University of Pittsburgh

School of Medicine
Department of Pathology

The Pathology Gazette

Fall 2026 Newsletter

Diagnosis • Discovery • Education • Patient Care

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Advancing Knowledge for Better Care

Liron Pantanowitz, MD, PhD, MHA

What Should Never Change as Pathology Changes?

A Fall Message from the Chair



Maud Menten Distinguished Professor
& Chair of Pathology

Fall has always been a season of transition. Here in Pittsburgh, we see it in the changing colors, the return of students to campus, and the beginning of another academic year. It is also a good time to reflect on where we have been, where we are going, and what matters most as we move forward. For those of us in pathology, however, change no longer seems seasonal. Change has become a constant. This has become particularly apparent to many of us during our transition to Epic as our principal laboratory information system across the UPMC system.

I have spent much of my career working at the intersection of pathology and technology, and I cannot remember a more exciting, or more consequential, time for our field. Molecular diagnostics, precision medicine, automation, data analytics, digital pathology, and artificial intelligence (AI), are rapidly changing what is possible. Here at the University of Pittsburgh and UPMC, we are not simply watching this transformation occur, we are helping to shape it. But, as I think about our department and its future, I find myself increasingly asking a different question… With so much attention focused on what must change, what should never change?

Behind Every Specimen Is a Patient

First and foremost, our commitment to patients must remain at the center of everything we do. Pathologists and laboratory professionals frequently work behind the scenes. Many of the patients whose lives we influence will never meet us or know our names. Yet every day across UPMC, our work helps diagnose cancer, identify infections, guide targeted therapies, ensure safe blood transfusions, characterize genetic disease, and answer countless other questions that determine patient care. Behind every specimen is a patient. Behind every slide, tube, test result, molecular alteration, and data point is a person waiting for an answer. This is easy to forget when our days become filled with cases, meetings, emails, metrics, deadlines, and operational challenges. It is worth reminding ourselves that the ultimate measure of our success is not simply how many cases we process or how quickly we complete them. It is whether our work helps another human being receive the right diagnosis and the right care. Technology can help us accomplish this mission, but technology itself is not the mission.

Excellence Must Remain Nonnegotiable

As we embrace new technologies, our commitment to excellence should not change. Molecular technology is incredibly helpful because it can now extract extraordinary amounts of information from increasingly small specimens. Automation can make our laboratories more efficient. Digital pathology can allow expertise to move across geographic boundaries. AI can augment clinical expertise by prioritizing concerning findings and detect subtle patterns, thereby enabling earlier, more consistent, and more efficient diagnoses. But "new" does not automatically mean better. We must continue asking the questions that have always defined excellent pathology: Is it accurate? Is it reproducible? Is it safe? Does it improve care? Can we trust it? Can it reduce cost? I want our department to remain a place where enthusiasm for innovation and scientific rigor with validation coexist. We should be willing to take risks, challenge conventional thinking, and explore technologies that may transform medicine. But we must be equally willing to carefully evaluate these technologies before entrusting them with patient care. That balance is one of the great responsibilities, and opportunities, of a hybrid academic-community pathology department.

Curiosity Still Matters

Another quality we must protect is our curiosity. Pathologists and laboratorians are naturally curious people. We often encounter a diagnostic problem and wonder whether there is a better way to solve it. Similarly, when experimental pathologists make an unexpected observation, they pursue it until it becomes a discovery.

Today we have extraordinary tools for asking these questions. But no computer can tell us which questions are most worth asking. People do that. One of the greatest strengths of Pitt and UPMC is the extraordinary concentration of expertise around us. Our ability to collaborate across pathology, and many other disciplines, creates opportunities that few institutions can replicate. The solutions to many of our problems, and the breakthroughs of the future, will increasingly occur at these intersections. Our job is to create an environment where curious people can find one another, and where good ideas have an opportunity to become meaningful discoveries.

Innovation With Purpose

I am enormously proud of the innovation taking place across our department. One highly visible example is our Computational Pathology and AI Center of Excellence (CPACE), a joint Pitt-UPMC initiative that has quickly grown into a major hub for AI in pathology and laboratory medicine. CPACE brings together pathologists, computer scientists, data scientists, trainees, and others to solve real clinical problems through collaboration. Their progress has been remarkable. New AI tools are being developed, educational programs are expanding AI literacy, and collaborations are extending across Pitt and beyond. Major partnerships with Leidos and Dell are providing the infrastructure necessary to perform AI at a scale that would have been difficult to imagine just a few years ago. Our recent Pitt AI PathConnect symposium, focused this year on generative AI across the diagnostic continuum, is another example of what happens when we bring clinicians, researchers, industry innovators, and others together to solve common problems. These accomplishments make me proud, but not simply because they involve exciting technology. They make me proud because our people made them happen. And innovation extends far beyond AI. Across our department, faculty and staff are advancing diagnostic care, developing and implementing new tests, conducting important basic and translational research, educating the next generation, improving quality, and finding better ways to serve our patients. This is the innovation that matters most: innovation with purpose.

Investing in the Next Generation

We must also never lose our commitment to education and mentorship. The pathologists and laboratory professionals we are training today will practice in a world very different from the one in which many of us trained. They will work with increasingly sophisticated molecular diagnostics, digital pathology, AI, and likely technologies that have not yet been invented. Our responsibility therefore cannot simply be to teach trainees everything we know today. We must teach them how to learn, how to question, how to evaluate evidence, and how to adapt. And we must mentor them. Over the course of a career, a conversation with a mentor, encouragement from a colleague, or being given an unexpected opportunity can change someone's professional trajectory. Those moments rarely appear on a dashboard, performance evaluation form, or annual report, but they may be among the most important contributions we make.

Our Greatest Strength Is Our People

Finally, as our department grows and changes, we must protect our sense of community. When people hear "Department of Pathology," they may initially think only of pathologists. But our department is so much more. It includes laboratory professionals, researchers, residents and fellows, graduate students, postdoctoral scholars, administrative teams, informaticians, technologists, research staff, educators, and many others working across numerous laboratories, hospitals, and facilities. Every person contributes to our mission. A great department cannot be measured solely by publications, grants, case volumes, turnaround times, rankings, or technological accomplishments. A great department is also a place where talented people want to work. It is a place where people feel respected, where excellence is recognized, where colleagues help one another, where trainees are supported, and where people understand that what they do matters. As Chair, I consider maintaining that environment one of my most important responsibilities.



In conclusion, I am tremendously optimistic about where our department is headed. We should continue to lead in quality patient care, experimental pathology, translational research, molecular diagnostics, digital pathology, AI and education. We should also continue to develop new discoveries and treatments. In addition, we should always strive to rethink workflows that no longer serve us well. But as we build the pathology department of the future together, we should also remember what has made this department successful in the first place. Our commitment to patients, our pursuit of excellence, our scientific curiosity, our dedication to education as well as mentorship, and our commitment to one another. These things should never change.





From 14 CPACE Innovations to AI Education for All

A practical AI ecosystem, a department-wide innovation milestone, and a new model for accessible AI learning.

Hooman H. Rashidi MD, MS, FCAP

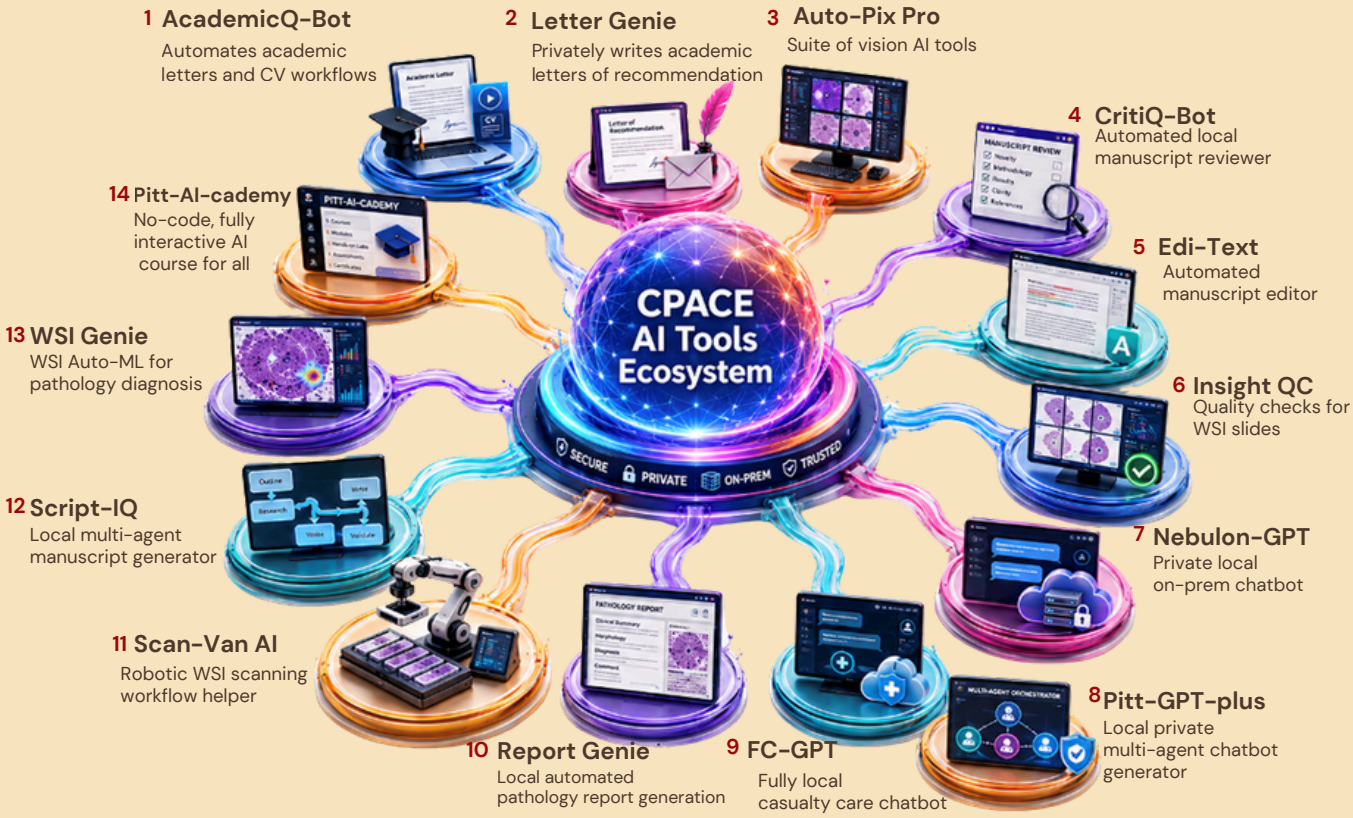


Associate Dean of AI in Medicine, Professor & Endowed Chair of Lombardi-Shinozuka Experimental Pathology Research at University of Pittsburgh School of Medicine, Executive Vice Chair of Computational Pathology & Informatics Division at UPMC, Executive Director of CPACE (Computational Pathology & AI Center of Excellence

Artificial intelligence is changing research, education and everyday work across medicine. At the University of Pittsburgh, the Computational Pathology and AI Center of Excellence (CPACE) is turning that momentum into something tangible: useful tools that respond to real clinical, academic and operational needs. Equally important, CPACE is helping people gain the knowledge and confidence to evaluate and use AI responsibly.

Fourteen innovations, one connected mission

Under the leadership of Hooman H. Rashidi, MD, MS, FCAP, CPACE has developed a 14-innovation ecosystem spanning image analysis and research Auto-ML tools to manuscript support, clinical and operational AI assistants, and hands-on education. Its tools emphasize private, practical and locally deployable approaches where appropriate—while Pitt-AI-Cademy, innovation No. 14, makes AI literacy itself a central deliverable.



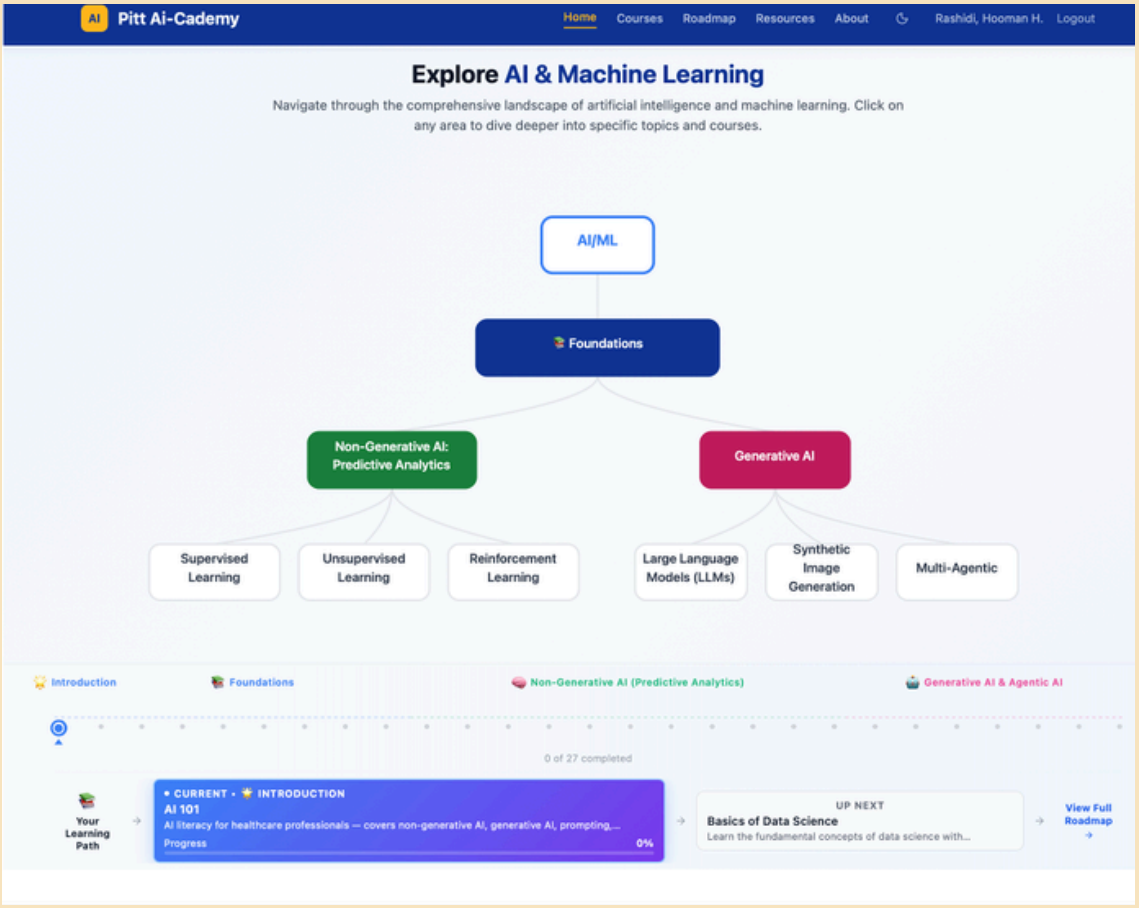
The CPACE ecosystem brings together 14 distinct innovations, from pathology and academic workflow tools to Pitt-AI-Cademy, its no-code educational platform.

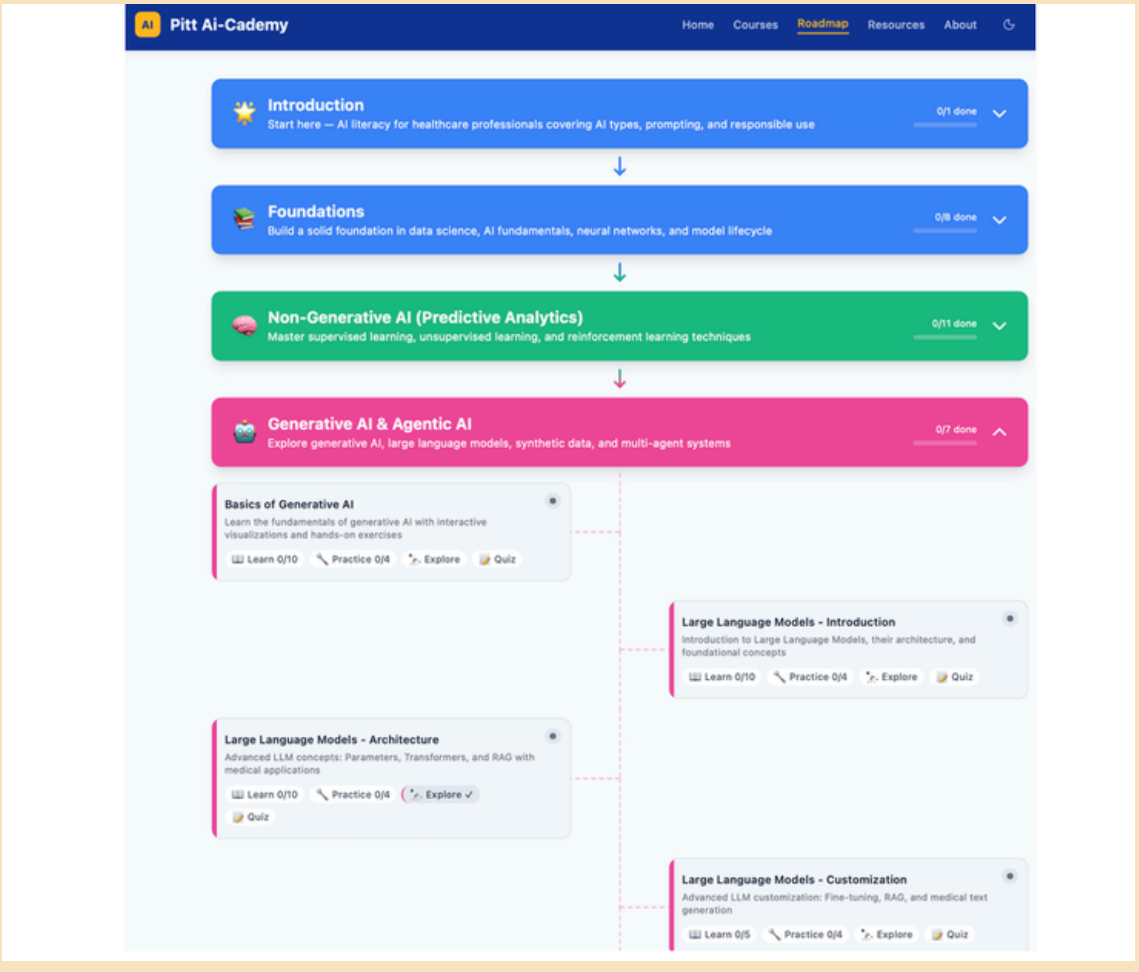
A strong innovation record for Pathology

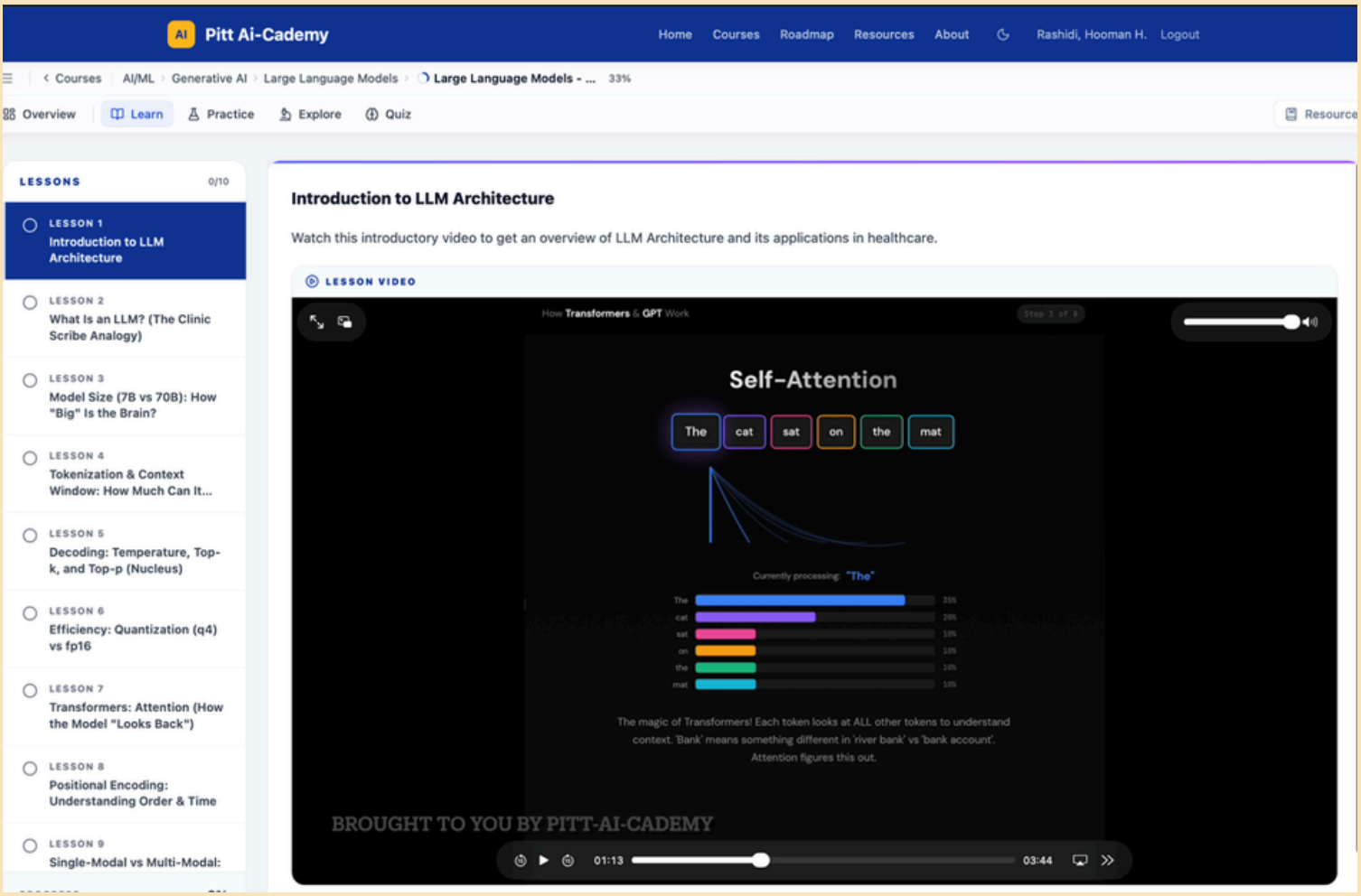
The FY2026 innovation snapshot places the Department of Pathology as one of the top leaders for invention disclosures. CPACE made an important contribution: there were 14 disclosures submitted by Dr. Rashidi and his team which places CPACE as the top center (amongst Pitt heath science centers) for its number of invention disclosures. These rankings reflect invention disclosures—not a claim that every tool has been patented or clinically deployed—but they demonstrate a remarkable culture of innovation.

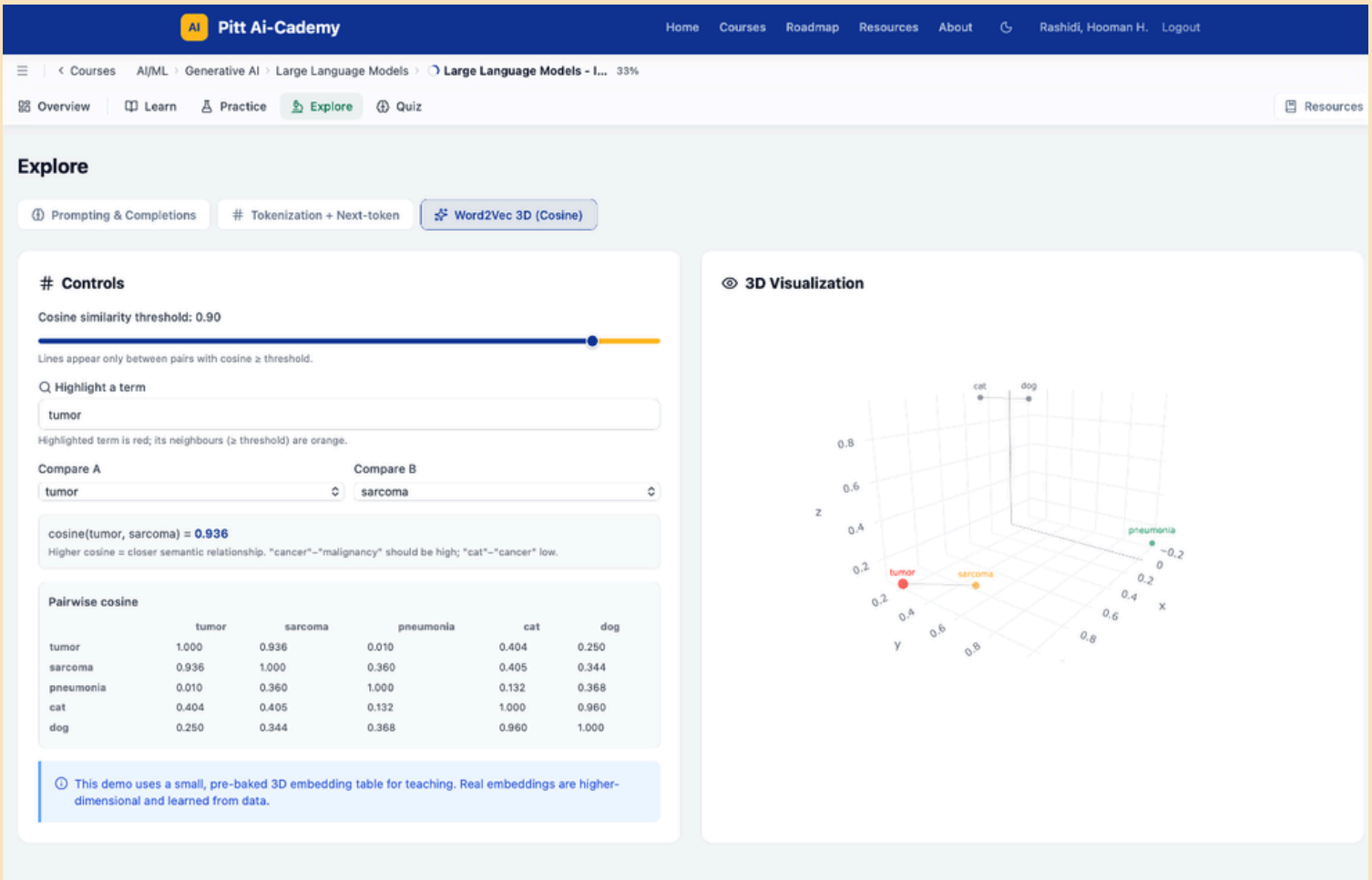
Pitt-AI-Cademy: AI education that starts with access

Among these innovations, Pitt-AI-Cademy may have the broadest potential reach. Officially and successfully launched within the University of Pittsburgh School of Medicine, the platform is designed for students, clinicians, scientists, faculty, staff and learners in general who want to understand modern AI without first becoming programmers. It is a structured, self-paced, no-code pathway—NOT a collection of PowerPoint presentations, disconnected videos or one-off demonstrations.









Inside Pitt-AI-Cademy: an AI concepts map, a guided course roadmap, video instruction and hands-on exploration. Learners can move between “Learn,” “Practice,” “Explore” and “Quiz.”

A course built to learn by doing

The learning pathway moves through four stages: Introduction; Foundations; Non-Generative AI (Predictive Analytics); and Generative AI & Agentic AI. Across 27 interactive learning applications (i.e. mini-courses), participants encounter visual explanations, bite-sized instruction, practice activities and knowledge checks. The goal is to make topics such as supervised learning, neural networks, large language models and AI agents approachable—even for someone starting with no technical background.

A learner might watch a short lesson, manipulate a visual example, test what they learned in a quiz and then revisit a related concept on the roadmap. This blend of structure and exploration is especially valuable for busy professionals: it allows focused learning in manageable steps while preserving the option to go deeper. Instead of memorizing terminology, participants begin to see how ideas relate and where their limits lie.

What makes the learning experience different

Pitt-AI-Cademy puts the learner in control. A visual concepts map helps show how core ideas fit together; a learning roadmap clarifies what comes next; and built-in exercises allow people to test ideas rather than only read about them (with embedded synthetic data and interactive hands-on tools). For example, users can examine how a transformer model handles attention, explore tokenization and word representations, or change temperature parameters and see how a model's behavior changes. These experiences make technical concepts visible, memorable and easier to discuss with data scientists or technology teams.

Just as importantly, the no-code approach removes a longstanding barrier. Understanding the difference between predictive and generative AI, recognizing where bias can arise, or asking whether a model was validated for a specific setting should not require proficiency in Python. Faculty, laboratory professionals, administrators and trainees all need practical AI judgment. Pitt-AI-Cademy begins with that shared need, while offering a pathway into deeper topics for those who want to advance.

Different professional groups also bring different questions. A research team may focus on study design and external validation; clinicians may emphasize patient safety and privacy; and operational leaders may want to know whether an impressive demonstration can translate into a dependable workflow. A shared educational foundation helps all three groups participate in the same informed conversation.

Grounded in peer-reviewed science

Accessibility is only half the equation. Pitt-AI-Cademy is anchored in 14 peer-reviewed AI review articles, most notably a coordinated seven-part series published in Modern Pathology (the official journal of United States and Canadian Academy of Pathology as part of its global AI education initiative). Together, these open access reviews (https://www.modernpathology.org/article/S0893-3952(24)00253-9/fulltext) provide an evidence-based foundation for understanding AI fundamentals, non-generative and generative approaches, statistics and research design, validation, regulation, ethics, bias, and the challenges of bringing AI into real workflows. The course pairs that scientific foundation with interactive learning rather than asking users to accept exciting outputs at face value.

This is a consequential distinction for a medical community. A polished AI demo may look convincing even when its results are incomplete, biased or unreliable. Evidence-based education helps learners consider data quality, reproducibility, performance measurement, privacy and appropriate oversight. The reviews strengthen the scientific foundation of the curriculum; as with any educational program, real-world learning outcomes and individual AI tools still require their own evaluation. In this way, Pitt-AI-Cademy encourages both curiosity and healthy scientific skepticism in an evidence-based approach to learning.

From a successful Pitt launch to a broader audience

The recent School of Medicine launch has established Pitt-AI-Cademy as a working educational platform for all our students. The next step is scale: a wider rollout is being planned through Pitt EDGE, the University's Center for Excellence in Digital Education. The program has also been licensed to institutions and organizations seeking a reliable way to introduce AI across diverse professional groups. Because the material is no-code and organized around broadly applicable concepts, it can serve learners far beyond pathology without sacrificing its evidence-based core. Major Pitt-AI-Cademy contributors include Hooman H. Rashidi, MD, MS; Liron Pantanowitz, MD, PhD; Matthew Hanna, MD; Raehash Shah, MS; Parth Sanghani, MS; and Nam Tran, PhD.

Why it matters to our faculty and staff

For our department, this is about more than gaining familiarity with AI vocabulary. Shared AI literacy can help researchers frame better projects, support faculty as they evaluate new methodologies, equip clinical and operational colleagues to assess proposed workflows, and make staff and trainees fuller participants in institutional conversations about AI. CPACE's 14 innovations show what a multidisciplinary team can build. Pitt-AI-Cademy shows how knowledge about AI can travel much further—helping democratize education while keeping scientific rigor at the center.

Division of Experimental Pathology

Alejandro Soto-Gutierrez, MD, PhD



Professor of Pathology,
Division of Experimental Pathology

Jon Klosinski
Division of Experimental Pathology



Over the past two years, the Division of Experimental Pathology has undergone a strategic transformation, culminating in 2026 with the establishment of an integrated network of specialized research Hubs. This coordinated framework unites scientific expertise, advanced technologies, shared infrastructure, and faculty development resources to accelerate discovery and collaboration. With this foundation in place, our strategic priorities now focus on empowering investigators, strengthening research competitiveness, expanding funding opportunities, and accelerating translational innovation, while fostering intellectual property generation, technology commercialization, and the creation of new biotechnology ventures.

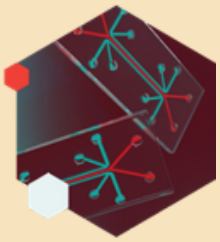


The **Human Organ Processing Hub** and **Genomics and Epigenomics Sequencing Hub** serve as foundational pillars of this integrated research network, establishing a coordinated pipeline from patient-derived biospecimens to comprehensive molecular data generation. The Human Organ Processing Hub provides access to freshly processed human tissues, primary cells, iPSC generation and differentiation, genome editing, and specialized therapeutic delivery platforms, including lipid nanoparticles (LNPs). To enhance accessibility, efficiency, and user engagement, we have launched a new, user-friendly web platform (https://www.exppathhub.pitt.edu) for the **Genomics and Epigenomics Sequencing Hub** that streamlines sequencing sample submission, provides real-time workflow tracking, and delivers automated updates throughout sample processing and data generation. Complementing these capabilities, the Sequencing Hub enables high-resolution genomic and epigenomic profiling, including whole-genome sequencing. Together, these Hubs create a powerful, multidisciplinary platform that transforms patient-derived biological materials into actionable molecular insights, accelerating discovery, translational research, and cross-disciplinary collaboration.





The Human Mimetic Hub, led by Amanda Clark, PhD, accelerates disease discovery and therapeutic development through advanced human-relevant models and organ-on-a-chip technologies. Complementing this mission, the **SHERLOCK Hub**, directed by Christiano Alves, PhD, bridges scientific discovery and commercial innovation by advancing intellectual property development, biotechnology entrepreneurship, and venture creation. Together, these Hubs strengthen the Division's capacity to translate scientific breakthroughs into transformative technologies and therapeutic solutions. Both initiatives are highlighted in dedicated articles by their respective leaders in this newsletter.



The newly established **AiX Hub** (**AI × Experimental Pathology**) unites the Division of Experimental Pathology and the **Computational Pathology & AI Center of Excellence (CPACE)** to accelerate scientific discovery at the intersection of artificial intelligence and experimental biology. Led by Drs. Daniel Angarita, Rami Vanguri, under the strategic vision and oversight of Drs. Hooman Rashidi, Nam Tran, and Alejandro Soto-Gutierrez, **AiX** integrates experimental biology, digital pathology, computational modeling, and multimodal data analytics to transform complex biological data into actionable insights, pioneering a new era of AI-driven discovery and translational innovation.



A central goal of AiX is to bring AI expertise directly into the experimental research process. Working alongside experimental investigators, AI experts can analyze complex datasets, predict experimental outcomes, and identify promising genes, molecules, pathways, and therapeutic targets for further investigation. Multimodal approaches can integrate genomics and other omics technologies, pathology images, microscopy, human samples, and clinical or physiological data to uncover biological relationships that may be difficult to identify through traditional methods alone.



Importantly, this relationship is intended to work in both directions. AI-driven findings can guide subsequent experiments, while new experimental results can refine computational models and generate additional hypotheses. Through connections with CPACE, the Digital Pathology Research Center, and other Experimental Pathology Hubs, **AiX** adds a computational dimension that can extend across the Division's research infrastructure.

The **Incubator Hub**, also established this year, expands the Hub model beyond technology platforms by providing flexible research infrastructure to support junior and early-stage investigators as they develop independent research programs and pursue competitive extramural funding.



Central to this effort is the Experimental Pathology Incubator Laboratory, an open, collaborative space designed to foster creativity, empower investigators, and transform bold ideas into scientific discoveries and entrepreneurial opportunities. Now operational in Scaife S733, the Incubator provides accessible laboratory infrastructure for the entire research community, with particular emphasis on postdoctoral fellows, early-career investigators, junior faculty with limited federal funding, and aspiring biotechnology entrepreneurs. It also serves as a training and innovation platform for educational initiatives, including the Pathologist Investigator Residency / Research Training Program (PIRRT). By removing financial and infrastructural barriers, the Incubator enables investigators to test innovative concepts, generate preliminary data, and establish proof of concept, creating a pathway toward independent research programs, competitive funding, intellectual property development, and biotechnology venture formation.

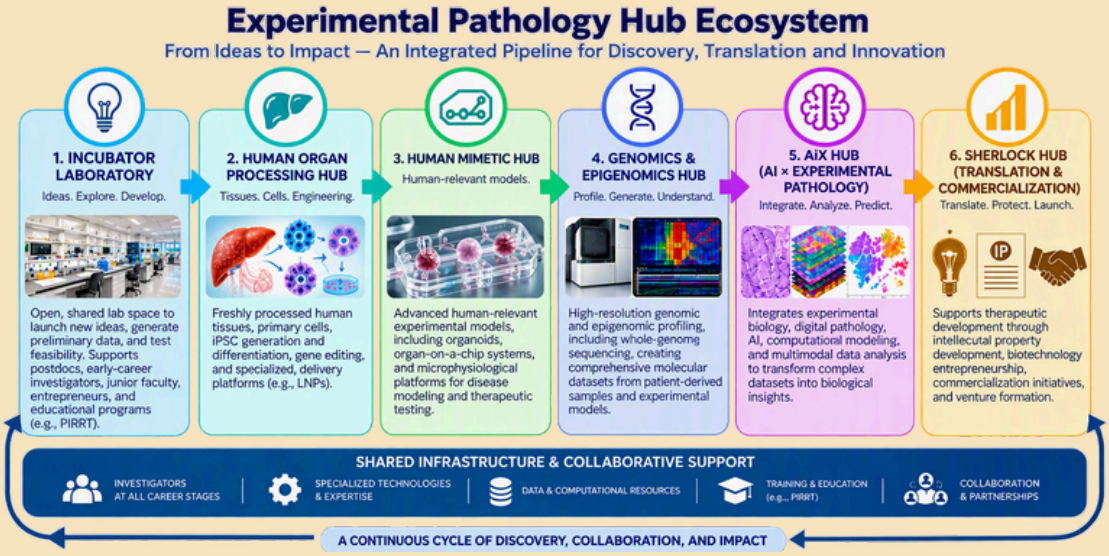
An initial Pilot Validation Program has been established with the incubation of the laboratory of Dr. Yannis Hadjiyannis, a graduate of the PIRRT program in partnership with Cindy G. Avalos-de León, PhD, Research Instructor in Experimental Pathology, who is overseeing the laboratory and its day-to-day scientific operations. Their involvement provides investigators using the Incubator with an additional point of scientific and operational support as new projects are established, methodologies are implemented, and the shared laboratory environment continues to develop.

This first use case provides an opportunity to evaluate the Incubator model in practice, optimize shared resources and workflows, and establish a framework for expansion to additional investigators and research programs. As projects mature and secure extramural support, investigators can transition from the Incubator environment into independently supported laboratories, allowing the shared space to continually support new investigators and emerging research directions.



Incubator Laboratory, Scaife Hall S733

Taken together, the Division's Hubs represent more than a collection of individual technologies or programs. They create a framework capable of supporting investigators across multiple stages of scientific development. An early-stage concept can be developed through the Incubator, investigated using human tissues and advanced human-relevant experimental systems, characterized through genomic and epigenomic technologies, analyzed using multimodal artificial intelligence, and ultimately explored for translational or commercial potential.

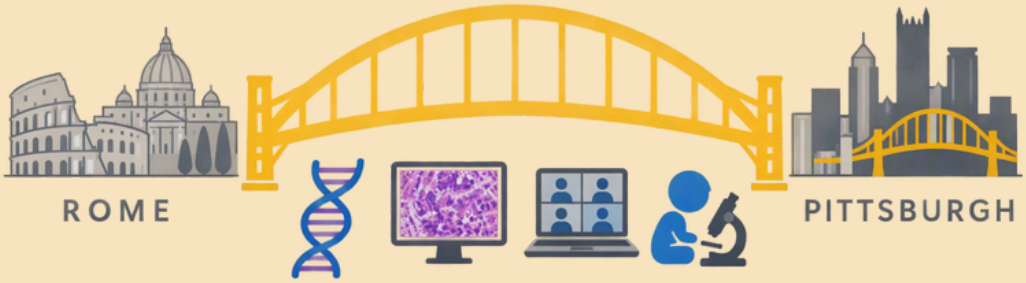


Experimental Pathology: Integrated Research-to-Innovation Pipeline. The Division's Hubs form a connected ecosystem that advances scientific ideas from early-stage exploration through human-relevant experimentation, molecular characterization, AI- driven discovery, and ultimately clinical translation and commercialization.

The strength of our integrated Hub network lies in transforming individual expertise into collective scientific impact. By connecting investigators with advanced technologies, specialized resources, and multidisciplinary expertise, the Division enables discoveries beyond the reach of individual laboratories, accelerating competitive funding, translational research, intellectual property development, and biotechnology ventures.

We invite scientists, clinicians, and trainees to engage with this integrated pipeline, leverage its capabilities, and forge collaborations that bridge fundamental discovery and clinical needs. Together, we can transform bold ideas into impactful research and position Experimental Pathology as a driving force for scientific discovery, translational innovation, and entrepreneurship.

Building Bridges from Pittsburgh to Rome



Jennifer Picarsic, MD

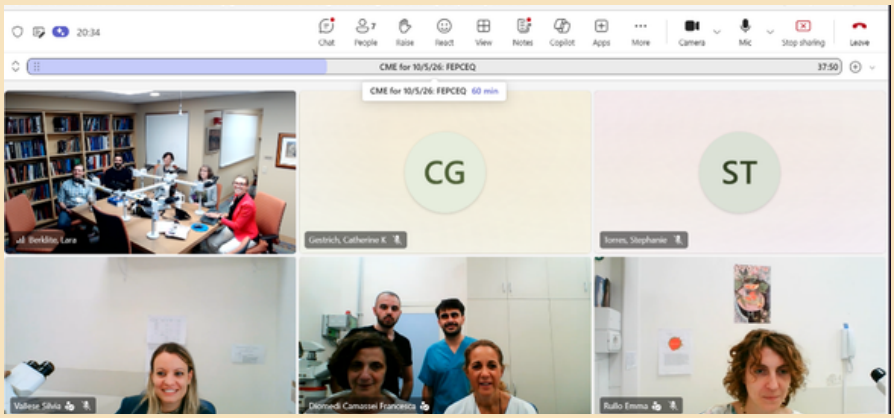


Marjory K. Harmer Professor and Chair in Pediatric Pathology
UPMC Children's Hospital of Pittsburgh Pediatric Pathology and Laboratory

Over this past year, the Kids First Lab began construction on a new bridge—not one of steel or tied to EPIC, but one designed to strengthen our pediatric pathology "people pillar" through an international collaboration between Pittsburgh and Rome. This collaborative is grounded in a shared commitment to advancing the future of pediatric pathology through digitally enabled dialogue and investment in the education and scientific development of the next generation. This partnership unites the pediatric pathology team at UPMC Children's Hospital of Pittsburgh and the University of Pittsburgh, led by Dr. Picarsic, with the pediatric pathology team at Ospedale Pediatrico Bambino Gesù and Sapienza University of Rome, led by Professor Alaggio.

A recently signed Memorandum of Understanding (MoU) between our institutions now provides a formal framework for future scientific and educational initiatives. Professor Alaggio's periodic Pittsburgh visits have helped establish the collaboration's operational foundation, which has since grown our personal connections between institutions. Beginning earlier this year, thrice-weekly, one-hour CME Teams based conferences have allowed faculty and trainees from each institution to discuss complex "unknown" cases using de-identified whole-slide images (WSI), while providing a forum to compare different diagnostic approaches and available technologies at each institution. Subsequent didactic sessions have also reinforced learning through case-based presentations, given both by UPMC and Rome faculty for trainee education at both institutions. These ongoing exchanges have also generated several collaborative academic based projects, including studies on emerging and poorly understood entities in pediatric histiocytosis and ALK-rearranged mesenchymal lesions, while other studies on newly described pediatric molecular-based entities are in progress. Furthermore, inter-institutional collaboration has already resulted in the submission of joint manuscripts, and plans are underway for an international master program for subspeciality training in Italy with a 2-day course held in Rome next year, alternating with Pittsburgh in 2028. This collaborative bridge will serve as an incubator for new ideas and learning from different but shared perspectives with a virtual learning platform enabled with WSI and Teams-based conferences, coupled with periodic in-person exchange of visiting faculty. This innovative international teaching model was submitted to the Society for Pediatric Pathology's annual meeting, which was selected for presentation this October in Columbus, Ohio. For those Pitt/UPMC faculty who are interested in connecting with other subspecialty pathologists at Sapienza University of Rome, please reach out to Dr. Picarsic for more information.

"A bridge is not just a structure. It is a symbol of connection, cooperation, and possibility." ~unknown.



The team at a recent virtual CME conference hosted between UPMC Childrens and Ospedale Pediatrico Bambino Gesù with faculty and trainees in attendance.



Dr. Picarsic in-person with Dr. Alaggio and the Pediatric Pathology faculty of Ospedale Pediatrico Bambino Gesù at the 2026 European Congress of Pathology in Stockholm.



Dr. Alaggio (pictured far right) with the UPMC CHP Pediatric Pathology Faculty at a recent Pittsburgh visit.

ROSE and Telecytology: From Adequacy Assessment to Real-Time Cytopathology Consultation

Samer Khader, MD



Professor of Pathology,
Division of Anatomic Pathology

Rapid on-site evaluation (ROSE) has become an important part of modern cytopathology practice, particularly for image-guided biopsies. Its traditional role is to assess specimen adequacy while the procedure is still underway, but the questions asked during ROSE go beyond whether enough cells are present. It helps determine whether the sampled material represents the target lesion and disease process, guides additional sampling of the same or other lesions when needed, and ensures that limited tissue is appropriately allocated for ancillary studies. It also gives the cytopathology and clinical teams a chance to discuss the findings and plan the next steps in patient care.

Decisions made during sampling can affect the accuracy of the final diagnosis, whether another procedure is needed, and how quickly the workup can be completed. With increasing procedure volumes and growing demands for molecular and other ancillary testing, cytopathologists and cytologists (cytotechnologists) must consider both the immediate assessment and the material needed afterward.

Telecytology allows the cytopathologist to take part in these decisions remotely. With appropriate staffing and technology, the same expertise can reach several procedural sites, including facilities without on-site cytopathology coverage.

ROSE in Clinical Practice: The UPMC Experience

Our ROSE teams in the UPMC Cytopathology Division cover procedures across several hospitals and clinical settings, including interventional radiology (CT- and ultrasound-guided procedures), bronchoscopy, gastrointestinal endoscopy, inpatient units, the operating room, and the Fine Needle Aspiration (FNA) Clinic. At Shadyside alone, we may cover 15–20 procedures in a single day, so close coordination among cytologists (cytotechnologists), cytopathologists, administrative staff, procedural teams, and other laboratory personnel is essential.

Making Sure No Cells Are Left Behind

Preparation for ROSE often starts the day before the procedure, when the cytopathology team reviews the anticipated procedure list, plans coverage, and checks the relevant clinical history. As add-on procedures are scheduled throughout the day, the list may change, and the team needs to adjust accordingly.

The cytologist and cytopathologist play equally important, complementary roles in ROSE. During sampling, the cytologist prepares and evaluates slides, recognizes potentially diagnostic material, and communicates what material remains available. Working with the cytopathologist, the cytologist allocates specimens among cytologic preparations and ancillary studies. For telecytology, the cytologist also checks that the equipment and internet connection are working properly and reports technical issues to IT when needed.

The cytopathologist assesses whether lesional material is present, whether the preparation is suitable for interpretation, and whether additional passes are likely to improve diagnostic yield. The cytopathologist brings together the microscopic findings and the clinical and radiologic context to guide further sampling and specimen triage, while discussing the preliminary findings with the clinician or proceduralist.

This partnership is especially important when specimens are scant or several ancillary studies are needed, requiring careful decisions about how best to use the available material. ROSE involves more than checking adequacy. The team must also anticipate what will be needed for the final diagnosis and communicate those needs while sampling is still underway.

Specimen Triage and Tissue Management

One of the most important responsibilities during ROSE is deciding how to use limited material. A specimen may be adequate for a preliminary assessment but still require additional material for a cell block, immunohistochemistry, special stains, molecular testing, flow cytometry, microbiologic studies, or other investigations. Recognizing these needs early can help prevent situations in which diagnostic material is exhausted before the full workup is complete.

How specimens are allocated depends on the suspected diagnosis and the requirements of each test. For example, microbiologic studies generally require fresh material collected in a sterile container, while flow cytometry commonly requires fresh material in RPMI or another validated transport medium. Fixatives and unsuitable transport or storage conditions may compromise testing, so specimen handling and allocation should follow local laboratory protocols.

Touch preparations, also called touch imprints, offer a quick way to examine cells from fresh tissue. The tissue surface is gently touched to a glass slide, transferring cells for microscopic evaluation. Gentle handling is especially important with small biopsies to preserve material for histologic examination and ancillary studies.

Sometimes, tissue architecture is needed to answer the diagnostic question, and the team may request a core biopsy. When Hodgkin lymphoma is suspected, for example, a surgical biopsy, preferably an excisional biopsy when feasible, may be needed. In other settings, FNA can offer practical advantages: multiple passes allow different areas of a lesion to be sampled, and the procedure may carry a lower risk of complications in selected cases. The choice depends on the suspected diagnosis and the material needed to complete the workup. A detailed comparison of these approaches is beyond the scope of this article.

Ultimately, effective triage is about obtaining the right material, not simply more material.

Telecytology: Remotely Bringing Expertise On-Site

Telecytology allows a cytopathologist to evaluate cytologic material remotely in real time while the specimen remains at the procedure site. In a live digital microscopy workflow, the cytologist operates the microscope and navigates the slide, working closely with the cytopathologist reviewing the images remotely. The cytopathologist can request focusing on specific fields or changes in magnification, then use the findings to assess adequacy and guide further sampling and specimen triage.

This telecytology model preserves an important strength of traditional ROSE: A trained cytologist remains on-site to handle the specimen and prepare the slides. The cytologist can describe the material available for cell block preparation or ancillary testing, while the cytopathologist provides interpretation and clinical guidance. Their interaction also allows immediate discussion of uncertain findings and provides an additional opportunity for quality control.

Other platforms use whole-slide scanning, allowing the cytopathologist to evaluate digitized slides remotely. This may be useful at sites without an on-site cytologist, although slide preparation, scanning, and specimen handling still require appropriately trained personnel.

For the cytopathologist, remote coverage reduces travel between procedure rooms or hospitals. After completing a consultation, or during a pause in sampling, the cytopathologist may connect to another procedure at a different site, provided they remain available when the original team needs further guidance. Intervals between samples may also allow time for other clinical, teaching, or administrative work.

This flexibility depends on adequate staffing, reliable technology, and coordination among the sites being covered. Live image sharing also supports teaching through case discussions among cytologists, trainees, and cytopathologists. Secure systems and controlled access are essential to protect patient privacy and data.

Patient-Centered Benefits

ROSE gives the team a chance to address sampling issues during the procedure. If the sample is inadequate or does not appear to represent the target lesion, additional material may be collected before the patient leaves. When enough representative material has been obtained, the team may be able to avoid further passes or move on to sampling additional sites.

Sharing a preliminary diagnosis with the clinical team can help them begin planning the next steps in patient care. It may guide surgical planning, prompt a hematology referral when an unexpected lymphoid process is identified, or help the team prepare for urgent interventions, such as radiotherapy, when clinically appropriate.

At facilities without on-site cytopathology coverage, telecytology provides access to this guidance without requiring a cytopathologist to travel to the procedure. It may therefore help address differences in access to specialized cytopathology services.



Even with ROSE, some patients will need repeat sampling, and diagnostic delays can still occur. Outcomes depend on the lesion, sampling technique, specimen quality, available technology, and coordination among the clinical and laboratory teams. On-site assessment is one part of that process, not a substitute for the rest of the diagnostic workup.

Quality Assurance, Validation, and Workforce Considerations

A reliable ROSE service requires ongoing quality assurance. Preliminary assessments should be compared with final diagnoses. The sign-out pathologist is required to review the on-site evaluation in every case. Any clinically significant discrepancy should be reviewed and communicated to the treating clinician when appropriate. The review should consider the entire process, including sampling, slide preparation, image quality, field selection, specimen triage, communication, and interpretation.

When a discrepancy occurs, it is important to look beyond interpretation alone. The sample may not represent the lesion, the preparation or digital images may be suboptimal, or too little material may have been saved for ancillary testing. Reviewing the entire process helps the team understand what went wrong and how to improve, with everyone sharing responsibility for quality.

Telecytology systems and workflows must be validated before clinical implementation and monitored thereafter. Validation should address diagnostic concordance, image quality, staff training, and procedures for handling technical failures or disagreements. Clear escalation pathways are especially important when the remote cytopathologist cannot adequately assess the specimen.

Workforce challenges add another dimension. Limited availability of cytopathologists and cytologists, along with uneven access to their expertise, remains a concern. Community hospitals, rural facilities, and smaller healthcare systems may have little or no on-site cytopathology support, even when they perform procedures that could benefit from ROSE.

Telecytology can help bridge these gaps by allowing cytopathologists to cover multiple locations. But it does not remove the need to train and retain qualified cytopathologists and cytologists. The service still needs enough staff, reliable technical support, and validated workflows, with a realistic limit on how many procedures the team can safely cover.

Education and Future Directions

ROSE gives residents, fellows, and cytologists a chance to see how sampling and microscopic findings shape decisions during a procedure. It offers hands-on experience in recognizing diagnostic material, discussing uncertain findings, and understanding why the team may need additional samples.

Telecytology allows trainees at different sites to review images together and take part in discussions during a procedure. These conversations give them a chance to ask questions and understand how the team reaches a decision, rather than simply hearing the preliminary diagnosis. As practice moves toward more digital workflows and AI-assisted diagnosis, training should also help them assess digital images, recognize their limitations, and connect what they see on screen with the specimen itself.

As digital workflows and AI-assisted diagnosis become part of practice, training should address how to assess digital images and recognize their limitations. Trainees will also need to understand the potential uses and limitations of AI tools, including when to question an output and seek further review. Microscopic findings and clinical context must remain part of that judgment.

The tools may change, but the purpose remains the same: helping the team obtain, preserve, and interpret the material needed to care for the patient.





Telecytology for ROSE at UPMC

Same expertise. More places. Real-time patient care.

1 During the procedure

A sample is obtained at a UPMC clinical site (e.g., interventional radiology, bronchoscopy, endoscopy, operating room, inpatient unit).

2 Slides are prepared

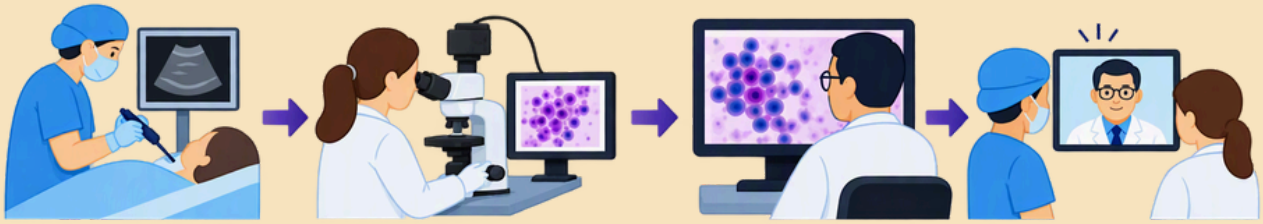
An on-site cytologist prepares and screens slides, operates the microscope, and shares live digital images with the remote cytopathologist.

3 Remote evaluation

A UPMC cytopathologist reviews the live images remotely, requests specific fields or magnification, and assesses adequacy and lesional material.

4 Real-time guidance

Findings are discussed with the procedural team, and additional sampling or specimen triage is guided as needed — while the patient is still in the room.



UPMC Procedural Site

Sample collected

On-Site Cytologist (UPMC)

Prepares slides
Operates microscope
Shares live images

Remote Cytopathologist (UPMC)

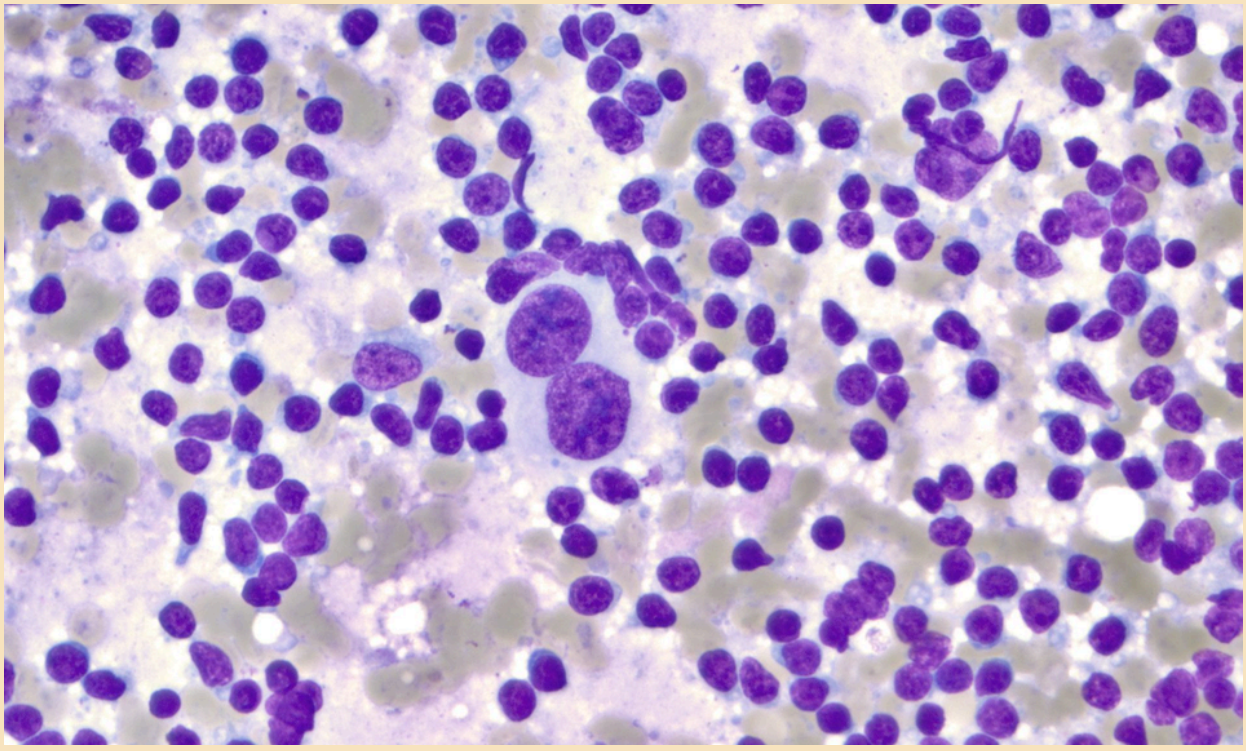
Interprets in real time
Guides further sampling
Helps triage material for ancillary tests

UPMC Care Team

Discusses findings
Plans next steps
Ensures optimal specimen use

Telecytology extends ROSE expertise across UPMC, supporting high-quality, timely, and patient-centered care.

UPMC LIFE CHANGING MEDICINE



Cytologic direct smear preparation (DQ stain, ×40) from a fine-needle aspiration biopsy of a para-aortic lymph node demonstrates a large atypical binucleated cell with conspicuous nucleoli in a polymorphous lymphoid background with scattered macrophages. The atypical cell is morphologically consistent with a Reed-Sternberg (RS) cell in this patient with classic Hodgkin lymphoma.

Year 1: Building Momentum for Advancing POCT, Biobanking, Core Facilities, and AI

Nam K. Tran, PhD



Professor of Pathology
Associate Dean for Biobanking and Core Facilities
Senior Technical Director forAI Technologies and Operations, CPACE
Vice Chair for Biobanking and Medical Director for POCT, Dept. of Pathology, UPMC

I am honored to have joined the Department of Pathology at the University of Pittsburgh as Associate Dean for Biobanking and, more recently, Associate Dean for Core Facilities. At UPMC, I also serve as the system-wide Medical Director for Point-of-Care Testing (POCT).

The City of Pittsburgh has a long history of leadership in mobile healthcare, including the development of the nation's first modern emergency medical service. That legacy remains closely aligned with POCT, where testing is often performed in mobile, time-sensitive, and resource-limited settings. As such, UPMC also has a strong tradition in POCT – notably our former POCT Manager, Jamie Acero, being recognized by the Association for Diagnostics and Laboratory Medicine (ADLM) as its 2023 Coordinator of the Year—an award I had the privilege of presenting while serving as Chair-Elect of the ADLM POCT Division.

Since joining UPMC on July 1, 2025, I have had the opportunity to meet many members of our POCT team across the system and gain a deeper appreciation for the scale and strength of the program. I am especially grateful to our POCT Workgroup, medical directors—Drs. Blair, Peck-Palmer, Wheeler, and Wells—and laboratory administrative leaders Kevin Marson, Abbie Malon, and Pam Kunjara Na Ayudhya for their guidance and support. My vision for POCT is centered on three principles: people, stewardship, and diagnostic ecosystems.

POCT is fundamentally people-centered and often performed by non-laboratory personnel at the bedside. Success therefore depends on empowering our POCT team and building strong partnerships with clinical service lines. Stewardship is equally important: not every test or clinical scenario requires POCT, and thoughtful utilization is essential to maximizing clinical value. Finally, POCT must function within a broader diagnostic ecosystem, integrating with the clinical laboratory, informatics, and increasingly artificial intelligence (AI). Standardizing platforms and improving device and data integration will help us optimize testing across the system.

Our first year has already been very productive to say the least. The POCT team successfully navigated an FDA recall affecting a widely used blood gas platform during Epic "Wave 1," while also advancing standardization of viscoelastic testing across the system. We are evaluating the first bedside whole-blood traumatic brain injury biomarker test through UPMC's Health Technology Advancement Program https://www.pittmed.pitt.edu/news/whole-new-game **(Photo #1)** and participating in a multicenter study examining the environmental impact of POCT, including waste, plastics, and energy consumption. These projects, along with three medical student-led studies, will be presented at the ADLM International Critical and POCT Symposium in Pittsburgh this October. https://myadlm.org/meetings-and-events/international-cpoct-symposium

At the University of Pittsburgh, I am leading the Pittsburgh Biobanking Modernization Initiative (PBMI), which supports more than 130 registered biobanks with varying informatics, storage, and operational capabilities. The goal is to modernize this infrastructure while preserving investigator ownership and control of samples and data. We are implementing an enterprise biobanking laboratory information management system at no cost to investigators, beginning with the Pittsburgh Biospecimen Core (PBC) directed by Dr. Rajiv Dhir. The platform will improve sample discovery, analytics, metadata capture, regulatory documentation, and consent tracking. We are also developing system-wide collection and processing standards and evaluating large-capacity robotic cold-storage solutions for the campus.

This work aligns closely with my new role as Associate Dean for Core Facilities, where I oversee 43 core facilities (including the PBC) and work with their directors to strengthen quality, sustainability, and integration across the research enterprise.

In parallel, as Senior Technical Director for AI Technologies and Operations within the Computational Pathology and AI Center of Excellence (CPACE), I am helping develop AI tools for laboratory and POCT operations while continuing research in near-patient combat casualty care. My involvement in Department of Defense research dates to 2009, including work on an early AI-assisted POCT platform for acute kidney injury. More recently, we have adapted CPACE's local Pitt-GPT-Plus platform into Field Care GPT, a multi-agent chatbot designed to provide medical decision support in communication-denied and resource-limited environments from a portable computer like a high-performance laptop.

As modern conflict increasingly involves unmanned systems and delayed evacuation, military personnel may need to manage casualties for prolonged periods without reliable connectivity. Locally deployed AI tools can provide critical medical knowledge without requiring internet access. These capabilities are also translatable to civilian settings including rural medicine, disaster response, mobile testing, and even space medicine.

Field Care GPT has been evaluated with colleagues from the Center for Military Medicine Research, observationally tested with law-enforcement personnel, and demonstrated at Exercise Northern Strike **(Photo #2),** a multinational, multi-service military exercise in Michigan. The work was also recently highlighted by Business Insider. https://www.businessinsider.com/ai-tools-aim-to-help-troops-treat-wounds-2026-9

There is an extraordinary amount of innovation underway across POCT, biobanking, core facilities, and AI. I am grateful for the opportunity to work with such outstanding teams and look forward to building on this momentum in 2027.

Photo 1



"Ribbon cutting" ceremony after going live with the whole blood POC TBI test on May 27, 2026.

Photo 2



Simulated combat casualty care at Exercise Northern Strike on August 10, 2026.

Rediscovering the Wheel – Low Titer Group O Whole Blood for Hemorrhagic Shock is Back!

Mark H. Yazer, MD



Professor of Pathology
Associate Director of the
Centralized Tranfusion Service

It might seem simple – a bleeding patient is bleeding red blood cells (RBC), plasma, and platelets so wouldn't the ideal resuscitation fluid replace all three components at once? What if that resuscitation fluid was routinely donated thousands of times per day at blood centers around the world and in fact is the starting material for the manufacture of the three main blood components that are kept in the blood bank for transfusion? This ideal resuscitation fluid is called whole blood (WB) because it contains everything that the donor donates meaning that it has a dose of RBCs and plasma, and about a third of an adult dose of platelets; providing all of these blood components in a 1:1:1 ratio is known as balanced resuscitation because it mimics what the patient is losing when they bleed. Furthermore, WB comes in one bag so that the recipient receives balanced resuscitation with every drop, so why would we not use it for every patient in hemorrhagic shock?

Well, sometimes "progress" makes us think that the newest thing is the best. WB was an important resuscitation fluid in both World Wars; however, centrifugation and the ability to split WB into its aforementioned components came along in the 1970s and 1980s and the concept of precision transfusion medicine was borne. Instead of having to transfuse plasma and platelets when only RBCs were needed, such as for anemic oncology patients, we can now give the lifesaving benefit of a single donation to three people instead of just one. Manufacturing components from WB was a revolution for transfusion medicine and benefitted many transfusion recipients, but it led the resuscitation of bleeding patients astray because now, in order to provide balanced resuscitation, three components had to be transfused instead of just hanging one bag. During a resuscitation, it can be very difficult to keep track of the ratios of transfused blood products, which often leads to a very imbalanced resuscitation where one or two of the components are not administered in the same quantity as the other components.

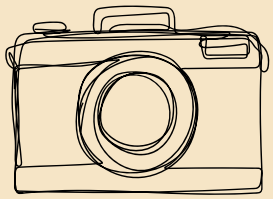
Furthermore, the 1990s ushered in the concept that crystalloids like "normal" saline (really, there is nothing normal about it in terms of its concentration of sodium and chloride and its very acidic pH) should be the primary resuscitation product because it was inexpensive, did not transmit diseases, and, if administered in heroic quantities (literally 15-20 liters) it could help to maintain the patient's blood pressure thereby allowing the large physiological reserve of platelets and clotting factors to be transported to where they are needed. Since then, we have learned that administering huge quantities of crystalloids leads to severe edema and the inability to close body compartments due to iatrogenically swollen organs, that patients do not require normal blood pressures during their resuscitation (except those with traumatic brain injury) and maintaining systolic blood pressures between 100-110 mmHg helps to preserve and stabilize the nascent clots that are forming so less fluids are needed during the resuscitation, and that patients have higher mortality when transfused with large quantities of crystalloids.

Thus, the current concept of resuscitating patients in hemorrhagic shock does not involve using any crystalloids and emphasizes administering transfusions in balanced ratios as early as possible, even before the patient arrives at the hospital. The easiest way to provide this balanced resuscitation is with WB, but WB contains both RBCs and plasma, so how can we assure compatibility with recipients whose ABO groups are not known when the resuscitation begins? The solution is to use group O WB with a low titer of anti-A and anti-B. Group O RBCs are compatible with every recipient, and having low titers of these naturally occurring antibodies reduces the risk of causing hemolysis in a recipient who is not group O. Known as low titer group O whole blood (LTOWB), the University of Pittsburgh Medical Center was on the forefront of its implementation for massively bleeding civilian trauma patients when we started using it in late 2014. At that time, only one or two other centers in the United States were using LTOWB, and now its use has spread to nearly 400 trauma centers across the country, as well as many other countries around the world including Israel, Czech Republic, Norway, Brazil, Estonia, Sweden, Spain, and to some extent in Ukraine.



The story of WB is really the story of military experience influencing civilian practice and vice versa. In parallel with the civilian adoption of LTOWB, many militaries around the world have also moved to reimplement LTOWB as their main resuscitation product or, as in the case of the US Army Rangers, actual WB collections on the battlefield that are collected from group O soldiers who had been shown to have low titers of anti-A and -B and administered to their injured colleagues. The US military has abolished the use of crystalloids in favor of balanced transfusion resuscitation preferably with LTOWB, individual blood components, or WB collected on the battlefield when previously donated and tested blood products are not available. Countless case reports and personal testimonies from military medics and surgeons support the modern emphasis on bringing blood as far forward as possible. To this end, UPMC has recently entered into a partnership with Vitalant, the local blood collector and supplier, and the City of Pittsburgh whereby LTOWB is now available on two of the rescue ambulances that attend the scene of major injuries. Since this program's inception in late September 2025, at least a half dozen local patients have already benefitted from the rapid provision of LTOWB during their prehospital resuscitation as of November 2025. This regionally groundbreaking program complements the alternative method for delivering blood to the scene of an accident whereby an emergency medical services physician can obtain LTOWB at the UPMC Presbyterian and Mercy hospital emergency departments and take it in a cooler to the scene.

Using LTOWB is the latest development in the evolution of resuscitating patients in hemorrhagic shock. Its origins are over a century old yet the principle of providing balanced resuscitation remains as valid now as it was in the trenches of World War one.



Featured Through the Lens of Dr. David Lacomis, Professor of Neurology and Pathology



A waved albatross is seen feeding its chick on Espanola Island in the Galapagos (November 2024)

UPMC's Image Analysis Laboratory: Translating Digital Pathology into Clinical Care

Ibrahim Abukhiran, MD

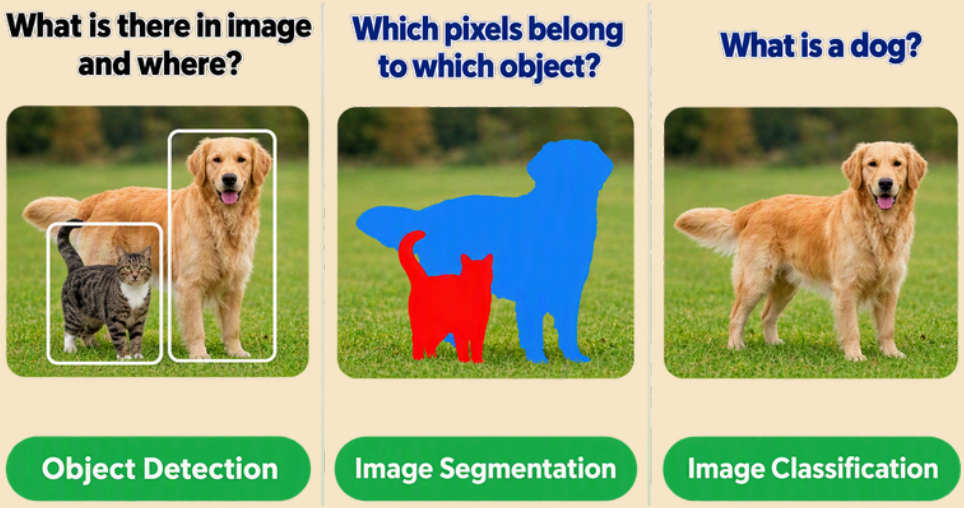


Assistant Professor of Pathology
Director, Leidos Computational Pathology Fellowship, Director, Pathology Image Analysis Laboratory, Associate Director, AI Operations, Computational Pathology and Artificial Intelligence Center of Excellence (CPACE)

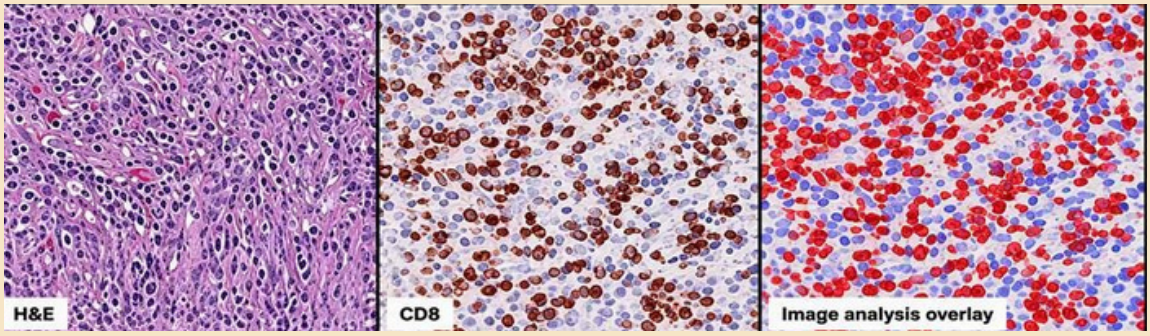
Introduction to Image Analysis in Pathology

Image analysis refers to the extraction of meaningful information from images using computational methods. In pathology, this process is applied to whole-slide images (WSIs)—high-resolution digital representations of glass slides—to identify, measure, and interpret histologic features in a reproducible and scalable way. At its core, image analysis transforms visual patterns that pathologists recognize intuitively into quantitative data that can be measured, validated, and integrated into clinical workflows.

Most image analysis pipelines are built around three fundamental steps: detection, segmentation, and classification. Detection answers the question, "Is something present?"—for example, identifying regions or patches of an image that may contain a structure or organism of interest. Segmentation goes a step further by precisely delineating structures within the image, assigning individual pixels to specific objects or classes (such as nuclei, cytoplasm, or background). Classification then assigns biological meaning to those segmented objects, determining what they represent—for example, distinguishing tumor cells from lymphocytes, or classifying cells as positive or negative for a given biomarker.



These processes rely on the fact that digital images are composed of millions of individual pixels, each defined by numerical values representing red, green, and blue (RGB) color intensities. Image analysis algorithms convert these color values into numerical features that can be analyzed computationally. By examining pixels one by one—and grouping pixels with similar numerical characteristics—the software can identify biologically meaningful structures, such as a single nucleus or a cluster of immune cells. This framework enables a wide range of clinical applications. For example, detection-based approaches are used in tools like the AFB AI detection algorithm to flag regions suspicious for mycobacteria, while segmentation and classification-based approaches underpin quantitative assays such as Ki-67 and CD8 analysis, where individual positive and negative cells are reliably identified and counted. Together, these techniques form the foundation of modern computational pathology and enable objective, reproducible measurement from complex histologic images.



Example of digital image analysis applied to CD8 tumor-infiltrating lymphocyte quantification.

This example illustrates the fundamental principles of image analysis as applied to whole-slide images. On the left, the hematoxylin and eosin (H&E) image provides the morphologic context. In the CD8 immunohistochemistry image (center), the image analysis process begins with object detection, where individual lymphocytes are identified as candidate objects of interest. This is followed by segmentation, in which the algorithm precisely delineates the boundaries of each detected lymphocyte by outlining its nucleus. Finally, classification assigns biologic meaning to each segmented object, distinguishing CD8-positive lymphocytes from negative cells based on staining characteristics. The resulting image analysis overlay (right) visualizes this process, highlighting how individual cells are detected, segmented, and classified to enable accurate and reproducible quantitative assessment of the tumor immune microenvironment.

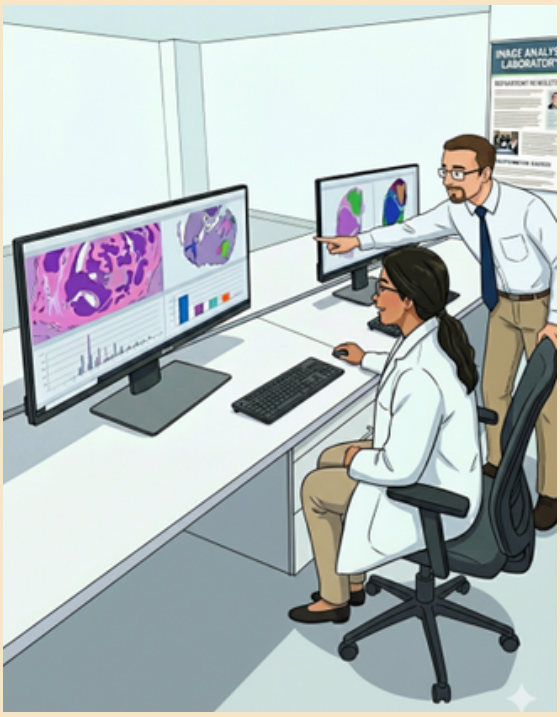
Background of the Image Analysis Laboratory

The Image Analysis Laboratory (IAL) is a CLIA-certified, CAP-accredited diagnostic laboratory dedicated to the development, validation, and clinical deployment of image analysis–based assays for anatomic pathology. The laboratory supports both quantitative and non-quantitative digital image analysis, enabling the translation of advanced computational tools—ranging from traditional algorithmic methods to modern AI-based models—into routine patient care.

The IAL was originally founded and developed by Dr. Liron Pantanowitz, a national leader in digital pathology, and is now under the direction of Dr. Ibrahim Abukhiran, who continues to expand the laboratory's capabilities, test menu, and clinical footprint. The establishment of a fully accredited, standalone image analysis laboratory is a distinctive strength of our department; very few academic pathology programs of comparable size operate a separate CLIA/CAP laboratory exclusively dedicated to digital pathology and computational imaging. This unique infrastructure positions UPMC at the forefront of clinical digital pathology, enabling rapid innovation, rigorous validation, and system-wide integration of quantitative imaging tools.

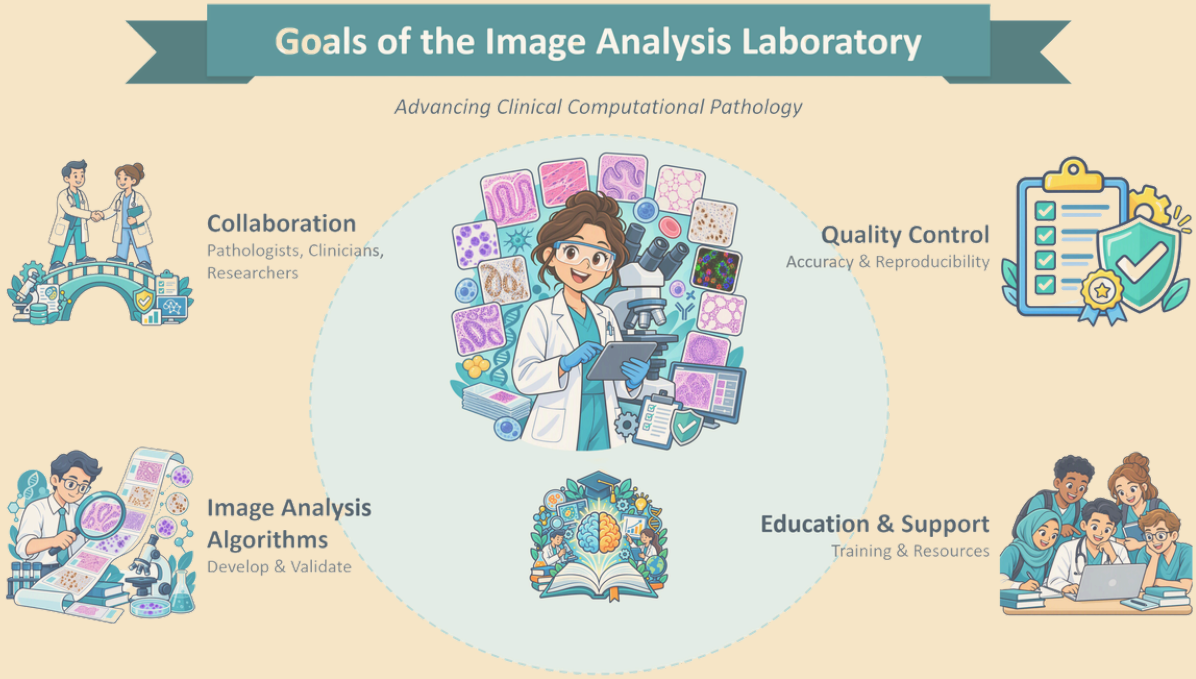
Personnel of the Image Analysis Laboratory

The Image Analysis Laboratory is a uniquely structured facility supported by its own research and development budget and staffed by a highly specialized team whose work extends far beyond routine digital pathology operations. The laboratory is led by the Medical Director, who oversees both clinical and research functions and guides the strategic development of new image-based biomarkers and workflows. The core analytical work is performed by our Image Analysts, who focus on high-complexity tasks such as whole-slide image segmentation, biomarker quantification, and the execution of clinically validated digital assays—rather than routine scanning. Our Lead Image Analyst, Lindsey Seigh, plays a pivotal role in ensuring that all image analysis pipelines remain accurate, reproducible, and operational across diverse specimen types and hospital sites. The IAL team is further supported by dedicated Scanning Personnel in the histology laboratory, whose expertise enables the high-throughput acquisition of whole-slide images across multiple scanners and platforms. Together, this coordinated team forms the backbone of a digital pathology resource unmatched in most academic medical centers.



Goals of the Image Analysis Laboratory

The Image Analysis Laboratory is committed to advancing the clinical integration of computational pathology through a set of forward-looking goals that guide its daily operations and long-term strategy. A central mission of the IAL is to develop and clinically validate image analysis algorithms for a wide range of diagnostic and prognostic applications, emphasizing high-complexity testing that adds measurable value to patient care. The laboratory maintains a strong focus on rigorous quality control, continuously implementing and refining QC metrics to ensure accuracy, reproducibility, and consistency across all platforms and hospital sites. Collaboration is another core pillar of the IAL's mission: the team works closely with pathologists, clinicians, and researchers across UPMC to identify clinical needs, refine biomarkers, and support translational studies that bring innovative tools into practice. In addition, the IAL is dedicated to education and support, providing training, resources, and hands-on guidance to promote the adoption of image analytics throughout the health system. Collectively, these goals position the Image Analysis Laboratory as a leader in digital pathology innovation and clinical translation.



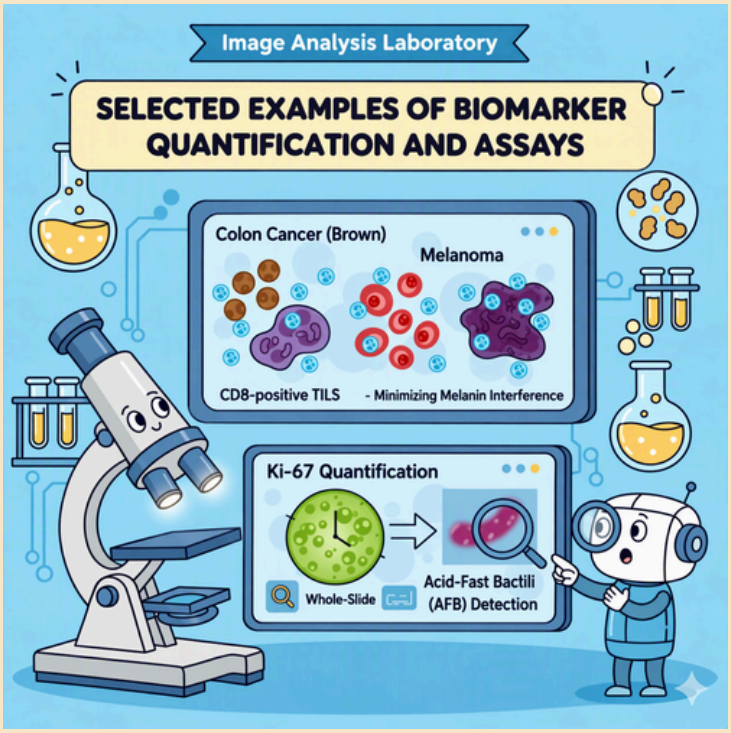
Selected Examples of Biomarker Quantification and Assays

A major focus of the Image Analysis Laboratory is tumor immune microenvironment assessment, particularly through the quantification of CD8-positive tumor-infiltrating lymphocytes (TILs) across multiple tumor types. CD8-TIL assays are clinically validated for cancers such as colon adenocarcinoma, head and neck squamous cell carcinoma and, most recently, primary and metastatic melanoma. These workflows demonstrate the laboratory's ability to adapt to diverse staining and chromogen patterns—for example, CD8 quantification in colon cancer is performed on brown chromogen immunostains, while melanoma specimens are analyzed using red chromogen to minimize melanin interference and enhance accuracy.

In addition to immune profiling, the Image Analysis Laboratory performs comprehensive biomarker analysis, including Ki-67 quantification across solid malignancies. These assays leverage whole-slide quantification to improve reproducibility and prognostic value beyond traditional hotspot methods.

The laboratory's capabilities also extend to non-quantitative, AI-enabled detection tools, such as the Acid-Fast Bacilli (AFB) Mycobacterial Detection Algorithm, which assists pathologists by screening whole-slide images for organisms that may be difficult to identify manually.

Together, these examples illustrate the breadth and adaptability of the laboratory's image analysis capabilities, spanning nuclear, cytoplasmic, and membranous biomarkers across multiple chromogens and tissue types. This versatility underscores the IAL's mission to deliver clinically meaningful digital tools that enhance diagnostic precision and support patient care across the health system.



Rigorous Validation of Image Analysis Assays

Operating a clinical digital image analysis laboratory is not a plug-and-play endeavor; it represents high-complexity testing and therefore requires a carefully designed and rigorously executed validation process before any assay can be deployed clinically. In the Image Analysis Laboratory, validation begins well in advance of implementation and follows a structured and deliberate framework designed to ensure clinical reliability and regulatory compliance.

Each validation effort starts by clearly defining the clinical intent of the assay—whether it is diagnostic, prognostic, or predictive of therapy response. This is followed by careful cohort selection and database construction to ensure appropriate case representation. A critical component of this process is establishing a robust ground truth, which may be derived through manual expert counting, orthogonal testing methods (such as immunohistochemistry or FISH), consensus agreement among pathologists, or a combination of these approaches.

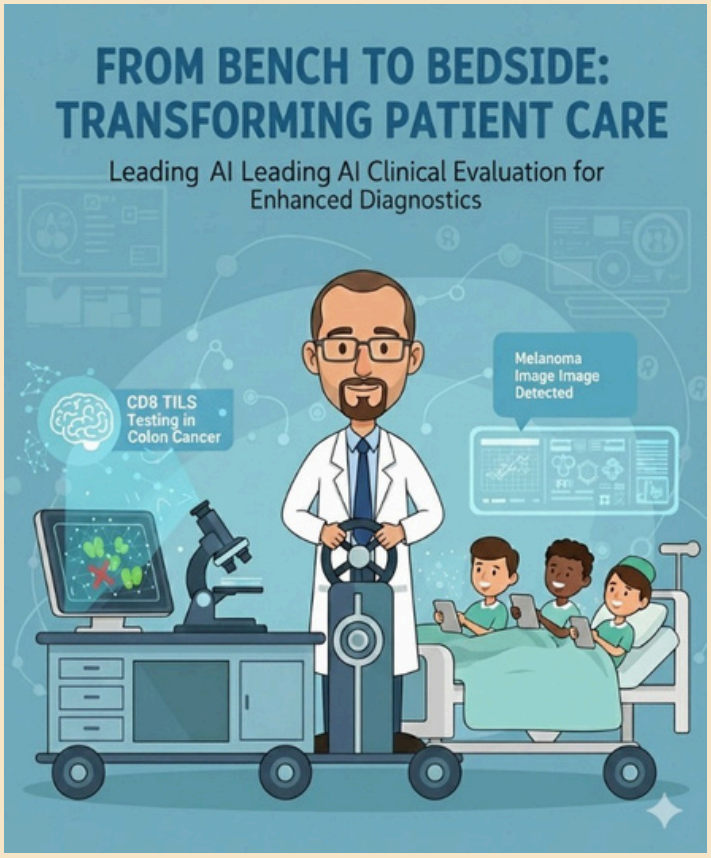
Once the reference standard is established, the image analysis algorithm undergoes iterative tuning and fine-tuning, a step that requires deep understanding of algorithm behavior and image biology. Customizable analysis parameters—such as nuclear size thresholds, shape descriptors, and staining characteristics—are adjusted based on the target cell population. For example, lymphocyte quantification requires different nuclear size and roundness settings than tumor epithelial cell analysis, reflecting their distinct morphologic properties. This biologically informed calibration is essential to achieving accurate, reproducible, and clinically meaningful results.

Continuous Quality Control and Post-Validation Monitoring

Validation does not mark the end of the quality process in the Image Analysis Laboratory. Once an assay is clinically deployed, it enters a phase of continuous quality control, supported by multiple checks and balances designed to ensure ongoing accuracy and reliability. One key component is batch control, in which representative positive and negative cases—often using on-slide tissue controls—are selected and reanalyzed to confirm that the entire end-to-end workflow is functioning as expected.

Quality control in digital image analysis is uniquely challenging because the assay is highly dependent on all upstream laboratory processes. Unlike many ancillary tests, image analysis is affected by a wide range of variables, including tissue fixation, section thickness, histology cutting, tissue folds, and other preparation artifacts. Variability in immunohistochemistry staining quality can directly impact algorithm performance, as can scanner performance and software behavior. Because image analysis integrates all of these steps, even subtle issues at any point in the workflow can influence results, making rigorous QC essential.

Beyond batch controls, the laboratory also employs precision controls, such as designated reference slides that are scanned at defined intervals (e.g., monthly) to monitor scanner consistency and performance over time. Importantly, the QC framework is continuously evolving. This year, the laboratory added a new quality check to monitor the integrity of the scanner light source, following the identification of an unexpected artifact that led to increased false-positive signal in otherwise negative cells. Investigation revealed that the issue was related to light source degradation, prompting the addition of this safeguard. This example highlights the IAL's commitment to continuous learning, early detection of technical issues, and proactive refinement of quality systems to maintain the highest standards of clinical image analysis.



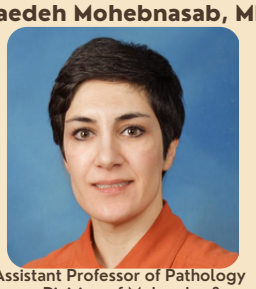
Future Directions of the Image Analysis Laboratory

Looking ahead, the Image Analysis Laboratory is focused on continued growth, modernization, and system-wide integration. A major upcoming initiative is the planned upgrade of the laboratory's image management system and image analysis software to a more robust and scalable platform. This transition will expand our ability to deploy advanced deep learning models, support more sophisticated image analysis workflows, and provide greater flexibility and customizability for assay development and validation. In parallel, the laboratory aims to further expand its clinical test menu, with a long-term vision of running commonly used cancer biomarkers—such as ER, PR, HER2, and Ki-67 in breast cancer—on a centralized digital platform across the entire UPMC health system. By standardizing and centralizing these assays, the IAL seeks to improve consistency, efficiency, and quality at scale. At the same time, we remain committed to developing and implementing tools that directly support pathologists in their daily practice, enhancing diagnostic accuracy, workflow efficiency, and clinical decision-making. Together, these efforts reflect the laboratory's mission to remain at the forefront of clinical digital pathology while delivering practical, high-impact solutions that benefit both pathologists and patients.



How Are We Serving Our Community? Sustainability in the Laboratory

Maedeh Mohebnasab, MD



Assistant Professor of Pathology
Division of Molecular & Genomic Pathology

As laboratorians, we sit at the center of patient care. From a routine metabolic panel to the workup of a widely metastatic tumor, the results we generate drive prevention, diagnosis, prognosis, and therapy selection. Delivering that care, however, carries a cost we rarely discuss: the chemicals, energy, water, and single-use plastics consumed every day, and the hazardous and nonhazardous waste we leave behind.

The scale is easy to underestimate. One study found that a surgical pathology department processing roughly 40,000 cases per year generates a carbon footprint equivalent to driving about 262,000 miles, roughly ten trips around the Earth.

This conversation is not about blame or about compromising patient care. It is about recognizing that small, thoughtful operational choices, multiplied across thousands of specimens and workflows, meaningfully reduce waste, improve efficiency, and often lower cost without touching diagnostic quality. Sustainability is simply a practical extension of the stewardship we already practice when we optimize reagent use, avoid unnecessary repeat testing, and consolidate workflows.

What You Told Us: 2025 Sustainability Survey

Thank you to the 311 colleagues who completed our 2025 departmental sustainability survey. Your responses give us, for the first time, a clear picture of where we stand and where to begin.

Survey finding	Result
Consider sustainability important to our operations	96% (62% “very important”)
Unaware of any current departmental initiative	55% (plus 27% unsure)
Have received no training or guidance on sustainability	65%
Estimate that 25% or less of their workspace waste is handled sustainably	41%
Likely to adopt new practices if resources and training were provided	93%
Interested in a sustainability committee (yes or “maybe, with more information”)	48%

These results are genuinely encouraging. Almost everyone who responded already believes this work matters, and fewer than 1% said they would be unlikely to adopt new sustainable practices if given the right support. That is an exceptionally strong starting position: the motivation is not something we need to build. It is already here.

Just as encouraging is how much we are already doing. Sustainable habits are woven into daily work across the department, with 257 of you properly disposing of hazardous and chemical waste, 218 recycling, 160 actively minimizing paper, 142 shutting down lights and idle equipment, and 134 using reusable containers, bottles, or utensils. These are not small numbers. They represent a department that has quietly built good practice into its routines without being asked.

What the survey identified are gaps that are genuinely solvable: awareness, access to resources, and training. Unlike shifting attitudes, these respond quickly to practical fixes, such as clearer signage, better-placed bins, and short, workflow-specific guidance. The hardest part of any culture change is the willingness, and that part is already behind us. Our task now is simply to make the sustainable choice the easy choice.

What You Asked For, and What Comes Next

The initiatives you most wanted to see are practical, low-cost, and directly aligned with the barriers you identified:

- Improved recycling facilities and clearer signage (208 requests): auditing bin placement and standardizing labeling across lab and office areas.
- More education and training (195): brief, workflow-specific guidance rather than another lengthy module, addressing the 65% who have received nothing to date.
- Digital workflows to minimize paper (192): beginning with the highest-volume printed documents named in your comments, including orders, reports, and duplicate documentation.
- Recognition for sustainable behaviors (151) and reduction of single-use plastics (134), including a review of reagent and consumable purchasing with our vendors.

Join Us: The Sustainability Group

The survey also asked how visible this work feels day to day. Many of you, 40%, answered neutrally, and that is understandable: much of what has been underway has not yet been communicated widely. That is something we can fix, and this newsletter is a first step.

Our department has an active sustainability group working under the Wellness Committee. The group's guiding principle is that sustainability cannot be designed from the top down: it has to be shaped by the people who actually run the workflows. We are interested in involvement at every level of operations, including technologists, pathologists, residents and fellows, administrative and support staff, facilities colleagues, and our vendor partners. Each of you sees a different part of the operation, and the best ideas have consistently come from the bench, the office, and the loading dock rather than from a committee room.

Nearly half of survey respondents said they would be interested in this kind of involvement, or open to it with more information. Consider this your invitation. Participation can be as substantial or as light as your schedule allows, whether that means joining meetings, piloting a change in your own area, or simply sending along an observation about something that could be done better.

To get involved or share an idea, contact the Wellness Committee at **mohebnasabm@upmc.edu** and mention sustainability, or simply reply to this newsletter. Every suggestion will be reviewed.

Why It Matters

At its core, sustainability in the laboratory honors the same mission that brought us into healthcare: to improve human health. By reducing unnecessary waste and conserving resources, we help protect the air, water, and environments our patients, families, and coworkers depend on. That is another meaningful way we serve our community, quietly, steadily, and alongside the essential diagnostic work we already do every day.

Sustainability



Human Mimetic Hub

Amanda Clark, PhD



Research Assistant Professor
Division of Experimental Pathology

This Hub provides access to advanced microphysiological system (MPS) technologies and houses two complementary platforms: the **CN Bio Innovations PhysioMimix System** and the **Emulate Zoë CM2 System**. Both enable physiologically relevant studies of human organ and tissue biology and align with priorities outlined by the NIH and the FDA Modernization Act 2.0, positioning them to accelerate translational discoveries.

What are MPS platforms?

- Organ-on-a-chip devices that recapitulate human tissue- and organ-level complexity and disease pathobiology
- Viability and functioning are maintained over extended periods due to active fluid flow
- Improved preclinical predictability of drug pharmacodynamic, pharmacokinetic, and toxicity profiles, with better disease recapitulation than animal models

Mission of the Human Mimetic Hub

- Our mission is to establish science-driven collaborations that facilitate the coordinated and efficient adoption of human-relevant experimental models
- This will transform our ability to:
  1) Mimic and interrogate the underlying pathobiology of numerous diseases (general or patient-specific)
  2) Accelerate the preclinical development and evaluation of therapeutics for precision medicine approaches

Why collaborate with the Human Mimetic Hub?

- Partnering with the Hub offers several advantages:
  - Strengthens competitiveness for funding by providing preliminary data from human-relevant models
  - Helps you seamlessly integrate MPS models into your project with scientific and technical support from our team
  - Interconnects with the collective expertise and scientific acumen of the Human Organ and Sequencing Hubs within the Department

CN Bio PhysioMimix System

- Single- and multi-organ platforms
- Validated for liver, lung, and gut models
- High-throughput platform



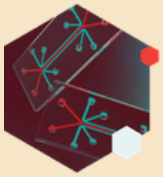
Emulate Zoë CM2 System

- Models a tissue-vascular interface
- Compatible with 10+ organ types, including liver, lung, intestine/gut, kidney, brain (BBB), bone marrow, skin, heart, lymphoid tissue, and tumor models



How to collaborate with the Human Mimetic Hub?

Reach out to Dr. Amanda Clark at amc235@pitt.edu



- Discuss which platform will best suit your needs
- Coordinate with the other Hubs where applicable for cells and analysis
- Design and perform experiment(s) for publications and/or proof-of-concept for grant applications

Together, these collaborations strengthen our shared strategy for advancing drug development and personalized medicine across both the clinical and research spectrum.



If I Could Recommend Only 5 Books...

Pranav Patwardhan, MBBS, MD



Clinical Assistant Professor of Pathology

Books have a unique ability to shape the way we think, challenge our assumptions and inspire our personal and professional growth. Some books entertain; some educate while a few fundamentally change our outlook towards the world or our attitudes towards our personal and professional lives. I have tried to read books regularly, even during the training years since I truly believe they enrich our lives and make us wiser and better human beings. For this newsletter, I was asked to share the 5 books I would recommend all my colleagues to read; and although it was a phenomenally difficult task to choose 5 out of a list I maintain, I hope you like the choices below. I have selected books which will help in personal and professional capacity, enhance our awareness about the coming wave of artificial intelligence and the opportunities and challenges in larger institutions like ours.



Better by Dr. Atul Gawande

Better is an excellent book written by Dr. Atul Gawande which I believe should be read by everyone in Medicine, ideally in the beginning stages of their career. The book tries to find an answer to what it takes to be good at something in which "failure" is so easy & so effortless. It details three core requirements for success in Medicine: Diligence, to do right and Ingenuity. Diligence or "attention to detail" is something all of us, pathologists very routinely talk about or teach trainees about. Our work, right from the H&E evaluation to the interpretation of immunostains, molecular diagnostics and considering relevant clinical history involves and requires diligence at every step of the process. Through examples like smallpox eradication in the world, polio eradication in Asia and the story of Paul O'Neill, Peter Perreiah and the Pittsburgh Regional Healthcare Initiative whose combined efforts reduced healthcare-related infections in the Pittsburgh region, Dr. Gawande highlights the accomplishments that diligence can achieve on a larger scale. Ingenuity has shaped and continues to shape medical advances, as can be seen from the utility of the Apgar score or from the rapid advances in molecular pathology like NGS, Methylation etc. Similarly, "doing right" is not just about prescribing the right medications but goes beyond it: to include clarity in communication with the patient, giving the patient all reasonable options for care and how far to go and when to stop, especially in the era of chronic morbid illnesses being managed in hospital wards and critical care units. In summary, the book offers great examples to highlight the importance of "being" better, "trying" to be better and always maintaining a growth mindset. To end, in Dr. Gawande's words: "Better is possible. It does not take a genius. It takes diligence. It takes moral clarity. It takes ingenuity. And above all, it takes a willingness to try!"

The Seven Habits of Highly Effective People by Stephen Covey

The Seven Habits of Highly Effective People is one of the most famous books written in the last century. As our work becomes more complex and medicine evolves as a team, and becomes a multi-disciplinary endeavor, I think it is extremely important for us to be effective, efficient and act as "multipliers" to provide the best care for our patients and for our health systems to thrive and succeed in their mission. The book highlights many important concepts apart from the seven habits which are extremely relevant in our daily lives. Mr. Covey describes how paradigms are related to our perceptions, why it is important to learn to listen and how life matures from stages of dependence to independence to interdependence. He also highlights the importance of Emotional Intelligence and the need for effective time management. The beauty of this book is that it is filled with numerous interesting thoughts throughout the text: like Life is not just logical, it is emotional or love is a verb before it becomes a feeling or what you are shouts at me louder than what you say. The seven habits that Mr. Covey highlights are: 1) Be proactive, 2) Begin with the end in mind, 3) Put first things first, 4) Think win-win, 5) Seek first to understand, then to be understood, 6) Synergize, and 7) Sharpen the saw. I think that this book, when read and absorbed truly, provides an excellent recipe for growing and helping others grow. Many of the concepts, however, need a very conscious effort from the reader for their effective implementation. I highly recommend this book for our personal and professional growth.

Who Says Elephants Can't Dance? By Louis V. Gerstner, Jr

Who Says Elephants Can't Dance? is a remarkable book by the past IBM CEO Louis V. Gerstner Jr. who is largely credited for the complete recovery and transformation of IBM. It offers enormous insights into how problems, systemic and personal, can creep in the DNA of large organizations and can lead to catastrophic effects in the long run. Mr. Gerstner describes his first IBM meeting like a congressional hearing and highlights systemic issues, like concentration of >90% revenue from mainframe servers and excess spending on redundancies that he noticed when he started his tenure. Mr. Gerstner offers numerous lessons in leadership as he describes his transformative approach, which included "Operation Bear Hug" (each executive meeting at least 5 customers), communicating directly with employees through the "Dear Colleagues letter" and moving to a performance-based compensation model. The initial days of transformation at IBM were so secretive that the USA today wrote that there was "no major change" at the end of Mr. Gerstner's 100 days at office. Mr. Gerstner advocates for constructive impatience, emphasizes that vision can lead to a degree of comfort that can be dangerous and is interested in the future "marriage" of information technology and medical sciences. As employees of a large healthcare organization, and as aspiring future leaders, I thought this book offers excellent managerial and leadership lessons, tied to demonstrable outcomes seen with the transformation and revival of IBM.

Deep Medicine by Eric Topol

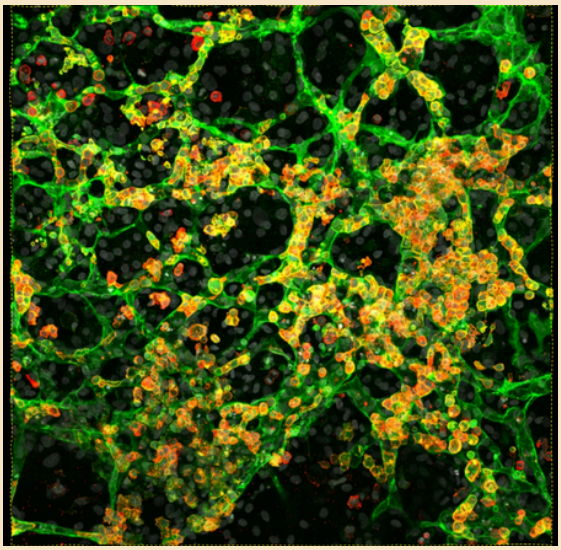
Artificial Intelligence is the hot topic of everyday conversation this year and many think AI will lead to a transformation in the field of Medicine. *Deep Medicine* by Dr. Eric Topol offers a factual insight into how AI can help improvise healthcare. It enlists examples of numerous projects ongoing around the country and the world which aim at harnessing the use of AI to improve healthcare. The book also has a dedicated segment on "the pattern-based doctors": doctors who utilize patterns (images, slides etc.) like radiologists and pathologists. We can relate to this, given the steps our own department has taken in integrating AI into routine diagnostic workflows (for e.g. AI based AFB interpretation, utilization of IBEX algorithms for prostate biopsy interpretation etc.). AI will potentially help radiologists detect tiny abnormal lesions on imaging, will potentially reduce the overall time needed to preview or sign out a case by a pathologist and may help with better predictive algorithms like in predicting retinopathy, or helping detect early, minute changes in the ECG which are otherwise unable to be detected by the human eye. AI would potentially help improve electronic health records, allowing physicians to spend more time with their patients rather than "computer screens" completing clinical notes and would also help enormously in assessing data related to our genome, methylome or proteome. DNA Methylation studies, which are also performed in our department, utilize classifiers which can predict the classification of tumors based on the methylation signature. AI based tools for variant annotations in gene sequencing are being increasingly built and recognized. AI based protein structure design tools are being already developed and used in the pharmaceutical industry in drug design. The book also includes a word of caution about the need to have guardrails in the use of AI and also addresses concerns of privacy and patient data protection. I personally recommend the book since it provides a 360-degree view of the effects of AI in Medicine and allows us to better envision what the future would look like. I think it is important to embrace and adopt AI to deliver tools that will help advance healthcare for our communities.

Deep Work by Cal Newport

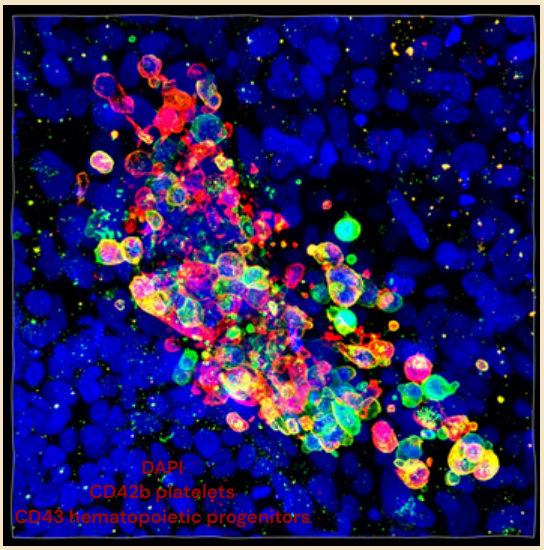
I recommend this book especially due to the high-stakes nature of our daily job and the increasingly distracted world and environment that surrounds us. Cal Newport highlights that in knowledge economy, people who can focus deeply are valued more over others who suffer from fragmented attention. Continuous emails, rise of social media, instant messaging and even certain practices rewarded or viewed favorably in the corporate environment like visibility, rapid response and communication lead to fragmented attention and drop in efficiency and productivity. He also describes how there is a lag in time while switching focus from one activity to another. Multitasking is a myth. Our human brain is only capable of doing a certain amount of stuff meticulously, perfectly or with attention to detail. Cal Newport advocates a strategy of "Deep work" through monastic, bimodal, rhythmic or journalistic approaches or philosophies, whichever one suits the individual. I personally think avoiding distractions is the single thing that can raise the quality of our work from good to great! For that, one has to prioritize and triage work; one has to learn to say "no", one has to schedule time blocks for complete focus, one has to realize that multitasking is a myth and one needs to nurture and develop Emotional Intelligence to let Type 2 thinking drive most of one's day, rather than Type 1 intuitive, reflexive thinking. Cal Newport also highlights various things in the modern workplace which prevent deep work and enlists the aforementioned measures that can be taken to generate a positive shift. I think it is a very good read in the current era of distractions and can potentially stimulate us, as a group, to brainstorm ideas to make our workplaces more efficient and less distracting.

I do acknowledge that there are numerous other books which offer insightful ideas and lessons for us. I, however, hope you liked my list of 5 books and hope you will continue reading and continue to enjoy reading.

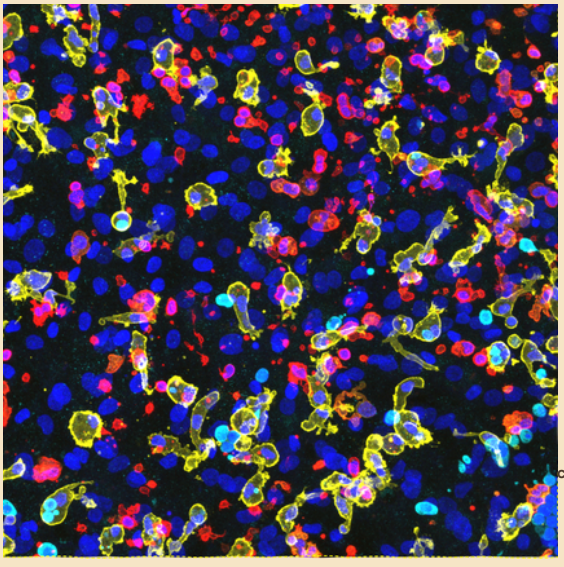
Images courtesy of Dr. Mo Ebrahimkhani



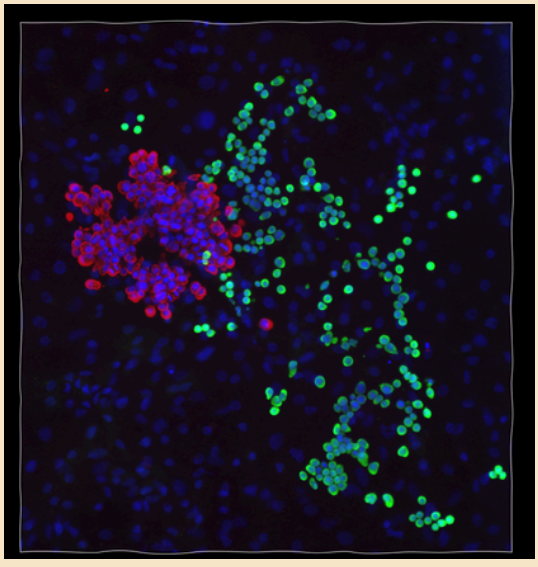
IF staining of Endothelial network (green) and hematopoietic cells (red) from heX-embryoid yolk sac ←



IF staining of Blood Island in stem cell derive yolk sac →



IF staining of Erythroid cells (cyan), megakaryocytes(red), and hematopoietic progenitors (yellow) made from the synthetic yolk sac ←



IF staining of Mega karyocytes(red) and hemoglobin erythroid cells(green) forming a flower shape from synthetic stem cell derived yolk sac →



Christiano Alves, Ph.D.



Assistant Professor of Pathology
Founding Director, SHERLOCK Program

SHERLOCK Program Launches at Pitt Pathology

The Department of Pathology launched the inaugural SHERLOCK (Strategic Hub for Exploratory Research, Learning, Outreach, and Commercialization Know-how) Program in fall 2026.

SHERLOCK was created to expose trainees to career paths and skills at the intersection of academic science, biotechnology, entrepreneurship, investment, and therapeutic development. Sponsored by the Department of Pathology, the program was initiated by Dr. Christiano Alves in the Division of Experimental Pathology and co-organized by Jon Klosinski, with mentorship and support from Drs. Andrew Duncan, Wendy Mars, and Alejandro Soto-Gutierrez. In its inaugural year, SHERLOCK attracted more than 120 registered participants from across the Pitt community, demonstrating strong interest in opportunities that connect scientific training with innovation and real-world translation.

Throughout September, SHERLOCK hosted four live podcast-style sessions featuring eight guests, with approximately 50 participants attending individual sessions live and recorded versions distributed to registered participants to extend the program's reach. Rather than traditional scientific seminars, these conversations focused on the experiences behind different career trajectories: transitioning from academic research to industry, building biotechnology companies, raising capital, evaluating emerging technologies, developing therapeutics, and navigating scientific careers beyond conventional academic pathways.

The inaugural speaker series featured Eric Green, M.D., Ph.D. (Co-Founder and CEO of Trace Neuroscience); entrepreneurs Luca Giani and Shardule Shah, Ph.D.; Jihee Sohn, Ph.D., Senior Principal Scientist in Clinical Biomarkers at Bristol Myers Squibb; genome-editing scientist Cicera Lazzarotto, Ph.D.; and a biotechnology investment panel from TD Cowen featuring Ritu Baral, Managing Director, Nicole Martucci, Ph.D., Research Associate and Pitt CMP alumna, and Joshua Fleishman, Pharm.D., Research Associate. Together, the speakers provided trainees with perspectives spanning scientific discovery, drug development, company formation, biotechnology investing, and career development.

The program culminated on September 28 with the SHERLOCK Innovation Bootcamp and Pitch Competition. The morning began with elevator pitches followed by a keynote from Armon Sharei, Ph.D., Founder and CEO of Portal Biotechnologies, who shared his journey from scientist to biotechnology entrepreneur. Dr. Sharei previously founded SQZ Biotechnologies based on technology developed during his doctoral research at MIT, raising more than $400 million, establishing a collaboration with Roche valued at more than $1 billion, advancing three oncology clinical trials, and taking the company public. He now leads Portal Biotechnologies, where he is developing next-generation technologies for cell engineering.

The bootcamp also brought trainees into direct contact with representatives from the broader Pittsburgh and biotechnology innovation ecosystem, including Pitt's Office of Innovation and Entrepreneurship (OIE), Nucleate, TD Cowen, and The Trivedi Institute for Space and Global Biomedicine. These interactions were designed to help participants understand how scientific ideas move beyond the laboratory and how researchers can access resources, mentorship, funding, and networks to support translation.

The program concluded with a competitive pitch session featuring seven trainee-developed ideas. Jason Hong and Karensa Tjoa (CMP MD/PhD students) received first place for their pitch The Molecular Missile, while Igor Gomes dos Santos (Vigil Neuroimmune) and Riley Sawka (Vasguard Neuro) were recognized as runners-up. The competition challenged participants to move beyond scientific merit alone and consider unmet need, differentiation, feasibility, commercialization, and how to communicate an innovative idea to audiences outside their immediate scientific disciplines.

The inaugural SHERLOCK Program was launched as a pilot initiative to explore trainee interest in opportunities connecting rigorous scientific training with entrepreneurship, innovation, and real-world translation. Feedback from participants and invited guests will now be used to evaluate the program's impact and determine whether and how SHERLOCK should continue in future years. Our team will consider future editions of the program and opportunities to further strengthen its format and reach.

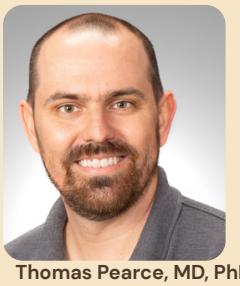


Cancer Classification with DNA Methylation

Advances in machine learning have enabled pathologists to find global patterns in large-scale cancer datasets. DNA methylation is a stable, highly reproducible feature of both normal and cancer cells, and tumors largely retain the methylation signature of their cell of origin. This epigenetic fingerprint lets us trace a tumor's origin and re(de)fine current classification systems. In CNS tumors, methylation profiling is already an established diagnostic tool. Here at Pitt/UPMC, we are extending it to cancers of every organ system through CERES, the Cancer Epitype RESource, an upcoming collaborative effort. https://ceres.pathology.pitt.edu/



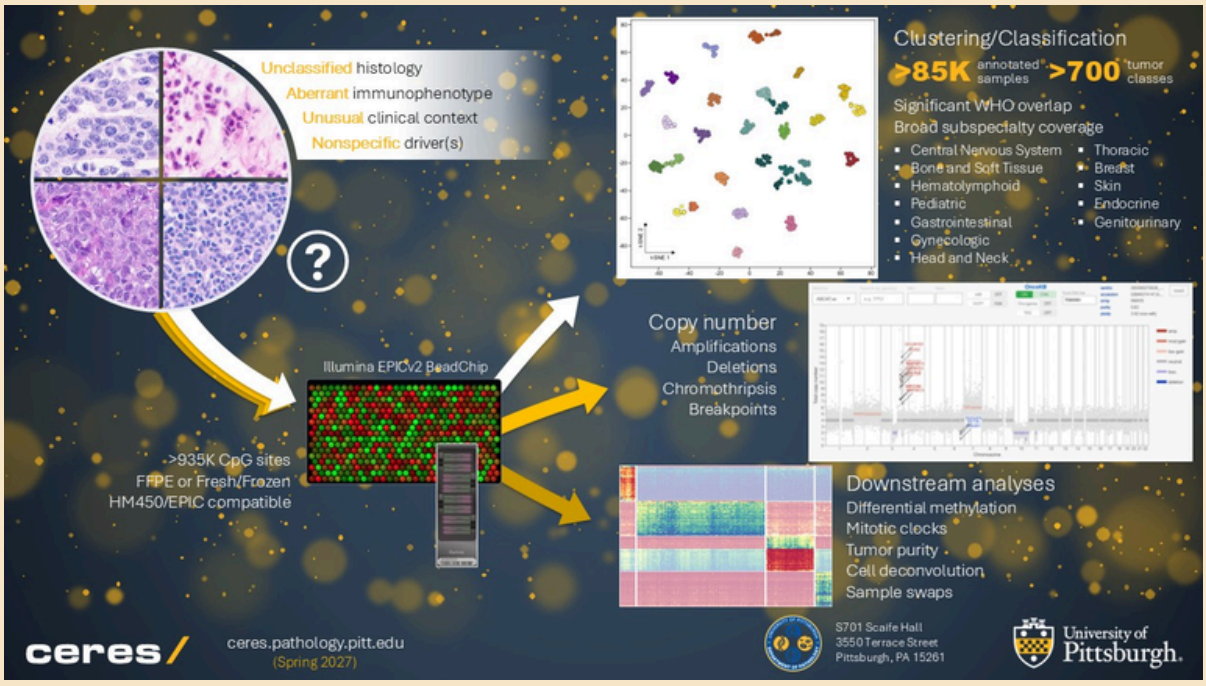
Drew Pratt, MD
Associate Professor of Pathology
Division of Neuropathology

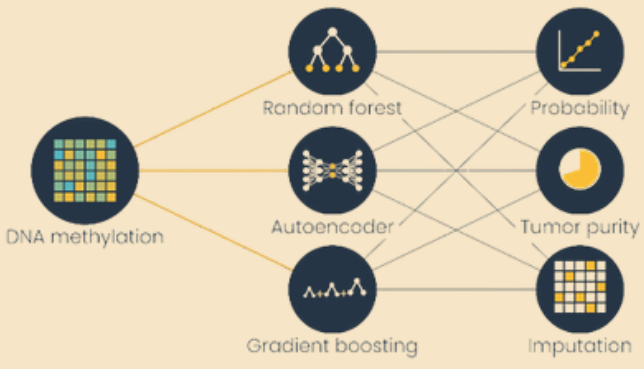


Thomas Pearce, MD, PhD
Assistant Professor of Pathology
Neuropathology/CPACE



John Skaugen, MD
Assistant Professor of Pathology
Molecular Pathology





Machine Learning

Machine learning, a branch of AI, can classify tumors using DNA methylation patterns as molecular fingerprints. Rather than relying solely on tumor morphology, immunohistochemistry, or mutations, the algorithm examines epigenetic changes across thousands of genomic locations to predict the tumor's identity. Pathologists can read resulting scores as diagnostic probabilities. Other tools (e.g., tumor purity) leverage neural networks and gradient boosting. The University of Pittsburgh Center for Research Computing (crc.pitt.edu) provides the high-performance computing and GPU resources used to train these models at scale.

Molecular & Genomic Pathology (MGP)
Fall 2026 Update

John Skaugen, MD



Assistant Professor of Pathology
Division of Molecular &
Genomic Pathology

The first half of 2026 has seen continuous growth of the MGP lab test volume, serving as a high-complexity molecular pathology resource and performing a high volume of complex next generation sequencing (NGS) testing for UPMC patients and clients around the country (and world). The volume of solid tumor comprehensive genomic profiling by Oncomine Plus (500+ gene panel) continues to expand. Brain tumor testing (GlioSeq and methylation array) has also continued to grow despite intermittent challenges with access to commercial methylation classifiers. PancreaSeq has continued to see rapid growth under the guidance of Dr. Aatur Singhi, offering a diagnostic tool for patients with pancreatic cysts.

After several years of hard work, the MGP lab officially launched an in-house DNA NGS panel for hematolymphoid neoplasms (UPMC HemeDx) in June 2026. This MGP test is a custom DNA-based NGS panel performed on Illumina sequencers. The panel covers sequence alterations for 160 genes which are important for the characterization of myeloid and lymphoid neoplasms. The efforts were led by several MGP faculty, fellows, and lab staff, including Dr. Nidhi Aggarwal, Dr. Abby Wald, Dr. Mana Mohebnasab, Dr. Tanner Freeman, Dr. Robert Bubar, Dr. Pranav Patwardhan, Shannon Keating, and James Tucker, among others. The planning and validation of this panel also saw UPMC join the GOAL[1] Consortium, allowing for enhanced collaboration with and support from other molecular laboratories.

The division was happy to welcome a new faculty member, Dr. Azhar Saeed, who joined as a Clinical Assistant Professor in March 2026. Dr. Saeed was previously at the University of Vermont, where she was actively involved in gastrointestinal and molecular pathology sign-out and research. She received her medical degree from Arabian Gulf University and completed her residency at the University of Kansas and fellowships at the University of Minnesota and the University of Utah. The division also welcomed Heidi Tarnaski as a laboratory administrative assistant in September 2026.

The division and laboratory also saw major leadership shifts this year, with Dr. Marina Nikiforova deciding to step down from her role as Director of the UPMC MGP Laboratory in August 2026. Dr. Nikiforova led the MGP lab for 20 years and was instrumental in its expansion and success as well as the development of many innovative tests. Dr. Nikiforova will remain faculty in the division, participating in clinical sign-out, and will continue as the Co-Director of Molecular Genomic Commercialization. Dr. Abby Wald was named as the new Director of the MGP lab after serving several years as Assistant Director and 14 years overall in multiple roles. Dr. Mana Mohebnasab was named Assistant Director of the MGP lab as well as Director of MGP Informatics. Additionally, Dr. John Skaugen was appointed as Division Director after previously serving as Assistant Division Director. Dr. Yuri Nikiforov will continue as Executive Vice Chair for Molecular Pathology in the department and provide valuable leadership during this period of transition.

[1] Genomics Organization for Academic Laboratories (GOAL) - . https://www.goalabs.org

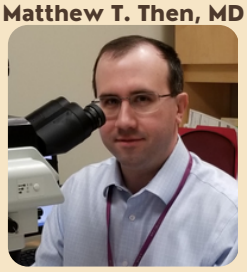




MGP lab celebration for launch of Heme NGS panel

Fall Community Update

Matthew T. Then, MD



Clinical Assistant Professor of Pathology
Division of Community Pathology

The past several months have brought a great deal of activity across the Community Division. We are pleased to welcome three new staff members: Dr. Jacob Jerome at Passavant, Dr. Pranav Patwardhan at Altoona, and Dr. Matthew Chambers at East. It is also great to see three excellent graduates of the UPMC residency training program join us in the community. I encourage any trainees interested in general or community practice to consider a community elective rotation during your training. Each new member has shared a brief introduction and a heartfelt message, offering colleagues an opportunity to get to know them.

Following the retirement of Dr. Harold Ashcraft from UPMC Somerset, the laboratory has undergone a series of significant workflow changes. Special thanks go to the Somerset staff for skillfully navigating a complete transformation of their anatomic pathology practices, and to the Altoona team for supporting the grossing and histology of Somerset specimens. The clinical laboratory has also strengthened its connection with Altoona through the thoughtful consolidation of microbiology services. The excellent leadership of Cindy Lecomte and Jason Oliver has helped maintain consistent quality throughout this transition.

The Community Division recently held its annual meeting at Passavant. Thank you to the department leaders and the many pathologists from across the division who gathered for camaraderie, meaningful conversation, and important updates. We were especially pleased that Dr. Jacob Gildea traveled from Harrisburg and that Drs. Nathaniel Sherwood and Lawrence Lee made the long journey from UPMC Washington. For geographically dispersed colleagues, the opportunity to connect in person and share fellowship is every bit as valuable as the messages delivered from the podium. Special thanks to the Passavant team for hosting this memorable event.

In the past several months, I was fortunate to visit the Altoona campus and each site in the Northern Regional pod. Beyond its vital support of Somerset, Altoona has a modern, efficient, and growing laboratory. Across the Northern Regional group, the laboratory renovations at Northwest were particularly impressive. Horizon's two campuses continue to meet a diverse range of anatomic and clinical pathology needs, while Jameson has developed into an outstanding grossing and histology hub for the pod. Together, these sites demonstrate the strength and adaptability of our regional network.

Finally, the demanding Epic transition has underscored the remarkable cooperation and teamwork found throughout the Community Division. At UPMC East, colleagues from Somerset and Altoona provided invaluable support and guidance as the site began its Epic journey. Similar stories of collaboration emerged across the rest of Wave 2, reflecting a shared commitment to helping one another adapt, succeed, and continue delivering high-quality service through a period of significant change. With any successful project in the lab, snacks are essential.



Dr. Matt Chambers:



I joined community pathology in July 2026. I received my M.D. from the Icahn SOM at Mount Sinai in 2021. I completed residency training in Anatomic and Clinical Pathology at UPMC, as well as a fellowship in Genitourinary Pathology at Shadyside Hospital. Prior to coming to UPMC, I completed a Ph.D. in microbiology, with a focus on hepatitis C virus and Zika virus, studying how viruses enter cells as well as virus-antibody interactions.

Dr. Jacob Jerome:

As a Pittsburgh native, I am thrilled to continue my long tenure at UPMC, a place that has been central to so much of my professional and personal life. I completed my undergraduate studies at the University of Pittsburgh, earned my MD from the University of Pittsburgh School of Medicine, completed residency at UPMC, and went on to breast and GYN fellowship training at Magee-Womens Hospital. I look forward to working with the fantastic group at Passavant and continuing to be in contact with all the great faculty in Oakland and Shadyside that trained me. Outside of work, I enjoy getting outside whenever I can and spending time with my amazing family, my wife, Shelby, and my daughters, Talia, who is 3, and Maeve, who passed away in 2026.



Dr. Pranav Patwardhan:



Hello! I am Pranav Patwardhan. I finished my medical education and a pathology residency in India before coming to the United States to pursue further training. I finished my AP/CP residency followed by a fellowship in Hematopathology & Molecular Genetic Pathology at UPMC before continuing in the health system as a Clinical Assistant Professor.

I am strongly interested in research endeavors related to Hematopathology & molecular pathology. I am equally passionate about pathology education and have tried to highlight and emphasize the role of diagnostic pathology in the modern practice of medicine through my social media accounts, including my Facebook page “Understanding Pathology”. I hope to continue my career in the fields of hematopathology & molecular pathology.

Outside of work, I truly enjoy classical music. I have trained in Indian classical music for nearly 25 years and have performed at various concerts in India, before my career in medicine began. I truly feel my training in music helped me in my career in medicine. It taught me the value of patience and perseverance and has kept me grounded (no matter how well you have performed in the past, you still need to give your 100% the next time you perform). I also love reading books (at least 1/month).



GO TEAM!

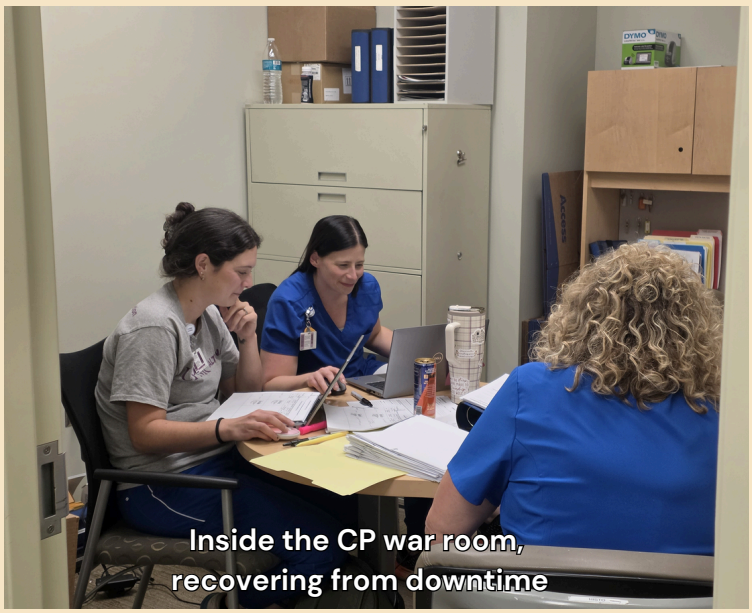


Somerset anatomic pathology

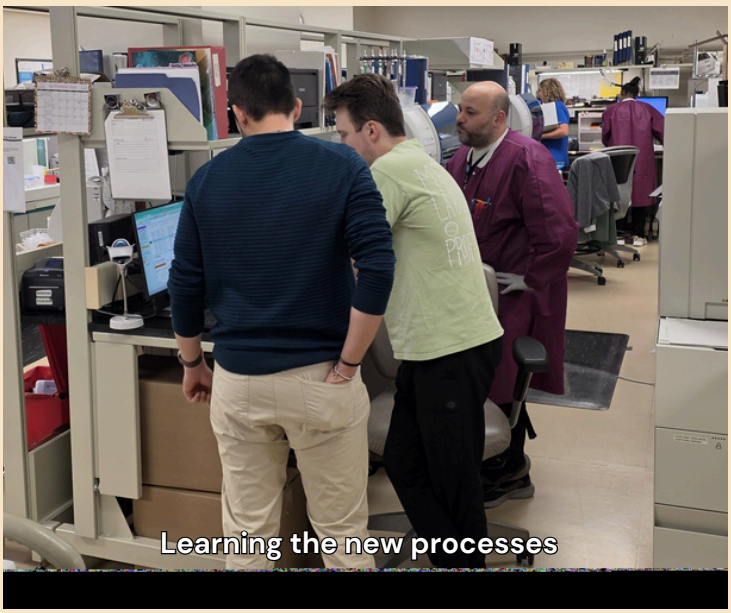


Somerset clinical pathology

Go Live



Inside the CP war room, recovering from downtime



Learning the new processes



Exploring Epic workflows



Go live snacks

Finding a Needle in a Haystack: Flow Cytometry AML MRD Testing at UPMC

Sara Monaghan , MD



Associate Professor of Pathology, Division of Hematopathology

Ahmad Al-Attar, MBChB, PhD



Associate Professor of Pathology, Division of Hematopathology

As of July 16, 2026, the Division of Hematopathology and the Clinical Flow Cytometry Laboratory at UPMC began offering in-house flow cytometry acute myeloid leukemia measurable/minimal residual disease (AML MRD) testing. MRD is defined as leukemic cells below the detection threshold by morphologic methods. Bringing this testing in-house represents a major expansion of our laboratory's diagnostic capabilities, with faster turnaround time, closer integration with hematopathology workflows, and significant cost savings for UPMC by reducing reliance on expensive send-out testing.

MRD status is the most important posttreatment prognostic marker for AML patients who meet criteria for morphologic complete remission (CR). The goal of MRD testing in AML is to monitor effectiveness of treatment, predict relapse, guide treatment decisions and monitor disease progression. Our flow cytometry assay meets all recommendations of current National Comprehensive Cancer Network (NCCN) Guidelines (Version 5.2026), including (1) application of both different from normal (DfN) and leukemia-associated immunophenotype (LAIP) assessment, (2) interpretation by experienced hematopathologists in the same laboratory in which the AML diagnosis has been established, and (3) a minimum limit of detection (LOD) ≤ 10^{-3} or ≤ 0.1% (i.e. the ability to detect ≤ 1 abnormal cell in 10,000 cells), which in some cases extends to 10^{-4} depending on specimen quality and leukemic immunophenotype. Although molecular MRD assays can be more sensitive than flow cytometry (e.g. LOD 10^{-4}–10^{-5}), they are only applicable to AML with specific abnormalities, namely NPM1 mutation, RUNX1::RUNXT1, CBFB::MYH11, PML::RARA.

The panel adopted by our laboratory is a 23-parameter, 12-color assay recommended by the European LeukemiaNet (ELN)-DAVID International Working Group (Cloos J, et al 2025). The panel includes 5 markers beyond those recommended as core consensus markers, including some newer AML markers (CD25, CD54, CD133). CD25 is the IL-2 receptor, which is minimally expressed on hematopoietic progenitors. CD54 is an adhesion molecule that plays a role in cell trafficking and retention in the marrow microenvironment. Both CD25 and CD54 can be overexpressed in AML. CD133 is positive on early progenitors and granulocyte committed progenitors but is absent on normal monocytic- or erythroid-committed progenitors, and it can be abnormally lost in AML.

Comprehensive understanding of what can be expected in normal and regenerating bone marrows is important for evaluation of the expression patterns of all markers. For example, increased expression of CD25 can be seen on the earliest progenitors within 30 days after induction chemotherapy, hematopoietic stem cell transplant, or therapy with granulocyte colony-stimulating factor. Although overtly abnormal antigen expression differs from that seen in these regenerating settings, flow cytometry AML MRD assessment is difficult during exuberant regeneration and appropriate caution must be exercised.

Flow Cytometry AML MRD testing is the most complex testing performed by clinical flow cytometry laboratories. Successful implementation at UPMC has been accomplished after an extensive validation process, implementing the highest standards for this laboratory developed test (LDT). It required the coordinated efforts of medical laboratory scientists, laboratory leadership, and Hematopathology faculty. Normal patterns and intensity of antigen expression were established for our laboratory based on 79 AML MRD-negative bone marrow specimens. Diagnostic accuracy was demonstrated based on (1) verification with molecular MRD studies (MRD-positive and negative samples) in 70 cases, (2) verification with other positive molecular/cytogenetic confirmatory testing in 35 cases, (3) nine experiments of spiking AML blasts into negative pooled bone marrow specimens, and (4) clinical correlation/follow-up. A comparison with reference laboratory flow cytometry AML MRD results was also conducted in 163 specimens. Other aspects of the validation included sensitivity and linearity studies, precision studies, specimen stability and processed sample stability studies and carryover studies.

Faculty providing the AML MRD interpretation for this testing participated in multiple rounds of learning cases and a final validation set. Consensus was reached for reporting different MRD interpretations, with specified guidance for each category:

· MRD-positive
· MRD-positive in a limited sample
· Indeterminate
· MRD-negative
· MRD-negative with mild atypia
· MRD-negative in a limited sample
· Inadequate for MRD assessment

The indeterminate category is used when atypical cells are detected but they are indeterminate for reactive atypia, clonal hematopoiesis, background MDS, or AML MRD with immunophenotypic switch or an emerging subclone. Limited samples are defined as those with <200 CD34+ myeloid progenitors/blasts or <200,000 nucleated cells for a prior CD34-negative AML. "Inadequate for MRD assessment" is only used for cases without convincing abnormal blasts and does not apply to an MRD-positive case; criteria are <100 CD34+ myeloid progenitors/blasts or <100,000 nucleated cells for a prior CD34-negative AML.

For patient care testing, a second faculty member is available to review all cases prior to sign-out. Faculty providing AML MRD interpretations meet regularly to review interesting or difficult cases, any MRD interpretations that appear discordant with other testing, any technical difficulties, and other clinical service issues.

Below are key points for providers who order flow cytometry AML MRD testing:

1. Specimen Requirement — The assay is validated for adult bone marrow aspirates. The sample should be collected as the "first pull" bone marrow (maximum 4-5 mL) and submitted in sodium heparin anticoagulated tube (green top). Please ensure that the tube(s) are thoroughly mixed to prevent clotting.

2. Assay Design — The AML MRD assay is designed to detect leukemia-associated immunophenotypes (LAIPs) and difference from normal (DfN) maturation patterns.

3. Assay Sensitivity — Sensitivity is between 0.1-0.01% (10^{-3}–10^{-4}) , depending on specimen quality and the immunophenotype of the leukemic clone.

4. Limitations of a Negative Result — A negative MRD result does not exclude the presence of residual disease. Sensitivity may be affected by sample quality, hemodilution, immunophenotypic shifts following therapy, or low-level disease below the limit of detection.

5. MRD results must be interpreted in conjunction with morphology, cytogenetics, molecular testing, and clinical context. Discordant results may occur and should prompt multidisciplinary review.

For more information on this assay, or any related question to the services provided by the Hematopathology Division / Flow Cytometry Laboratory, please contact: (1) Wendy Shallenberger, Manager, Special Hematology, millerwl@upmc.edu; (2) Kaitlyn Livengood, Hematopathology – Senior Administration Assistant, livengoodkp@upmc.edu

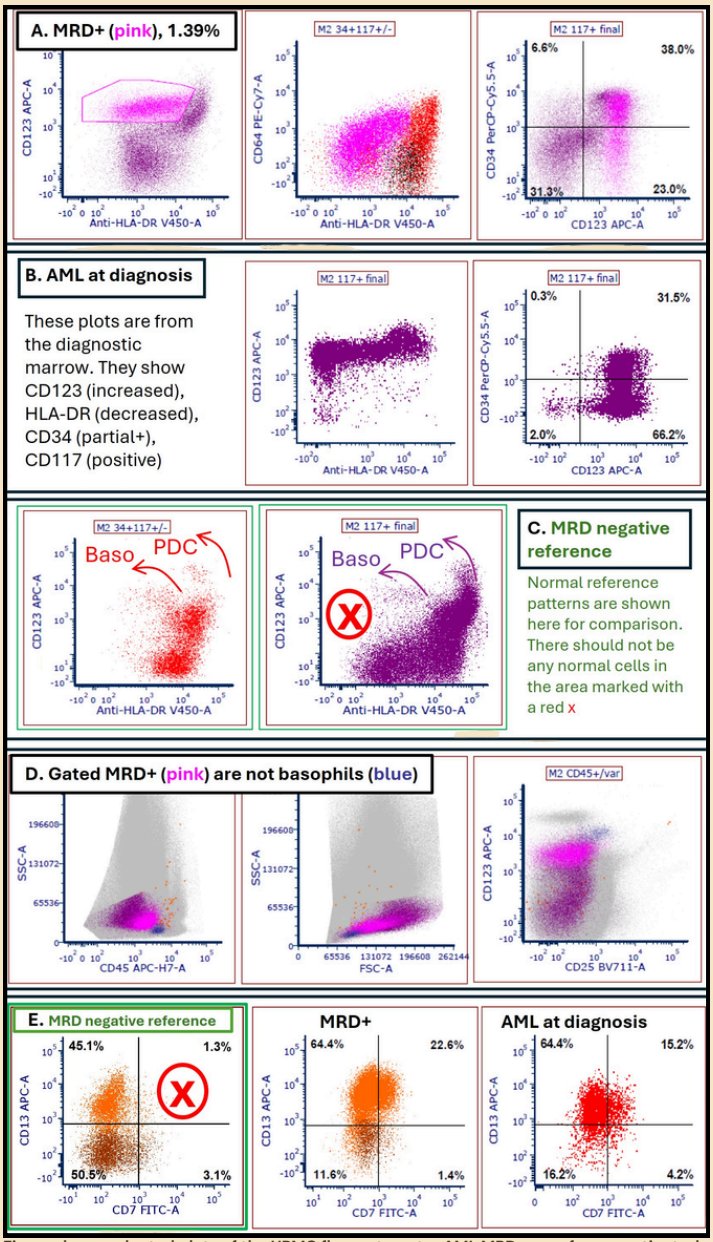
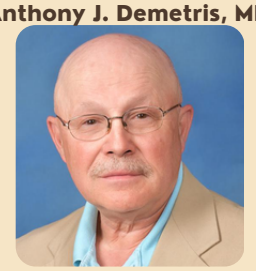


Figure shows selected plots of the UPMC flow cytometry AML MRD assay from a patient who is status-post induction chemotherapy (x2), and cycle 1 of consolidation chemotherapy for AML, NOS. The morphologic bone marrow evaluation revealed a normocellular bone marrow without increased blasts. The interpretation of the flow cytometry is MRD-positive with abnormal blasts representing 1.39% of total cells that are CD123 (increased), HLA-DR (decreased), CD34 (partial+), CD117+ (A), similar to the diagnostic marrow (B). The findings are different from normal reference patterns shown in C. The MRD population does not represent early basophils seen in D. Normal reference pattern for CD7 and CD13, and abnormal coexpression of these markers for MRD+ population and diagnostic AML are shown in E.

Hepatic and Transplantation Pathology



Anthony J. Demetris, MD

Starzl Professor of Liver and Transplant Pathology, Division Director, Transplantation Pathology

Since 1990, the Division of Hepatic and Transplantation Pathology has played an integral role in the comprehensive transplant program at UPMC. The Division's mission is to provide expert, comprehensive consultation in native and allograft liver, kidney, intestine, composite tissue, and solid organ transplant pathology for both community-based and academic physicians. In addition, the Division is committed to fostering an academic environment dedicated to education and training, while advancing translational and basic research in native liver, kidney, and transplantation pathology.

Our Division's reputation for excellence and longstanding expertise continues to generate consultation requests from both UPMC-affiliated and external institutions. The vast majority of cases reviewed are complex specimens that require extensive evaluation and expert interpretation. The third quarter marked another period of growth, continuing the positive trajectory observed throughout 2026. Total consultation volume increased from 173 cases in the first quarter to 191 cases in the third quarter, representing a year-to-date increase of more than 10%. This sustained growth reflects the continued demand for the Division's specialized expertise, highlights strong operational performance, and positions the Division for continued success through the remainder of the year.

The Division is deeply committed to education and training in transplantation pathology. Our faculty actively teach and mentor medical students, graduate students, residents, fellows, clinicians, and pathologists at both local and international levels. The Division heads the Banff Working Group on Liver Allograft Pathology and the Banff Working Group on Borderline Change and T-Cell Mediated Rejection in Kidney Allografts. These groups establish the international consensus standards for allograft pathology and convene biennially to present emerging findings, review advances in the field, and define future directions. The 2026 Banff Meeting was held October 5 – 9 in Banff, Alberta, Canada. This meeting featured strong representation from our faculty and former fellows, many of whom have advanced into leadership roles within their institutions and within the Banff structure, including small intestine allograft pathology and molecular profiling of liver allografts. Their contributions underscore the Division's longstanding commitment to training the next generation of leaders in transplantation pathology.

The division continues to maintain a strong and diverse portfolio of extramural funding at approximately $5 million annually, from sources including the National Institutes of Health (NIH), Immune Tolerance Network (ITN), pharmaceutical companies, and biomedical technology firms. For many of these initiatives, the Division serves as a Core Laboratory, providing critical support for the development of emerging technologies, evaluation of novel therapeutics in clinical trials, and investigation of innovative approaches to immunosuppression management following kidney and liver transplantation. This sustained level of support reflects the Division's internationally recognized expertise in transplantation pathology, strong publication record, and commitment to advancing the field through the application of cutting-edge tissue analysis technologies. These capabilities include digital imaging, image analysis, and a broad range of multi-omics platforms, such as spatial transcriptomics and single-cell RNA sequencing (scRNA-seq). These enable comprehensive molecular characterization of allograft and native organ disease and support translational research at the forefront of transplantation medicine.

The Division was proudly represented at the 31st International Congress of The Transplantation Society (TTS), held in Sydney, Australia September 20-23. During the Congress, Dr. Anthony J. Demetris was honored as the recipient of the 2026 TTS Starzl Innovation Award, a prestigious international distinction recognizing groundbreaking and original contributions that have significantly advanced the field of transplantation medicine. We extend our heartfelt congratulations to Dr. Demetris on receiving this remarkable honor. The TTS Starzl Innovation Award is widely regarded as one of the most respected and distinguished awards in transplantation medicine, reflecting Dr. Demetris's enduring impact on the field and his commitment to advancing transplant science and patient care.



TTS 2026 Starzl Award ceremony.
Pictured: (From left to right) Dr. John Fung, TTS President, Professor of Surgery, Co-Director, Transplant Institute – University of Chicago, Chicago, IL. Dr. Anthony J. Demetris, 2026 Starzl Award recipient. Dr. Mehmet Haberal, Pioneering Turkish Surgeon and Academic, and philanthropist who helped fund this award.



Former Transplant Fellows and current faculty represented at the 2026 Banff Meeting in Banff, Alberta, Canada. Pictured: (From left to right) Dr. Ibrahim Batal, Pathologist at New-York Presbyterian Hospital-Columbia and Cornell, New York, NY (NIH funded physician). Dr. Parmjeet Randhawa, Professor of Pathology, Division of Transplant Pathology, UPMC. Dr. Heather Stevenson-Lerner, Professor, John Sealy School of Medicine, Director, Liver and Transplantation Pathology and John Sealy Diagnostic Center, Co-Director, combined MD/PhD Program, The University of Texas Medical Branch (NIH funded physician). Dr. Oyedele Adeyi, Professor and Division Director of Anatomic Pathology at the University of Alabama Medical School. Dr. Mohamed El Hag, Liver and Gastrointestinal Pathologist, Cleveland Clinic. Dr. Anthony J. Demetris, Starzl Professor and Director, Transplant Pathology, UPMC. Andrew Lesniak, Director Software Engineering, UPMC.

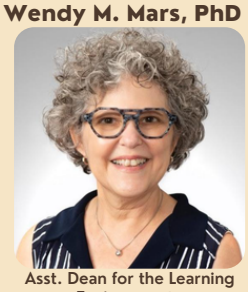


The Banff Liver Group Meeting held at the 2026 Banff Meeting in Banff, Alberta, Canada.



Pathology Faculty in Partnership with the School of Medicine

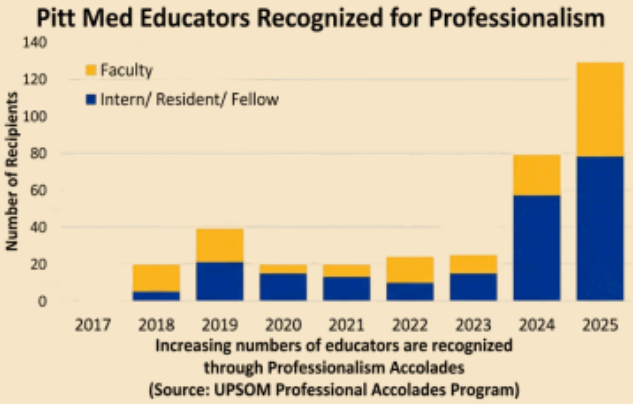
Wendy M. Mars, PhD

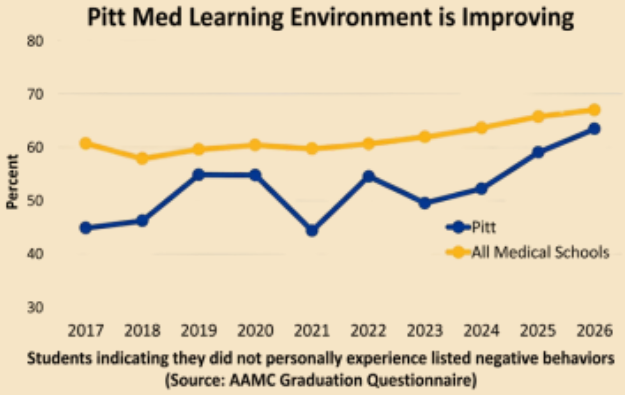


Asst. Dean for the Learning Environment,
Professor of Pathology,
Director, Pathology Graduate Program

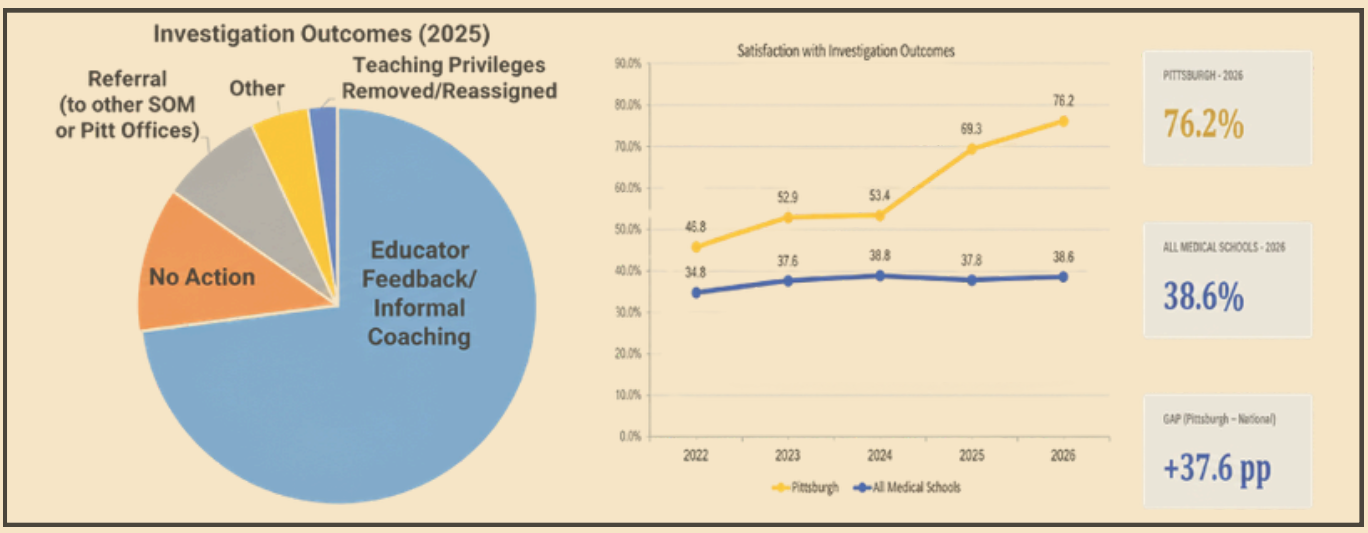
I am excited to share information about the partnership between the Office of the Learning Environment (OLE) and the Department of Pathology. The OLE is one of nine Offices within the University of Pittsburgh School of Medicine that reports to the Vice Dean for Education, Abbas Hyderi, MD, MPH. Our mission is to ensure a safe, supportive, and respectful educational experience for all Pitt Med medical and graduate students by partnering with each Department to 1) celebrate outstanding educator, staff, and student professionalism ("Accolades"), 2) identify, investigate, and prevent educator lapses in professionalism ("Incidents").

Accolades: Public celebrations of positive educator behaviors through multiple venues, including our Professionalism Accolade and Incident Reporting (PAIR) submission program, have had a notably positive correlation with improvements in the learning environment. As PAIR accolade submissions have risen, our students have reported a more favorable view of the learning environment overall. We invite you to recognize excellence in education and professionalism exhibited by your peers by submitting an accolade.





Incidents: Notifying the OLE of concerning behavior allows us to help develop better educators! Most reports we receive result in informal educator feedback and/or coaching, administered in partnership with Departmental Vice Chairs for Education (Dr. Marie DeFrances in Pathology). Action is only taken when permission is granted by the reporter and feasible (i.e. the reported educator is identifiable and part of our system). In rare cases, educators are removed from their teaching role or the student is re-assigned to another location. As shown below, our students appear greatly satisfied with this approach. Feel free to email me if you have any questions: wmars@pitt.edu



Transfusion Medicine: A Multidisciplinary Specialty Beyond Blood Banking

Magali J. Fontaine, MD, PhD



Professor of Pathology, Director, Division of Transfusion Medicine and Cellular Therapy, Director of Transfusion Services and Reference Laboratories at Vitalant Pittsburgh, Professor, Department of Immunology

At the intersection of blood banking and organ transplantation, Transfusion Medicine is often perceived as a "black box" by non-laboratory clinicians and trainees. The primary responsibility of a Transfusion Medicine physician is to ensure the safe collection, processing, and administration of blood products, while preventing transfusion-related adverse events. The complexity of this role is substantial, requiring expertise across multiple scientific disciplines. Specialists must understand genetics and immunology for compatibility testing, hematology for transfusion management, and bioengineering for the technologies used to collect, manufacture, and store blood products using optimized preservation strategies. In addition, the rapidly expanding field of Cellular Therapy increasingly relies on the same foundational expertise, further broadening the scope and impact of Transfusion Medicine.

The Division of Transfusion Medicine and Cellular Therapy at the University of Pittsburgh School of Medicine is directed by Magali Fontaine, M.D., Ph.D., who joined the Department of Pathology in January 2026 after serving on the faculty at the University of Maryland and previously at Stanford University. Dr. Fontaine completed her Clinical Fellowship in Transfusion Medicine at the Mayo Clinic in Rochester MN and earned her Ph.D. in Cell Transplantation from the University of Illinois. She served on the Board of the American Society for the Advancement of Blood and Biotherapies (AABB) and currently serves on the Board of BEST Collaborative in Transfusion Medicine and Cellular Therapies. Her research focuses on the role of red blood cell interaction with innate immune cells specifically in patients with inflammatory vascular diseases such as sickle-cell and end stage renal disease. To improve the safety of the blood supply, Dr Fontaine's Lab is embarking on a collaboration with engineers at Colorado State University to test novel technologies of pathogen inactivation through UV irradiation, funded by the FDA/CBER.

In partnership with Vitalant Blood Services, the division serves a centralized transfusion service, comprised of a team of six physicians dedicated to excellence in patient care, education, and research. The team provides clinical service coverage to over twenty hospitals, including multiple trauma centers, with hematology/oncology, solid organ transplants, and cardiovascular surgery programs. Recently many process improvement procedures have been initiated, including a system-wide blood administration policy and guidelines on the use of granulocytes and HLA matched platelets, a rotational schedule and inventory management for low titer O whole blood, and a standardized UPMC-wide EMR for apheresis procedures. The Division also participates in numerous clinical trials including the Sickle Cell Disease and Cardiovascular Risk —Red Cell Exchange (SCD-CARRE) trial, which results will be presented at the Plenary Abstract Session of the 2026 Annual Meeting of the American Society of Hematology (ASH).

The division plays a key educational role led by Dr. Lirong Qu, Professor of Pathology and Associate Director of the Pathology Residency Program, whose dedication and expertise have greatly strengthened the Transfusion Medicine educational experience. The University of Pittsburgh. Pathology residents benefit from an exceptional training environment that inspires future leaders in the field. As evidence of this success, three current pathology residents have chosen to pursue fellowships in Transfusion Medicine.

Dr. Alesia Kaplan, Director of the Transfusion Medicine Fellowship Program, recently established the first combined Transfusion Medicine/Informatics Fellowship at UPMC, with the inaugural trainee expected to begin in 2028. She is also actively developing a Cellular Therapy Fellowship program targeted for launch in 2029. Dr. Suzanne Bakdash, together with Dr. Irina Chibisov, leads the educational curriculum and lecture series for Coagulation Rotation. Combined with the Blood Bank Rotation, this program was recently nominated for the CP Rotation Educational Experience Award. Dr. Bakdash was also honored with the 2026 CP Teaching Faculty Award in recognition of her commitment to trainee education.



The division is further distinguished by the contributions of Dr. Irina Chibisov, Director of Apheresis Collections and Therapeutics, and Dr. Mark Yazer, co-investigator on multiple grants: a DARPA-funded project on artificial blood, a DOD study on safety of low titer whole blood, and NIH-funded grant on Rh immunization in pregnancy. Most recently, Dr Yazer co-authored a NEJM paper on Prehospital Resuscitation with Type O Whole Blood for Trauma and Hemorrhage. Through their leadership in clinical care, education, and research, the Division of Transfusion Medicine and Cellular Therapy continues to advance the field, while preparing the next generation of transfusion medicine specialists.

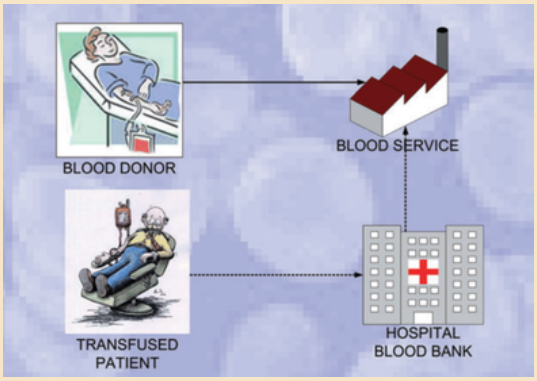


Figure 1. The Centralized Transfusion Service. A Donor-Vein-to-Patient-Vein service adapted to specific patients' needs.

Klionsky Summer Research Fellowship in Pathology

Marie C. DeFrances, MD, PhD



Vice Chair, Pathology Medical Education, Professor of Pathology, Division of Molecular & Genomic Pathology

On Monday, June 1, we welcomed seven Klionsky Summer Research Fellows to the Department for approximately eight weeks of research and exposure to pathology as a career. The Klionsky Summer Research Fellowship in Pathology provides medical students with an opportunity to engage in exciting research projects with our faculty following their first year of medical school. It is directed by Drs. Wendy Mars, Christi Kolarcik and Marie DeFrances.

In addition to their research experiences, the fellows gain firsthand exposure to the clinical practice of pathology through the Summer Training Experiences in Pathology for Medical Students (STEPS) program. Held weekly throughout the summer, STEPS offers interactive activities designed to introduce students to the breadth of the specialty, including performing a mock fine-needle aspiration (FNA), observing an autopsy, and touring the histology laboratory. Seven faculty members and nine residents from our Department hosted and mentored the medical students during these sessions.

The Fellowship was the brainchild of the outstanding educator and esteemed pathologist Dr. Bernard Klionsky (1925 - 2017), who enjoyed a long and distinguished career in our Department. Dr. Klionsky also generously supported the program, enabling each fellow to receive a stipend while training with us.

This year's Klionsky Fellows came from medical schools as far away as Puerto Rico and as close to home as Pittsburgh. Their research spans a broad range of areas, from transplantation and pulmonary fibrosis to melanoma, cancer metastasis, and artificial intelligence in digital pathology. We hope many of the fellows will have the opportunity to build upon their summer work, developing their projects into abstracts and presentations at national meetings and, ultimately, first-author publications.

Medical Student	Medical School	Mentor	Project Title
Katherine Beavis	University of Pittsburgh School of Medicine	Dr. Jonhan Ho	Digital Measurement of Breslow Thickness in Malignant Melanoma
Hannah Kim	SUNY Upstate Medical University	Dr. Amanda Clark	Modulating the Premetastatic Niche: The Role of Statins in Preventing Metastasis
Rebecca Maysonet	Duquesne University College of Osteopathic Medicine	Dr. Ari Karunamurthy	Utility of P16 Stain in the Evaluation of Ambiguous Melanocytic Neoplasms
Sandra Ruiz	San Juan Bautista School of Medicine	Dr. Daniel Kass	Investigating the Role of CXCL6 in Collagen Translation in Lung Fibroblasts
Karlene Stanton	University of Pittsburgh School of Medicine	Dr. Nigar Khurram	A Pilot Spatial Transcriptomic Study of Indeterminate Antibody-Mediated Rejection in Liver Allografts
Jacqueline Wang	University of Pittsburgh School of Medicine	Dr. John Kirkwood	Evaluating the Impact of Sulforaphane on the Histopathology of Atypical Nevi of Patients at High Risk for Melanoma
Denise Zheng	University of Pittsburgh School of Medicine	Dr. Steven Chinn	Digital Pathology for Immunotherapy Response Prediction: Integrating AI Models for Biomarker Development and Virtual PD-L1 Staining in Head and Neck Cancer

Cellular & Molecular Pathology GRADUATE PROGRAM UNIV. OF PITTSBURGH



Andrew W. Duncan, PhD
Associate Professor of Pathology,
Division of Experimental Pathology

The Cellular & Molecular Pathology (CMP) Graduate Program brings together a broad community of students and faculty studying metabolism; heart, lung, and vascular biology; cancer biology; liver biology; neurodegenerative diseases; regeneration and repair; and other areas of pathobiology. These interconnected research areas provide PhD students with opportunities for multidisciplinary training and collaboration. CMP is led by Andy Duncan, PhD (Director), Wendy Mars, PhD (Emeritus Director), Rodrigo Florentino, PhD (Curriculum Director), and Amanda Bytzura, MBA (Coordinator).

Welcome New Students

In 2026, CMP welcomed 18 new PhD students: 11 from the Interdisciplinary Biomedical Graduate Program (IBGP), four from the Medical Scientist Training Program (MSTP), and three transfer students. These additions bring the program's total enrollment to 56 PhD students. We are pleased to welcome the following students and recognize their faculty mentors:

- Molly Behan (Kliment Lab)
- Joseph Collura (McGovern Lab)
- Andrew Craig (Alder Lab)
- Maria Dam Ferdinez (Dong Lab)
- Rutuja Deshmukh (Lee Lab)
- Jack Drda (Kohan Lab)
- Alysa Evans (Megli Lab)
- Benjamin Glennon (Alves/Thathiah Labs)
- Danielle Illy (Tan Lab)
- Minjie Kuang (Turnquist Lab)
- Noor Nader (Bruno Lab)
- Justin Navidzadeh (Razani Lab)
- Sita Paudel (Apetrei Lab)
- Ruvi Ranatunga (Megli Lab)
- Yahira Rivera-Lopez (Dong Lab)
- Justine Shamber (St. Hilaire Lab)
- Aisha Vallopra (Boyd-Shiwarski Lab)
- Xiyun Zhang (Alves Lab)

Recent Graduates

Congratulations to the seven CMP students who successfully defended their dissertations in 2026. We celebrate their research accomplishments and wish them continued success as they begin the next chapter of their careers.



- Ibrahim Ahmed, PhD (Gomez Lab)
- Salma El-Mossier, PhD (Hussey Lab)
- Taylor Gatesman, PhD (Agnihotri Lab)
- Jack Little, PhD (Lucas/McAllister Labs)
- Varun Mandi, PhD (Yechoor Lab)
- Zana Ross, PhD (Kershaw Lab)
- Jiazhen Xu, PhD (Donnelly Lab)

Welcome New CMP Faculty

- Marija Balic, MD, PhD, MBA
- Afshin Beheshti, PhD
- Cary Boyd-Shiwarski, MD, PhD
- Jishnu Das, PhD
- Brian Davis, PhD
- Taylor Eddens, PhD
- Magali Fontaine, MD, PhD
- Neil Kelly, MD, PhD
- Adrian Lee, PhD
- Jing Li, PhD
- Melissa McGovern, PhD
- Matthew Neal, MD
- Amrita Sahu, PhD
- Heth Turnquist, PhD
- Alexandria Wells, PhD

Welcome

CMP Summer Research Programs

CMP offers summer research programs for high school and undergraduate students. These programs provide hands-on research experience and faculty mentorship, introducing students to pathobiology and encouraging careers in biomedical research and medicine.

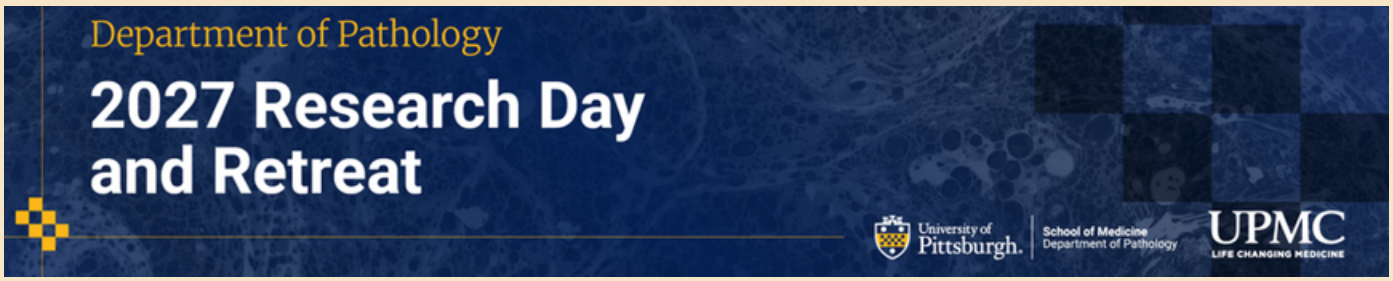
- **Pathobiology Site, UPMC Hillman Research Academy:** The Pathobiology Site introduces high school students from the Pittsburgh area to biomedical research through hands-on experiences in Pathology laboratories. Students explore how tissues develop and function and how cellular and molecular changes lead to disease, with projects spanning basic science and clinical research. In 2026, 10 students conducted research in 10 Pathology laboratories. Director: Andrew Duncan, PhD. Learn more about Hillman Research Academy. https://hillmanacademy.upmc.com/about-us/our-research-sites/
- **CMP Site, Summer Undergraduate Research Program (SURP)**: SURP is a competitive University of Pittsburgh School of Medicine program that draws undergraduate students from across the country. Students at the CMP site gain hands-on research experience and mentorship in the laboratories of CMP faculty members. The program also helps recruit promising students into PhD and MD/PhD training at Pitt. In 2026, the CMP site hosted two students. Directors: Amanda Clark, PhD, and Hun-Way Hwang, PhD. Learn more about SURP Summer Undergraduate Research Program (SURP) | School of Medicine Graduate Studies

Both programs will be recruiting faculty research mentors for summer 2027. If you are interested in hosting a student in your laboratory, please contact the respective program directors.

Get Involved with CMP

CMP welcomes faculty interested in mentoring students, teaching, and contributing to other program activities. To learn more about opportunities to participate, please contact Dr. Duncan (duncana@pitt.edu) or program coordinator Amanda Bytzura (amb430@pitt.edu).





Join us on May 26, 2027, from 9:00 am to 7:30 pm, in the Scaife Hall West Wing and the University Club for the 2027 Pathology Research Day and Retreat. The event will highlight departmental innovations and partnerships, feature cutting-edge science through a keynote presentation and talks by faculty and trainees, and include an interactive poster session.

Organizers: Aatur Singhi, MD, PhD, Andrew Duncan, PhD, Wendy M. Mars, PhD, Marie DeFrances, MD, PhD, and Amanda Bytzura, MBA.

Learn more about the 2027 Pathology Research Day and Retreat or contact Amanda Bytzura (amb430@pitt.edu).