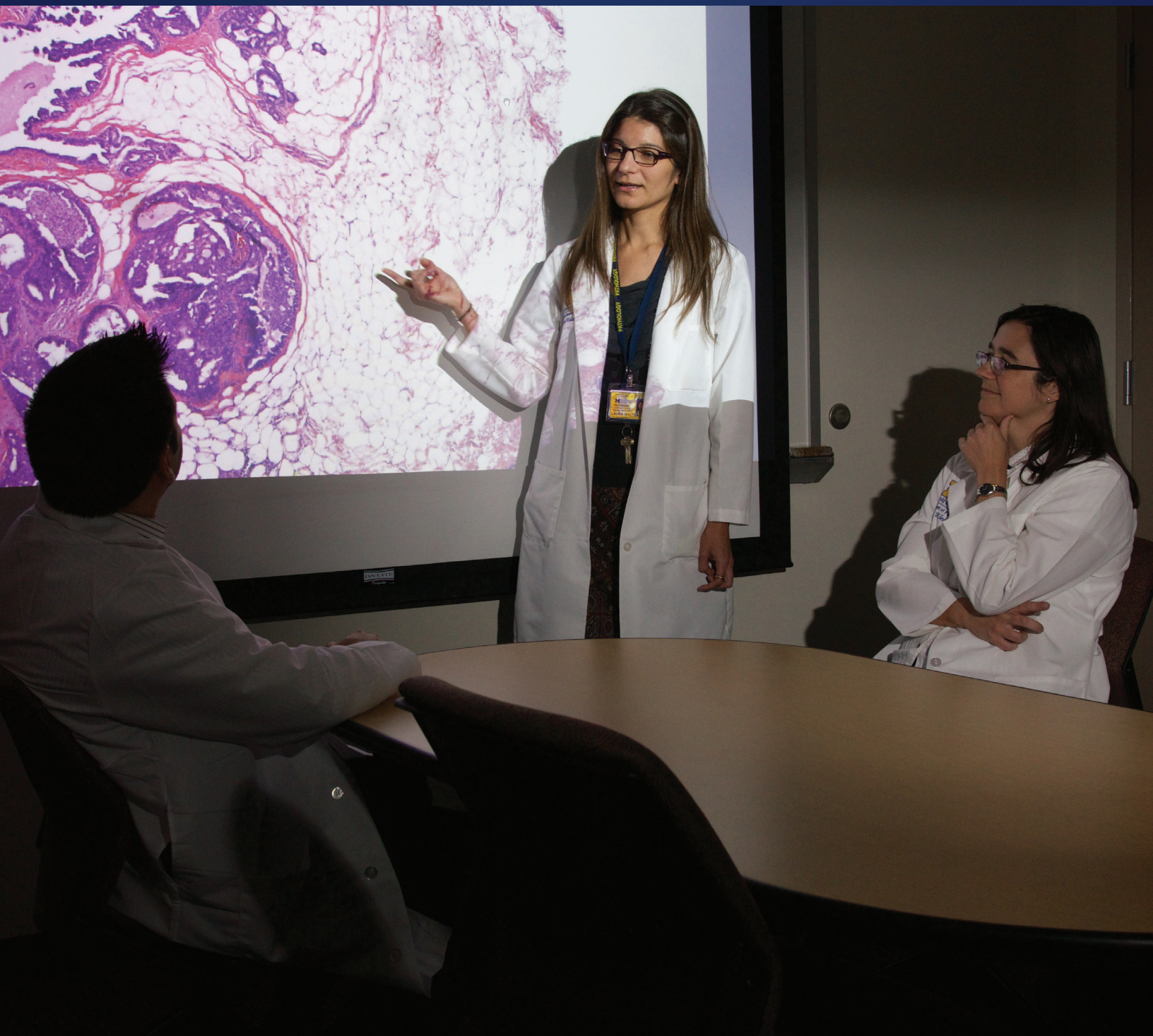
INSIDE PATHOLOGY

DEPARTMENT OF PATHOLOGY
UNIVERSITY OF MICHIGAN

FALL 2014



INSIDE PATHOLOGY

FALL 2014

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(Interim, 7/2013-9/2014)

Charles A. Parkos, M.D., Ph.D.
(Incoming, 9/2014-Present)

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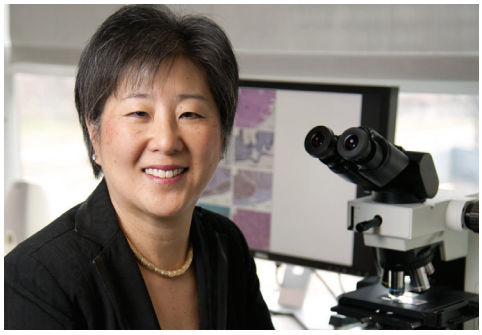
CHAIR'S CORNER



I am delighted to share the first issue of our departmental newsletter with you. A fantastic group of faculty and staff (noted at left) contributed to this inaugural issue and I hope you'll enjoy reading it as much as I have.

Although I couldn't possibly summarize the past year's events in a couple of paragraphs, I'd like to highlight a few particularly noteworthy ones. Selection of our new Chair tops the list – Dr. Charles (Chuck) Parkos brings an exceptional portfolio of scholarship and leadership to our department and I expect the next several years to be very exciting and productive ones. You can "meet" Chuck and get a sense of his plans for the department on the next page.

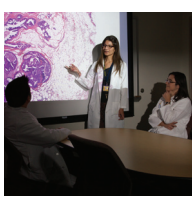
While we awaited selection of our new Chair, our faculty continued to be highly visible on the national stage. Dr. Jeff Myers completed a very successful term as USCAP President and Dr. Henry Appelman was honored with the USCAP 2014 Distinguished Pathologist Award. In this issue, Henry has provided "One Old Guy's Perspective on Pathology at Michigan" for your reading pleasure, including some terrific photos from back in the day! Our faculty received numerous institutional and national accolades this past year – our newest endowed professors (Drs. Andy Lieberman and Nick Lukacs) are highlighted in this issue.

The department's clinical and basic research programs continue to thrive and funding remains very strong, despite the flat NIH budget and keen competition for extramural grants. We experienced growth of clinical activity in both AP and CP, and Dr. Ul Balis led our long-awaited Laboratory Information System transition from Pathnet to Soft. Under the superb leadership of Drs. Barbara McKenna and Scott Owens, Doximity recently ranked our residency program #1 among large public universities and #7 overall.

Earlier this year, UMHS leadership approved a plan for Pathology to move most of its clinical operations to the North Campus and to renovate existing Pathology space in the University Hospital (UH) to accommodate an automated core lab and upgrade other laboratories that will remain at UH. Planning for Pathology's Relocation and Renovation (PRR) project is now in full swing. Assuming the Regents approve the PRR project in early 2015, most of our clinical operations will move to the North Campus by early 2017 and the UH renovation will be complete by early 2019.

We hope you enjoy reading about what's happening in Pathology at the moment. Please send us feedback and suggestions of things you'd like to read about in future issues. Also, if you have news to share with us, we'd love to hear from you!

Kathleen R. Cho, M.D.
Peter A. Ward Professor and Interim Chair



On The Cover
Breast team reviewing a patient's slide.

(From left to right)
Ghassan Allo, Fellow
Laura Walters, Clinical Lecturer
Celina Kleer, Professor

For information on making a gift to the Department of Pathology, please contact **Maher Salah**, Office of Development, University of Michigan, at:
Phone: (734) 647-4178
E-mail: *msalah@umich.edu*.

New Sheriff in Town

"I look forward to leading the University of Michigan's Department of Pathology into new areas, while learning from each of you about the exciting frontiers that have yet to be explored."

Introducing Our New Chair

Charles A. Parkos, M.D., Ph.D.

I am thrilled to join the University of Michigan (U-M) as the new Chair of the Department of Pathology. The opportunities in front of us are enormous.

I come to Michigan from the Emory University School of Medicine (Atlanta, GA) where I held the position of Vice Chair and Director of Experimental Pathology. I received my M.D./Ph.D. degrees from the University of California at San Diego and Scripps Research Institute in 1987. I completed my residency and fellowship training in Pathology at Brigham and Women's Hospital, with sub-specialization in diagnostic gastrointestinal surgical pathology. I was recruited to Emory University in 1997 and was promoted to Professor in 2003.

I have a deep appreciation for research as a core component of academic pathology. Over the past 25 years, my research interests have focused on understanding the molecular mechanisms responsible for the pathobiology of diseases associated with leukocyte migration across intestinal mucosa, such as inflammatory bowel disease. Recent studies in my lab have advanced our understanding of how barrier-regulating proteins of the epithelial tight junction play central roles in controlling mucosal homeostasis under normal and inflammatory conditions. My passion for promoting basic and translational research in experimental pathology resulted in my election as Vice President (2008-2009), President Elect (2009-2010), and then President (2010-2011) of the American Society of Investigative Pathology (ASIP).

In addition to my research, I am deeply committed to teaching, training, and mentoring at all levels. I have trained and mentored many post-doctoral fellows and junior research faculty, and I have served in a leadership capacity for Emory University's M.D./Ph.D. program for the past 14 years, the last seven of which I was the Director. During my tenure, Emory's M.D./Ph.D. program has nearly doubled in size, and many trainees have gone on to highly successful academic careers in related areas.

As I consider our priorities moving forward at the University of Michigan, the outstanding talent base in the divisions of Anatomic, Clinical, and Experimental Pathology will be invaluable. Having actively practiced as a surgical pathologist in gastrointestinal and hepatobiliary pathology for the past 25 years, I appreciate the importance of quality and value-added health care delivery. Therefore, careful consideration of work flow and departmental informatics to optimize digital connections between on and off-site operations will be critical.

I will work to facilitate strategic positioning of research faculty and programs in order to take full advantage of the many interdisciplinary and collaborative opportunities available at U-M. Guiding faculty in proximity and programmatic-based decisions will not only benefit individual research programs but also enhance the research and educational missions at U-M.

I believe that with the top-notch faculty and institutional resources already present, along with targeted recruitment, U-M's Department of Pathology can significantly rise in national rankings to a level shared by only a few of the very top programs. U-M's efforts at strategic investment of resources to facilitate disease-relevant investigation in areas such as inflammation, cancer, vascular and metabolic diseases, the nervous system, and personalized medicine will optimally position the university as a top destination for biomedical research, education, and state of the art health care. I have the energy, enthusiasm, and experience to lead the department in this exciting time and very much look forward to interacting with each of you personally.

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Charles A. Parkos, M.D., Ph.D. began his Chairmanship on September 15, 2014.

In 2008, the Division of Surgical Oncology moved outpatient breast surgeries offsite from the University Hospital (UH) to East Ann Arbor Ambulatory Surgery Center (EAA), about 5.5 miles away. While EAA had six operating rooms, there was no surgical pathology lab on-site. Specimens removed during surgery had to be transported to UH by courier at the end of each day. Not only were the specimens late to arrive in Pathology, they were often mislabeled and not in adequate formalin. As a result, the turn around time for pathology reports was increased by at least a day. Knowing that a delay in results would negatively impact patient care, a team of UH physicians and administrators, led by the Director of Anatomic Pathology, Dr. Jeff Myers, came together to find a solution. In February 2014, that solution resulted in the East Ann Arbor Intraoperative Breast Cancer Management Practice receiving the award for 2013 Clinical Services Program of the Year.

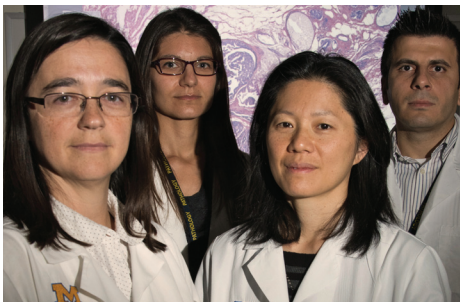
From the beginning, the team was faced with a choice. "Do we want a lab that is a triage lab or do we want to have a practice of excellence and do something that is above and beyond what most places do?" recalled Julie Jorns, Clinical Assistant Professor of Pathology, who was the breast pathology fellow at the time.

When the topic was raised at an Anatomic Pathology Operations meeting, a decision was made. Pathology's Administrative Director, Marty Lawlor, would bid for laboratory space at EAA and the goal would be for pathologists, pathology assistants, and histology technicians to work side by side with the surgeons to offer the ultimate in patient care. They would perform frozen sections of breast tissue allowing for real time evaluations of tumor margins.

"Mainly, if you talk to anyone in pathology around the world, they would tell you they never do frozen sections of breast tissue.

"They would perform frozen sections of breast tissue allowing for real time evaluations of tumor margins."

"We were all afraid of doing these frozens at first...we're not afraid of them at all anymore."



Top-left: Dr. Julie Jorns reviewing breast films.

Top: Pathology Assistant Matt Gabbeart puts a piece of breast tissue on a chuck in preparation for freezing.

Middle: Group photo of a portion of the breast team (left to right) Drs. Celina Kleer, Laura Walters, Judy Pang, Ghassan Allo.

Bottom: Frozen sample.

It can't be done. The integrity of the tissue can't be kept intact to assess margins because fat's squishy, and if you ever could do it, it's a very long and arduous process", said Christine Rigney, Assistant Administrator of Operations.

The faculty and staff were intimidated, scared even, by the idea of performing frozen sections on breast tissue. However, they knew that if there was a way to figure out if tumor margins were clear in real time, with the patient still on the operating table, it would result in a decreased re-excision rate and a decrease in patient morbidity, inconvenience, and cost to the patient.

In order to maintain safety for the patients, the process for freezing, cutting, staining, and reading up to seven blocks of tissue would have to be fast, under 20 minutes. In August 2009, with only a week until the lab was set to open, Pathology Assistant Tiffany Vail and Histology Tech Misty Wideman were given the task of developing a procedure for freezing the tissue. They had to work intensely to come up with a workable solution. "We thought of the way we freeze muscle tissue in Immunohistochemistry using liquid nitrogen and isopentane, but freezing with both liquid nitrogen and isopentane takes too long. Through trial and error, we discovered that you could dip tissue directly into liquid nitrogen, cut it at 20 microns (6-7 is normal), and still get readable results," Wideman said. "We're still using the same method. We're better at cutting tissue now. I think close proximity and being able to communicate what the surgeons need and what their expectations are has contributed to better care for patients."

Not only were the results readable, they resulted in the reoperation rate for breast patients being reduced from 55.3% to 19.3%. Michael Sabel, Associate Professor of Surgery, expressed "It's just been a boon for patients; and from a surgical point of view, I don't have to go wider or err on the side of taking wider margins because I can get my lesion out, see what the pathologist says, and go from there. Having less close margins results in less radiation and better cosmetic results down the road from that initial operative experience."

"We were all afraid of doing these frozens at first," Jorns said. "We're not afraid of them at all anymore."

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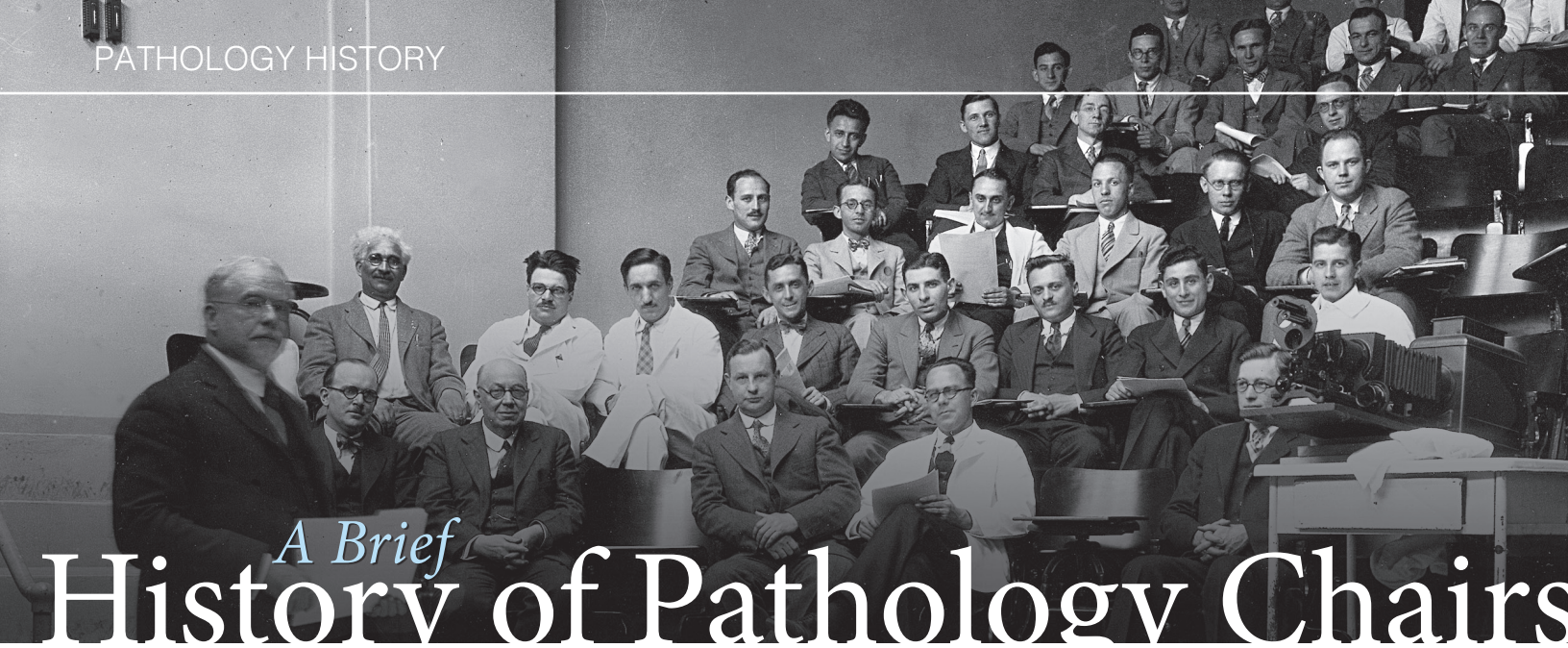
Written by
Elizabeth Walker
Pathology Imaging Specialist



A Brief History of Pathology Chairs

1887-1931

Early in the history of the University of Michigan (U-M), the "professor of pathology" was combined with whatever other professorship happened to be handy. In 1887, the medical faculty of the University noted the Science of Pathology as one of the most important branches of medicine with instruction provided as laboratory work. The first "independently recognized" Professor of Pathology (1888) was N. Heneage Gibbes, who taught a class in pathology in the third year of the four year medical school curriculum. A total of 64 hours of lecture, 50 hours of laboratory work, and one autopsy, performed during the senior year of the curriculum, summarized this era. Dr. Gibbes introduced the staining of slides to aid in the diagnosis of disease and established a course on Histology. However, subsequent conflicts with Dean Victor Vaughn led to a regental recommendation to combine the professorship of pathology with that of internal medicine, thereby eliminating Professor Gibbes' job. Dr. George Dock, an internist/pathologist, replaced Dr. Gibbes and Dr. Aldred Scott Warthin, a graduate of the U-M (1891), was appointed as Dock's assistant. Once he had gained competency in the performance of autopsies, Dr. Warthin became the university pathologist (1895). He was appointed as the first Chairman of Pathology in 1903 and expanded the training in Pathology for medical students from four weeks to nine weeks, encompassing 135 hours of work. Also during Dr. Warthin's chairmanship, autopsy work greatly increased, specialized undergraduate courses were introduced, an expanded summer program was established, and an ambitious program of research and extramural service was carried out. Dr. Warthin continued in this role through 1931.

1931-1956

A former student and assistant to Dr. Warthin, Carl V. Weller, M.D., assumed the Chairmanship of the Department of Pathology in 1931, and held this position until 1956. Dr. Weller, in addition to his role as Chair, was also a private practitioner of Pathology and reviewed hundreds of slides each year. In 1931, the Pathology Service in the University Hospital was made full time and the question of what to do with these outside referrals came into question. It was determined that Dr. Weller could continue to receive and charge for these referrals, however, the receipts were submitted to the Treasurer of the University who would deposit these funds into the diagnostic fund. The Executive Committee of the Medical School would review this information and would use a portion of these funds to reimburse the University for the services of its faculty and staff (an early version of overhead) and would provide a supplement to Dr. Weller's salary.

1956-1980

A. James French, M.D. served as Chairman from 1956-1980. Under the direction of Dr. French, the diagnostic services of

Warthin

1903

Weller

1931

French

1956

the Department of Pathology grew rapidly and included the consolidation of the clinical laboratories into the Department of Pathology. Dr. French provided leadership, guidance, and wisdom to numerous residents, faculty, medical societies, and organizations. Known for his dedication to the education of young pathologists, many of today's leaders in the field either trained under, collaborated with, or worked with faculty who had trained with or worked with Dr. French. In 1987, his former colleagues and trainees established the A. James French Society of Pathologists, which has in excess of 150 active members. In 1995 the French Society, working with the Medical Center Development Office and the Department of Pathology, established the A. James French Endowed Professorship.

1980-2005

In 1980, Peter A. Ward, M.D., a graduate of the University of Michigan Medical School and the Residency Training Program in the Department of Pathology, was appointed as the fourth Chairman of Pathology. Dr. Ward had been named Chairman at the University of Connecticut Health Center at the age of 37, and when he accepted the Chairmanship at the U-M, he brought with him an international reputation as a scientist and a well-established research program. With minimal research facilities at Michigan, Dr. Ward led a major renovation to house the research programs and other fledgling programs being developed by the young faculty arriving at Michigan with Dr. Ward. Under his administrative direction, a graduate student Ph.D. program was begun, the MLabs reference laboratory enterprise was started, and research, especially in immunopathology, continued to grow at Michigan. Also under Dr. Ward's leadership, the Department was organized into divisions, including Educational Programs, Anatomic Pathology, Clinical Pathology, Immunopathology Research, Administrative Support, Residency Training Program, Medical Technology Training Program, and the Veterans Administration Medical Center Laboratory Services. Dr. Ward continues an active research program today.

2005-2013

In July 2005, Jay L. Hess, M.D., Ph.D., a graduate of Johns Hopkins University School of Medicine and the Residency Training Program at Brigham and Women's Hospital/Harvard Medical School, joined the faculty as the Carl V. Weller Professor of Pathology and fifth Chair. Dr. Hess lead the expansion of the Molecular Diagnostics and Informatics divisions in the Department and was a co-founder of Paradigm, a diagnostics, non-profit corporation designed to bring biomarker-driven clinical trials to benefit cancer patients. Dr. Hess continued to grow the department by adding many new faculty members and expanding the research effort, especially in the field of cancer research. He currently serves as the Dean of the School of Medicine and Vice President for University Clinical Affairs at Indiana University.

2013-2014

After graduating from Yale University with a B.A. in Chemistry and the Vanderbilt University School of Medicine (1984), Kathleen R. Cho, M.D., completed her residency training in anatomic pathology and fellowship training in cancer genetics at the Johns Hopkins Medical School. After being on the Johns Hopkins faculty, she joined the Department of Pathology at the University of Michigan in 1995 and rose to the rank of full Professor in 2002. She is the Peter A. Ward Professor of Pathology, which is fitting for a faculty member with a strong interest in pathology research. Her research explores the molecular pathogenesis of common gynecological cancers. Dr. Cho's clinical interests are in gynecological pathology, and she is a practicing surgical pathologist in this area. She served as the Interim Chair of the Department, recruiting faculty members, guiding the department through implementation of new electronic health records and laboratory information systems, and planning a major expansion of clinical laboratory space.

2014-Present

The seventh chair of the Department of Pathology is Charles A. Parkos, M.D., Ph.D. A graduate of the University of California, San Diego Medical School, and with a Ph.D. from the Scripps Clinic and Research Foundation, Dr. Parkos comes from Emory University's Department of Pathology. He served as the Vice Chair of the Department of Pathology and Laboratory Medicine at Emory University School of Medicine, and was the Director of the Division of Gastrointestinal Pathology and the Division of Experimental Pathology. He also directed the Medical Science Training Program at Emory. A practicing surgical pathologist, his clinical focus is diagnostic surgical pathology of the gastrointestinal tract and hepatobiliary system. He is the Carl V. Weller Professor of Pathology and intends to continue the tradition of excellence in leadership set by his six predecessors.

Funding Great Causes

Our Vision

The Department of Pathology is advancing the future of health care through our interrelated patient care, education, and research missions. In all of our clinical service areas, we are committed to achieving the highest standard of service excellence to ensure an ideal experience for our patients and their families. We provide comprehensive training to our residents and clinical fellows, to ensure that our trainees have a strong foundation for their clinical practice. Our research programs are extremely robust and making significant advances in the basic science, translational pathology, drug discovery, and informatics arenas. A notable example is the development of Oncomine, a paradigm-shifting informatics tool for studying the molecular features of cancers. The department consistently ranks amongst the top Pathology departments in total funding from the National Institutes of Health. Many of our faculty members are recognized as international leaders in diagnostic pathology, education, and research. There is no more gratifying gift than one that improves the health and health care of our patients.

Support Leaders & Best

In the pursuit of continued excellence in our educational training, clinical care, and scientific discovery, the Department of Pathology has always been grateful for private support. Gifts from individuals, foundations, corporations, and associations play a key role in medicine at Michigan.

Available Funds

Pathology Faculty Research Fund
Established to support the research programs of faculty in the Department of Pathology.

Pathology Resident Research Fund
Established to support research by Residents in our Anatomic and/or Clinical Pathology training programs.

Pathology Fellowship Fund
Established to support Fellows in our clinical subspecialty fellowship programs.

To learn how to help, contact Maher Salah, Office of Medical Development at 734-647-4178 or *msalah@umich.edu*.

Saving Lives & Improving Futures

Below are just a few examples of the research in Pathology that impact our understanding and treatment of multiple diseases.

Breast Cancer

Dr. Celina Kleer's laboratory is focused on elucidating the molecular determinants of aggressive breast cancer, especially inflammatory breast cancer and triple negative carcinomas, by investigating how the EZH2 oncogene induces invasion and metastasis. In triple negative breast carcinomas, EZH2 functions via a new mechanism which involves activation of genes that play a role in cancer cell motility and invasion. Dissecting this novel mechanism may lead to a better understanding of how breast cancer spreads and provide targets to inhibit metastasis.

Prostate Cancer

The research of **Dr. Rohit Mehra** aims to assess the role of SChLAP1 (a novel long, non-coding RNA) as a prognostic biomarker in prostate cancer. His work also involves characterization of genitourinary tumors (e.g., from a morphologic and molecular perspective, including papillary renal cell carcinomas, urethral clear cell adenocarcinoma, and renal cell carcinoma) associated with HLRCC syndrome. These projects and approaches will allow pathologists to more accurately classify and prognosticate these malignancies, as well as reveal potential therapeutic targets.

Anaplastic Large Cell Lmphoma

ALK is an oncogene that is deregulated in many forms of cancer, including anaplastic large cell lymphoma, lung cancer, and neuroblastoma. Studies in **Dr. Megan Lim's** laboratory have revealed that the NPM-ALK product reprograms cellular metabolic pathways in anaplastic large cell lymphoma, a finding which may have therapeutic potential.

Myeloid Leukemia

Dr. Yali Dou's research involves the characterization of epigenetic mechanisms in human cancers and identification of novel gene-targeting therapies. Recently Dr. Dou's team has developed inhibitors for histone methyltransferase MLL, which show efficacy in inhibiting human acute myeloid leukemia and are amenable for future clinical developments.

Merkel Cell Carcinoma

Merkel cell carcinoma is a highly aggressive and frequently lethal cutaneous malignancy for which no targeted therapies are currently available. The research of **Dr. Paul Harms** involves characterizing expression patterns and genetic changes in Merkel cell carcinoma using high-throughput assays such as next generation sequencing and microarray expression profiling with a goal of better understanding its molecular basis and identifying possible therapeutic targets.

Research: Building Breakthroughs

The Department of Pathology continues to excel, by any number of criteria, in the competitive arena of medical research. We are fortunate to have a dedicated group of faculty whose passion is research and translating their scientific findings into improved clinical care and outcomes. The following are a few metrics on our research endeavors.

For FY 2013:

National NIH Pathology Ranking	**6**
Number of Pathology Faculty with Extramural Support	**78**
Number of Pathology Research Laboratories	**40**
Number of Active NIH Awards	**57**
Number of R01 Grants (investigator initiated, health-related)	**34**
Number of R21 Grants (exploratory/developmental research)	**4**
Number of T32 Grants (predoctoral training grants)	**3**
Number of Types of Grants Our Faculty Have Been Awarded	**14**
Number of NIH Institutes Providing Funds to U-M Pathology	**11**
Market Share of Total Pathology Award	**3.5%**
Number of Grant Applications Submitted to External Sponsors	**189**
Success Rate Based on Number of Grants Funded	**29.3%**
Success Rate Based on Direct Cost Funding Dollars	**29.2%**

Our NIH ranking (6) is up from number 8 in FY 2012, and our faculty have diligently been working to secure grant funding, as the number of applications submitted is up 7% from last year. In addition, our success rate, based on direct funding dollars, is also up nearly 7%. This is taking place in the current NIH environment where only a fraction of submitted grants are approved. Currently, depending on the institution, a grant must rank in the top 7-14% nationwide for it to be funded.

Of course, numbers aren't the only story. The primary focus is searching for answers to pathological questions in many areas of disease and improving patient health care. Scientists in the department are working hard to tease out mechanisms in a myriad of diseases, develop new diagostic tools, discover better therapies, and implement improved methodologies of patient care. Additionally, our faculty serve on NIH study sections, as scientific and society journal editors and reviewers, symposium organizers, invited lecturers, and recipients of many national and international honors and awards. They also serve as mentors to over 65 postdoctoral fellows and 26 predoctoral students within our department, training the nation's next generation of medical scientists.

Annual Events

Clinical Pathology Symposium
October 14 and 16, 2014
Two-day educational CE event for Pathology medical lab scientists and staff geared towards a variety of lab topics. CE credits are applied to the Certification of Maintenance Program (CMP).

13th Annual Pathology Research Symposium
November 14, 2014
Graduate student event showcasing research within the Department by faculty, postdoctoral fellows, and students. An International Keynote Speaker concludes the conference.

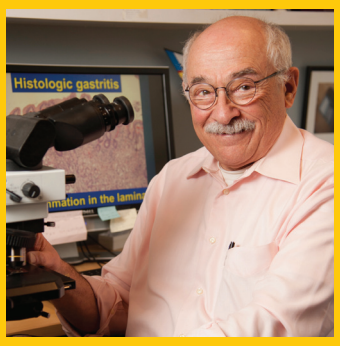
Anatomic, Molecular, and Hematopathology Research Day
February 21, 2015
One-day event showcasing scientific presentations by Department faculty and trainees with open discussions for applying lessons learned to attendee areas of interest.

Current Topics in Blood Banking
Spring 2015
Educational program for medical lab scientists, residents, fellows, and faculty designed to discuss topics related to blood banking, hemostasis, quality, and management. CE credits offered for medical lab scientists.

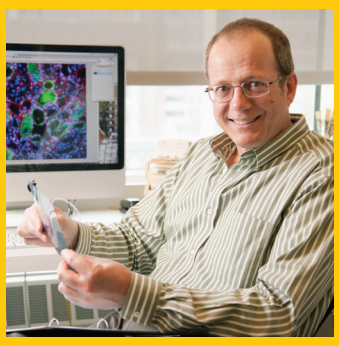
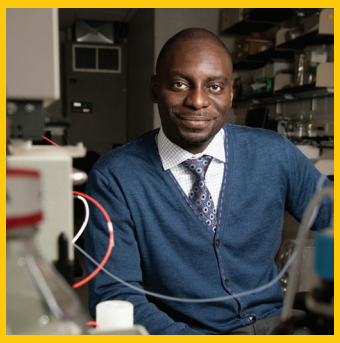
Advances in Forensic Medicine & Pathology
May 6-7, 2015
Two-day symposium, held yearly, designed to meet the needs of practicing pathologists, medical examiners, law enforcement personnel, coroners, health care professionals, and district attorneys. A distinguished and diverse group of forensic pathology specialists serve as faculty.

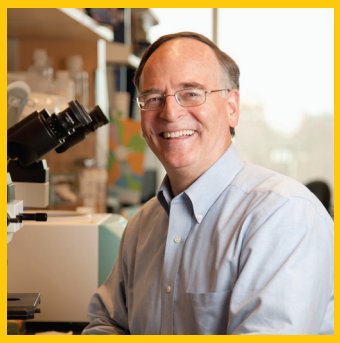
New Frontiers in Pathology
October 22-24, 2015
Annual two and a half day state-of-the-art conference designed to meet the educational needs of pathologists, residents, and fellows. AMA PRA Category 1 CME and SAMs credits offered. U-M Pathologists lead lectures and breakouts with an acclaimed keynote speaker closing the conference.

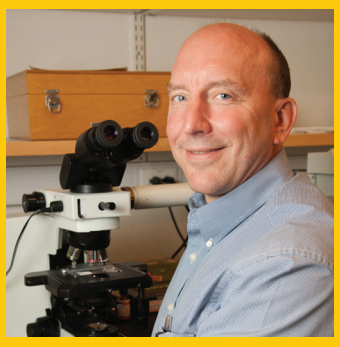
Additional information on all yearly conferences may be found on our website: *www.pathology.med.umich.edu.*









Endowed *Professorships*

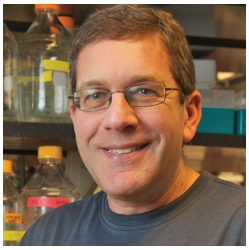





An ***Endowed Professorship*** is one of the highest honors the University can bestow. With this honor, recipients are recognized for their outstanding achievements, including a dedication to the highest quality of patient care, significant research contributions, and an ongoing commitment to the education of future physicians and scientists.

In honoring these professors, we show our appreciation to the many donors whose generosity and dedication to improving the human condition through support for education and research have made these endowments possible.

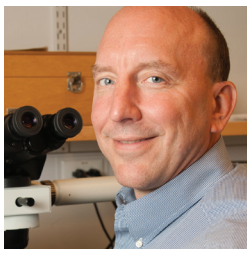
Recently Endowed Professors



Andrew P. Lieberman, M.D., Ph.D.
Gerald D. Abrams Collegiate Professor
Effective December 1, 2013

For more than five decades Dr. Gerald Abrams has made a powerful and indelible mark on the education of Michigan medical students. He is a legendary pathologist known for his diagnostic skills, his pursuit of a variety of research interests, and for his legacy of educating nearly 10,000 graduates of our Medical School. In honor of a cherished teacher and devoted mentor, the Gerald D. Abrams Collegiate Professorship was established through donations from former medical students and residents, as well as through gifts from the Department of Pathology.

Dr. Andrew Lieberman is the first recipient of this collegiate professorship honoring Dr. Abrams. Dr. Lieberman joined the faculty at the U-M in 2001, and is today the Director of the Neuropathology Section for Anatomic Pathology. His work on neurodegenerative diseases has led to many honors and awards both inside the Department and out. Dr. Lieberman has a special connection to Dr. Abrams as well. Early in his career, he taught the neuropathology lab in Dr. Abrams' renowned pathology course.



Nicholas W. Lukacs, Ph.D.
Godfrey D. Stobbe Professor of Research
Effective October 1, 2013

When Dr. Godfrey Stobbe died in 1985, he left his entire estate to the University of Michigan Medical School and his "family" in the Department of Pathology. Dr. Stobbe's bequest resulted in the creation of two professorships: the Godfrey D. Stobbe Endowed Professorship in Pathology, established in 1987, and the Godfrey D. Stobbe Professorship in Pathology Education, established in 1995. Now a third professorship has been established in Dr. Stobbe's name for Research.

Dr. Nick Lukacs is the proud recipient of this third professorship honoring Dr. Stobbe. Dr. Lukacs joined the U-M as a Research Investigator in 1993 and rose through the academic ranks to Professor of Pathology with tenure in 2006. Dr. Lukacs is world-renown in the field of chronic pulmonary diseases, including asthma and viral infections. His research into the role of specific innate and acquired immune responses has identified several new pathways for disease intervention.

Currently Endowed Professors

Henry Appelman, M.D.
M.R. Abell Professor of Surgical Pathology

Arul Chinnaiyan, M.D., Ph.D.
S.P. Hicks Endowed Professor of Pathology

Kathleen Cho, M.D.
Peter A. Ward Professor of Pathology

Greg Dressler, Ph.D.
Collegiate Professor of Pathology Research

Kojo Elenitoba-Johnson, M.D., Ph.D.
Henry C. Bryant Professor of Pathology

Celina Kleer, M.D.
Harold Oberman Collegiate Professor of Pathology

Steven Kunkel, Ph.D.
Endowed Professor in Pathology Research

Barbara McKenna, M.D.
Godfrey D. Stobbe Professor of Pathology Education

Jeffrey Myers, M.D.
A. James French Professor of Diagnostic Pathology

Gabriel Nunez, M.D.
Paul H. de Kruif Professor of Academic Pathology

Charles A Parkos, M.D., Ph.D.
Carl V. Weller Professor of Pathology

Peter Ward, M.D.
Godfrey D. Stobbe Professor of Pathology

Jeffrey Warren, M.D.
Aldred S. Warthin Professor of Pathology

At Left:
Example of DNA sequencing.

Paradigm

Harnessing the Power of Genomics to Help Personalize Therapy For Cancer Patients Nationwide

Robert J. Penny, M.D., Ph.D., CEO and Co-Founder of Paradigm

The Paradigm Cancer Diagnostic (PCDx) developed at the University of Michigan (U-M) is a new, advanced test for cancer patients with late stage and difficult to treat cancers. Commercially available under CLIA, PCDx returns results within 4-5 business days of specimen receipt. Utilizing next-generation sequencing (NGS), the evidence-driven analysis provides a comprehensive genomic landscape of the patient's cancer, including DNA mutations, copy number alterations, gene fusions and rearrangements, and most uniquely, a comprehensive RNA analysis. The goal of PCDx testing is to help match the cancer patient with therapies and biomarker-driven clinical trials that are likely to be more effective based on associations with the key cancer's pathways. The experience of the Paradigm leadership team in pioneering this area of medicine, combined with their history of successfully running The Cancer Genome Atlas Project (TCGA), has helped accelerate Paradigm past other competitor's in the market. The PCDx test has one of the largest number of FDA approved drug associations of any tumor profiling service currently available. Furthermore, this effort builds upon the foundation established by Paradigm's leadership in a pivotal and hallmark clinical trial, demonstrating that molecularly directed therapy was more effective than standard of care treatment in improving the progression free survival (PFS) rate of cancer patients with refractory, metastatic cancer. The prospective clinical trial was published in the Journal of Clinical Oncology in October of 2010[1]. The PCDx test may be ordered through the MLabs (mlabs.umich.edu) or Paradigm (paradigmdx.org) websites.

PCDx is a new paradigm of next-generation sequencing-based cancer testing currently available to help improve patient care.

Background

Launched in August of 2012, Paradigm is a spin-off, non-profit company envisioned and launched by Robert J. Penny, M.D., Ph.D., of International Genomics Consortium (Phoenix, AZ) and Jay Hess, M.D., Ph.D., formerly of the U-M. By building upon experience gained from creating and successfully running the Molecular Profiling Institute (now Caris Life Sciences) and helping to lead the NIH-sponsored TCGA project, Paradigm's expert team in genomics, pathology, oncology, informatics, and translational medicine is delivering advanced genomic testing to help drive targeted therapies to patient care. Paradigm builds upon and joins the success of the MI-ONCOSEQ cancer research-sequencing program at the U-M with a highly accurate, clinical grade next-generation sequencing test on formalin fixed paraffin sections. MI-ONCOSEQ, Paradigm, and MLabs cover a needed and unique spectrum of services for the nation, spanning research (MI-ONCOSEQ) to a mixture of standard of care testing, multiplexed early adoption therapies with a subset of clinical trial analysis (Paradigm), to accepted individual standard of care testing and surgical pathology consultation (MLabs).

Top-Left: Benjamin Lowe, Clinical Technologist, creating DNA/RNA Libraries-PCR set up, using Qiagility liquid handling instrument.

Top-Right: (From left) Dr. Robert Penny, CEO; Dr. Joseph Paulauskis, COO; Dr. Heather Walline, Staff Scientist/Production Manager; Steven Angersbach, Director of Operations.

"The Paradigm team has also been instrumental in assisting the University of Michigan's leadership in developing a new centralized biorepository, designed to help facilitate and accelerate translational research."

Clinical Need

In the U.S. alone, there are an estimated 2.5 million cancer patients with advanced solid tumor disease that are actively undergoing therapy.[1,2] Many of these patients suffer from common forms of cancer, such as breast cancer and colorectal cancer, but have exhausted standard of care therapies. Others are suffering from rare cancers, such as sarcomas, with limited or no standard of care options. Some are confronting particularly aggressive cancers, such as non-small cell lung cancer (NSCLC) or pancreatic cancer. With continued advances in the development of targeted therapies, as well as our better biological understanding of efficacy of existing therapies, tumor profiling has emerged as an important clinical option to help better inform a patient's cancer treatment.

The PCDx Cancer Testing Service

Through a sophisticated multiplexed analysis of a tumor's DNA, RNA, and – soon to be available in coming months – protein via IHC, Paradigm provides patients and physicians with a blueprint of a patient's cancer, what drugs and clinical trials are associated with these pathways, and the associated level of evidence to support the use of a drug on that pathway in the relevant cancer. This approach helps reveal potential treatment options that are tailored to the underlying genomics of what is driving tumor growth that otherwise might not have been considered.

PCDx provides a clinically actionable, broad-spectrum analysis covering over 114 "genes" (soon to be 130) with over 500 regions of interest, including DNA mutations, DNA copy number variation, DNA chromosomal inversions, deletions, translocations, and mRNA expression. NGS has emerged over the past few years as a technological breakthrough, enabling the analysis and interrogation of numerous alterations in the tumor in a cost-efficient, confident, and rapid manner.

"PCDx is a best-in-class cancer testing service and the only one currently available that provides a combined NGS genomic analysis including mRNA on standard formalin processed tissue," Dr. Penny said. "For patients that need our services, we understand that time is of the essence. Paradigm's ability to interrogate the patient's cancer for key genomic alterations with clinical quality at > 5000x depth of coverage in 4-5 business days is a differentiator in helping to improve patient care."

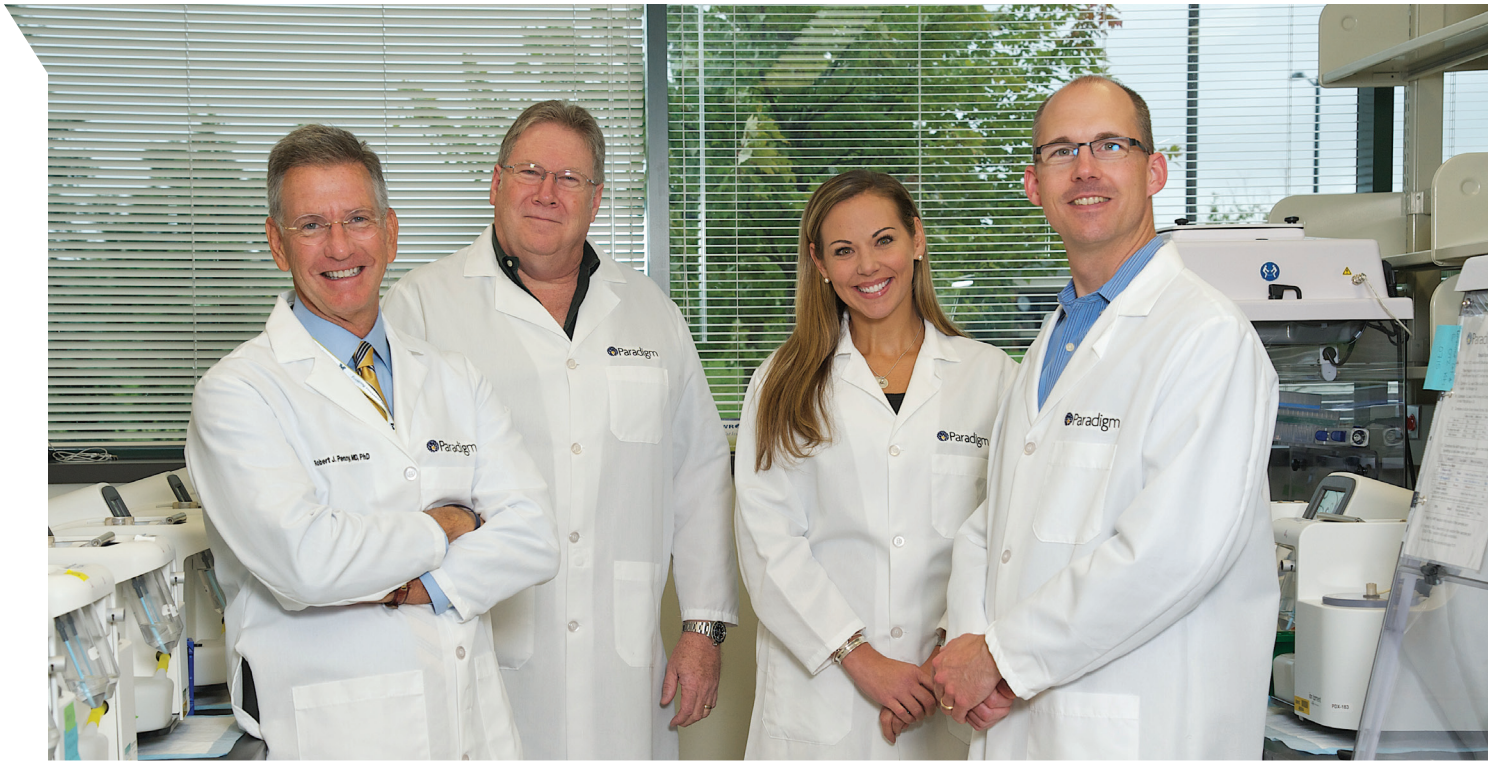
The PCDx test is for cancer patients with solid tumors when first-line or second-line treatment or standard of care options are not working. PCDx may also be clinically appropriate for patients with cancers that are rare or of an aggressive nature with limited treatment options.

An Evidence Driven Analysis

At the heart of the PCDx service lies a sophisticated biomarker evidence engine built by a team of experts. Years in the making, the purpose of this "engine" is to ensure that the PCDx testing and associated clinical report most accurately reflects the current state of translational medicine in oncology. This team of biomarker experts has reviewed over 100,000 peer-reviewed clinical abstracts and scientific journal articles as part of establishing this critical information tool.

Building Synergy with the UMHS

As a collaborative effort, the Paradigm team is able to not only tap into the laboratory capabilities of the University of Michigan



Health System (UMHS), but also into the considerable knowledge and thought leadership available.

"Our relationship with UMHS is a win-win," said Dr. Penny. "We see Paradigm's aggressive and earlier broad based biomarker NGS clinical testing aligning quite well with the later stage biomarker testing already performed at MLabs, and the cutting-edge cancer sequencing research discovery efforts of Dr. Arul Chinnaiyan with MI-ONCOSEQ."

Paradigm's Role in Launching the U-M Biorepository

The Paradigm team has also been instrumental in assisting U-M's leadership in developing a new centralized biorepository for clinical disease specimens designed to help facilitate and accelerate translational research. Paradigm's leadership in biobanking is exemplified in important national personalized medicine projects, including the expression project for Oncology (expO) and TCGA.

What the Future Holds for Paradigm

While Paradigm has been focused on the development and technical validation of the PCDx cancer testing service, they are now strategically positioning and executing on growth and commercial expansion, prospective clinical studies, and forging strategic biopharma relationships.

In March 2014, Paradigm officially announced a partnership with CRO Pharmatech, where Paradigm will provide rapid molecular diagnostic profiling for patients with solid tumors to help better position them for treatment and biomarker driven clinical trials.

Paradigm also announced a ground-breaking clinical study with Indiana University to provide NGS in a prospective clinical trial for triple negative breast cancer patients to test whether certain treatment choices improve survival rates. The trial will enroll 130 women who have received standard surgery and chemotherapy but who are at high risk for relapse. Half will receive the standard of care, while genomic sequencing will direct therapy for the other half.

Paradigm also forged strategic partnerships with two biopharma companies, TESARO and Forma Therapeutics, to help innovatively characterize patients that enable their clinical trials to be more precise and have better outcomes, as well as develop tests to most effectively analyze those alterations.

"These are important as well as exciting times for both Paradigm and the field of oncology", noted Dr. Penny. "Paradigm's experience, translational expertise, and broad-reaching laboratory capabilities position us well to make a significant and long-lasting impact on improving the care of cancer patients both nationally and internationally."

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1. Von Hoff, D., et al. Pilot Study Using Molecular Profiling of Patient's Tumors to Find Potential Targets and Select Treatment for Their Refractory Cancers. J Clin Oncol 20; 28(33): 4877-83. Epub 2010 Oct 4.
2. ACS Cancer Facts 2014

Ethics and Pathology

By Lauren Smith, M.D.

When I tell people that I'm a pathologist who does clinical ethics consultations and academic work in ethics, this news is often met with surprise. It's true that I am the only pathologist on our hospital ethics committee which consists of an interdisciplinary team of 40 individuals including physicians, social workers, nurses, genetic counselors, lawyers, trainees, and community members. However, when one takes a closer look, there are many ethical issues in pathology worthy of discussion and debate.

My interest in ethics began before medical school when I worked in a genetics laboratory and was involved in a study on genetic testing at the University of California, San Francisco. These were the early days of genetic discovery when sequencing was an arduous process and the genome project was in full swing. We were looking for the genetic basis of bipolar disorder, and we wanted to know if there would be interest in genetic testing for psychiatric conditions, should specific genetic associations ever be found.

I continued to be interested in ethics in medical school and joined the University of Michigan Adult Ethics Committee in 2005 as a hematopathology fellow. Our ethics committee has an active clinical ethics consultation practice dealing with ethical issues that arise in our hospital. Many of these cases involve end of life care, but there is a broad range of issues that arise. Some of these cases are directly related to pathology.

One case involved a woman who had a terminal cancer invading her intestines who required approximately five units of blood per day for survival with no hope of cure or a definitive therapy to stop her gastrointestinal bleeding. The ethics committee was called to determine whether daily transfusions of this magnitude should be provided to this patient when they would only serve to postpone the moment of death. In this case, the scarcity of blood products was discussed with the patient and family and she agreed to limit transfusions to 1-2 units per week. The bleeding stopped spontaneously and she was discharged to hospice.

I was also aware of a case in which trauma surgeons provided massive transfusion to a patient who they were sure would not survive so that family members could arrive before death to say "goodbye". Only later did the transfusion medicine service realize that the case was medically futile.

As pathologists, we understand that blood products are a unique type of scarce resource. However, rationing is frowned upon in our current health care system. These types of cases made us realize that we need a hospital policy addressing the rational use of blood products in unusual circumstances, such as end of life care and in the setting of massive transfusion. In collaboration with my transfusion medicine colleagues, we published some guidelines in the journal *Transfusion* that may be helpful in these situations (see Smith LB, Cooling L, Davenport, R. How do I allocate blood products at the end of life? An ethical analysis with suggested guidelines. *Transfusion* 2013; 53:696-700.)

Ethical issues can also be found in other areas of pathology, including patient safety/reporting medical errors, second review of outside diagnoses at academic centers, the autopsy service with "saved" tissue, and the HLA laboratory when non-paternity is discovered. Many ethical dilemmas arise with whole genome sequencing studies and how to report results to patients. I recently organized a Michigan State Medical Society (MSMS) Annual Bioethics Conference that dealt specifically with the topic of ethical issues in personalized medicine. As the newly appointed Chair of the MSMS Bioethics Committee and Director of the Ethics Path of Excellence, a co-curricular four-year program for medical students, I am excited to continue my work in this area, exploring ethical questions related to pathology and other areas of medicine. A further MSMS Bioethics Conference addressing ethical issues in palliative care was held November 7-8, 2014 at the Campus Inn in Ann Arbor, MI.

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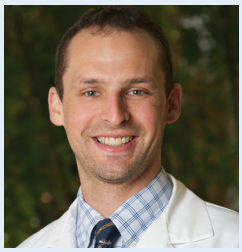
Dr. Smith is an Associate Professor in the Department of Pathology and currently the Director of the Hematopathology Fellowship Program.

Learn More About the Ethics Path of Excellence

The Medical Ethics Path of Excellence is a co-curricular program for medical students who are interested in pursuing an interest in ethics while in medical school. The program is designed to educate the ethics committee members and consultants of the future. It is also intended for students who want to pursue academic interests in ethics. Students are exposed to medical ethics in a series of lunch time discussions, evening seminars with specialized topics, and independent study/mentoring. Field work consists of involvement with the adult and pediatric ethics committees and consultation services. In the future, involvement in a Path of Excellence will be a requirement of the new medical school curriculum rather than an elective option.

medicine.umich.edu/medschool/

A. Alfred Taubman Emerging Scholar



Scott Tomlins, M.D., Ph.D.
Assistant Professor
Genitourinary Pathology

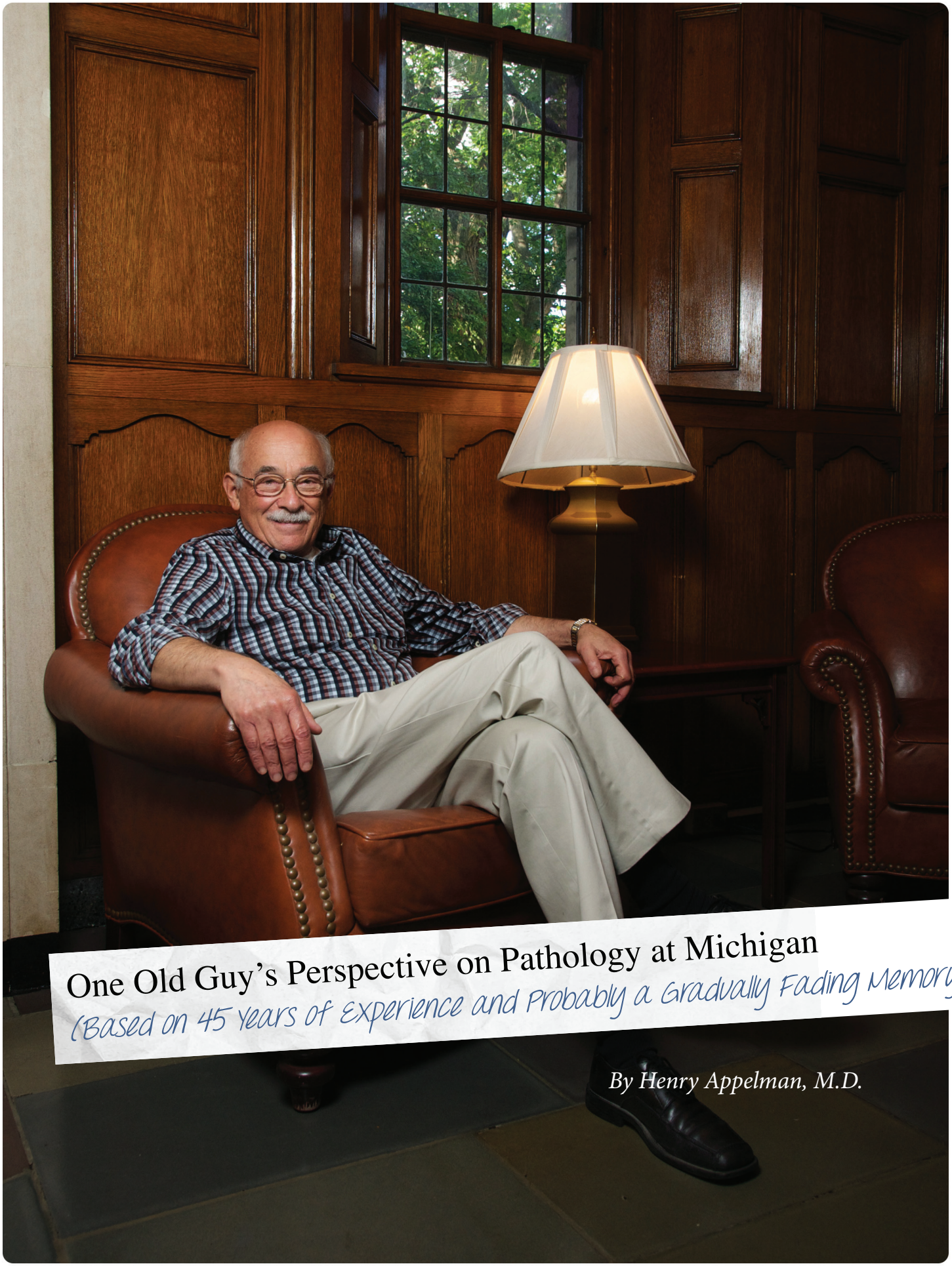
Dr. Scott Tomlins (Residency '12), an Assistant Professor of Pathology and member of the Michigan Center for Translational Pathology (MCTP), was recently named the A. Alfred Taubman Emerging Scholar by the Taubman Medical Research Institute at the University of Michigan (U-M). The Taubman Institute was created to provide the freedom, resources, and collaborative environment needed by physician scientists at the U-M to push the boundaries of medical discovery and produce disease treatments and ultimately cures.

Dr. Tomlins is an active member of the diagnostic genitourinary pathology service in the Department and also runs a research laboratory focusing on the clinical translation of findings from high throughput molecular characterization of genitourinary cancers. The Taubman Emerging Scholar Award will provide him with $150,000 over a three year period to further his research in developing personalized medicine strategies for patients with urothelial cancer. Specifically, Dr. Tomlins will use cutting edge, next-generation sequencing technology to identify DNA-based and RNA-based signatures that can identify which patients with urothelial cancer will respond to conventional neoadjuvant chemotherapy and identify personalized treatment hypotheses for all patients. The preliminary data used to support his proposal leveraged the extensive tissue archive maintained by the Department of Pathology, and was facilitated by the team of slide librarians who manage clinical and research requests.

Under the mentorship of Dr. Arul Chinnaiyan, the S.P. Hicks Endowed Professor of Pathology and a Senior Scholar in the Taubman Medical Research Institute, Dr. Tomlins identified recurrent ETS gene fusions in prostate cancer as a graduate student. This discovery resulted in a fundamental shift in our understanding in the type of genetic alterations that drive common epithelial cancers.

Through collaboration with other faculty members of the Department of Pathology, including Dr. L. Priya Kunju, Associate Professor; Dr. Rohit Mehra, Assistant Professor; and Dr. Chinnaiyan, Dr. Tomlins has led the introduction of ERG as a diagnostic immunohistochemistry prostate cancer marker. This team, in collaboration with industrial partners and members of the Department of Urology, have also developed a urine based test that reports out a patient's risk of having prostate cancer (Mi-Prostate Score, or MiPS), which is offered through the MCTP and the U-M's MLabs.

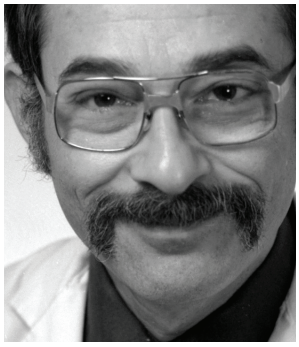
In recognition of his translational work in prostate cancer, Dr. Tomlins was also awarded the inaugural AAAS Martin and Rose Wachtel Cancer Research Award for Young Investigators in 2013.



One Old Guy's Perspective on Pathology at Michigan

(Based on 45 Years of Experience and Probably a Gradually Fading Memory)

By Henry Appelman, M.D.



"This sameness, basically an inability to find a job in another place, has given me a long term opportunity to see from within what has happened to this department over the long haul, and, hopefully, it has also given me the opportunity to look at the department's evolution over almost half a century."

A set of buzzwords, actually a buzzphrase, currently in widespread use throughout the University of Michigan, including its Department of Pathology, is "the Michigan Difference", implying excellence here, compared to the other places and services on the planet, all of which apparently accept mediocrity or worse as a performance standard. As someone who has been part of the faculty of the Department of Pathology for 45 years, I may more appropriately be designated as an example of "the Michigan sameness", rather than "the Michigan difference". This sameness, basically an inability to find a job in another place, has given me a long term opportunity to see from within what has happened to this department over the long haul, and, hopefully, it has also given me the opportunity to look at the department's evolution over almost half a century.

I went to the University of Michigan for my undergraduate and medical school educations. I actually started working in the Department of Pathology as a second year medical student, and I stayed on as a Pathology Resident because I felt comfortable here, and because I did not have enough money to go elsewhere. After I finished my residency, I spent a few years in other places and, as luck would have it, I was called back to my medical roots – the Department of Pathology at Michigan. I began as an Assistant Professor in 1969 and gradually climbed the academic ladder to full Professor-hood about seven years later. I lived in four faculty offices from 1969 to the present – two on the fourth floor, one on the fifth floor in the Pathology building, and one in the University Hospital which opened in 1986. This meant that I have had to pack up all my junk and move only four times. This brief professional autobiography sets the stage for my views of what has happened in the past 45 years.

During my tenure here, I have seen and been a part of several huge changes in department goals, essentially seismic shifts, which I believe are much more powerful than simple paradigm shifts that almost anyone can undertake. As a medical student working in the department, I had no concept of trends in pathology, and as a Resident I was indifferent to trends since I felt that I would complete my training and leave. As a faculty member, I had a solid stake in what was happening in the department.

The first decade – the A. James French years – were highlighted by an emphasis on continued consolidation of the clinical laboratories, spread around the medical center and run by faculty in several different departments, into a single Pathology department. As it turned out, this was happening in a number of departments all over the country, often under the direction of world-renowned pathology chairmen who were well-known friends and colleagues of Dr. French. This was also the period when the small faculty was expanded to include young pathologists with specialty diagnostic expertise. Each clinical laboratory and anatomic pathology service had leaders who were usually the only faculty members with interest in those specific services. Dr. French actively encouraged the faculty to engage in clinical research and publish the results. In contrast, basic science research, which was being promoted intensely in pathology departments in other prestigious institutions, was mainly limited to a small laboratory run by Barry Pierce, who subsequently became the Chair of Pathology at the University of Colorado. As it turned out, although the department offered exceptional diagnostic services in anatomic and clinical pathology with many of its faculty developing national reputations in the diagnostic fields, the lack of a high-powered basic science research program became the defining issue when Dr. French retired and recruitment of a new Chair was undertaken.

The first seismic shift began with the appointment of Dr. Peter Ward as the Chair to replace Dr. French in 1980. Peter Ward, who trained in anatomic pathology under Dr. French, was known for his remarkable basic research accomplishments and breakthroughs in inflammation. He brought with him a group of young, energetic, and creative scientists from the University of Connecticut where

"During my tenure here, I have seen and been a part of several huge changes in department goals, essentially seismic shifts, which I believe are much more powerful than simple paradigm shifts that almost anyone can undertake."

he had been Chairman before coming back to Michigan. Thus began the emphasis on basic research that has continued to the present. Dr. Ward formalized the positions of Director of Anatomic Pathology and Director of Clinical Pathology, and he appointed an individual to direct the Residency Training Program. During this period, the departmental ambience was one of research excellence, grant getting, and reputation developing. It was expected that the clinical services would continue to produce outstanding work, and while they did so, some superb investigators from around the country were recruited as faculty by Dr. Ward, many of whom became internationally known scientists, and many of whom are currently active. Nevertheless, in spite of the basic research emphasis, during this period several outstanding clinically-oriented faculty were hired, many of whom are still active and productive today, and many of whom are also nationally and internationally known for their clinical expertise.

In 2005, Dr. Peter Ward was replaced by Dr. Jay Hess, a clinically trained hematopathologist and outstanding investigator with an active, highly funded research laboratory dealing with the genetics of leukemias. Under his leadership, the emphasis on basic science research continued, but there was renewed emphasis on development and expansion of the diagnostic services. During Dr. Hess' recruitment, the powers-that-be in the medical center recognized that there was a long-standing extreme need for additional departmental space, mainly for improved clinical services. Several plans for such extra space, including new buildings, were proposed during Dr. Hess' tenure, and a couple of them even had beginning architectural analyses, but none of these proposals survived beyond the initial planning stages. During the "Hess Years" many young, energetic, and diagnostically superb new faculty were hired, most of whom are still members of the faculty today. In addition, Dr. Hess expanded his own research program, incorporating scientists who were not trained in the medicine and science of pathology, but who were accomplished scientists in other areas, such as pharmacology.

In 2013, Dr. Hess accepted the position as Dean of the School of Medicine and Vice President for University Clinical Affairs at Indiana University, so another Chair search was initiated. During the period extending from the exodus of Dr. Hess to the installation of our new Chair, Dr. Charles Parkos, Dr. Kathleen Cho served as Interim Chair. Dr. Cho dove into the morass of Chair-personhood with both feet flying, and she held the department together in grand and glorious fashion, including every research laboratory and every clinical service. She also started new initiatives, including detailed planning for additional space for the clinical services. She has been the role model for an Interim Chair, and in fact, is THE role model for a permanent Chair.

Now we have the "Parkos Years" in front of us. They have barely begun, and by the time they have covered the first few months, this 45 year veteran of the departmental shifts will have probably lost all perspective, and someone else will have to take on the next such historical evaluation.

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If you knew Henry Appelman back in the day, you'll still know him now. Dr. Appelman is still a Professor in the Department of Pathology and Director of the Gastrointestinal Pathology Fellowship Program.

Molecular and Cellular Pathology Graduate Program

By Zaneta Nikolovska-Coleska, Ph.D.

The Molecular Cellular Pathology (MCP) Graduate Program is an interdisciplinary program under the Program in Biomedical Sciences (PIBS) at the Medical School. The MCP Graduate Program trains students pursuing either a Ph.D. or a combined M.D./Ph.D. with a focus on molecular and cellular mechanisms underlying disease processes. The Department of Pathology's MCP Graduate Program bridges basic and clinical sciences to encourage interdisciplinary projects and interdepartmental cooperation while providing an enhanced educational experience. Students are immersed in a diverse research environment that offers broad opportunities in cutting edge interdisciplinary science, including developmental biology, cancer biology, epigenetics, chemical biology, immunopathology, neurobiology, aging, omics studies, biomarkers, and experimental therapeutics. The MCP Graduate Program provides a strong background in pathology, related basic sciences, and translational research to prepare students for academic, research, teaching, and biotechnology careers.

Since its beginning in 1986, the MCP Graduate Program has been led by several Program Directors including Drs. Joe Fantone (1986-1997), Sem Phan (1997-2005), Nick Lukacs (2005-2013), and Zaneta Nikolovska-Coleska (2013-present). Over this period, 79 students enrolled in the program with 48 earning Ph.D.s (of which 10 earned M.D./Ph.D.s) and 5 earning M.S. degrees. Presently the MCP Graduate Program has grown to 26 full-time students (5 from the MSTP program) and 42 faculty members. Many faculty members hold joint appointments with other biomedical science departments and graduate programs at the U-M, offering students an interdisciplinary approach to their training. The MCP graduate students produce high quality research that has resulted in publications in top tier journals, such as *Science*, *Nature*, *Cell*, *Molecular Cell*, *NEJM*, and *PNAS*, and presentations at multiple venues at the U-M and other national/international venues. They have been recognized with prestigious research awards including the ProQuest Distinguished Dissertation Award and individual fellowships from the NIH and other professional societies. Students are heavily involved in program activities including organization of the Annual Pathology Research Symposium, which highlights research within the department, and has hosted internationally known external keynote speakers including Dr. Ralph Steinman, the 2011 Nobel Laureate.

The MCP Graduate Program is constantly changing to improve the training of our students. We recently expanded our curriculum to introduce innovative coursework in translational research to improve the training of Ph.D. scientists who will conduct research at the interface between biomedical science and clinical medicine. In addition, the Department of Pathology has invested in a pilot Pre-doctoral Training Program in Translational Pathology for students in the MCP Graduate Program for the next two years (2014-2015). Enrolled students will receive enhanced training, including coursework and clinical rotations, providing them with impactful experiences.

The Department of Pathology's MCP Graduate Program offers an environment that supports state-of-the-art research for trainee development and is dedicated to training future generations of scientific leaders.

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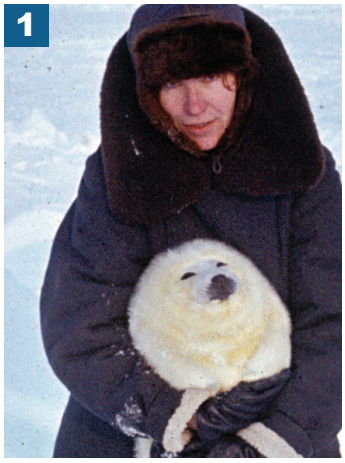
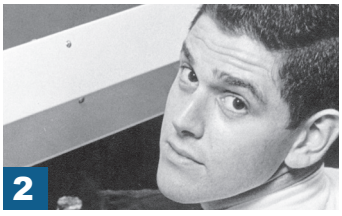
Dr. Nikolovska-Coleska is an Assistant Professor in the Department of Pathology and Director of the Pathology Graduate Program.

A Flash From the Past...

Can you identify these U-M Pathologists? Answers are shown at the bottom of page 22.





2014 Pathology Resident and Fellow Graduates

We are proud of all our trainees and look forward to future interactions with them. Listed here are their areas of accreditation and where they are presently located.

Residents

Megan A. Alderman, M.D.
Surgical Pathology Fellowship
University of Michigan, Ann Arbor MI

David P. Arps, M.D.
Dermatopathology Fellowship
University of Michigan, Ann Arbor MI

Karen Choi, M.D.
Surgical Pathology Fellowship
University of Michigan, Ann Arbor MI

Jennifer A. Hipp, M.D., Ph.D.
Cytopathology Fellowship
Johns Hopkins University, Baltimore MD

Mark J. Kiel, M.D., Ph.D.
Molecular Genetics Pathology Fellowship
University of Michigan, Ann Arbor MI

Sean Li, M.D., Ph.D.
Transfusion Medicine Fellowship
University of Michigan, Ann Arbor MI

Andrew S. McDaniel, M.D., Ph.D.
Genitourinary Pathology Fellowship
University of Michigan, Ann Arbor MI

Jiaqi Shi, M.D., Ph.D.
Gastrointestinal Pathology Fellowship
University of Michigan, Ann Arbor MI

Jennifer N. Stall, M.D.
Gynecologic Pathology Fellowship
Massachusetts General Hospital, Boston MA

Fellows

Amir Behdad, M.D.
Northwestern University, Chicago IL

Kurt D. Bernacki, M.D.
Associated Pathologists, Tampa FL

John L. Blau, M.D.
University of Iowa, Iowa City IA

Melissa M. Bombery, M.D.
Spectrum Health, Grand Rapids MI

Noah A. Brown, M.D.
University of Michigan, Ann Arbor MI

Randall T. Butler, M.D.
MD Anderson, Houston TX

Amanda O. Fisher-Hubbard, M.D.
Neuropathology Fellowship
University of Michigan, Ann Arbor MI

John K. Frederiksen, M.D., Ph.D.
Hematopathology Fellowship Research Year
University of Michigan, Ann Arbor MI

Thanh T. Ha Lan, M.D.
University of Chicago, Chicago IL

DOCTOR RECOMMENDED

Ranked in **Top 10** Nationally in **12 of 20 Residency Specialties**

#1 Ranking of Otolaryngology, ***Pathology*** and Surgery Residency Programs among public hospitals

#10 Or Higher among public hospitals in 19 out of 20 specialties

1,199 Residents currently in training

105 Accredited residency and fellowship programs offered

40% Residents who choose to stay in Michigan after training

U-M's Pathology Residency Program was ranked #1 nationally in the recented published **Doximity/*U.S. News & World Report*** survey**.**

Jeffrey S. Hudson, M.D.
University of Michigan, Ann Arbor MI

Scott J. Kantola, M.D.
Beloit Memorial Hospital, Beloit WI

Maria A. Pletneva, M.D., Ph.D.
Surgical Pathology Fellowship
University of Michigan, Ann Arbor MI

Andrew P. Sciallis, M.D.
University of Michigan, Ann Arbor MI

Olga N. Speck, M.D., Ph.D.
Peoria Tazewell Pathology Group, Peoria IL

Chelsea E. Tooke-Barry, M.D.
Pathology Associates, Fresno CA

Jeremy G. Vincent, M.D.
Innovative Pathology Services, Knoxville TN

Laura L. Walters, M.D., Ph.D.
Gynecologic and Breast Fellowship
University of Michigan, Ann Arbor MI

Joshua I. Warrick, M.D.
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