and Pathology*, hosted in collaboration with the Washtenaw County Medical Examiner's Office in May 2011 at The Inn at St. John's in Plymouth, MI. Feedback was extremely positive and this will continue to be an annual component of our CME programs.

Some of our AP All-Stars at *New Frontiers in Pathology*

Back Row (L-R): Ralph Van Loton and Beth Minors, Dr. Jeffrey Myers, Dr. Joel Greenson and Jann Wesolek, Dr. Megan Lim

Front Row (L-R): Harlene and Dr. Henry Appelman, Dr. Kojo Elenitoba-Johnson

Below: Angela Suliman and Robin Kunkel provide meeting coordination and guest services

Dr. Jeffrey Jentzen, Director of Autopsy Services at the University of Michigan, introduces Dr. Lindsey Thomas, Minnesota Regional Medical Examiner, Minneapolis, Minnesota, at the 2nd Annual *New Frontiers in Forensic Medicine and Pathology* Conference.

Division of Clinical Pathology

Jeffrey S. Warren, M.D.
Alfred S. Warthin Professor of Pathology
Director, Division of Clinical Pathology

The Clinical Laboratories encompass Specimen Processing; the Reference Sendout Laboratory; UMHS off-site limited function laboratories; point-of-care testing throughout the Hospitals and more than twenty satellite facilities; a 24-hours-per- day/7 days-per-week Phlebotomy Service; and comprehensive hospital-based laboratories. The latter include Hematology (which encompasses Special Hematology, Automated Hematology, Flow Cytometry, and Coagulation); Chemical Pathology (which encompasses Special Chemistry, Automated Chemistry, Immunology, Ligand Assays, Toxicology-Therapeutic Drug Monitoring and Endocrinology); Cytogenetics; Microbiology/Virology; the Blood Bank/Transfusion Medicine Service (which encompasses Therapeutic Apheresis and the Cellular Therapy Laboratory (CTL), an FDA-approved Good Manufacturing Process–compliant processing facility, and an Immunohematology Reference Laboratory); Histocompatibility; Molecular Diagnostics; and the CAP/CLIA-licensed section of the Michigan Center for Translational Pathology. Pathology Informatics, Specimen Processing, and Pathology Administration continued to provide logistical, operations, and regulatory support for the Pediatrics Biochemistry and Molecular Diagnostics Laboratories, Adult and Pediatrics Blood Gas Laboratories, the Assisted Reproductive Technology Laboratory, and the Pediatrics Pulmonary Laboratory.

The Clinical Laboratories were comprehensively supported by the Division of Pathology Informatics directed by Dr. Ulysses Balis and managed by Ms. Kathy Davis. The overarching 2010-11 Informatics initiative related to the Clinical Laboratories included development and training for implementation of a new laboratory-wide information system (Soft Corporation). Deployment of the Soft LIS has been delayed as resources have been redirected to the planned UMHS-wide Epic Orders Management Project.

The Laboratories continued to experience growth in both clinical volume and scope of activity. 2010-2011 was marked by intensive focus on communication, operations, service, and efficiency. 5.24M procedures (billed units) were performed in FY11, a 0.2% increase over FY10 (5.23M). Gross laboratory revenue was $442M, a slight decrease of 0.2% from FY10 ($444M). Blood product expenses decreased to $13.5M, 5.6% below $14.3M in FY10, while Pathology reference test (send-out) expenses again remained under $7M at ($6.8M), a reflection of successful in-sourcing and the Laboratory Formulary initiative (see below). The total number of clinical laboratory employees at the end of 2011 was 271.

Major 2010-2011 accomplishments included successful completion of our biannual, unannounced College of American Pathologists (CAP) inspection in May, 2011; adjusted discharge -normalized decreases in aggregate blood product expense (>$1.3M/month to consistently <$1.15 M/month) and utilization (>10,000 units/month to 9200 units/month); and a dramatic decrease in cryoglobulin wastage (>15% to <12%.). Our

Clinical Pathology Sections

- Combined Hematology Laboratory
- Chemical Pathology Laboratory
- Clinical Micro-biology/ Virology Laboratories
- Blood Bank/Transfusion Medicine
- Specimen Processing
- Phlebotomy Service
- Clinical Immunopathology Laboratory
- Histocompatibility and Immunogenetics Laboratory
- Molecular Diagnostic Laboratory
- Cytogenetics

two-tiered general and laboratory-specific QA program was extended (>40 indicators), refined, and rendered more effective (42% actionable indicators). Laboratory-wide expense per test (exclusive of blood costs and phlebotomy) decreased to nearly $7/test. Turnaround times, timeliness of first morning blood draws, and proficiency testing performances all remained very robust. A new laboratory-wide communication plan was developed. The communication plan, entitled "Transforming the Clinical Laboratory from a "Black Box" to an Information Source that Drives Optimal Patient Care: Strategy for Advanced Function", articulates a comprehensive tiered and faceted approach. The Employee Recognition (led by Beverly Smith) and Service Excellence Programs (led by Dr. Duane Newton) each moved forward, the former culminating in May 2011 with the first annual recognition event and the latter as it progresses toward a first annual Clinical Pathology Symposium scheduled for October 2011. The Hematology Laboratory, ably directed by Dr. Will Finn, successfully converted to a new high volume Sysmex platform. Many new programs and assays were implemented. Examples, among many, include everolimus immunosuppressive drug monitoring in Chemistry, flow cytometric HLA crossmatch in Histocompatibility, EGFR mutation analysis in Molecular Diagnostics, and a novel graft versus host disease panel in Immunology. Additional advances are detailed within individual section and laboratory reports.

We continued to raise the academic profile of the Division. Publications, extramural grant funding, and both regional and national leadership positions by individual faculty are detailed within individual reports. Several new faculty were recruited. Dr. Daniel Ramon (Northwestern University) arrived in September to direct the Histocompatibility Laboratory. Dr. Ramon has made outstanding progress in laboratory operations, new assay development, clinical and academic collaborations with members of the transplantation community, and in the establishment of non-HLA and endothelial target antibody testing currently only offered by UCLA, Northwestern, and Johns Hopkins. Dr. Michael Bachman (University of Pennsylvania) will join the department in August 2011. Dr. Bachman will help further develop molecular microbiology and brings an NIH-funded research program in microbial pathogenesis. Finally, Dr. David Keren has committed to join the faculty in January 2012. Dr. Keren is an authority in clinical electrophoresis, is past President of ASCP, and is currently President of the American Board of Pathology. Dr. Keren will serve as Associate Director of Clinical Pathology. Dr. Kojo Elenitoba-Johnson, Director of the Molecular Diagnostics Laboratory (and the Division of Translational Pathology) was inducted into the American Society of Clinical Investigation.

DANIEL RAMON, M.D.

Dir. of Histocompatability Lab

In concert with training program director, Dr. Barbara McKenna, Drs. Will Finn and Tom Annesley provided able support and leadership to the residency training program. Dr. Annesley established a heavily-subscribed program in medical writing. Dr. Lloyd Stoolman developed a novel set of flow cytometry portals and databases that promise to dramatically facilitate clinical work flow, as well as the academic and educational missions. The groundwork was laid to establish a formal educational and academic relationship between Clinical Pathology and the Department of Biomedical Engineering.

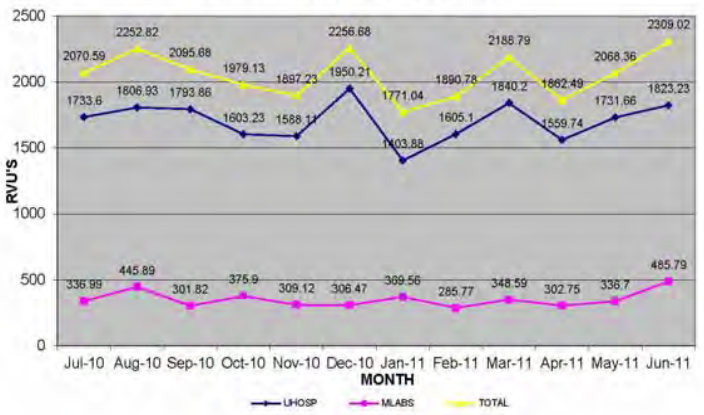
<u>Combined Hematology Laboratory (Hematology, Bone Marrow, Flow Cytometry, Coagulation)</u>

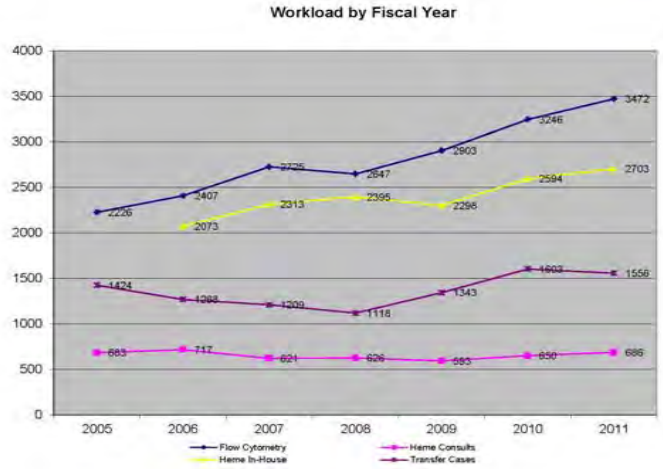
The Hematopathology Section of the Clinical Pathology Division is comprised of several laboratories including the Clinical Hematology Laboratory (headed by Dr. William Finn), Coagulation Laboratory (headed by Dr. Steven Pipe), and the Clinical Flow Cytometry Laboratory (headed by Dr. Lloyd Stoolman).

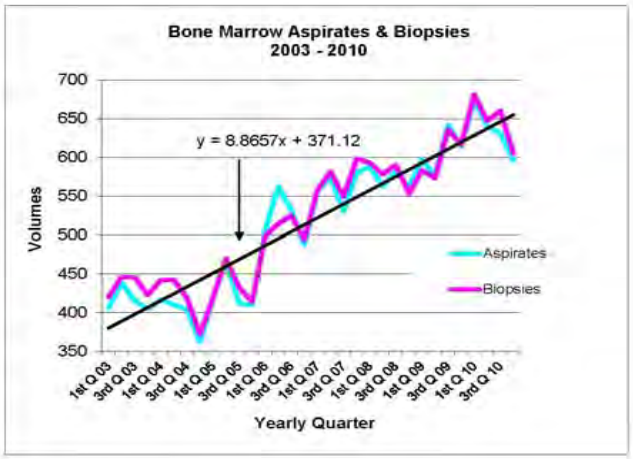
MEGAN LIM, M.D.

Director of Hematopathology

The Hematopathology Section continues to offer an extended menu of tests in hematology, coagulation, and flow cytometry, with more than 1 million total







test orders in FY 2011. Overall volume in the clinical hematology laboratory was equal to nominally increased over previous years. The volume of complete blood count (CBC) testing—a key benchmark of laboratory activity-- was increased approximately 2% in fiscal 2011 compared to fiscal 2010, with over 450,000 CBCs performed. The laboratory has seen steady growth over the past several years, as indicated in the accompanying graphs, representing a 35% increase in RVUs since 2006. In February 2011, we changed our platform for high-throughput automated hematology testing from Beckman-Coulter technology to the Sysmex XE-5000 system and WAM software package. In addition, the bone marrow biopsy processing area transitioned to scheduling bone marrow biopsy procedures based on the enterprise-wide scheduling (EWS) system. This allowed better coordination of schedules between the clinics and the bone marrow laboratory, optimizing utilization and decreasing waste.

The Coagulation Laboratory also saw several process improvements take place this Fiscal Year, including:

- Addition of thromboxane analogue for platelet aggregation studies, aiding in the differentiation of aspirin-like platelet defects from platelet storage pool disorders.
- Replacement of an Amelung manual coagulation analyzer with a Stago Start 4. This new analyzer does tests in duplicate, calculates INR, and give us the ability to perform manual fibrinogen assays for those patients whose samples cannot be analyzed on our main automated coagulation system (BCS-XP).
- Enrollment in a NASCOLA program for platelet aggregation interpretations.
- Participation in a large research study for Diagnostic Stago to evaluate their Chromogenic Ecarin Clotting assay for direct thrombin inhibitors.
- The switch to a lupus-insensitive reagent for use in factor specific inhibitor assays, which helps reduce false positive titers due to the presence of a lupus anticoagulant.
- Deployment of a new anti-IIa assay for the determination of Dabigatran, a new oral direct thrombin inhibitor anticoagulant.

Overall volume in the clinical coagulation laboratory was equal-to-nominally decreased over previous years.

The volume of prothrombin time (PT) and activated partial thromboplastin time (aPTT) tests— key benchmarks of laboratory activity-- were decreased approximately 3% and 1.5%, respectively, in fiscal 2011 compared to fiscal 2010.

Many of the accomplishments of the Clinical Flow Cytometry Laboratory have been detailed in the Translational Pathology Division Report, including moving to a 10-color flow cytometry assay, continued development of 10-color panels and planned expansion of our 10-color analysis. In addition, expanded hours of lab operation improved the ability to release the results of urgent cases and to improve turnaround time. The laboratory continues to perform testing for paroxysmal nocturnal hemoglobinuria (PNH) in-house, and is collecting data on the results of sendout testing for small PNH clones (<1%) with the goal of bringing this aspect of the testing in-house as well. Overall test volumes in the clinical flow cytometry laboratory increased by over 9% between fiscal 2010 and fiscal 2011.

A major emphasis for the Hematopathology Section this Fiscal Year was making service improvements and enhancing our Quality Control and Quality Assurance efforts. Over the past year, we added a number of immunohistochemical stains for diagnostic purposes including TCL-1, FOX-P1, with nucleophosmin and SOX 11 in the validation process. We also completed a decalcification pilot with histology and have implemented the use of Formical 2000 as our new decalcifying agent for bone marrow biopsies. We have made a number of changes as well that impact QA/QC arenas. A key new component is the development of a case queue portal for use by the hematopathology group which identifies cases that may have both flow cytometry and tissue evaluation. This tool encompasses most cases reviewed within the Pathology Department and allows for monitoring of the progress of cases and linking to various sites such as the patient's chart (Careweb) and the internal laboratory information system, Pathnet. This portal is an important step in creating a complete and accurate pathology report.

The Section has also made organizational improvements, beginning with the hiring of two exceptional new Administrative Assistants, Pamela Warwashana and Mandy Roteman. These new members of our team have assisted in making a number of process improvements in the office. We have begun a two-week return rotation of outside assets, with all outside consult cases being returned to the contributing institution within two weeks of verification of the hematopathology surgical report resulting in greater efficiencies and fewer opportunities for misplacement of materials.

We have also begun working more closely with the MLabs Outreach Program of the Department. HR consultation reports are now distributed within one hour of verification via the MLabs call-back portal, improving turn-around time from as long as 24 hours down to 1 hour. MLabs anticipates a significant potential increase in outside bone marrow studies this year. As such, we are developing a standardized multi -laboratory process for receiving, distributing, processing and reporting these cases. We hope to finalize this process within the year.

An important component of the Hematopathology Section involves the Educational Mission of the Department. To allow our Fellows more dedicated time on their elective services, we applied for and received approval from the ACGME for a permanent third HP fellowship position. To aid in recruitment of the best Fellows, a dedicated Hematopathology (HP) Fellowship website is currently under development which will include information for potential HP Fellows including an overview of the program, faculty information, and current/previous Fellow scholarly activity. In recognition of the importance of laboratory management expertise and to further enhance the education of our trainees, the laboratory management focus for the HP Fellowship was revised to include:

- Formal LEAN training
- Participation in at least 1 standing management committee/ meeting per year
- Participation on regular laboratory Gemba walks
- Completion of the CAP Inspector course and subsequent inspection of a portion of the hematology laboratory
- Attendance at Anatomic Pathology Quality Improvement quarterly meetings
- Participation in at least one QI or management project over the course of the year.

We have also formalized a Hematology-Oncology Fellow rotation through the Hematology laboratory. We hope to accommodate up to one adult Hematology-Oncology Fellow per month as well as one pediatric Hematology-Oncology Fellow. One of the biggest improvements we made to hematopathology education over the last year is the en-

hancement of the hematopathologist's role at the multidisciplinary lymphoma conference. We developed a system in which slides for cases presented at the lymphoma conference can be viewed as a scanned slide on a projection screen at the conference. The entire slide is available for viewing and supplements the trainee's description of the pathology report. As part of this process, we continued and expanded our program of developing a repository of scanned slides of interesting hematopathology cases which will be searchable and retrievable on-line, scanning all slides from interesting cases, cases for lymphoma conferences, and all cases from HP educational conference case presentations. We are retroactively obtaining previous cases and will continue scanning all current cases that fit any of the above criteria.

Our Fellows were also actively involved in research activities, presenting over 10 scientific abstracts at National meetings. It is also vital to our educational mission to ensure top-quality continuing educational experience

for our laboratory staff. We initiated a monthly/bimonthly program of faculty presenting in-services for the hematology technologists, which was well received. We hope to add additional presentations this year.

Hemepath Faculty (L-R, back row): Lauren Smith, M.D., Charles Ross, M.D., Megan Lim, M.D., Lloyd Stoolman, M.D., Bertram Schnitzer, M.D., Jason Cheng, M.D., Ph.D.

Hemepath Fellows (L-R, front row): Jennifer Hummel, M.D., Cohra Mankey, M.D., Ali Gabali, M.D.

Chemical and Clinical Immunology Pathology Laboratory

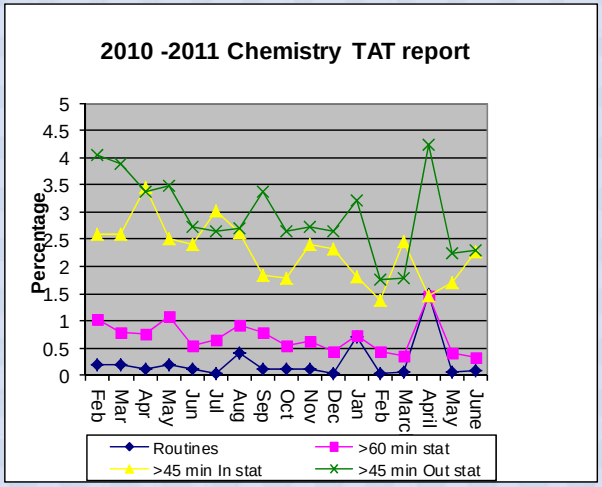
The Chemistry Section, under the leadership of Donald Giacherio, Ph.D., and the administrative management of Sue Stern, experienced an approximately 1.5% increase in overall testing volume this year. The lab produced nearly 8 million individual patient test results. In addition, the lab serves as a reference lab for two major national projects. The Chemistry Lab processed and analyzed 11,000 samples for the Drive Against Prostate Cancer, a Washington DC based non-profit that schedules prostate cancer screening clinics all across the country. The Chemistry Lab also performed over a thousand lipid profiles for the multicenter SWAN Study (Study of Women's Health Across the Nation).

DON GIACHERIO, PH.D.

Director of Clinical Chemistry

The Chemistry Section continued its efforts at utilizing lean principles to continually improve the turnaround times for testing. Daily monitoring and posting of STAT test turnaround time (TAT) data and continued cooperative efforts by all staff to improve performance led once again to a consistent trend towards overall TAT reductions. Approximately 22% of the over 75,000 samples a month processed on the Chemistry automation line are STAT's. Currently, less than 1.0% of STAT samples take over 1 hour to complete, and greater than 97% of STAT samples are verified in less than 45 minutes from time of receipt in the lab.

The activities of lean team groups in chemistry and the suggestions from weekly team huddles have led to the implementation of multiple changes that have positively impacted workflow. Lean team members from the lab have also actively participated in successful and ongoing projects aimed at reducing issues with mail in immunosuppressant drug test samples, improving turnaround times for inpatient immunosuppressant drug for faster discharge of patients, and simplifying processes for sharing samples across laboratory boundaries. Eric VasBinder and Sue Stern from the lab presented a talk at the Siemens ADVIA Automation User's Group on the "The Positive Impact of ADVIA Automation on Work Processes." Lab staff also presented posters on lean activities at the annual Hospital Quality Improvement Day and at the inaugural University of Michigan Voices of the



Staff day. The lab has been selected as one of 7 UMHS sites to receive additional training of all staff as part of a Lean Implementation Teams program to spread Lean in the workplace.

The Automation section of the lab completed contact negotiations then validated and installed three new Centaur XP immunoassay analyzers. Negotiations are nearing completion for replacing the three ADVIA 2400 Chemistry analyzers which are 5 years old with four newer models, the ADVIA 1800. This should position the automation section of the lab for continued growth over the next 5 years, as well as significantly reducing maintenance requirements. The lab evaluated and began performing a more sensitive estradiol assay on the ADVIA Centaur, and also began offering a quantitative Hepatitis B surface antibody test. The lab installed a new deionized water production system for the automation line which has greatly reduced the frequency of problems with several different assays. New automation line operating software was also tested and installed.

Eric VasBinder and Sheridan Mattson display their Lean project poster

The Special Chemistry section validated assays for fructosamine as a short-term indicator of glycemic control, and the measurement of thyroglobulin in fine needle aspirates from the Cytology service. The lab is finishing an evaluation of a rapid screen for antibody to HIV 1,2, that will be less expensive and also more sensitive than the current assay. This rapid test will be utilized for employee needlestick exposures and high risk labor and delivery patients. The Special Chemistry group continued its support of intraoperative PTH testing in the OR's of University Hospital and the Cardiovascular Center. The lab performed io-PTH testing on 300 parathyroidectomy surgery patients over the past year.

The Toxicology section validated and implemented an LC-MS assay for the new immunosuppressant drug Everolimus. The lab made a number of changes in the screening assays for drugs of abuse in urine to better serve the needs of ordering physicians. A more specific assay for amphetamine / methamphetamine in urine which also detects MDMA (Ecstasy) was evaluated and implemented. The lab is finalizing the validation of a new immunoassay for Methadone and its major metabolite to better serve the needs of the high risk OB-Gyn and Adult Treatment service groups. The cutoff concentration for a positive benzodiazepine screen was lowered to enhance the use of the test in monitoring compliance. The substantial growth in volume of testing of comprehensive drug screen by GC-MS led to an educational effort to the Psychiatry Faculty and high risk OB-GYN service to alter ordering patterns. This project has been led by Matthew Elkins, senior resident in Pathology. Lastly, a Lean analysis of workflow for tacrolimus testing was completed and changes implemented to allow for priority processing of inpatients samples on the first run of the morning to help expedite early discharge of transplant patients.

The Immunology section of the lab evaluated and validated specific antibody tests for confirmation of anti-neutrophil cytoplasmic antibodies on the Bioplex 2200 analyzer (myeloperoxidase and proteinase 3). The lab moved testing for Mumps and Rubeola antibody from the Virology Lab to the automated BioPlex 2200 analyzer. The lab has also begun the develop-

ment of ELISA assays to support graft versus host disease detection in the bone marrow transplant population. These assays include elafin, soluble TNF-alpha receptor 1, IL-2 receptor alpha, and REG3a. The lab acquired a second DSX ELISA platform to handle continued growth of the ELISA workload and the proposed four new markers for GVHD.

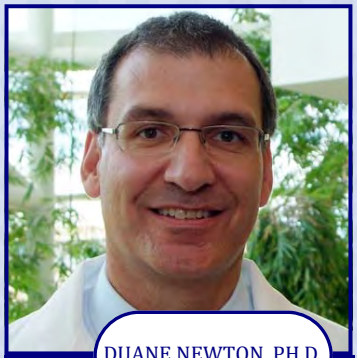
The lab has continued its leadership role in Point of Care (POC) testing both within the hospitals and at the off-site health care centers. Chemistry staffs the laboratory within the Emergency Department and continues to perform Troponin I testing and blood gas / electrolyte testing with rapid TAT for the ED patients. Planning for staffing the emergency department laboratory of the new Children's and Women's hospital has been ongoing for the past 6 months. The Chemistry Lab is actively reviewing replacement glucose meters for the POC program. RFP response for meters and connectivity have been received, with a goal of increasing to 350 meters at UMHS by late fall. The POC team has also played an active role in researching potential new colon cancer screening tests for fecal occult blood.

The lab continues its significant role in education. Pathology residents on a monthly rotation through the lab meet daily with Dr. Giacherio or Dr. Annesley and spend additional time with the supervisory staff and senior clinical technologists. Six medical technology students spent a week each rotating through the lab. The lab hosted two Pediatric Endocrinology fellows for one week of laboratory testing exposure in January. One afternoon a month, Department of Pediatrics residents come to the laboratory for tours and interactions with the supervisory staff.

In the coming year, the Chemistry Laboratory will continue its Lean efforts to improve TAT for testing, continue searching for ways to automate manual testing, and work toward bringing in additional testing from the list of sendout tests. The lab will be actively involved in multiple projects that should include:

- Decide on the replacement glucose meter and deploy them throughout the system.
- Continue efforts on the building and validation of the SOFT laboratory information system.
- Complete an RFP for new immunoassay analyzers with a goal of new instrumentation with expanded menus to allow bringing in additional send-out testing (bioavailable testosterone, free PSA, bone alkaline phosphatase).
- Finish development of ELISA assays for the detection of graft versus host disease and begin implementing this testing.
- Validate and implement replacement chemistry analyzers for the lab cell automation line.
- Finalize plans for the delivery of POC services to the Mott replacement hospital.

Clinical Microbiology/Virology Laboratories



DUANE NEWTON, PH.D.

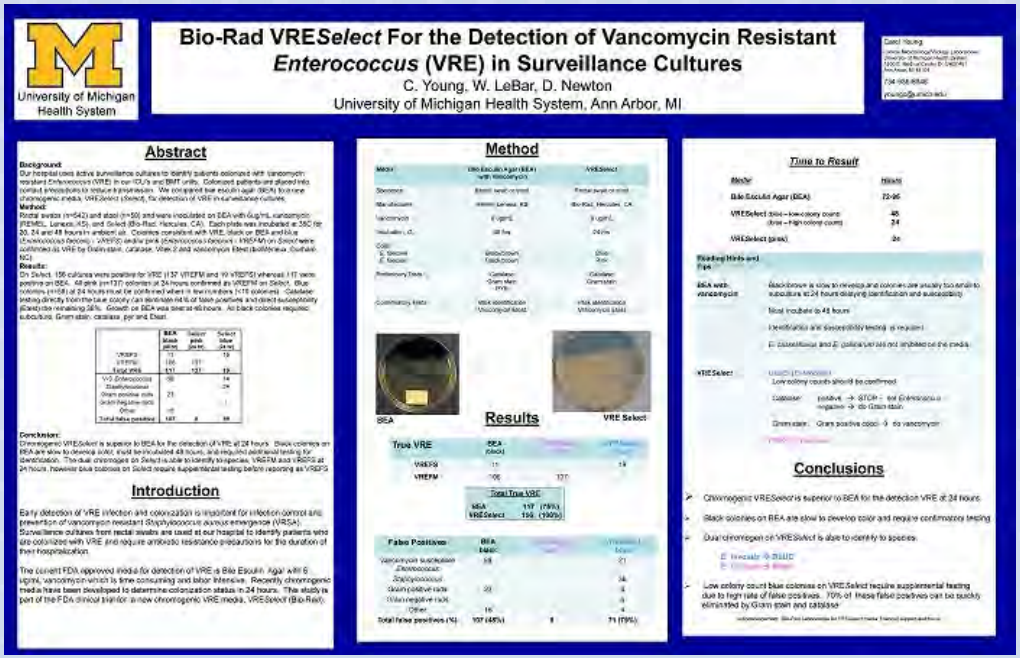
Director of Clin. Micro/Viro Labs

Testing volumes for the laboratory exhibited a modest (5%) increase from the previous FY. However, this should be taken into the context that test volumes from FY09-10 included substantial increases due to increased testing related to the novel H1N1 influenza pandemic in the fall of 2009. Even with these volume increases, we have managed to address many issues designed to improve processes and service. The following are a few examples of the multiple technical, administrative, and educational activities undertaken this past fiscal year to enhance the quality of clinical services provided for our patients.

The laboratory completed an RFP process to allow for assessment of platforms for Chlamydia/Gonorrhea testing due to the expiration of the existing contract with the incumbent vendor. Responses to the RFP were evaluated, site visits were conducted, and a new platform was selected and implemented in the laboratory. This change required substantial coordination between the laboratory and our various UMHS and MLabs customers, as collection instructions and devices were different and necessitated significant communication to ensure a smooth transition. This occurred with minimal disruption and has had a measurable positive impact on the laboratory due to improved analytical performance, increased efficiency, and decreased hands-on time afforded by this platform (Viper, Becton-Dickinson). We are currently investigating opportunities to expand testing on this platform to include HSV from genital specimens which would eliminate the need for culture.

Additional transitions have occurred involving molecular testing—namely the conversion of CMV viral load to a real-time PCR assay utilizing the instrumentation acquired to support testing for novel H1N1 influenza (Abbott m2000). We are in the process of implementing EBV viral load testing on this platform, and have expanded the menu of respiratory viruses tested on the m2000 to include human metapneumovirus and parainfluenza viruses 1-3. The conversion of testing for the respiratory viruses to this platform would significantly reduce the need for viral cultures. We further expect to utilize this platform to establish in-house testing for BK virus, HHV-6 and adenovirus viral loads in immunocompromised patients.

In an attempt to both reduce turnaround-time and costs from send-outs, as well as respond to decreases in services provided by the state health department, we have expanded the array of susceptibility testing panels performed for esoteric, fastidious and slow-growing microorganisms. This was particularly focused in service enhancements for susceptibility testing of AFB, fungi, and actinomycetes. We have reduced TATs for these tests from weeks to days, which has significant implications for clinical management due the more rapid detection of resistance.



In addition, we have expanded our Quality Assurance program to include mechanisms to more rapidly identify, respond to, and track quality variances that occur throughout the lab. We have instituted a labora-

tory QA for notification of laboratory managers of problems that might occur through the total testing process. These forms are reviewed regularly by the Chief Technologist for trend monitoring and results communicated monthly during staff meetings. We have also instituted systems for monitoring QC data in our molecular areas using Westgard rules. This has not only raised awareness of QA/QI amongst the laboratory staff, but it has also made it easier for the technologists to interpret testing data objectively using the electronic tools that were developed. This has resulted in improved satisfaction of employees performing the testing as well as decreased errors, repeat runs, and short samples.

Finally, we have organized a multidisciplinary working group that includes members from the Microbiology senior staff, the Antibiotic Stewardship team, Adult and Pediatric Infectious Diseases, Pharmacy, and Infection Control, whose function is to meet quarterly to discuss strategies to improve the approach to testing and/or reporting of results from the microbiology laboratory. Meeting on a regular basis has provided a forum for both the clinicians and laboratorians to discuss issues or problems with the goal of utilizing our resources in a manner which optimizes the quality of care provided to our patients.

In addition to the clinical service improvements, our faculty were actively pursuing research on a number of topics with an eye toward improving patient care:

- Use of magnetic nanoparticles for the detection and susceptibility testing of bacteria (McNaughton, PI; Coulter grant awarded, NIH grant submitted)
- Multicenter evaluation of in vitro susceptibilities of multi-drug resistant gram negative bacilli (Kaye, PI)
- Virulence factor and genomic analysis of *Clostridium sordellii* isolates (Aronoff, PI)
- Respiratory virus detection using a multiplex nucleic acid assay system (Newton/Burke, PIs)
- Characterization of the Viral Pathogens and Subsequent Immune Response in Children with Clinical Respiratory Tract Infections (Shanley, PI)
- *H. influenzae* genes associated with COPD (Gilsdorf, PI)
- Epidemiology of bacterial pathogens of gastroenteritis (Manning/Rudrik, PIs)
- Histopathology of chronic *C. difficile* colitis (Hammer, PI)
- The Laboratory responded to numerous IRB-approved requests from clinical services for specific laboratory data to fulfill research goals.

In addition, all laboratory personnel continued to provide instruction to Pathology House Officers and Infectious Disease Fellows and residents on diagnostic procedures used in the Microbiology/Virology Laboratories. We provided several laboratory preceptorships for medical students, pharmacy students, and Pharm.D. residents during the year. Infectious Disease Laboratory rounds were held each weekday during which staff members and assigned Pathology House Officers interacted with ID team members to answer questions, demonstrate laboratory diagnostic procedures and discuss interesting findings. Numerous in-service education programs were held during the course of the year with individual technologists and Pathology House Officers giving presentations to staff members.

Our educational efforts were not limited to the physicians – our staff were also actively pursuing learning opportunities. The laboratory's administrative manager, both supervisors and most of our Sr. Technologists attended one or more regional or national scientific meetings during the year. Several other staff members attended national and regional scientific meetings of interest. All of the above-mentioned individuals were involved in presenting posters at national meetings, and a previously presented poster was ultimately published. The laboratory continues to be active in multiple research projects that involves many bench-level technologists and provides them with opportunities to attend scientific meetings, which additionally enhances the academic visibility of the laboratory and department.

In addition, the Laboratory subscribed to two audioconference programs which provided a total of 5 conferences during the year that were available to all staff members and Pathology House Officers as part of our ongoing CME program. Pathology residents and faculty also provided monthly in-service programs to the laboratory staff.

As a result of these activities, our laboratory presented 10 posters at national meetings and had six manuscripts published in peer-reviewed journals.

Blood Bank/Transfusion Medicine

ROBERTSON DAVENPORT, M.D.

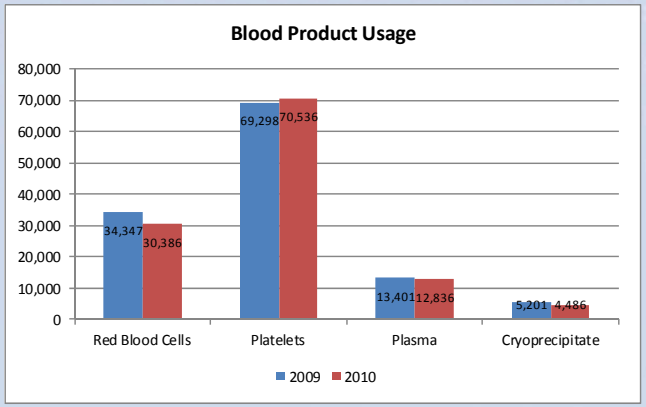
Dir. of Blood Bank/Trans Med.

In an effort to provide excellence in patient care and to make the best use of this life-saving resource, the Transfusion Committee worked diligently to promote adherence to transfusion guidelines. This resulted in reductions in total blood component utilization in all areas except for platelets. The increase in platelet usage reflects the acuity of the patient population, particularly in hematology/oncology and cardiac surgery.

The activity of the Cellular Therapy laboratory increased in all areas except for unrelated transplants, including both adult and pediatric activity. Overall, hematopoietic progenitor cell transplantation activity continues to grow. Likewise, the total activity in the Apheresis Procedure Unit was increased compared to the previous year, with significant increases in HPC collections and LDL apheresis.

In addition, the Reference Laboratory activity increased compared to the previous year with a continuing trend of increasing complexity of serologic work-ups. As a result in the increased usage this past year, professional billing activity for the Transfusion Medicine faculty increased by more than 40%.

There were two major processing changes made in the laboratory this past year. An OR Blood Ordering project was implemented with preliminary results indicating a reduction in the number of phone calls to determine blood availability and a slight decrease in the number of units cross-matched in the morning hours. Assessment of the results is continuing. In addition, Verax routine testing for detection of bacterially contaminated random platelets was initiated. Pneumatic tube system modifications have made blood delivery challenging, but the laboratory staff have stepped up to meet this challenge.



The Blood Bank medical and technical staff were fully integrated into the educational missions of the Department. They participated in Pathology house officer teaching, Hematology fellow teaching, M2 and M4 medical student teaching, the transfusion component of

Cellular Therapy Lab	2009	2010	% change
Units processed[1]	485	531	9.5
Bags frozen	667	738	10.6
Transplants, autologous	121	127	4.6
Transplants, allogeneic	51	67	31.4
Transplants, unrelated	64	56	-12.5
Transplants, total	236	250	5.9

1 Includes units received from outside sources.

Apheresis Proc. Unit	2009	2010	% change
Therapeutic apheresis	1102	1113	1
HPC collections	421	466	10.7
LDL apheresis	274	326	18.6
RBC exchange	44	43	-2.3
Total procedures	841	1947	5.8

Reference Laboratory	2009	2010	% change
Antibody identifications	1002	1123	12.1
ABO resolution	102	76	-25.5
M-Labs/referrals	25	23	-8
BMT	831	942	13.4
Eulates	213	236	10.8
Adsorptions	199	252	26.6
Titers	170	123	-27.6
Total activity[1]	3104	3449	11.1
Prof. Billing			
Gross charges	$538,488	$757,662	40.7
Charge units	1,923	2,421	25.9

1 Include charges not included above.

nursing orientation, and many interdepartmental conferences. The nationally acclaimed continuing education course, "Current Topics in Blood Banking", was successful again this year. This is one of the longest running and best recognized continuing education course in the field. In addition, members of the Blood Bank and Transfusion Service staff were active at the regional and national levels. Andrea Hickey, Louann Dake, and Theresa Downs were invited to present lectures at professional meetings. Andrea Hickey served as president of the Michigan Society for Clinical Laboratory Science and Theresa Downs served as president of the Michigan Association of Blood Banks.

Histocompatibility and Immunogenetics Laboratory

Under the capable new leadership of Dr. Daniel Ramon, the Histocompatibility laboratory restructured the leadership organization of the laboratory in order to manage the cumulative growth experienced the past few years. In addition to a new director, the supervision activities were distributed between the general supervisor and two senior technologists who were promoted to intermediate supervisory position; one dedicated to the HLA molecular typing section and the other to the serology and crossmatch section of the Histocompatibility laboratory. The laboratory was sad to lose two critical members of our team, but we were fortunate to hire new members and we start the new business year with a full team.

One of our top priorities this past year was to obtain accreditation to run the Flow Cytometric Crossmatch assay. This is a critical tool for the management of matching kidney transplant patients with living donors. Our team was successful in achieving this goal and the incorporation of this assay to our catalog will represent a 600% cost reduction to our department and allow us to offer a more competitive price to the transplant team. The lab also validated a new screening method for anti HLA antibodies. With this tool, we are proposing a new algorithm for maintaining our patients on the waiting list for a kidney transplant, which is expected to result in more successful outcomes for our transplant patients.

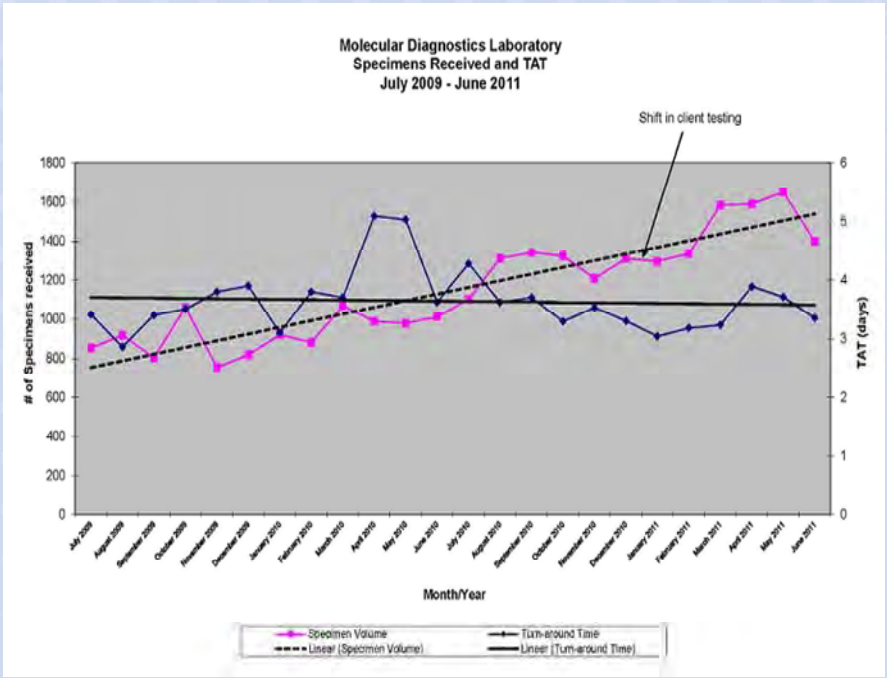
In order to provide solutions for detection of non-HLA antibodies, the lab completed the validation for a MICA (HLA related molecule) genotyping test. Some transplanted patients develop antibodies against these molecules, which can result in organ rejection. The lab is currently working to validate other tests for this purpose as well.

The laboratory acquired a robotic system to automate our Luminex reactions during FY11. With this instrument, the lab team will reduce the bench time and create more time for analysis of our results. A vendor education fund provided funding for this acquisition without any cost to our department. In addition, the histocompatibility laboratory has begun implementation of a new HLA specific laboratory information system called HistoTrac. This system will allow us to more effectively manage our patient information and results as well as enable us to coordinate with the KPD program, searching for new living donor candidates for our highly-sensitized patients. This tool will allow us to monitor our QA and QC parameters, sample storage and update our billing system.

The Histocompatibility laboratory performed very well in the inspections by American Society of Histocompatibility and Immunogenetics and by the College of American Pathologists in February and May 2011 respectively, passing the inspections with no deficiencies.

Molecular Diagnostics Laboratory

The Molecular Diagnostics laboratory is directed by Dr. Kojo S. J. Elenitoba-Johnson. The laboratory's Technical Director is Dr. Bryan Betz with Jennifer Sanks as Technical Supervisor. This has been a very productive year for the laboratory, with five new tests and two updated tests being brought online, with six more in development for 2012. Over the past year, the laboratory has seen a 48.6% increase in specimen volume with a nearly 7% decrease in turn-around times. In September of 2010, the laboratory capital equipment request was approved for an additional real-time PCR instrument (ABI7500) and two addition thermal cyclers (ABI9700). Delivery is still pending. These additional instruments are necessary given the increased testing volume, and also for redundancy in the case of instrument failure, preventative maintenance, or repair. With the extended laboratory test menu, increased specimen volume, and additional FISH testing/scoring coverage, we added 2 full-time technologists; the laboratory now employs 11 full-time and two part-time medical technologists. In addition, we expanded our service hours such that the laboratory hours are 8:00am until 8:30pm Monday through Friday, and 12:00 noon to 8:30pm on Saturdays, with daily case signout Monday through Saturday. With an increase in specimen volumes and a shift in testing towards more labor-intensive assays, the day-to-day testing operations were restructured several times to include increased technologist coverage in these areas to maintain the laboratory's standards of quality and efficiency. Once the newly-acquired technologists are fully trained, further restructuring of testing rotations is planned in a continuous effort to reduce test turn-around time and increase customer satisfaction.



The laboratory is also committed to the educational mission of the Department. Monthly lab meetings are conducted during which a member of the staff or faculty gives a presentation on a new or current test being performed in the laboratory. This helps to give residents, fellows, and staff an introduction to new testing, and to give further information as to why certain testing is performed. In addition, the laboratory also conducts regular monthly Project Meetings, which include the director, technical director, attendings, supervisor, R & D technologist and fellows/residents associated with the laboratory. These meetings aid in organizing ongoing projects and keep all involved parties informed of new projects and developments. The Laboratory also hosts the Molecular Genetic Pathology Fellowship Program.

This past year, the program welcomed Drs. Nathanael Bailey from West Virginia and Joseph Willman from Texas, who graduated from our Program's 2nd class of Fellows on June 30, 2011. Dr. Gaurav Sharma from Michigan, will be the incoming Fellow for the 2011-2012 Academic Year. A monthly resident/fellow molecular conference is conducted where the resident/fellow presents a current or proposed molecular test that includes a discussion on the clinical indication and test interpretation as well as considerations involved in designing, developing, and validating that test in the laboratory. The topic is chosen under the guidance of the molecular laboratory faculty. Major 2010-2011 accomplishments included successful completion of our biannual, unannounced College of American Pathologists (CAP) inspection in May 2011; adjusted discharge-normalized decreases in aggregate blood product expense (>$1.3M/month to consistently <$1.15 M/month) and utilization (>10,000 units/month to 9200 units/month); and a dramatic decrease in cryoglobulin wastage (>15% to <12%.). Our two-tiered general and

New Tests
MYC (8q24) Rearrangement by FISH
EWSR1 (22q12) Rearrangement by FISH
IGH/BCL2 t(14;18) Translocation by FISH
BCL6 (3q27) Rearrangement by FISH
MPL Mutation
Updated Tests
BCR/ABL1 Analysis, Quantitative
Hereditary Hemochromatosis Mutation
In Development
EGFR Mutation by sequencing
IDH1/2 mutation by sequencing
MALT1 (18q21) rearrangement by FISH
ALK (2p23) rearrangement by FISH
BRAF mutation test update
JAK2 V617F mutation test update

laboratory-specific QA program was extended (>40 indicators), refined, and rendered more effective (42% actionable indicators). Laboratory-wide expense per test (exclusive of blood costs and phlebotomy) decreased to nearly $7/test. Turnaround times, timeliness of first morning blood draws, and proficiency testing performances all remained very robust. A new laboratory-wide communication plan was developed. The communication plan, entitled "Transforming the Clinical Laboratory from a "Black Box" to an Information Source that Drives Optimal Patient Care: Strategy for Advanced Function", articulates a comprehensive tiered and faceted approach. The Employee Recognition (led by Beverly Smith) and Service Excellence Programs (led by Dr. Duane Newton) each moved forward, the former culminating in May 2011 with the first annual recognition event and the latter as it progresses toward a first annual Clinical Pathology Symposium scheduled for October 2011. The Hematology Laboratory, ably directed by Dr. Will Finn, successfully converted to a new high volume SysMx platform. Many new programs and assays were implemented. Examples, among many, include everolimus immunosuppressive drug monitoring in Chemistry, flow cytometric HLA crossmatch in Histocompatibility, EGFR mutation analysis in Molecular Diagnostics, and a novel graft-versus-host disease panel in Immunology. Additional advances are detailed within individual section and laboratory reports.`

We continued to raise the academic profile of the Division. Publications, extramural grant funding, and both regional and national leadership positions by individual faculty are detailed within individual reports. Several new faculty were recruited. Dr. Daniel Ramon (Northwestern University) arrived in September to direct the Histocompatibility Laboratory. Dr. Ramon has made outstanding progress in laboratory operations, new assay development, clinical and academic collaborations with members of the transplantation community, and in the establishment of non-HLA and endothelial target antibody testing currently only offered by UCLA, Northwestern, and Johns Hopkins. Dr. Michael Bachman (University of Pennsylvania) will join the department in August 2011. Dr. Bachman will help further develop molecular microbiology and brings an NIH-funded research program in microbial pathogenesis. Finally, Dr. David Keren has committed to join the faculty in January 2012. Dr. Keren is an authority in clinical electrophoresis, is past President of ASCP, and is currently President of the American Board of Pathology. Dr. Keren will serve as Associate Director of Clinical Pathology. Dr. Kojo Elenitoba-Johnson, Director of the Molecular Diagnostics Laboratory (and the Division of Translational Pathology) was inducted into the American Society of Clinical Investigation.

In concert with training program director, Dr. Barbara McKenna, Drs. Will Finn and Tom Annesley provided able support and leadership to the residency training program. Dr. Annesley established a heavily subscribed program in medical writing. Dr. Lloyd Stoolman developed a novel set of flow cytometry portals and databases that promise to dramatically facilitate clinical work flow, as well as the academic and educational missions. The groundwork was laid to establish a formal educational and academic relationship between Clinical Pathology and the Department of Biomedical Engineering.

Cytogenetics

DIANE ROULSTON, PH.D.

Director of Cytogenetics Lab.

The Cytogenetics Laboratory was heavily involved in all three missions of the Department over this past year: Clinical, Educational and Research. The Laboratory experienced an increase in sample volume during the past fiscal year, with a total of 4,469 tests requested, for a 7.7% increase over the previous year. These gains were due to increases in the number of bone marrow samples sent for cytogenetics, and all categories of FISH analysis, as detailed in the accompanying table. New FISH tests validated in the past year include several oncology FISH tests and a reflexive test, XX/XY FISH, for patients found to have a 45,X karyotype, developed to follow guidelines from the American College of Medical Genetics. In addition, Dr. Lina Shao will be developing genomic microarrays for neoplasia over the coming year. As volumes grow, the Laboratory will be looking to add additional technolo-

gists and another FISH microscope to complement development of additional FISH tests, such as the multiple myeloma panels, which are in increasing demand. Thomas Glover, Ph.D. (Professor, Department of Human Genetics) continued to provide invaluable expertise and sign-out coverage of constitutional genetics cases and locum tenens continued to help cover case sign-out with our increased volumes.

In addition, the Cytogenetics Laboratory was very active in the Educational mission of the Department. Dr. Purvi Kakadiya, a fellow studying clinical cytogenetics under Stefan Bohlander, M.D. at the University of Munich, Germany, visited for six weeks to learn our techniques and workflow for oncology and constitutional genetics; we look forward to future collaborations as well. Six Pathology residents, five Genetic Counseling graduate students, two fellows from Molecular Genetics in Pathology and one fellow from Hematopathology training programs performed rotations in the Cytogenetics Laboratory. The residents and fellows gave brief talks for the technologists, making a much-appreciated contribution to continuing education. Two cytogenetics technologists attended the Great Lakes Chromosome Conference in Toronto, and the supervisor attended the annual meeting of the national Association for Genetic Technologists.

The Research Mission of the Department saw the Laboratory maintain Approved Laboratory status for participation in clinical studies for the Children's Oncology Group (COG) and the Southwest Oncology Group (SWOG). Dr. Roulston provided exceptional leadership as she served on the Cytogenetics Committee for COG, Chair of the SWOG Cytogenetics Committee and study coordinator for the SWOG 9007 Study Section.

Duct Tape Lab Coat Competition

CP helped raise funds for needy patients' families—one of many charitable activities held this year.

Sample Volumes in Clinical Cytogenetics Fiscal Year 2010-2011			
Sample Type	# of Tests	Increase (Decrease)	% Change
Bone Marrows	2,159	103	5
Tumor/Lymph Nodes	266	62	30
PB Constitutional	365	(53)	(13)
Prenatal: Amnios	159	(7)	(4)
Prenatal: CVS	118	24	25
Tissues (POC)	115	45	64
Subtotal (Chroms)	**3,182**	**174**	**5.8**
Tissue Culture Only	**3**	**(12)**	**(-80)**
FISH			
Genetics	309	99	47
CMA FISH	223	95	135
Oncology	934	51	5.8
Panels	38	9	31
Total FISH	**1,284**	**159**	**14.1**
Total Tests	**4,469**	**321**	**7.7**

Division of Pathology Education

Barbara J. McKenna, M.D.
Endowed Professor of Pathology Education
Director, Division of Pathology Education

Education is a core mission of the department, and the quality and breadth of its Education programs reflect this commitment. Our faculty is involved in the education of undergraduate students and dental students, and integral to the education of medical students, graduate students, residents, and specialty fellows. Similarly, our trainees are part of the educational process for their more junior counterparts. The strong foundation in our existing educational programs is the basis upon which novel ways of teaching and learning can be built, and from which new programs can grow.

Graduate Medical Education—Pathology Residency Program

The Department offers both individual and combined residency programs in Anatomic and Clinical Pathology to its 28 residents, continuing a longstanding tradition of excellence in pathology training. The 2010-11 academic year was one of self-assessment, debate, and new initiatives for those involved in the Anatomic and Clinical Pathology Residency Program. The new leadership and administrative team that included the Program Director, Barbara J. McKenna, M.D., Assistant Program Directors Peter Lucas, M.D., Ph. D., and William Finn, M.D., Manager of Education Programs Laura Blythe, Residency Program Coordinator Pamela Howard, and Fellowship Coordinator for Cytopathology, Pediatric Pathology and Surgical Pathology Marie Sassano reached out to additional faculty and residents to form a Curriculum Workgroup, charged with examining all aspects of residency training, and making recommendations about its future directions. The Group included the Chief Resident, Suntrea Hammer, M.D., the Assistant Chief Resident, Kurt Bernacki, M.D., and additional faculty, Jonathan McHugh, M.D., Thomas Annesley, Ph. D., and Lloyd Stoolman, M.D.. The Workgroup met through the summer, fall, and winter and reviewed surveys, past CP Task Force reports, and other sources of information, resulting in a series of recommendations. The 2011-12 academic year will see a set of changes in the residency program curriculum including the following:

- Restructuring of parts of the Clinical Pathology curriculum to focus the experiences on laboratory leadership.
- Introduction of residents to all surgical pathology subspecialties during the first year of training.
- Creation of a web-based archive of core AP and CP content,
  partially replacing the traditional conference structure.
- A new morning conference series that continues two case-based conferences, and adds three new CME-granting conferences titled Career and Professional Development, Laboratory Management, and Clinical Perspectives
- Changes in resident assignments at the Veteran's Administration Hospital to better utilize the educational opportunities afforded by increasing surgical pathology volumes.
- The planned development of Action Learning Projects
  to enhance experiential learning in laboratory

Pathology Education

- **Graduate Medical Education**
- **Pathology Residency Program**
- **Fellowship Programs**
- **Medical Student Teaching**
- **Molecular and Cellular Pathology Graduate Program**

CHIEF RESIDENT

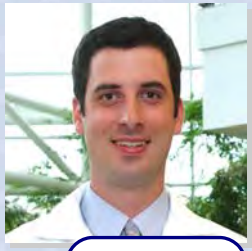
Suntrea Hammer, M.D.

management and informatics.

- New, competency-based Program Goals, Rotation Goals and Objectives, and Resident Evaluations.

The 2011-12 academic year will also bring a class of seven first year residents whose recruitment was among the most successful in the recent history of the department of pathology. These individuals come from medical schools in the Midwest, Mid-Atlantic and Southeastern United States, and as far away as Hawaii. The recruitment process was updated based on input from our current house officers, and provided more opportunity for candidates to meet and become acquainted with our residents and each other, and with faculty selected based on the candidates' interests. A dynamic ranking process allowed participation of all interviewers.

While focusing on what is new and changing, it is important to note that the accomplishments of our residents continue much as they have in the past. One of the easiest ways to gauge this success is by reviewing the impressive list of scholarly accomplishments of the group. Together, they accounted for twenty-two publications in peer-reviewed journals, at least ten oral or poster presentations, with many additional manuscripts in preparation. They serve on committees of several national pathology organizations, including the United States and Canadian Academy of Pathology, the American Society for Clinical Pathology, and the College of American Pathologists. Our residents have been invited to speak at national and regional meetings and educational conferences, as well. Their success and accomplishments are also evident in their post-residency destinations. All are placed in excellent fellowships or jobs.



ASST. CHIEF RESIDENT

Kurt Bernacki, M.D.

Graduate Medical Education—Fellowship Programs

The number of clinical fellows training in the department has increased substantially in recent years, and continues to grow. Over the past year, nineteen fellows have been engaged in twelve fellowships, including the ACGME-accredited fellowships of Cytopathology, Dermatopathology, Hematopathology, Molecular Genetic Pathology, Pediatric Pathology and Surgical Pathology, as well as subspecialty fellowships in Breast, Gastrointestinal, Genitourinary, Gynecologic and Pulmonary Pathology, and Informatics. Each of these fellows has contributed significantly to the missions of patient care, education, and scholarship. The fellowship in Blood Banking and Transfusion Medicine has accepted fellows for coming years, and approvals for additional fellowships in Neuropathology and Forensic Pathology are being pursued. The fellowship directors have worked together to create common processes for fellowship promotion, recruiting, and program evaluations. Among those fellows completing training this year, one, Julie Jorns, M.D., will be joining the faculty as Assistant Professor, and another, Elizabeth Wey, M.D., will be continuing in the department as a Hematopathology fellow.

Each of the ACGME-accredited programs, including the core residency program and the fellowships, must comply with a schedule of Internal Reviews by the University\'s Graduate Medical Education Committee and the Accreditation Council for Graduate Medical Education (ACGME). Successful Internal Reviews occurred this year for the Molecular and Genetic Pathology and Cytopathology fellowships. Successful ACGME Site Visits were conducted for the Surgical Pathology and Blood Banking and Transfusion Medicine Fellowships .

Medical Student Teaching

Once again, pathology faculty has devoted hundreds of hours to teaching first, second, and fourth year medical students. The Component I curriculum for first year medical students includes introductory histopathology lectures in the fall and spring, culminating in a set of spring laboratories. Drs. Gerald Abrams and Stephen Ramsburgh continued to take primary responsibility for the lectures, with an expanded group of faculty participating in the laboratory ses-

sions. Component II, the curriculum for second year medical students, includes pathology lectures and laboratories in each sequence, given and conducted by a rotating set of pathology faculty, organized by areas of expertise, and coordinated by Dr. Paul Killen. Medical student evaluations of the pathology teaching in both components is consistently high. Plans are underway to refine the teaching laboratories to best meet the needs of future physicians. In the meantime, it is gratifying to note that the web-based resources for the Pathology Laboratories, using virtual slide technology, are among the highest-ranked resources in a recent survey of University of Michigan medical students. In addition, Dr. Henry Appelman was honored to receive the Harvey Goldman Master Teacher Award at the United States and Canadian Association of Pathologists.

HENRY APPELMAN, M.D.

Harvey Goldman
Master Teacher Award

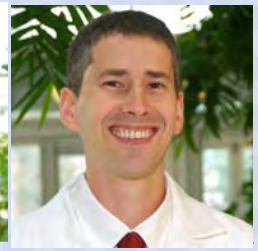
Seventy-three fourth year medical students enrolled in senior pathology elective rotations during the 2010-11 academic year. These rotations gave each student a broad overview of the field of pathology, while permitting them to concentrate part of their time in an area of most relevance to their future goals. The M4 elective rotations occurred under the direction of Stewart Knoepp, M.D., Ph.D., Assistant Professor of Pathology. Dr. Knoepp has instituted several changes to the always-popular course over the past year. While the course is maintained as a largely self-directed experience, clinical rotations are given more structure and incorporated into the grading schema. The students have the option to participate in various "clinical projects" on their rotations which may result in a higher grade (i.e., high pass or honors). The clinical projects are defined for each clinical area of pathology in AP or CP; they generally involve a two-day commitment by the student and culminate in a 1-2 page write-up upon completion of the experience. For example, to participate in an autopsy clinical project a student must assist in the autopsy and complete a formal 1-2 page autopsy report of their findings, which is then checked by the relevant faculty who provides their signature to certify the project. Clinical projects in surgical pathology include specimen grossing, along with preview and sign-out. For patient-oriented experiences (e.g., blood bank or FNA), the students write more traditional "SOAP" notes that incorporate pathologic findings and diagnoses. The final presentation, based on an interesting pathology case encountered by the student on the rotation, is now a requirement for a passing grade in the course. New faculty mentors have provided their individual perspectives to each rotation. The mentors are Drs. Lindsay Schmidt, Angela Wu, Julie Jorns, Amir Lagstein, Scott Owens, Jon McHugh, Judy Pang, and Rajah Rabah. Didactic lectures have also been added to the course. The lecturers include Drs. Bryan Betz, Duane Newton, Rob Davenport, Laura Cooling, and Chisa Yamada. Marie Sassano of the Pathology Education Office is the administrative director. The course is compliant with requirements recently put forth by the Dean's Office: goals are clearly articulated and provided in electronic and written format at the beginning of the rotation, the grading schema is clearly explained, a mid-term evaluation is performed, and documentation of students' activities are maintained.

Molecular and Cellular Pathology (MCP) Graduate Program

The MCP Graduate Program, under the direction of Nicholas W. Lukacs, Ph.D., has 21 students who are presently in Pathology Department laboratories performing their Ph.D. thesis research. This past year 3 students wrote, defended and successfully completed their preliminary exams that allowed them to pass to candidacy

Our Leaders and Best

WILLIAM FINN, M.D.
Assoc. Professor



PETER LUCAS, M.D., PH.D.
Assoc. Professor

NICHOLAS LUKACS, PH.D.
Professor of Pathology

STEWART KNOEPP, M.D., PH.D.
Assistant Professor

PAUL KILLEN, M.D., PH.D.
Associate Professor

STEPHEN RAMSBURGH, M.D.
Asst. Professor Emeritus
Medical School Teaching

GERALD ABRAMS, M.D.
Professor Emeritus

and begin their 3rd year in the program. In April we finished the recruiting for the Fall, 2011 class for the Program in Biological Sciences (PIBS) and successfully recruited 7 of the 8 high quality students, indicating the vitality of the graduate program. This recruiting success can be attributed to the tremendous effort made by the students, faculty and administrative staff that participated in the recruiting weekend. In addition to the successful recruiting year we also had 3 students successfully complete their graduate research careers by defending their thesis and have continued their training in clinical and investigative sciences.

The MCP graduate students produce high quality research that has resulted in publications in top tier journals. In addition, the students have also participated in other academic activities, including mentoring of younger students and undergraduates. Perhaps the most impressive extramural accomplishment that the MCP students perform on an annual basis is the organization of the annual Department Research Symposium that is held in the fall each year for past 9 years. The MCP students invite an internationally known keynote speaker that gives the final talk in a half-day symposium that highlights short research talks from faculty, graduate students and post-docs. During the symposium they also organize a poster session that this past year had ~45 posters from laboratories in the Pathology Department. This event has become a true success and highlights the student's enthusiasm, collegiality, and passion for research.

Division of Pathology Informatics

Ulysses G. J. Balis, M.D.
Associate Professor of Pathology
Director, Division of Pathology Informatics

The 2010-2011 academic year was an exceptionally busy period for the Informatics Division, with it completing over 60 significant projects, while at the same time, maintaining primary focus on the clinical deployment of the long-anticipated SCC laboratory information system (LIS). The LIS project experienced delays in our receipt and validation of mission-critical interface functionality, which resulted in the go-live date being pushed back to the first quarter of 2013, with this shift mandated by the pending enterprise-wide deployment of the EPIC-based Mi-Chart solutions. The division is capitalizing on this schedule shift to further improve functionality in the overall anticipated repertoire of systems capabilities. In partnering with MCIT towards the goal of realizing a successful deployment of the anticipated Epic Ambulatory Care information solution, the division has enjoyed a collegial relationship with the Mi-Chart Deployment team, with close communication afforded by our representation on the Information Technology Executive Committee, Information Technology Scientific Advisory Committee and the Physician Advisory Committee.

JASON HIPP M.D., PH.D.

Pathology Informatics Fellow

Academically, the division has enjoyed significant national and international visibility, with continued success of the Pathology Informatics International Meeting (where U-M plays a highly-visible leadership role) and the visibility offered by a number of peer-reviewed publications, with these similarly showcasing the success of our informatics fellowship and our fellow, Dr. Jason Hipp. Collectively, these efforts have allowed for the creation of a number of intellectual property filings with the University's Technology Transfer Unit, and negotiations are now under way for licensing and research partnerships with several companies, including GE and Acturis/Life Technologies. The division's recent publication on use of Quantum formalisms to represent patient data securely across a data cloud was well-received by the IEEE medical informatics community, and was the catalyzing event for Dr. Balis' induction into the Dirac Foundation as its first-ever physician member.

Pathology Informatics

- Academic Support
- Clinical Support
- Help Desk and Desktop Support
- MLabs Support
- Integration Support
- Pathology Informatics Fellowship

Among the 60-plus significant projects completed in the past academic year, a number of them are particularly noteworthy. The Sysmex automation line in the Hematology Laboratory enjoyed an on-time activation at least in part due to comprehensive IT support and development resources from the division. This new lab automation line represents a major enhancement in testing technology and similarly, an opportunity for greatly improved patient care, reducing test result turnaround times and improving testing accuracy.

Another example of the division serving to enhance productivity and patient safety can be found in the completed on-line web-based IHC ordering tool suite. Designed to support electronic ordering of both Immunohistochemical studies as well as cytological studies, this tool now enables over now over 3500 study orders per month, with volume constantly growing.

As a similar order automation example, a future orders application was replaced by the Freeview software solution, which provides easier accessibility to requisition data associated with order submissions.

In support of AP workflow, the division assisted with an effort to consolidate the accessioning of anatomic pathology cases from multiple prefix assignments to a single AP prefix, thus reducing the need to re-label cases upon their possible reassigning to other pathologists who might be more adept at a particular sub-specialty. This workflow transformation resulted in reduced the turnaround times, and served to greatly reduce the patient safety issues inherent with mislabeling in re-labeled cases, as relabeling was avoided. Additionally, the overall revised workflow facilitated a reduction in the risk of lost materials.

In addition to the above examples of direct-patient-care-oriented support, the division provided exceptional support to the Department as a whole. Fiscal Year 2011 saw multiple systems upgrades, beginning the year with the department at large upgrading to Microsoft Office 2007. This was followed by a subsequent upgrade to Office 2010. Similarly, the enterprise at large elected to replace the aging Groupwise solution with Microsoft Outlook, and the Informatics Division carried through the task of stewarding the complex transition to its successful outcome in June. Complementary to the email transition process, the informatics team enhanced the Web Calendaring applications, along with several other web-related tools, some of which including: the faculty appointments and promotions web-based tool, the human resources tool suite, web form enhancements, and house officer and fellow recruitment tools.

Also during this academic year, the division worked closely with its integral pathology imaging photo lab to perform much needed updates and upgrades on their core equipment and capabilities. This effort included an update to process workflow for the whole-slide imaging core.

Finally, Pathology Informatics was instrumental in ensuring readiness for the CAP inspection that was conducted this year, with no Phase II deficiencies being received by the division.

While there are many additional completed projects which could be noted, it is sufficient to say that Pathology Informatics continues to the serve the department in a large plurality of critical operational, educational and discovery roles, with it similarly providing the underpinnings of support necessary to ensure service excellence for both our patients and our faculty and staff.

Some additional projects completed:

Extensive Mayo Interface test build to support their Soft migration
Implemented new instrument interfaces
Cerner Bridge IE7 readiness completed
Datagate interface engine decommissioned
Isolation precautions interface implementation
JVHL electronic reporting interface implemented
EMPI – database and schema completed; validation is underway
Blood Gas RFP – provide input and review responses
Hosted Cerner Bridge Site Visit
Atlas version upgrade in DEV
Atlas refresh of TEST system
Atlas client roll out support
CHCB interface project kickoff; testing in progress
MLabs enhanced reporting tool expansion (Jerome's reporting tool)
HistoTrac implementation project support
Courier tracking tool web application implementation
Enhancements to the on line policies and procedures tool
EPIC project planning activities
EPIC / Cerner interface testing
Cerner version upgrade planning and extend support licensing
Soft Implementation project
Increased use of EVA storage devices
Migration of VMWare cluster to new HP Blade technology; upgrade in progress
Server patch management
Security vulnerability ticket management
Enterprise System Investigative Report follow up for outages in Pathology or affecting Pathology
Mini-switch de-install project in progress
Conference room equipment upgrades

Division of Sponsored Research

Jay L. Hess, M.D., Ph.D.
Carl V. Weller Professor and Chair
Director, Division of Sponsored Research
Steven L. Kunkel, Ph.D.
Endowed Professor of Pathology Research
Co-Director, Division of Sponsored Research
Senior Associate Dean for Research

This has been another outstanding year for both the Department and the Medical School's research programs. The Department held a Symposium in Epigenetics and Drug Discovery organized by **Dr. Nick Lukacs** to bring together faculty working in diverse fields including immunology and cancer that might benefit from such interdisciplinary approaches. Our investigators in drug discovery continued to make strong progress in development of small molecule inhibitors of important epigenetic regulators. Investigators in the MCTP led by Dr. Arul Chinnaiyan have initiated a very exciting initiative that brings the Department a step closer to using high-throughput sequencing for routine clinical use with the MI-ONCOSEQ project, which is described in our introduction.

The arrival of **Dr. Jean-Francois Rual** from Harvard University adds additional capability in high-throughput proteomics while **Dr. Maria Figueroa** from Cornell University has brought great expertise in epigenetic profiling to the Department.

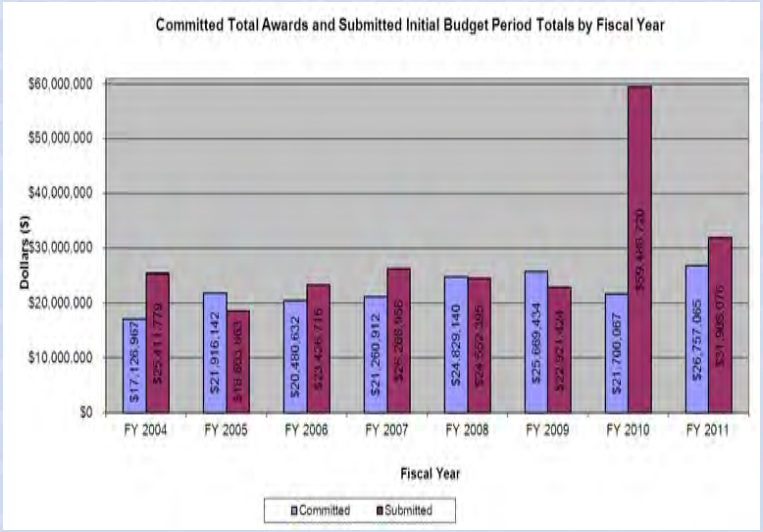
The Department is currently ranked 11th in NIH funding with $9,345,110 in NIH awards year to date.

JEAN FRANCOIS "JEFF" RUAL, PH.D.

Assistant Professor

MARIA "KEN" FIGUEROA, M.D.

Assistant Professor



The Department's faculty have continued to publish many innovative, high impact papers, just a few of which are highlighted here to illustrate the diversity of our research programs.

Sponsored Programs

- **30 Principal Investigators**
- **65 Research Faculty**
- **$26.75 Million in Research Funding**
- **Ranked 11th nationally in NIH Funded Research**
- **8 Endowed Professorships held by PI's**

Scott Tomlins M.D. Ph.D., an anatomic pathology resident, is the lead author on "Urine *TMPRSS2:ERG* Fusion Transcript Stratifies Prostate Cancer Risk in Men with Elevated Serum PSA" published in the August 3 issue of *Science Translational Medicine*. This work, which was performed in **Dr. Arul Chinnaiyan's** laboratory in the Michigan Center for Translational Pathology, showed that the combination of molecular detection of the *TMPRSS2:ERG* translocation in urine along with urinary PCA3 levels dramatically improves the utility of serum PSA for prostate cancer screening.

Jason Hipp M.D Ph.D.*, Pathology Informatics Fellow,* was first author and **Dr. Ul Ba**lis senior author on a paper "Optimization of complex cancer morphology detection using the SIVQ pattern recognition algorithm," which describes the use of vector quantization to identify areas of tumor in tissue sections and was published in *Analytical Cellular Pathology***.** This and other papers lay the foundation for broad application of image analysis techniques in diagnostic pathology.

The physician-scientist career model is alive and well at Michigan. **Dr. Peter Lucas**, Associated Professor of Pathology and a contributor to our breast pathology section and **Dr. Linda McAllister Lucas**, Associate Professor of Pediatrics and Communicable Diseases, are senior authors on a paper in *Science* entitled "Cleavage of NIK by the API2-MALT1 fusion oncoprotein leads to noncanonical NF-kappaB activation." The first author on this paper which described a novel mechanism of transcriptional activation by a fusion protein that arises as a result of translocations that occur in MALT lymphoma, Dr. Shaun Rosebeck, is a post-doctoral fellow in the Department.

The Department's contributions were by no means restricted to basic science research. The Department of Pathology continues to be well represented at the USCAP (United States and Canadian Academy of Pathology). At the most recent meeting in Washington, D.C. in March our faculty gave 6 platform presentations, 34 posters presentations, 1 keynote talk, 3 short courses, 1 long course, and spoke at 2 and moderated 1 scientific sessions, and spoke at 3 and moderated 1 evening specialty conference.

Division of Translational Pathology

Kojo S. J. Elenitoba-Johnson, M.D.
Henry Clay Bryant Professor of Pathology
Director, Division of Translational Pathology
Director, Molecular Diagnostics Laboratory

The Division of Translational Research includes the mass spectrometry-driven proteomics resource, the analytical flow cytometry core, the tissue procurement resource and the molecular pathology research laboratory. The updates for the individual constituents of the Division are discussed under separate headings below.

PROTEOMICS RESOURCE FACILITY (PRF)

The PRF is led by Kojo S. J. Elenitoba-Johnson, M.D. (Director), Venkatesha Basrur, Ph.D. (Lab Manager), Kevin P. Conlon (Senior Research Lab Specialist), and Damian Fermin, Ph.D. (Proteome Informatics Specialist). This facility is a resource service that supports the research needs of those both within and outside the Department and University, providing the following services:

- **Protein identification by LC-MS/MS sequencing:** *In-gel* and *In-solution* processing
- **Identification of post translational modifications (PTMs):** Phosphorylation, acetylation, methylation, ubiquitination, and citrullination (new) serine, threonine, and tyrosine. These services include cutting the gel slices (if needed), protease (trypsin) digestion, desalting/fractionation (where applicable), LC-MS/MS analysis, database search (X! Tandem/TPP). Results are delivered via an email link (internal users) and/or Excel file format (external users). In-solution digestion includes an SCX fractionation (3 fractions). If an enzyme other than trypsin is to be used, the users have provided them at the time of sample submission.
- **Differential protein expression analysis:** Relative quantitation using cICAT – Cleavable Isotope Coded Affinity Tags, iTRAQ – Isobaric Tags for Relative and Absolute Quantitation, and SILAC – Stable Incorporation of Labeled Amino acids in Culture

The majority of the projects submitted to PRF deal with the identification of interacting proteins, post-translational modification and determining the relative quantitation of differentially expressed proteins. To accomplish these analyses, PRF employs *in-gel* or *in-solution* digestion of the samples with trypsin followed by acquisition of data-dependent MS/MS spectra using ion-trap instruments. Over the past year, six manuscripts have been accepted or published in peer-reviewed journals with the proteomic data generated at the PRF, with three more currently under review.

FLOW CYTOMETRY CORE LABORATORY AND VIRTUAL SLIDE SCANNING SERVICE

These services are led by Lloyd M. Stoolman, M.D. (Director) and Ronald Craig, Ph.D. (Operator/Manager)

Translational Pathology

- **Proteomics Resource Facility**
- **Flow Cytometry Core Laboratory**
- **Virtual Slide Imaging**
- **Tissue Procurement Service**
- **Molecular Pathology Resource Laboratory**

Flow Cytometry Core Laboratory http://www.pathology.med.umich.edu/pathflowcore/ provides access to research grade flow cytometers (Coulter/Beckman FC 500 [2-laser, 5-color, 8-parameter; carousel-loader], Becton-Dickinson LSR-II [3-laser, 10-color, 13-parameter; plate-loader]), networked data storage and web-based scheduling system. More than 40 undergraduates, graduate students, post-docs, research associates and principal investigators from 15 laboratories used one or both instruments over the past year for a total of 2,345 hours (15% (FC-500) and 113% (LSR-II) of the available time). One of the main goals of the laboratory this year was the migration of users from the 5-color to the 10-color instrument. This migration required a substantial training effort on the part of Ronald Craig, PhD. Based on University of Michigan Cancer Center Core rates, the departmental subsidy of this activity saved users over $94,000. This figure does not reflect the added benefits of 24/7 access and the value of hands-on experience for trainees. Users report that this Core contributed to 13 publications in peer reviewed journals, 6 abstracts and a minimum of 21 NIH grants (active).

Pathology Virtual Slide Scanning Service generates diagnostic quality (200-1000X) digital slide scans using an Aperio XT-robotic slide scanner, a Zeiss Axiomat computer-controlled photomicroscope with "mosaic" stitching software and networked Image servers. This year scans for education and clinical support (58% of scans) exceeded those for research projects (42% of scans).

The Laboratory conducts automated and manual slide scans, operates servers that host over 9000 virtual slides (~8 terabytes) and provides leadership for Pathology Department education, training and research initiatives that involve virtual microscopy. The Virtual Slide Scanning Service maintains secure virtual slide servers and custom databases to support a variety of applications. Current projects include the following:

- **Hematopathology Slide Library** This project encompasses a systematic scanning of Hematopathology slides with educational value, providing a searchable database/user interface that links Hematopathology reports to virtual slides and the electronic medical record (Search-Tag Portal).
- **Lymphoma Conference Virtual Slide Project** This project encompasses a systematic scanning of Hematopathology slides for Lymphoma conference and the training of fellows and residents in virtual slide annotation, presentation, quality assurance.
- **Case study library for self-assessment** This project included establishing a D*eveloper interface* to allow free text and keyword search of custom database slides for Hematopathology cases containing 30K Flow Cytometry and 40K Histopathology reports with links to diagnostic materials; edit History, Diagnosis and Comment fields to improve educational value, and package it as a Case Study List with links to primary diagnostic materials (e.g. flow cytometry histograms and listmode data, virtual). It also included a *Trainee interface* (patient identifiers removed from Case elements). With this interface, trainees are presented with History and links to primary diagnostic materials from which the trainee composes a report (Diagnosis + Comment) that is archived for subsequent review with an attending. Archiving releases the (edited) report for immediate feedback.
- **Developed software (Search-Tag Portal)** that assigns keywords and conducts searches of flow cytometry (30K) and hematopathology (40K) reports since 2000. This software creates online Case lists for educational/research functions with one-click access from Case lists to histograms, virtual slides and medical record as well as links to the frozen tissue database, and export lists to Excel.
- **The Core continues to support The Virtual Microscope Teaching Project.** This Project encompasses a collection of virtual slide servers, teaching laboratory websites and personnel that jointly support the use of Virtual Microscopy in teaching programs on the Medical Campus. Dr. Stoolman led the team that developed the server/user interface architecture and authored the initial Pathology websites linking laboratory exercises to virtual slides. During its first 5-years of operation, the Virtual Slide Scanning Service in Pathology maintained the servers and managed the project. This year, responsibilities for daily operations were assumed by members of the Pathology Education Office, the Learning Resource Center and Medical School Information Systems. The Virtual Slide Scanning Service continues to support the Project by producing new slide scans and consulting. The Project now supports educational websites in Medical Histology, Medical Histopathology, Medical Organ Systems Pathology, Dental and Graduate Student Histology and Histopathology with ~500+ campus users and a

growing audience of Web users outside the institution.

- Investigators report that this Core contributed to 9 peer-reviewed publications, 4 abstracts, 3 NIH grants (active).

TISSUE PROCUREMENT RESOURCE (TPR)

This effort has been coordinated primarily by Dr. Megan S. Lim and Dr. Kojo Elenitoba-Johnson.

The TPR continues to make progress in archiving tissue material from hematopoietic malignancies, primarily lymphomas. Currently, the majority of these have been retrospective from existing material in fixed-paraffin-embedded tissue. The lymphomas have been re-classified according to the new WHO classification. The tissue microarray library has been expanded to include more than 2,000 cases of malignant lymphomas. With regard to frozen tissues, the Hematopathology tissue repository has archived approximately 800 specimens.

Efforts from the TPR have resulted in 9 peer-reviewed publications and 15 scientific abstracts since 2007. Further efforts to organize and archive the existing and future specimens within the flow cytometry lab will be made in the next year.

MOLECULAR PATHOLOGY RESEARCH LABORATORY (MPRL)

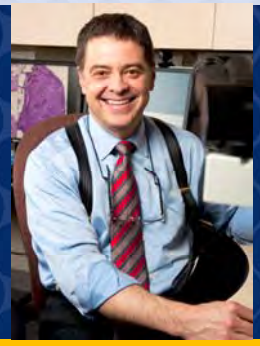
Lead by Thomas J. Giordano, M.D., Ph.D. (Director) and Dafydd G. Thomas, M.D., Ph.D. (Associate Director), the Molecular Pathology Research Laboratory (MPRL) completed another successful year in its mission to assist faculty and trainees in the Department of Pathology with lab-based research projects. In addition, we have expanded the scope of MPRL client base by formally incorporating its services into the Tissue Core of the UMCCC, which has been renamed the Tissue and Molecular Pathology Core. The MPRL has been working on expanding our technical abilities in FISH studies while continuing to provide tissue embedding and frozen sectioning (in part thru the UMCCC Tissue Core), DNA extraction, RNA extraction, protein extraction, PCR, quantitative RT-PCR, DNA microarray analysis thru the UMCCC Microarray Core, DNA sequencing thru UM DNA Sequencing Core, western blots, *in situ* hybridization, chromogenic *in situ* hybridization (CISH), quantitative *in situ* antigen detection (via AQUA analysis), laser capture microdissection thru the UMCCC Tissue Core, tissue array construction, and immunohistochemistry.

A number of projects were supported by the MPRL this past year resulting in 10 manuscripts published in peer-reviewed journals. The projects include:

Project	Status
Immunohistochemical project involving multiple antibodies to distinguish between oncocytoma and malignant renal neoplasms	Abstract presented at USCAP. Manuscript published
PCR project involving viral causes of placental infection. RNA and DNA were extracted from placental samples with chronic villitis and RT-PCR performed for a variety of viral pathogens	Ongoing
DFSP TMA made and attempts to perform break-apart FISH for the t17;22	Ongoing
EWS Project: Novel Chr4:19 translocation. Cases identified. FISH probes ordered and first round of FISH just completed. RT-PCR performed and demonstrated no evidence of classic EWS translocation in index cases. DUX4;CIC PCR was positive	Ongoing
FISH project for MDM2 in cutaneous pleomorphic lipoma	Abstract presented at USCAP. Manuscript in
Multiple immunohistochemical stains	Results presented at USCAP. Project ongoing
In situ hybridization probe prepared	Ongoing
DNA extracted from necropsy liver. PCR and sequencing performed for CYP2D6 polymorphisms	Correlated with drug overdose on 2 recent deaths
Immunohistochemical stains performed on cytology cell blocks	Ongoing
Sequencing of KCNJ5 gene in adrenal tumors. Validated and extended recently published results of KCNJ5 mutations of adrenocortical tumors associated with overproduction of aldoste-	Ongoing

MLabs Outreach Program

Jeffrey L Myers, M.D.
A. James French Professor of Pathology
Director, Division of Anatomic Pathology
Interim Director, MLabs Outreach Program



Established in 1985, MLabs is the University of Michigan Health System's outreach laboratory program. Its role is to extend the pathology department's laboratory services and faculty expertise to hospitals, reference laboratories, physician offices, nursing acute care facilities and other healthcare settings. As MLabs celebrates its 26th anniversary our vision is:

1) To be the provider of choice in the region for the delivery of high quality reference laboratory testing not performed in community hospital laboratories;

2) To be the center of excellence and assume a national leadership role in Molecular Diagnostic testing and personalized medicine;

3) To be top-of-mind when considering excellence in Anatomic Pathology;

4) To assist our clients in maintaining and growing their business by working together on innovative strategies and technologies to help them maintain their role as laboratory leaders in their communities.

Our management focus is further specified in our Departmental **MLabs Mission Statement:**

…to represent the "voice" of outreach clients and their patients in seeking constant improvement in all University laboratory, clinical, administrative, informatics, compliance and business operations where they might impact MLabs services; to do the same when dealing with external vendors who provide support services to the department that might impact MLabs services.

GROWTH

The MLabs Division's client portfolio includes over 500 accounts, with active management of approximately 100 physician offices, 5 full service referral hospitals, 15 sub-specialty referral hospitals, 3 national reference labs and 3 extended nursing care facilities. Servicing the needs of this diverse mix of clients is a team of dedicated professionals with over 100 years of combined experience in laboratory medicine.

The MLabs Division experienced significant growth FY11 as evidenced by a 23% increase in total gross charges and 16% increase in tests billed over FY2010 reflecting our sales and marketing effort. Our primary sales objective focused on marketing MLabs molecular diagnostic test menu to other commercial laboratories nationally and the second objective to increase our presence in the multi-physician office practices within UMHS service areas. To this end, we created a full time sales position followed by successful candidate recruitment. MLabs' team brought on board 60 new MLabs accounts in multiple market segments with resultant increase in molecular diagnostic referral testing, dermatopathology, surgical

MLabs Outreach Programs Serving

- **Physicians' Offices**
- **Hospitals**
- **Reverse Reference Laboratories**
- **AP Consultations**
- **Extended Care Nursing Facilities**
- **Managed Care & Laboratory Network**

pathology consultations and physician office business.

During FY2011, our MLabs Connect (MLC) team, along with Pathology Informatics, successfully deployed our web-based lab portal for electronic orders and result reporting to over 90 client sites (475 active users within those sites). In addition to providing these clients electronic result reporting, the lab portal allowed most of these patient results to be integrated into CareWeb, an advantage to our UM physicians caring for these patients as they move in and out of the hospital setting. This MLC roll out was a major milestone for MLabs and one that deserves recognition. The talent and dedication of the individuals directly involved with MLabs Connect development and implementation, allowed us to meet the needs of our physician office clients (patient safety and office efficiency) and remain competitive in a demanding environment.

CHANGE

During the fourth quarter, the MLabs Division moved into a new space in Traverwood IV. From an operational perspective, this move provided us with the space necessary to function efficiently as a MLabs Client Service Center. The MLabs group is very pleased with the new location. In the immediate future, we will be finalizing plans to put the finishing touches on our new space capturing the appropriate corporate look of our business division.

Finally, we saw the departure of our Division Director, Dr. Steven Mandell and look forward to our continued success under the directorship of Dr. Jeffrey Myers.

WORKFORCE

Faculty/Division Director — Steven Mandell, MD (resigned 4/1/11)
Jeffrey Myers, MD (effective 7/1/11)

Staff

The following individuals represent MLabs to the Department, Health System, patients and clients we serve on a daily basis. MLabs Client Services Center is consistently applauded by our clients as one of the most helpful and friendly in the reference laboratory industry. The MLabs Client Services extend from 7:00 am to 11:00 pm, Monday through Friday, and from 8:00 am to 5:00 pm on Saturday to serve the needs of both our hospital and physician office clients.

Position	Name	Years with MLabs
Manager	Susan Valliere, BS, MT(ASCP)	18
Operations / Client Services Supervisor	Deb Moss, BS, MBA MT(ASCP)	15
Account Representative	Melissa Brown, MT(ASCP)	15
Managed Care/Finance	Deirdre Fidler, MHSA, BS, MT (ASCP)	15
Informatics Support Specialist	Steve Goyette, BS, MT(ASCP)	6
Training Specialist, Senior	Jackie Goodman	5
Training Specialist, Intermediate	Steve Gregg	10
Sales Representative	Dustin Suntheimer, BS	<1
Customer Service Assistant, Senior	Chanin Kelly	7
Customer Service Assistant, Senior	Jenny Curtis	4
Customer Service Assistant Intermediate	Leesa Stanislovaitis	9
Customer Service, Assistant Intermediate	Denise White	10
Customer Service Assistant Intermediate	Cindi Lycan	4
Customer Service Assistant Intermediate	Billie Jo Bennett	4
Customer Service Assistant Intermediate	Mary Catherine Smith	2
Administrative Assistant	Sue Yopek	1

MARKET SEGMENTS SERVED

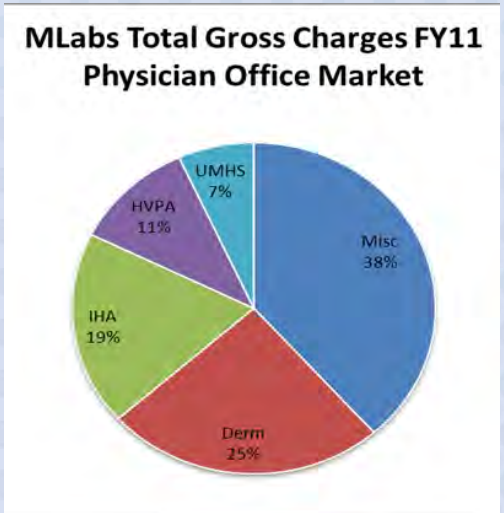
The MLabs Division plays a significant role in providing reference laboratory services within a 150 mile radius of Ann Arbor and our reach for molecular diagnostic services, anatomical pathology specialize services and surgical pathology consultations is national. MLabs categorizes its business into 6 Market Segments:

Physician Office – all Specialties
Hospital – both full coverage clients and those sending specialized testing
Nursing Home - extended nursing care and acute care facilities
Reverse Reference Laboratories – commercial/independent labs
AP Consults
Other – Miscellaneous 'catch all' category

Market Segment	FY09 % of Total Gross Charges	FY10 % of Total Gross Charges	FY11 % of Total Gross Charges	% CHANGE Gross Chgs ($$) FY10-11
Physician Office	36%	39%	41%	30%
Hospital	46%	37%	29%	-4%
Rvs Ref Lab	1%	3%	11%	389%
Other	12%	13%	10%	-2%
Nursing Home	4%	6%	6%	15%
AP Consult	2%	3%	3%	30%
TOTAL:				

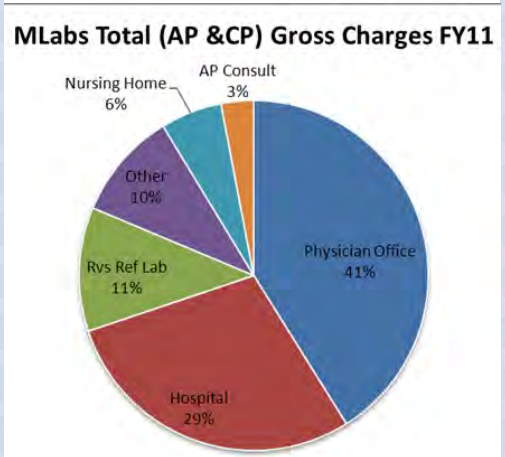
Physician Office Market Segment (41% of Total Gross Charges)

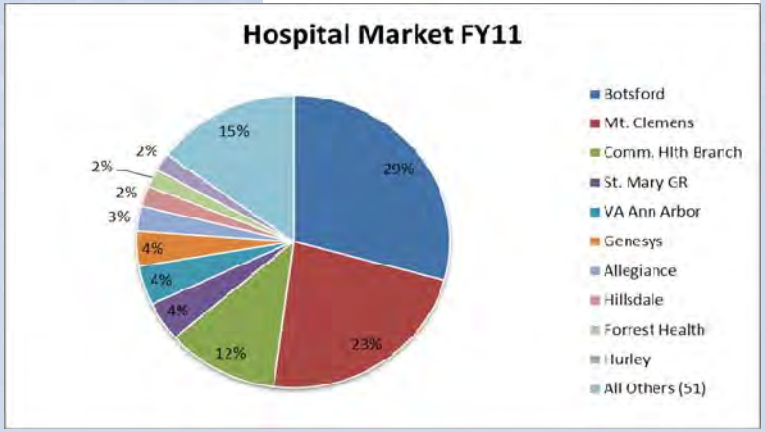
MLabs provides laboratory testing to over 125 individuals offices in the greater Washtenaw county service area. Majority of this testing is sent to MLabs by two primary care providers in this region, Integrated Health Associated (IHA) and Allied Primary Care (HVPA) and our dermatology offices, most notably our three new derm clients located in Grand Rapids and acquired during FY11. We continue with our efforts to identify those MISC offices (8999 REFR). Once identified, they are set up with a client code to facilitate the accessioning, resulting and billing processes. Proper client identification also assists us with additional marketing efforts.



Hospital Market Segment (29% of Total Gross Charges)

MLabs is the primary reference laboratory and provides full esoteric testing to 5 hospitals in Michigan. MLabs provides specialty services, e.g., renal, muscle, nerve biopsies, flow cytometry and molecular diagnostic testing to an additional 10+ hospitals throughout the state. MLabs served another 50 + hospital clients around the country that routinely use the Department of Pathology surgical pathology consultative service.





Reverse Reference Laboratories (11% of Total Gross Charges)

The dramatic increase in the Rev Reference Lab market segment reflects the outstanding effort of the Molecular Diagnostic Laboratory in providing a comprehensive hematopathology and solid tumor test menu and their commitment to service excellence. This, combined with MLabs focused marketing effort and Pathology Informatics ability to keep up with the challenging IT demands of these clients, accounts for this success.

Market Segment	FY09 % of Total Gross Charges	FY10 % of Total Gross Charges	FY11 % of Total Gross Charges	% CHANGE Gross Chgs ($$) FY10-11
Physician Office	36%	39%	41%	30%
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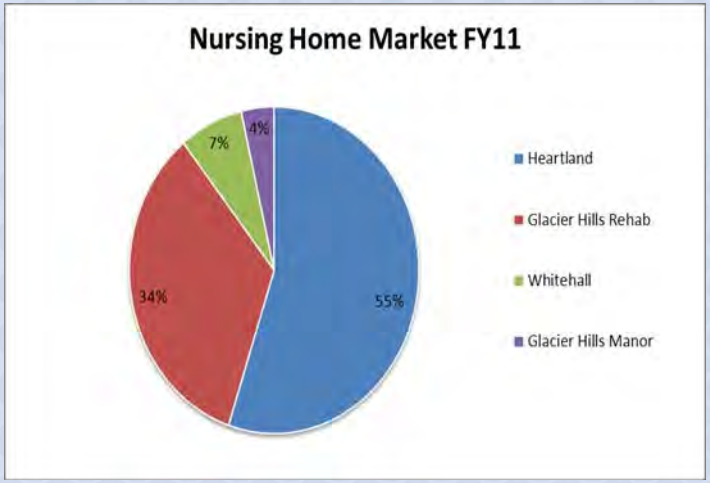
Other	12%	13%	10%	-2%
Nursing Home	4%	6%	6%	15%
AP Consult	2%	3%	3%	30%
TOTAL:				

AP Consultations (3% of Total Gross Charges)

Our Surgical Pathology faculty comprises one of the strongest groups of diagnostic pathologist in the world. It is the Department of Pathology's vision to be top of mind when anyone anywhere is considering excellence in Anatomical Pathology.

Extended Care Nursing Facilities (6% of Total Gross Charges)

MLabs provides laboratory and phlebotomy services to regional nursing homes in support of the institution's strategic initiatives. *MLabs Connect*, our web-based portal is fully implemented at each facility and used for both electronic test orders and test result delivery. Electronic order entry improves patient safety and service by giving real time, validated and legible patient information and creates a bar code label for each specimen greatly streamlining and improving the overall process. At the same time, it provides real time access to patient results when the care giver is ready to receive them. Providing laboratory service to this market has proved challenging but we have done so successfully and our service to these clients has been greatly appreciated by their staff, physicians and patients



MLABS MANAGED CARE AND LABORATORY NETWORK INVOLVEMENT

Joint Venture Hospital Laboratories (JVHL) is the largest laboratory network in Michigan and is organized as a limited liability company, equally owned by its hospital laboratory members. The University of Michigan Health System (MLabs) became an equity member of JVHL in 1997 and serves on its Executive, Quality Assurance and Operations Committees.

Great Lakes Laboratory Network (GLN) a network of hospital laboratories geographically located primarily on the western side of the state. MLabs became a member of GLN in 1996 but does not participate in managed care contracts through GLN. MLabs plays an advisory role through representation on the Steering Committee.

MLabs helps facilitate Departmental issues pertaining to contractual obligations as a member of Joint Venture Hospital Laboratories and Great Lakes Laboratory Network. MLabs serves as a resource for UMHS Managed Care Operations Office with lab related issues from their various contracted groups, e.g., IHA, HVPA.

SALES AND MARKETING STRATEGY

MLabs primary sales and marketing effort at this time is focused on making certain that pathologists, hospitals, and reference laboratories everywhere recognize The University of Michigan MLabs as the center of excellence for specialized laboratory testing, especially molecular diagnostics and pathology consultative services. Along with that recognition, is our commitment to provide these services in a cost effective and timely manner. We feel strongly that if a test can be performed by the University of Michigan, staying within the State of Michigan, than that is where it should be done.

ACKNOWLEDGEMENT

The MLabs Division had a remarkable year; its success reflects the efforts of each and every individual within the Department of Pathology, their commitment to service and their ability to push forward with innovative solutions to meet the sophisticated needs of our Clients

Ann Arbor VA Health System

Stephen W. Chensue, M.D., Ph.D.
Professor of Pathology
Chief, Pathology and Laboratory Medicine
Ann Arbor VA Health System

The VA Ann Arbor Healthcare System (VAAAHS) is a University of Michigan affiliated tertiary health care provider for veterans; one of three tertiary medical centers in the Veterans Integrated Service Network (VISN) #11 serving the veteran population of Michigan, and portions of Ohio, Indiana and Illinois. The VAAAHS laboratory retains full accreditation by the College of American Pathologists. The VAAAHS satellite laboratory at the Toledo Outpatient Clinic has been inspected by the Joint Commission and is currently fully accredited. The VAAAHS Pathology and Laboratory Medicine Service maintains a close relationship with the University of Michigan Department of Pathology at every level. VAAAHS pathologists are jointly recruited and appointed with the University of Michigan Medical School Department of Pathology and are selected on the basis of academic performance and potential as well as professional competence. There are currently four full-time pathologists plus a consultant dermatopathologist on staff.

The Pathology and Laboratory Medical Services (PALMS) has successfully shifted to meeting the needs of outpatient clinics and currently serves the Pathology needs for the VA Ann Arbor Healthcare System and 8 outpatient clinic sites, including Toledo, Grand Rapids, Battle Creek, Flint, Jackson, and Detroit as well as the local clinics. Integrated diagnostic services is a target for networking and consolidation among these independent facilities with an aim toward additional sharing of service responsibilities, equipment standardization, VISN-wide reagent contracting, decreased cost of referred (send-out) testing to non-VA clinical labs and an increase in the workload in VAAAHS's anatomic pathology and the clinical labs. Due to steady increases in overall testing volume, laboratory equipment standardization with blanket contracting promises to allow for substantial savings in laboratory costs. The Laboratory is currently performing all surgical pathology for the Battle Creek/Grand Rapid facilities as well as all gynecologic cytopathology for Battle Creek, Detroit, Toledo, and affiliated clinics, meeting targeted turnaround times and diagnosis accuracy nearly 100% of the time.

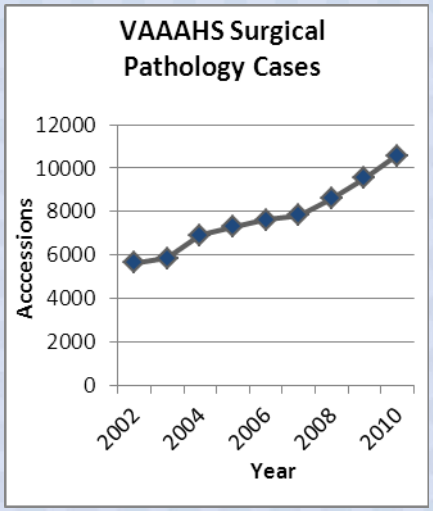
Service	# of Cases	Target	% on Target	Avg. TAT	Case Concordance
Surgical Pathology	10,932	Diagnosis <48 hrs.	99.60 %	1.3 days	96.60%
Frozen Sections	740	Completion <20 min.	100.00	8.0	98.60%
Autopsies	14	Completion < 30 days	100.00 %	8.7 days	N/A
Cytologies	4,817		100.00 %	3.4 days	99.6%
Gynecologic	1819	Completion <10 days	100.00	N/A	N/A
Non-Gynecologic	2998	Completion < 48	100.00	N/A	N/A

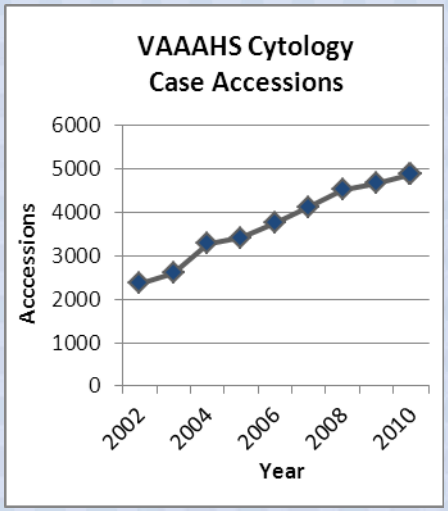
VA Ann Arbor Health System Laboratories

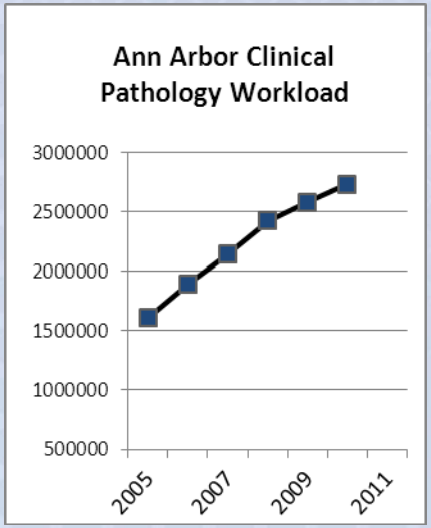
- **Anatomic Pathology**
- **Clinical Pathology**
- **Facilities Integration**
- **Resident Training**

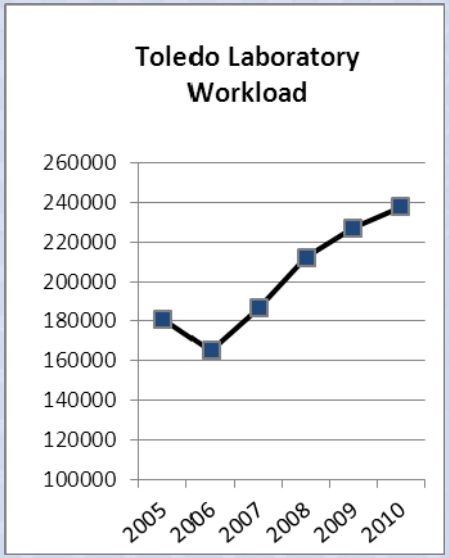
There is an extensive quality improvement program within Anatomical Pathology including regular consultations with the Armed Forces Institute of Pathology (converting to Joint Pathology Center in 2012), University of Michigan, and other outside consultants. There is a comprehensive quality assurance review with analyses of frozen section accuracy, amended diagnoses, surgical appropriateness, turnaround times, report quality, random retrospective review, and follow-up of positive cancer diagnoses. In addition, the VAAAHS PALMS has taken the lead with regard to patient safety by implementing preoperative second review The Laboratory does not have a targeted autopsy rate, but does encourage a maximum number of autopsies sufficient to examine a variety of diseases and clinical circumstances. Autopsy protocols are submitted to clinical staff for comparison of anatomic diagnoses with clinical findings. Each autopsy is also evaluated as to correlation of clinical and anatomic pathologic findings by review of the pathologist with monthly reports submitted to the VHA central office. Cytology specimens are of non-gynecologic diagnostic and gynecologic screening types. Due to the increasing population of women veterans, gynecologic pathology is becoming an important component of the VAAAHS workload. The VAAAHS performs all PAP screening cytologies for the northern tier of VISN 11. The Ann Arbor VA laboratory is rated a VA "Center of Excellence" in cytology. In addition, in the prior year, 2,732,078 clinical pathology tests were performed in the Ann Arbor laboratory.

Clinical Pathology	
Chemistry	1,925,823
Hematology/ Coagulation/ Urinalysis	474,349
Microbiology	82,750
Blood Bank	42,909
Phlebotomy	109,421
Point of Care Tests	96,650
Total Ann Arbor Cases	2,732,078
Toledo CP Cases	278,123
Total VAAAHS CP Cases	3,010,201









The VHA Decentralized Hospital Computer System (***VistA***) is recognized as the most fully integrated medical information system in the nation. It combined all of the clinical management of the patient, and shifted the VAAAHS to a computerized patient record system in the year 2000. Data storage for all components of pathology and the clinical laboratories contains full patient information for nearly 4 decades. Digital images of select-

ed patient surgical, cytopathology, and autopsy specimens are stored as part of the patient medical record and are accessible to clinicians and pathology residents. In the past year, the VAAAHS PALMS continued expansion of standardized synoptic reporting and addition of state-of-the-art tissue processors. The clinical laboratories have continued to incorporate as much automation as possible employing state-of-the-art analyzers. Microbiologic molecular diagnostics was further expanded to include testing for toxigenic Clostridium difficile. Future directions include efforts to institute digital telepathology consultation to further integrate VA facilities.

Three resident training positions in the University of Michigan Department of Pathology's program are supported with funds from the Department of Veterans Affairs. All residents serve monthly rotations in Surgical Pathology and Autopsy Pathology, with access to special study programs in Surgical Pathology, Cytopathology and Digital Imaging. Drs. Chensue, Utiger and Chamberlain oversee the clinical laboratory and make interesting and pertinent clinical laboratory information available to residents as desired. In surgical pathology, the staff pathologists provide one-to-one mentoring during the surgical case sign out. The resident assigned to surgical pathology, usually a first year resident in training, has the opportunity to examine all of the specimens grossly and microscopically under close one-to-one mentoring by the staff pathologists. Weekly Urology Case Review Conference is held by Dr. Hedwig Murphy. The residents assigned to autopsy and surgical pathology are primary presenters in clinical conferences. The residents obtain a broad educational experience and aid in providing high quality medical care. Residents are invited to join in continuing educational activities in histopathology and cytopathology from the AFIP, CAP, and ASCP. Because of the closeness of various sections of the laboratory, there is frequent consultation among the pathologists and the residents are involved throughout. Since the VAAAHS is physically close to the University, the residents are expected to attend the appropriate teaching conferences at the University. VAAAHS pathologist staff contribute to the laboratory and lecture portions of the second year medical and graduate students at the University of Michigan. In addition, Dr. Murphy designed and implemented pathology courses for graduate students (Path 581). Both Drs. Chensue and Murphy have made presentations at national and international pathology conferences. Through his research program, Dr. Chensue also mentors post-doctoral fellows, graduate students and undergraduate students.

Dr. Chensue has served as Chief of Service since March 2001. He serves on the VA/UM Dean's Committee as well as local and national VA oversight committees. The staff pathologists at the VA Ann Arbor Healthcare System serve in various capacities involving administrative tasks for the University of Michigan, such as the University Affiliation Council, Resident Selection Committee, the Medical Student Admissions Committee, Graduate student preliminary exam and thesis committees, teaching faculty for second year medical students as well as teaching for other graduate courses in the medical school. At the VAAAHS, the pathology staff members serve on all major committees involved with institutional policies and procedures.

In addition, Dr. Stephen Chensue has ongoing research programs funding by the NIH and VHA, and participates in cooperative studies with other investigators at the University of Michigan. Dr. Chensue maintains research laboratories in Research Building 31 of the VAAAHS. All staff participate in various clinical studies and collaborate with a variety of investigators. The laboratory, in general, serves the VAAAHS research program by providing considerable technical support for clinical research and, in some cases, for more basic research, in both anatomic and clinical pathology.

In summary, the VAAAHS Pathology and Laboratory Medicine Service is the major provider of Anatomic Pathology services for the northern tier of VISN 11. The primary goal of the department is to provide high quality diagnostic services and appropriate care to the veteran patients. This is evidenced by continuing accreditation by external review agencies such as the College of American Pathologists (CAP), Joint Commission for the Accreditation of Hospitals Organization (JCAHO) and the Food and Drug Administration (FDA). There is close supervision of resident activities as they are involved with patient care. All staff members are privileged and evaluated in accordance with their training, experience, continuing education and participation in quality improvement activities. Within the service there is an extensive quality improvement program that integrates with that of the hospital as a whole. The affiliation with the University of Michigan serves to strengthen and improve the quality of patient care to our veterans. The teaching effort involving both residents and medical students is of benefit to the two institutions. The VAAAHS PALMS is positioned to continue delivery of high-quality service to Veteran patients as demand for medical care continues to mount in the next decades.

Michigan Center for Translational Pathology

Arul M. Chinnaiyan, M.D., Ph.D.
S. P. Hicks Professor of Pathology
Professor of Pathology and Urology
Director, Michigan Center for Translational Pathology

The Michigan Center for Translational Pathology (MCTP) was formed in 2007 as a focused initiative to bring basic research discoveries from molecular medicine to clinical applications for the identification of biomarkers and therapeutic targets for cancer diagnosis and treatment. We have made several noteworthy discoveries that have driven cancer research forward and intend to develop these findings to advance cancer diagnostics and targeted therapies. It is our hope to explore avenues for the development of personalized medicine based upon an individual's specific genetic abnormalities underlying the development of his/her disease.

MCTP's overarching mission is to: 1) Establish the University of Michigan as the international leader in discovery and characterization of disease biomarkers and therapeutic targets using an integrated multi-disciplinary, systems biology approach. 2) Establish a new paradigm of bringing personalized medicine to routine clinical care through the use of high throughput sequencing. In parallel with the UM Health System, MCTP also has four core components to the mission: research, education, patient care and service. Our specific goals are to:

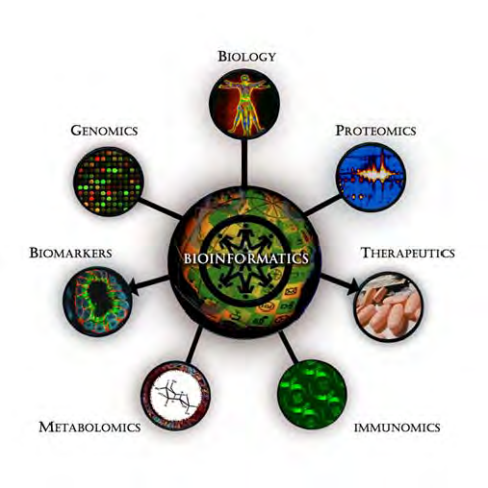
- Discover new disease biomarkers and candidate therapeutic targets using genomic, proteomic, and bioinformatics approaches.
- Employ a systems biology perspective in characterizing the molecular alterations in human disease.
- Translate and commercialize molecular discoveries for clinical utility.
- Train future translational cancer researchers.
- Ensure the long term scientific and funding success of the MCTP.
- Translate next generation sequencing based approaches (including associated bioinformatics) for clinical use in personalized medicine.
- Transform the practice of pathology and medicine.

This past year, the Center further expanded its efforts toward the translation of scientific discoveries to the clinics. The MCTP Molecular Testing Laboratory, in association with MLabs, recently added the Cell Search Circulating Tumor Cell (CTC) assay for breast, prostate and colorectal cancer. In April of 2011, we introduced Ventana assay for ERG gene fusion IHC for prostate cancer biopsies run in Pathology IHC lab, the first in the country for this assay. Plans are underway to offer the TMPRSS2-ERG (Ventana/Roche) urine gene fusion assay for clinical use in Q4 of 2011. Drs. Thekkelnaycke Rajendiran and Amjad Khan are also working on the development of a multiple metabolite panel for prostate cancer, with the hope of improving diagnostic specificity for progressive disease. This testing will be based upon changes in amino acid composition that occur during prostate cancer progression, and like the PCA3 testing, will also be urine based. Along with the Michi-

Michigan Center for Translational Pathology

- **Bioinformatics**
- **Cancer Biology**
- **Experimental Therapeutics**
- **Gene Fusion Discovery**
- **Genomics**
- **Immunomics**
- **Metabolomics**
- **Proteomics**
- **Tissue Core and Molecular Testing Laboratory**

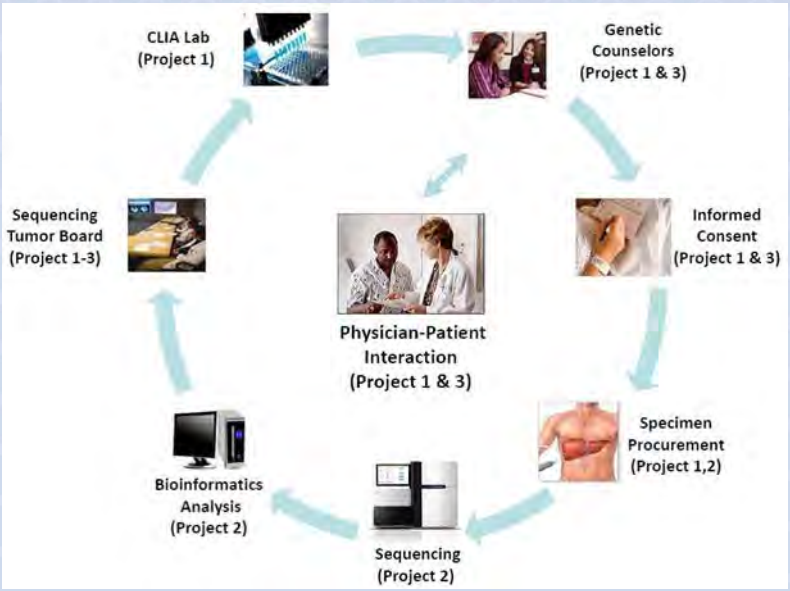
gan Institute for Clinical & Health Research (MICHR) and Prostate SPORE, we have established a centralized biological repository for controlled storage of biological samples, and related services (including DNA, RNA, extraction, and body fluid procurement); the biorepository houses MICHR freezers and coordinates database needs. Universal consent form for the biorepository to create a biolibrary has been approved. Collaborations have been established with industry partners such as GSK, Metabolon, Ventana, GenProbe, and Armune Bio Science to further develop clinical testing platforms.



In addition to the development of the aforementioned clinical tests, MCTP researchers continue to explore new technologies and research projects for the identification of critical biomarkers in cancer progression, as well as identifying drug targets to block the effects of genetic abnormalities. Dr. Nalla Palanisamy identified a new class of RAF Kinase rearrangements in prostate and gastric cancers and melanoma, that are potentially targetable with RAF and MEK inhibitors (*Nature Medicine*. 2010 Jul;16(7):793-8). Dr. Anastasia Yocum developed a new proteomics method to identify alternative splice variants present in cancer cells. Dr. Xiaoju Wang used a phage display technique to identify a critical peptide sequence that binds specifically to ERG, and he has shown its effectiveness in attenuating ERG-mediated cell invasion *in vitro*. This discovery may lead to the development of a novel small-molecule therapy to treat a subset of prostate cancer patients. Dr. Ifran Asangani is studying the role of MMSET, a histone methyltransferase, in cancer, and is screening small molecules to target this important regulatory enzyme. Dr. Ram Mani is developing methods to study early events that initiate the development of gene fusions in prostate cancer, and his discovery that the androgen hormone induces chromosomal proximity between TMPRSS2 and ERG genomic loci may hold important clues to the development of prostate cancer. He has extended his studies to examine global chromatin architecture leading to gene fusions and the role of inflammation in facilitating them. Dr. Chris Maher is currently developing a new pipeline for chimera discovery, and has constructed a classification system for these potential driving genetic mutations that may lead to prostate cancer progression. More recently he is developing single molecule sequencing platform for gene fusion discovery. Dr. Chandan Kumar is utilizing transcriptome sequencing to discover novel gene fusions in breast cancer cohort. Drs. Catherine Grasso and Scott Tomlins are studying the role of somatic mutations in cancer using exome capture sequencing, and Dr. Dan Robinson is currently working on the discovery of such mutations in prostate and breast cancers.

MCTP graduate students have also participated in this exploratory process. Chad Brenner is studying the role of ETS gene fusions in prostate cancer carcinogenesis, and has recently shown that ETS interacts in a DNA-independent manner with the enzyme poly (ADP-ribose) polymerase 1 (PARP1) and the catalytic subunit of DNA protein kinase (DNA-PKcs). Furthermore, inhibition of PARP1 attenuates ETS-mediated tumor growth (*Cancer Cell.* 2011 May 17;19(5):664-78). MSTP candidates Matthew Iyer and John Prensner have initiated an innovative new project to discover unannotated prostate cancer-associated lincRNAs in prostate cancer tissues using next generation sequencing techniques. They have nominated PCAT1 as a highly expressed non-coding RNA in metastatic prostate cancer. Discovery of such new transcripts may provide new biomarkers for non-invasive clinical testing using patient urine samples.

Finally, an exciting new initiative in personalized medicine has been undertaken with the establishment of MI-ONCOSEQ: The Michi-



MI-ONCOSEQ

gan Oncology Sequencing Center. The goal of MI-ONCOSEQ is to utilize powerful next generation sequencing technology to sequence the genomes and transcriptomes of cancer patients to identify actionable mutations that can inform therapeutic decision making.

MCTP researchers are moving forward with their efforts to promote both national and international collaborations with other research groups and industry partners. The Center continues to participate in research activities with the Early Detection Research Network (EDRN), caBIG, and Prostate SPORE. In association with Dr. Max Wicha's group at UMCCC, MCTP is working toward the creation of a National Center for Genetic Origins of Cancer (CGOC) here on the medical campus. This center will use new methodology to enhance our current understanding of cancer development and metastasis. MCTP scientists are also working with investigators nationwide as part of the Stand Up To Cancer research initiative to develop personalized treatment for breast cancer.

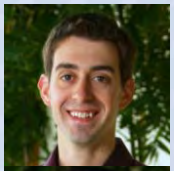
The Center's research continues to be published in the scientific literature (Appendix C). This past year, MCTP researchers collectively published 60 journal articles from July 1, 2010 to present. Papers were in high impact journals such as *Nature Medicine, Cancer Cell (2), Nature Reviews Genetics,* and *Science Translational Medicine*. A study led by Dr. Nalla Palanisamy used paired-end transcriptome sequencing to identify a new class of gene fusions involving RAF Kinase in prostate and gastric cancer and melanoma; the RAF gene fusions are targetable with available RAF and MEK inhibitors (*Nature Medicine*. 2010 Jul;16(7):793-8). This has important implications for the 1-2% of prostate cancer patients that harbor this fusion. This discovery was also highlighted in press releases from the Prostate Cancer Foundation, *NCI Cancer Bulletin*, and *News and Views*. Dr. Bushra Ateeq's study, "Therapeutic Targeting of SPINK1-Positive Prostate Cancer" that appeared in *Science Translational Medicine*, reported that an antibody against the SPINK1 protein, which is highly expressed in ETS-fusion negative prostate cancer, was able to inhibit the growth of cells that over-expressed SPINK1, and also significantly halted the tumor growth in mice that were implanted with SPINK1 over-expressing tumors (*Sci Transl Med.* 2011 Mar 2;3(72):72ra17). These results suggest that a sub-set of TMPRSS-ETS negative prostate cancer patients that over-express SPINK1 can potentially be treated with anti-SPINK1 antibody. Recently, Chad Brenner's paper entitled, "Mechanistic Rationale for Inhibition of Poly(ADP-Ribose) Polymerase in ETS Gene Fusion-Positive Prostate Cancer" was featured on the cover of *Cancer Cell* (*Cancer Cell*. 2011 May 17;19(5):664-78).

Accompanying our publications, the Center's visibility and reputation, both nationally and internationally, continues to grow as well. This past year, MCTP's research was featured in numerous press releases that appeared in media outlets such as *The Wall Street Journal*, *MSNBC*, and *Smithsonian Magazine*, among others. Jyoti Athanikar (MCTP science communication specialist) and Radhika Varambally (web programmer) have recently made substantial changes in content and organization to the MCTP website (http://mctp.path.med.umich.edu/mctp/main/index.jsp) and further enhancements are planned. The website consistently experiences approximately 50 visitors each day, with visitors coming from a diversity of domains, both nationally and internationally.

Our publications in high impact journals and increased exposure were coupled with the recognition of MCTP scientists by their scientific peers.

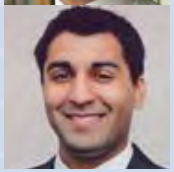
Dr. Arul Chinnaiyan was appointed by NCI Director, Dr. Harold Varmus, to National Cancer Institute Board of Scientific Advisors (BSA), and was also elected to the American Association for Cancer Research (AACR) Board of Directors. He was recently named a Taubman Scholar at the University of Michigan and he received the 2011 Outstanding Investigator Award from the American Association of Indian Scientists for Cancer Research.

Several of MCTP's young emergent researchers were also recognized for their achievements this past year:



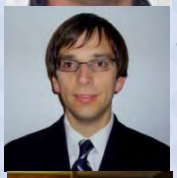
Dr. Chris Maher received the Young Investigators Award from Prostate Cancer Foundation.

Dr. Ram Mani received a Class of 2010 Stewart Rahr-PCF Young Investigator Award from Prostate Cancer Foundation and an AACR Scholar in Training Award.

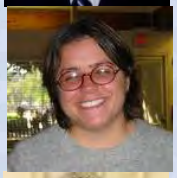


Dr. Sameek Roychowdhury received the prestigious AACR-Bristol-Myer Squibb Oncology Fellowship in Clinical Cancer Research.

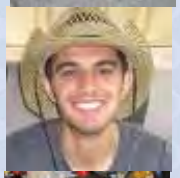
Chad Brenner was selected to attend the 61st Lindau Nobel Laureate Meeting and received an AACR Scholar in Training Award.



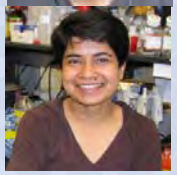
John Prensner received an AACR Scholar in Training Award and won first prize for poster at the Multi-Institutional Prostate SPORE Meeting.



Dr. Catherine Grasso was accepted to the 2011 UCLA NSF Institute for Pure and Applied Mathematics (IPAM) Session in Mathematical and Computational Approaches in High-Throughput Genomics.



Matthew Iyer won first prize for poster at the Multi-Institutional Prostate SPORE Meeting.

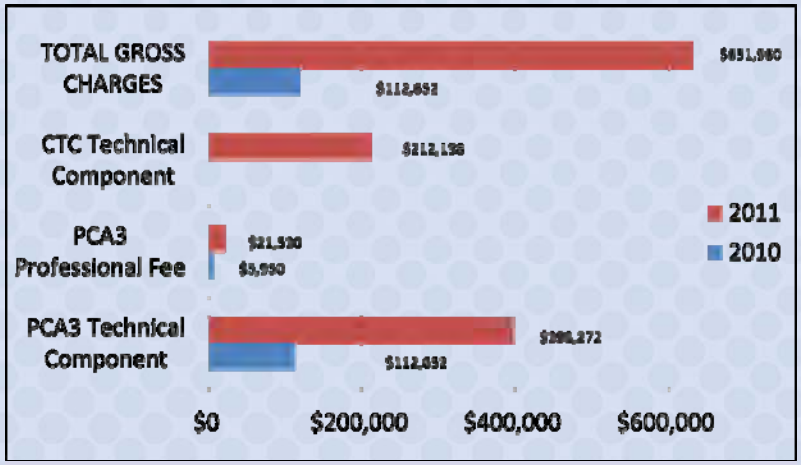


Dr. Bushra Ateeq's abstract was selected as one of top 8 abstracts for the 2010 Cancer Center Fall Symposium and she received the AACR-Women in Cancer Research Scholar Award.

MCTP continues to promote young faculty for career development. MCTP faculty, Drs. Sooryanarayana Varambally and Chandan Kumar both received their first NIH grants, R01 and R21 respectively. Dr. Ram Mani was promoted to MCTP Research Investigator. Dr. Priya Kunju also became an MCTP faculty member this year.

This past fiscal year, the Center obtained $4,795,857 in committed awards. In addition, we received $1.5M in funding from a Howard Hughes Medical Institute Award. Efforts to raise funds for MCTP, through the efforts of Steffanie Samuels (Director of Development, Dept. of Urology and MCTP), have been productive this year, with a total fundraising production of $1,122,700.00, including PCF matching funds. The majority of the gifts received were from foundations and corporations.

The highlights of some of the Center's activities this past year are summarized in greater detail in the *Michigan Center for Translational Pathology Annual Report for 2011*, which is a separate, comprehensive overview of the Center.



CLIA Lab Charges increased significantly over 2010 levels.

Our website experienced 395,074 hits last year, representing 9,077 unique IP's and a total of 19, 454 total visitors.

Division of Finance And Administration

Martin Lawlor
Director, Division of Finance and Administration

The Division of Finance and Administration, which is under the auspices of the Office of the Chairman and directed by Mr. Martin A. Lawlor, Department Administrator, is responsible for the business, operational, and fiscal affairs of the Department of Pathology as mandated by the policies of the Chairman, University of Michigan Health System (Medical School and Hospitals), and the University.

In addition to directing this division, Mr. Lawlor serves on various departmental, Health System and University committees. He is also the Co-Chair of the Cancer Center Ambulatory Care Coordinating Group and sits on the Executive Committee for the Joint Venture Hospital Laboratories. Mr. Lawlor also serves as Chair of the Administrative Modernization Research Subcommittee, which is charged with improving quality and finding cost efficiencies in Research Administration across the School of Medicine

Leadership provided by the administrator included several initiatives designed to improve patient safety and operational efficiency. A new Laboratory was identified in Mott Children's Hospital to provide Molecular Microbiology Clinical Services, with a DNA Sequencer being set up so that new tests can be brought on board when Dr. Michael Bachman joins our faculty in August 2011. This will result in tests brought in house that are currently sent out, and will lower our overall cost structure, and provide a higher level of service for our patients.

We saw our professional revenues increase once again. Pathology began professional component billing for Clinical Pathology outpatient services in 4th quarter of 2010, and that was expanded to include inpatient services in the 1st quarter of 2011, resulting in a new revenue stream of $970,000. UMHS Department of Pathology is the first group to institute professional component billing in the state of Michigan.

In addition, Mr. Lawlor was responsible for renegotiating a new Part A agreement with the Medical Center that accounted for all Medical Director effort provided by Pathology Faculty, and also renegotiated the MLabs agreement to include profit sharing for Molecular Diagnostics testing. These two initiatives resulted in approximately $1.3 million in additional revenue.

Mr. Lawlor has also been the lead negotiator on behalf of UMHS with Wayne County to provide Medical Examiner Services to the County. UMHS and the county have agreed to a tentative $7.5 million contract covering three years pending Wayne County Commission approval.

Sponsored research expenditures have increased $2.7M (15.1%) from FY10 to FY11. In addition, grant and contract committed awards increased markedly from $21.7M in FY10 to $27.2M in FY11.

Employee Engagement and Service Excellence have continued to be a priority, with Mr. Lawlor partnering with Dr. Duane Newton to move Pathology forward to being one of the early adopters of the UMHS Service Excellence Program. To date, 91 faculty and staff leaders have attended the first module of our program

ADMINISTRATIVE SUPPORT CENTER

Administrative Support Center/Pathology Laboratories

This includes preparation and monitoring of all Hospital laboratories' revenue, expense and capital budgets, and personnel and payroll systems. Gross revenue for FY2011 was $483,619,311, com-

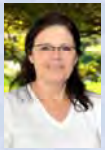
Finance and Administration

- **Administrative Support Center—Pathology Labs**
- **Human Resources, Faculty Affairs and Education**
- **Office of Academic and Business Affairs—Medical School**
- **Office of the Chair**
- **Professional Fee Billing Office**
- **Financial Data**

pared to $450,633,835 in FY2010, an increase of 7.3%. During this period, total laboratory expenditures were $90,940,860. Pathology is responsible for 11.4% of total Hospital Gross Revenue and 4.8% of total expense. Mr. Thomas Morrow is responsible for administration of the Clinical Pathology Laboratories and Ms. Christine Rigney is responsible for the administration of the Anatomic Pathology Laboratories.

Mr. Thomas Morrow oversaw the Clinical Pathology Laboratories, which account for 90% of the pathology laboratories revenue and expenses, during a challenging year in which increased length of inpatient stay and decreased activity of outpatient Healthcare clinics and centers caused extreme pressure to achieve our margin goal. Mr. Morrow was instrumental in putting together submissions and ROI's to get our capital needs met, as well as leading Lean workflow improvements.

Ms. Christine Rigney was hired into the role of Anatomic Pathology Operations Administrator in 2010. In addition to overseeing the Anatomic Pathology Labs, Ms. Rigney is the department lead for many building and renovation projects: the new Children and Women's Hospital space planning, the NIB forensics center to integrate our autopsy service with the Washtenaw County ME Office and Wayne County ME Office, potentially expanding services to other counties. Ms. Rigney is also involved in development of the new Laboratory Information System.



Ms. Brenda Schroeder, Administrative Coordinator, assists with the coordination of intra- and inter-laboratory activities for the anatomic and clinical pathology laboratories; is responsible for maintenance of all department and hospital laboratory licensure and accreditation, this includes coordination of required proficiency tests, coordination of internal inspections required for continuing certification or licensure by the JCAH, CAP, CLIA, COLA and MDPH. Brenda is a member of UM Accreditation and Regulatory Readiness Council and serves as a liaison to the UMHS Quality Improvement Team. Brenda also coordinates external CAP inspection training and survey teams. The Administrative Coordinator has oversight of department Laboratory Safety Programs and has oversight and review of injury/illness for reporting purposes and trend analysis. Brenda is responsible for maintaining and updating Pathology Health & Safety Manual, Chemical Hygiene Plans, Incident Management Plans and Unique Chemical Inventories. The Administrative Coordinator also serves as a Chair for the department Safety Committee and a representative on the UMHS Infection Control, UMHS Waste Management, and Disaster Committees. Brenda is responsible for maintenance and updating Laboratory General Policies, Chairs the Laboratory Communication Committee and acts as the department safety and compliance liaison with the Hospital for renovation projects, and coordinates the updates of the Pathology Laboratories Handbook (including online version).

Human Resources, Faculty Affairs and Education

The non-instructional human resource functions in the Department of Pathology are led by Ms. Beverly Smith with support from Ms. Cathy Bearman and are comprised of a Staff Human Resources Office for hospital laboratories (approximately 600 FTEs) and Medical School support staff, including our research programs (approximately 218 FTEs). Both Ms. Smith and Ms. Bearman coordinate the department's newly expanded orientation program. Ms. Smith coordinates the Medical Technology Internship Program, is a departmental representative for the Health System's Diversity Task Force, and this year led a group in development of the Employee Recognition program and actively participates in the Foundations for Supervision training program as a facilitator. Ms. Bearman is the department's Wellness Champion and has led a group in developing wellness initiatives within Pathology, as well as serves on the department Recognition Committee.

Faculty Affairs is the responsibility of Ms. Laura Blythe who coordinates appointments and promotions for our faculty (approximately 107 FTEs) as well as serving as the Department of Pathology effort certification specialist. Ms. Blythe has developed a web-based human resources management system for all faculty, serves as a member of UMHS M-ACE (appointments, credentialing and enrollment) Committee and the Medical School's Effort Certification Committee. Ms. Blythe is also responsible for Education Office activities including the Residency and Fellowship Training Programs (28 residents and 17 fellows in 7 ACGME and 5 non-ACGME programs) and the Medical Student Teaching Programs for the M1 and M2 laboratories and the M4 Clerkship Program.

Ms. Laura Hessler is responsible for administration of the Molecular and Cellular Pathology PhD program with 23 students actively pursuing their doctorates. Management responsibilities are focused around curriculum management (including the Research Seminar Series), academic records, budget planning and financial operations, recruitment, and program activities such as the annual departmental research symposium. Ms. Hessler is the administrator for the department's two NIH training grants (PIs Steven Kunkel, Ph.D. and Nicholas Lukacs, Ph.D.) which support 6 pre- and 8 post-doctoral trainees and two active seminar series. Ms. Hessler performs the human resource functions for the department's graduate students (43 including 20 non-MCP students with Pathology mentors) and training grant trainees (14).

Office of Academic and Business Affairs–Medical School

Mr. David Golden is responsible for all administrative operations associated with the academic side of the department. This includes managing department finances (budget, contracts, research grants, forecasts and analysis), clinical billing (professional and technical front end operations), partnering with the Chair and Administrative Director to design. He is also implementing and directing strategic goals for Medical School operations including development of policy and business plans, management of faculty compensation and departmental funds, and use of Departmental facilities, including modifications, renovations and reassignment of department space.

During the past year Mr. Golden has refined the component billing system that generated $2,750,158 in gross charges and $970,746 in incremental net revenue, and managed the UMHS and All Funds expenditures and forecast processes. Total All Funds expenditures for FY 2011 (Pathology and MCTP) were $50,790,966 and Hospital expenditures were $90,940,860. He also developed the 2012 forecast for the Hospital, Pathology and the MCTP. Mr. Golden managed the pre and post award research enterprise for both Pathology and the MCTP. There were 138 research proposals submitted to external sponsors this year. 43 of these proposals were submitted to the NIH. Committed awards are up more than 25% to $27,172,206. Actual sponsored research revenue is up this year by 15.1% to $28,944,716. Overall, the academic side of the Department saw a 15.8% increase ($6.59M) in the following revenue components: component billing, federal and non-federal research, Part A, General Fund and other revenue (Washtenaw County contract, Royalties, rebill activities, operating transfers) from FY 2010 to FY 2011. While FGP Net Patient Care was down slightly year-to-year (0.5%), the billing and taxation relief, as a result of the new FGP Funding Model, of $1.28M more than offsets this small deficit. Overall gross charges for Pathology's group practice were up 13.1% ($5.45M). Actual net payments were also up 10.2% ($1.47M). Mr. Golden continues to manage and mentor Karen Giles, John Harris, Nancy Parker, Thad Schork and Christine Shaneyfelt in their analytic and managerial roles.

Mrs. Nancy Parker is responsible for all front end billing operations. This includes laboratory gross charges of $483,619,311 and professional fee gross charges of $47,102,715. Mrs. Parker is responsible for Send-out billing, component billing, MLabs client statements, ensuring the accuracy of the daily billing files, correction of all errors with the appropriate Hospital department and responding to all questions regarding interdepartmental, MLabs or Hospital patient billings.

Mr. John Harris is responsible for oversight of the accounting and financial staff, supporting our research programs, and the daily management of post awards. Extramural sponsored expenditures for FY2011 amounted to approximately $28,944,716. Mr. Harris manages a staff of three accountants and two procurement specialists. He also provides many ad hoc financial reports related to Medical School and clinical operations.

Mr. Thad Schork is responsible for pre-award activities for our pathology research program and serves as Development Coordinator for the Department of Pathology. In addition, he also serves as the lead administrative staff member for facilities (building maintenance and renovation), including major renovation projects initiated in the University Hospital and other buildings occupied by Pathology.

Ms. Christine Shaneyfelt serves as the primary contact for UHHC finance. This includes completing the Hospital budget and developing and managing the departmental capital equipment process. In addition, Ms. Shaneyfelt has prepared a number of financial analyses including profit and loss statements, faculty incentive analysis and financial performance reports for both Anatomic and Clinical Pathology divisions.

Office of the Chairman

Ms. Lynn McCain provides support to the Chair of the Department including management of his calendar, completing travel arrangements and preparation of manuscripts, abstracts, clinical consultations and all materials related to the search committees chaired by Dr. Hess. In addition, Ms. McCain continues in her managerial responsibilities for our faculty support group, and continues to lead the monthly mentoring series for our administrative support staff.

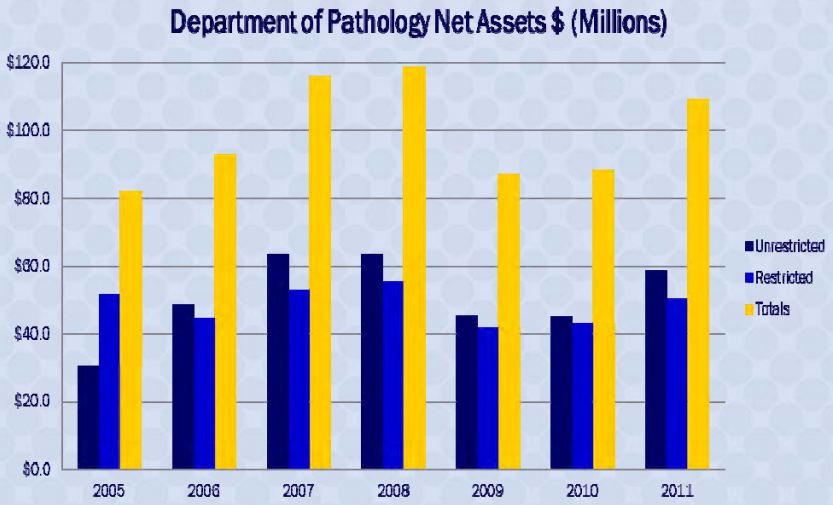
Ms. Angela Suliman joined our team in June 2010. Ms. Suliman provides support to the Administrator, Mr. Martin Lawlor, including scheduling, travel arrangements, data collection, and event planning. She has been the facilitator for the Sysmex Implementation Team that is responsible for the transition to the new Sysmex instrumentation in our Hematology Lab, and the Lab Formulary Committee. She reconciles the department P-cards, and is responsible for renewal of medical licenses and payment of honoraria for visiting professors. Ms. Suliman is overseeing all CME requests for faculty and house officers. She has also taken part in the planning and implementation of the Advances in Forensic Medicine and Pathology Conference.

Pathology Professional Fee Billing Office

Ms. Holly Daul continues in her role as Revenue Cycle Director of Professional Billing for the specialties of Pathology, Radiology, Radiation Oncology, Physical Medicine, and Neurology. She supervises 35 FTE staff and is responsible for accounts receivable management and collections of professional fees for services provided by Department of Pathology faculty. Ms. Daul serves on several physician professional fee committees and is one of the Process Owners for MiChart.

SUMMARY OF FINANCIAL DATA FOR FY2010

Grants and Contracts and Other Accounts	
482 active grants, contracts and other accounts *Includes General Fund, Extramural Funds, FGP Professional Fee Income, Gift, etc.	
Total Extramural Direct Expenditures	$ 20,501,181
Indirect Extramural Research Expenditures	$ 8,443,535
Total Sponsored Projects	$ 28,944,716
Committed Awards	$ 27,172,206
Faculty Group Practice Plan–Pathology Associates	
Number of charge entries	286,670
Gross Billings–Anatomic and Clinical Pathology	$ 47,102,715
Net (FGP – includes Component Billing)	$ 15,399,820
Part A Payment–Laboratory & Administrative Supervision	$ 4,001,069
All Fund Expenditures–Medical School	
Compensation & Benefits	$ 36,327,434
Commodities & Other Costs	$ 14,463,532
Total	**$ 50,790,966**
Number of Funded Faculty	115
Number of Funded Residents & Clinical Fellows	42
Number of Funded FTE Research Staff	178
graduate students	13
post-doctoral fellows	45
Pathology Laboratories	
Number of billed tests reported by CDM	5,525,297
Total Gross Revenue–Pathology Laboratories	$ 483,619,311
Total Direct Expenses–Pathology Laboratories (includes ACUs)	$ 97,556,407
Number of FTE Staff	617



Total margin (before market changes) $7,270,253
Total margin (with market changes) $21,144,892