MSK PATHOLOGY REVIEW

Initiatives
Innovations
Accomplishments

4th Quarter 2019

A Journey of *Technological Evolution* in Research and Diagnostics

Memorial Sloan Kettering Cancer Center

Commentary from the Department Chair

With this issue of the MSK Pathology Review, we resume the publication of our departmental quarterly newsletter after a 6 month hiatus. The lack of intervening issues has a simple explanation. Our talented science writer, Hope Cristol, decided to move on to new opportunities, and it took us quite some time to find a replacement. Finally, we were fortunate to find Onward Publishing, Inc., a professional writing group that has assigned several different writers to assist us with our production. Meanwhile, Sarah Virgo has continued to collect material and ideas for stories. The current issue is among our most comprehensive to date, including updates on events over the past 6 months along with continuing our series on diagnostic teams, individual faculty investigators, and fellows'milestones. We introduce a "Case of the Quarter" feature and highlight the quality improvement efforts throughout the department. Clearly, the MSK Pathology Review is back on track, and the continuing accomplishments and innovations from our department ensure we will have plentiful material for many issues to come! I would like to take this opportunity to acknowledge those who have contributed so much to this project – Hope Cristol, Allix Mazzella, Jordana Shapiro, and of course Sarah Virgo, whose investment in this effort is absolutely key to its success. I hope you will all enjoy this new edition!

- David Klimstra, MD

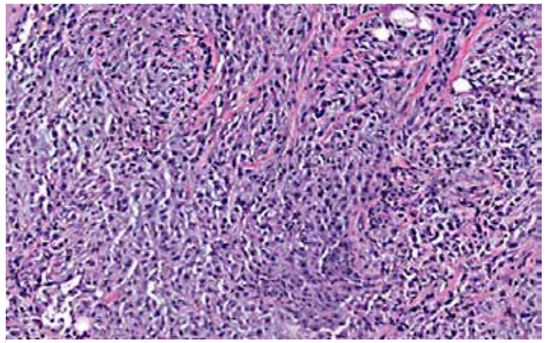
Case of the Quarter

CASE HISTORY

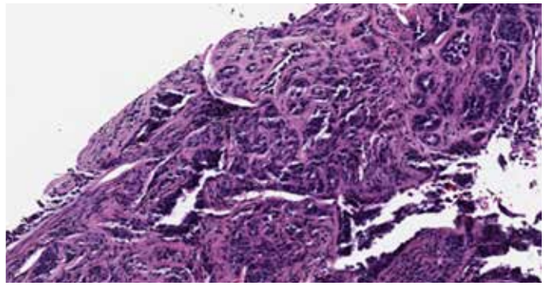
59 year old woman with palpable and tender 3.5 cm right lateral breast mass and weight loss and no axillary lymphadenopathy. Of note, she presented with a 1.6 cm right upper lobe lung mass. Both biopsies are shown here. The patient ultimately underwent mastectomy due to rapid growth of the breast mass.

The correct diagnosis will be provided in the next issue of the *MSK Pathology Review* and on Twitter at @MSKPathology

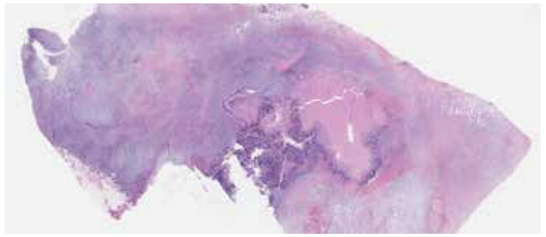
Scan the QR code to view digital slides available on mskcc.pathpresenter.com



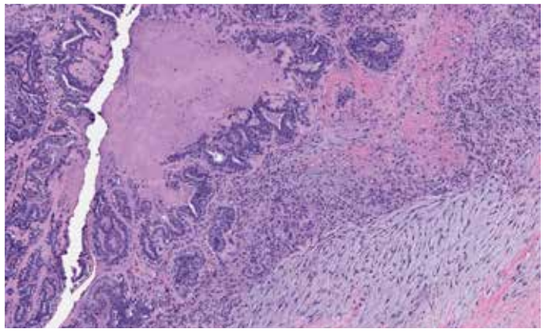
Breast, biopsy



Lung, biopsy



Breast, excision (10x)



Breast, excision (100x)

WENBIN XIAO, MD

For a relatively new hematopathologist, Dr. Xiao already has remarkable research experience.

By Hope Cristol

Some MSK pathologists prefer the clinical side of their responsibilities; others are primarily researchers. Hematopathologist Wenbin Xiao prefers both. Instead of splitting his time evenly between them, his career has focused primarily on either one or the other at different times.

After completing his MD/PhD training, Xiao spent six years doing bench work, first as a postdoc and then as a research scientist. "At that time, my research was mostly focused on signal transduction in leukemic cells," Xiao says. "But I was trained as a physician, so I wanted to get involved in patient care as well."

He returned to medicine, completing his residency and fellowship and then joined the staff at MSK. For a while, much of his work was on the clinical side of pathology. But his strong research interest kept tugging at him and soon he was back at the bench.

STUDIES ON AML

For the past three years, Xiao has been working to better classify hematological malignancies at the genetic level – especially secondary acute myeloid leukemia (AML). He cowrote a seminal review of the genetic basis of hematologic malignancies, published in *Blood*. The current World Health Organization (WHO) classification is "mostly based on morphology, history, and integrates some genetic data. For nearly half of the AML, the genetic information is still not utilized to classify disease", Xiao says.

Several of his recently published studies explored the genetic underpinnings of rare subclasses of AML. Among the subclasses, core-binding factor AML tends to have a good prognosis. However, it can turn into aggressive disease if it gains genomic mutations over time. Xiao was the lead author of a 2017 study, published in *Blood Advances*, in which a patient with inv(16) AML achieved five complete remissions with various chemotherapies but ultimately died from this aggressive and highly invasive disease. Bone marrow biopsies performed at each relapse revealed a consistent gain in cytogenetic abnormalities and a KRASG12D mutation. Although unusual, this unique case highlights how acquired genomic alterations can quickly alter prognosis, even for a chemosensitive patient.

> "The current World Health Organization (WHO) classification is 'mostly based on morphology and history, and integrates some genetic data. For nearly half of the AML, the genetic information is still not utilized to classify disease.'"

Another study, published in *Leukemia* in 2018, focused on an extremely rare and aggressive subclass: acute leukemia with megakaryocytic and erythroid differentiation (ALMED).

Previous research in mice suggested a cooperative role of JAK/MAP kinase pathway activation and TP53 mutations in the pathogenesis of ALMED. Xiao and colleagues were the first to explore the disease's mechanisms of pathogenesis in humans and concluded that the mechanism of pathogenesis in humans is similar to that in animals.

His recent work also identified PHF6 and DNMT3A mutations in mixed phenotype acute leukemia, a rare type of leukemia often challenging to diagnose. The findings, published in *Blood Advances* in 2019, showed a phenotype-genotype correlation between mutations and mixed phenotype, which can potentially facilitate the diagnosis.

More recently, Xiao reported at the ASH meeting a subset of AML patients showing RUNX1 mutations and plasmacytoid dendritic cell differentiation, a rare cell type normally responsible for host immunity against viral infection. Accurate diagnosis of this AML variant may benefit the patients from appropriate targeted therapies.

EVOLVING RESEARCH ROLE

Xiao continues to focus on secondary AML and is adding to the evidence on mutations including PHF6 and RUNX1. "The mutations of these two molecules probably comprise about 60% of secondary AML cases," he says.

Xiao's studies have relied on clinical data. However, he has recently moved back to the bench, joining the lab of Ross Levine, MD, the Laurence Joseph Dineen Chair in Leukemia Research and Chief of Molecular Cancer Medicine with the Human Oncology and Pathogenesis Program (HOPP). "I will apply my findings from the clinical side and use this knowledge to make mouse models to learn about the mechanisms of the disease," Xiao says.

Treatments for secondary AML are not adequate and disease prognosis is poor. This is partly because molecular targets have not yet been identified. Also, the disease usually strikes people later in life who "cannot tolerate regular cytotoxic chemotherapy. The patient could die from complications," Xiao says. "So we need to find better targeted therapy, which means we need to find those targets."

THE FOURTH ANNUAL SYMPOSIUM IN TRANSLATIONAL RESEARCH IN PATHOLOGY

Honors William L. Gerard Award Winner and Highlights Cutting-Edge Pathology Research

By Julie Grisham

On March 28, Memorial Sloan Kettering's Department of Pathology hosted its Fourth Annual Symposium in Translational Research in Pathology. The event, which included the presentation of the William L. Gerald Award, was held in the Zuckerman Research Laboratory Auditorium.

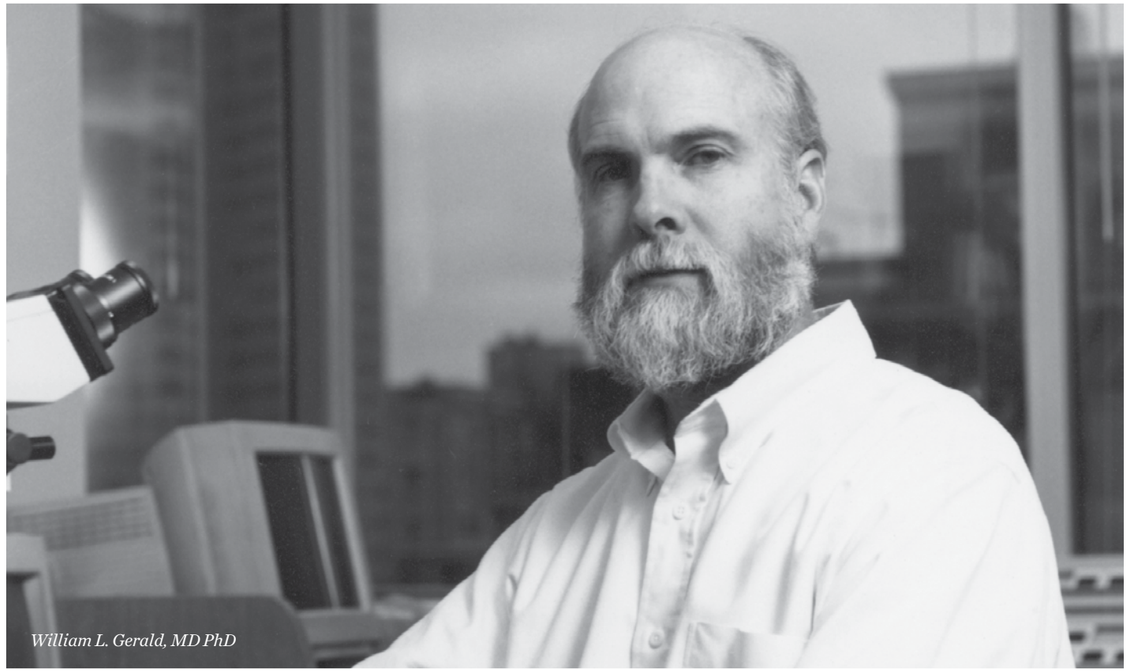
The winner of this year's Gerald Award was Kojo Elenitoba-Johnson, the Peter C. Nowell MD Professor at the Perelman School of Medicine at University of Pennsylvania. Dr. Elenitoba-Johnson is an international leader in the fields of hematopathology, molecular and genomic pathology, and mass spectrometry-driven proteomics. He gave a lecture entitled "Mass Spectrometry as a Driver for Discovery in Lymphoma Pathogenesis."

Dr. Elenitoba-Johnson is also the founding director of Penn Medicine's Center for Personalized Diagnostics and chief of the Division of Molecular and Genomic Pathology at Penn Medicine.

Attendees were welcomed to the symposium by Dr. David Klimstra, Chair of the Department of Pathology. Several other pathologists from the department gave presentations on a range of topics, including sample preparation, the role of fusion genes, and assessing minimal residual disease (see page 9 for a full lecture schedule).

The Gerald Award was created to recognize the contributions and values brought to MSK's Department of Pathology by William L. Gerald, who died in 2008. Dr. Gerald was a pioneer in the molecular characterization of cancer at a time when now-commonplace molecular techniques were still cutting-edge technology. Throughout his career, he provided mentorship and collaboration to numerous trainees and colleagues. The award is a tribute to his scientific contributions and personal attributes and to the legacy of his work in the department.

Past recipients of the Gerald Award include Drs. Arul Chinnaiyan of the University of Michigan Medical School, David Huntsman of the University of British Columbia, Adrienne Flanagan of the University College London Cancer Institute, and A. John Iafrate of Massachusetts General Hospital and Harvard Medical School.



William L. Gerald, MD PhD

KOJO ELENITOBA-JOHNSON, MD

Professor, Perelman School of Medicine at the University of Pennsylvania, Founding Director, Penn Medicine's Center for Personalized Diagnostics, Chief, Division of Molecular and Genomic Pathology, University of Pennsylvania, Penn Medicine's Center for Personalized Diagnostics

By Ahmet Dogan, MD, PhD

Kojo Elenitoba-Johnson is the inaugural Peter C. Nowell, MD Professor at the Perelman School of Medicine at University of Pennsylvania. He is also the founding director of Penn Medicine's Center for Personalized Diagnostics, as well as the chief of the division of molecular and genomic pathology. Dr. Elenitoba-Johnson is an international leader in the fields of hematopathology, molecular and genomic pathology, and mass spectrometry-driven proteomics.

Dr. Elenitoba-Johnson earned his medical degree from the College of Medicine at the University of Lagos. He completed his residency in anatomic and clinical pathology at the Brown University School of Medicine, where he served as Chief Resident. He then moved on to the National Cancer Institute to complete a fellowship in hematopathology, as well as to the Leadership Development for Physicians in Academic Health Centers program at the Harvard School of Public Health. Before arriving at Penn, Dr. Elenitoba-Johnson was the Henry Clay Bryant Professor at the University of Michigan and served as director of the Molecular Diagnostics Laboratory there.

His research focuses on the pathogenesis of human malignant lymphomas, biomarker discovery by genomic and proteomic profiling, and cancer. Dr. Elenitoba-Johnson has been recognized with numerous awards, including the American Society for Investigative Pathology Scholarship in 1993, the Outstanding Graduating Resident Award from Brown University in 1995, the Society for Hematopathology Pathologist-in-Training Award in 1998, Outstanding Teaching Awards in Anatomic Pathology from the University of Utah (1999 and 2003), and the Ramzi S. Cotran Young Investigator Award from the United States and Canadian Academy of Pathology in 2006. He is an elected member of the American Society for Clinical Investigation and is the recipient of the 2012 Outstanding Investigator Award from the American Society for Investigative Pathology.

Dr. Elenitoba-Johnson is a member of the Board of Scientific Counselors for the National Cancer Institute in the National Institutes of Health. He is an associate editor for the *Journal of Hematopathology* and a member of numerous professional societies, including the American Society of Hematology, American Society for Investigative Pathology, United States and Canadian Academy of Pathologists, and Association for Molecular Pathology (AMP). He served as the Chair of the Hematopathology Division of the AMP from 2008 to 2009. He has authored or co-authored more than 170 peer-reviewed research publications and has contributed more than 40 chapters to professional textbooks on pathology.

The Fifth Annual Symposium in Translational Research in Pathology will take place on Thursday, March 26, 2020. Dr. Sunil Lakhani of the University of Queensland will receive the William L. Gerald Award.

For additional information or to register for the course, please visit: www.mskcc.org/trs2020

Research Presentations
Selected Fellows and Faculty
Moderators: Drs. Hameed, Reis-Filho and A. Dogan

Comprehensive Solid Tumor Microbiome Profiling Via Analysis of Unmapped Reads in Large Panel, Hybridization Capture-Based NGS Assay Data
Dr. Chad Vanderbilt

Developing a Robust Sample Preparation Procedure for Deep Fourier-Transform Mass Spectrometric Profiling of Formalin-Fixed Paraffin-Embedded Clinical Tissue Specimens
Dr. Michael Roehrl

Recurrent but Not Pathognomonic Fusion Genes in Mucinous Carcinomas of the Breast
Dr. Fresia Pareja

Genomic Profiling of Mucinous Adenocarcinoma Can Assist in Determination of Site of Origin
Dr. Amir Boroujeni

GLI1-Amplified Soft Tissue Neoplasm: A Novel Entity Showing Morphologic Overlap with Tumors with GLI1 Gene Fusions
Dr. Narsi Agaram

Detailed Morphologic and Genetic Features of Urothelial Carcinoma in Patients with Lynch Syndrome
Dr. Hikmat Al-Ahmadie

Evolving Landscape of Minimal Residual Disease Assessment in Hematological Malignancies
Dr. Mikhail Roshal

Modalities and Applications for Quantitative Multiplexed Immunostaining in Immuno-Oncology
Dr. Travis Hollmann

Introduction, Gerald Award Presentation & Special Lecture Mass Spectrometry as a Driver for Discovery in Lymphoma Pathogenesiss
Dr. Kojo Elenitoba-Johnson

Michael Berger, PhD, Makes an IMPACT

By Kayt Sukel

When Michael Berger, PhD, now Associate Director of the Marie-Josée and Henry R. Kravis Center for Molecular Oncology at Memorial Sloan Kettering Cancer Center, joined MSK in 2010 he had never worked directly with pathologists. That said, he hoped to find new ways to apply his training in genomics and computational biology to improve diagnosis and treatment selection at one of the nation's foremost cancer centers. At the time, work in cancer genomics was still largely confined to the research lab and it wasn't fully clear how it might move from the bench to the bedside.

"In hindsight, it was fortunate timing," he says. "Leading cancer centers like MSK were trying to determine how best to incorporate genomic technologies and analysis into clinical care, which was exactly what I was excited to do. I've come to realize that pathology really is at the center of our clinical genomics efforts, offering new ways to diagnose different cancers as well as help guide treatment decisions by identifying the genetic pathways that may be dysregulated in individual patients' tumors."

HONING GENOME SEQUENCING

In the years since, Dr. Berger has worked closely with his colleagues in the Department of Pathology's Molecular Diagnostics Service to develop a groundbreaking genome-sequencing test called MSK-IMPACT™, which stands for Integrated Mutation Profiling of Actionable Cancer Targets. This unique, comprehensive test can detect specific mutations in hundreds of genes, as well as alterations in genetic pathways in both rare and common forms of solid cancer tumors. With the MSK-IMPACT™ results in hand, clinicians have targeted information to guide them as they match patients to a specific therapy or to a clinical trial that may benefit them.

"Typically, pathologists render a diagnosis based on looking at tissue under a microscope," says Dr. Berger. "But the genetic analysis that we perform can tell us about certain genomic alterations that are characteristic of certain tumor types, as well as which mutations, amplifications, or rearrangements might be targetable by available drugs. This provides complementary biological and clinical information that can give a pathologist a better idea of what type of cancer is there and how a particular patient might respond to a particular therapy."

Dr. Berger and his team spent years developing, refining, and clinically validating MSK-IMPACT™, carefully selecting what genes to include in the test panel, coming up with effective strategies to deal with lower-quality tumor specimens, and creating a bioinformatics platform to provide doctors with meaningful, actionable results. "The test reaffirms the importance of pathology not only to correctly diagnose a patient's cancer but to provide as much information as possible to oncologists so they can improve the quality of care they are giving each patient," says Dr. Berger.

EXPANDING IMPACT

One of the most valuable aspects of the MSK-IMPACT™ program is the size of the dataset the pathology department has now accumulated. At last count, more than 200 scientific papers have been published incorporating MSK-IMPACT™ data. "We are sharing this dataset in real time with all of the investigators at MSK," says Dr. Berger. "It opens up a whole new set of research opportunities, both within pathology and in other departments. It is remarkable how these data continue to provide new insights into how cancer can and will be treated in the future."

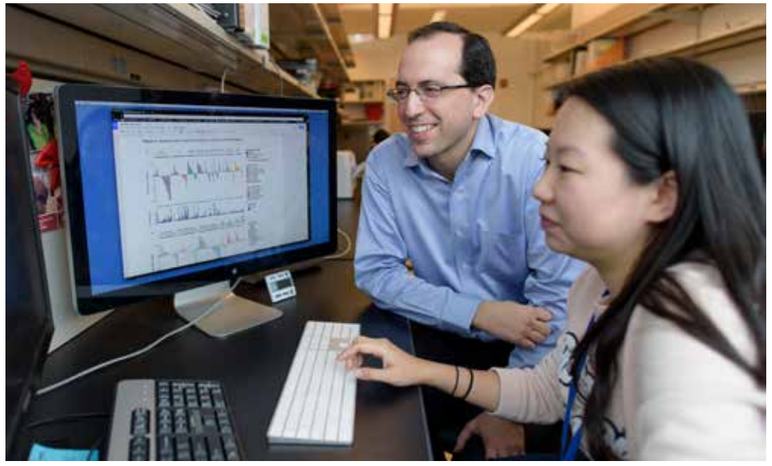
In addition, Dr. Berger's laboratory is working to expand pathology's genomic offerings. Since receiving New York State Department of Health approval to use MSK-IMPACT™ as a clinical test in 2014, Dr. Berger has made continual improvements, adding additional analyses and the ability to sequence new types of biological specimens in order to expand the test's clinical utility and its suitability for additional populations of patients.

"Originally, the test was used on patients with advanced cancer who are treated by medical oncologists and are candidates for clinical trials," he says. "But we want to expand our program to also test patients with earlier stage disease who are typically treated by surgeons. In doing so, we may be able to identify prognostic biomarkers that could affect how aggressively patients should be treated or monitored for disease recurrence."

He and his team have also developed a complementary sequencing test called MSK-ACCESS, or Analysis of Circulating Cell Free DNA to Evaluate Somatic Status. Sometimes referred to as a "liquid biopsy," this offers clinicians a way to screen for cancer or metastasis from a simple blood sample without the need for an invasive tumor biopsy. It was approved for clinical use by the New York State Department of Health in the summer of 2019.

"The opportunity to sequence DNA from a blood sample to detect mutations is very exciting," says Dr. Berger. "It allows us the ability to profile tumor DNA levels longitudinally throughout a patient's treatment course, even in patients from whom we cannot obtain tumor tissue. It's exciting and continues to show how genomics can help inform clinical treatment decisions to provide better outcomes for our patients. At the end of the day, that's what everyone here at MSK wants."

> "The test reaffirms the importance of pathology not only to correctly diagnose a patient's cancer but to provide as much information as possible to oncologists so they can improve the quality of care they are giving each patient."



A Journey of *Technological Evolution*

in Research and Diagnostics

MSK Pathology Chairman David Klimstra, MD, shares his vision for the future in his prestigious Maude Abbott Lecture at the 2019 USCAP annual meeting

By Kayt Sukel

When David Klimstra, MD, Memorial Sloan Kettering Cancer Center's Pathology Chairman and James Ewing Alumni Chair, received word that he had been selected to give the 2019 Maude Abbott Lecture at the annual United States and Canadian Academy of Pathology (USCAP) meeting, his first reaction was disbelief.

Since 1980, the Maude Abbott Lecture, named for the pioneering Canadian pathologist who co-founded the International Association of Medical Museums (later known as the International Academy of Pathology), has been one of the greatest honors that can be conferred by the USCAP. Each year, USCAP's executive committee puts forth for consideration three candidates, "revered authorities" who have contributed and continue to contribute to the advancement of pathology. Dr. Klimstra says his selection came out of the "clear blue sky."

His next reaction was anxiety at the prospect of delivering the meeting's highly anticipated keynote lecture. "I had no inkling I had even been nominated. And then to be asked to give what is supposed to be the key lecture of my career — well, it was a little nerve-racking. This isn't your standard talk where you report on specific research findings or give some type of didactic lecture," says Dr. Klimstra. "In this lecture, you need to reflect on where pathology's been and then offer more philosophical thoughts on where it is heading in the future — and you give it in front of thousands of your peers. I was very honored. But I also knew I had a lot of work to do to get that type of talk ready."

A LONG AND PRESTIGIOUS CAREER

Of course, Dr. Klimstra is no stranger to hard work. Twenty-eight years ago, after completing his anatomic pathology residency at Yale University, he followed his mentor, Juan Rosai, MD, to MSKCC to complete an oncologic surgical pathology fellowship. He's been with the department ever since.

"At the time, there were about 18 pathologists on the faculty, and now we are one of the largest cancer pathology departments in the world," he says. "Back then, almost all of those faculty were diagnostic pathologists who practiced general cancer pathology. The same pathologists were signing out the skin biopsies, the bone marrow biopsies, the breast biopsies, the colon resections — you name it. It was a broad general practice. But now we have become very sub-specialized with most of our now 100 faculty members focused on a specific niche, which gives us world-renowned diagnostic expertise in literally every different area of cancer pathology."

Dr. Klimstra first became interested in pathology while studying at Yale. Like most who pursue a career in medicine, he was driven largely by a desire to help people. But when his pathology courses first placed him in front of a microscope, he was immediately hooked.

"I've always loved science," he says. "But, in medical school, I became really interested in understanding disease at the morphologic level. If I can see it under a microscope, it somehow just makes more sense to me. I really appreciate the more mechanistic aspects of how a cancer develops and progresses and the ability to put all those pieces together in a logical pattern to understand a disease."

Over the course of his career, Dr. Klimstra has put his microscope to good use by working to better understand the pathology of tumors of the digestive system, pancreas, liver, and neuroendocrine system. Today, he is an internationally recognized expert on the correlations between the clinical, morphological, immunohistochemical, and molecular features of both common and rare tumors that develop in those areas.

When asked why he gravitated toward these forms of cancers even as early as his residency, he recounts an interesting case he encountered as a resident. That case, a pancreatic acinar cell carcinoma, led to his first major publication. He realized that very few American pathologists were studying pancreatic neoplasia at that time, and upon moving to MSKCC in 1991, it was clear there was a tremendous opportunity in pancreatic pathology. It was a challenging topic, given the aggressive behavior of most pancreas cancers, but it was also one with the potential to make a major difference in cancer care. Even now, he notes, few pathologists have established themselves in this discipline.

A WAY FORWARD FOR PANCREATIC CANCER

Pancreatic ductal adenocarcinoma, the most common type of pancreatic cancer, is an insidious and particularly lethal form of the disease, explains Dr. Klimstra. "Its five-year survival rates are in the single digits for the average patient. So, anything we can do to detect it earlier, even before it is radiographically evident, creates a greater opportunity to cure it. One of my interests has been in characterizing the precursors of pancreatic cancer so we can intervene before invasive cancer develops."

And based on our current knowledge, pancreatic cancer is proving to be more heterogeneous than we first believed, which is another reason Dr. Klimstra feels it's so important that more people investigate how it develops and progresses. "There are probably fifteen different kinds of pancreatic cancer and each has very specific attributes," he said. "But if we can understand how the distinctive clinical, histological, and molecular features fit together to result in disease, we have the best chance to define treatments to help our patients."

To date, Dr. Klimstra has published more than 400 peer-reviewed articles on tumors of the pancreas, and other organs, and co-authored four Armed Forces Institute of Pathology books, two editions each of Tumors of the Pancreas and Tumors of the Gallbladder, Extrahepatic Bile Ducts and Ampulla of Vater. He has also worked closely with the World Health Organization (WHO) and American Joint Commission on Cancer (AJCC) to develop appropriate classification and staging systems for tumors of the digestive system and endocrine organs to aid in detection and treatment of these conditions.

In his Maude Abbott lecture, Dr. Klimstra discussed the breadth of his research, starting in residency and continuing even now into his chairmanship, including his work to better understand less common forms of pancreatic cancer, acinar cell carcinoma (ACC) and pancreatic neuroendocrine tumor (PanNET). ACC makes up only about two percent of tumors that develop in the organ, but Dr. Klimstra says that even work on a rare disease like ACC highlights how pathology investigations have evolved over the last few decades and provides valuable insights that can be generalized to more common cancer types.

The theme of the lecture was the evolution of technology available to pathologists to study neoplastic disease. "We started by studying the conventional pathology. How do you make the diagnosis? How do the tumors stain using immunohistochemistry? What happens to the patients over time?" he explains. "But, over the years, with the availability of conventional and then next-generation genomic sequencing, we've discovered more and more molecular events that contribute to the development of ACC, including some potentially targetable molecular alternations that may allow us to treat patients specifically for this disease. We can learn a lot from unraveling the biology of tumors like this." Data from newer technologies have enabled us to paint a much more complete picture of this and other rare neoplasms.

Dr. Klimstra's lecture also touched on his work investigating PanNETs. Though not as rare as ACCs, PanNETs have a compelling biology of their own. "Pancreatic neuroendocrine tumors tend to progress rather slowly as compared to conventional pancreatic cancer, sometimes evolving over years or even decades," he says. "It's a different type of tumor system and has different types of genetic aberrations that require a different kind of medical management. So, we've been working hard to characterize what features will predict the biology of these tumors. How can you tell whether they will be more or less aggressive? How do we identify which patients need immediate treatment as opposed to those who just need to be observed?"

That work, he says, has led to a new way of thinking about not only pancreatic neuroendocrine tumors, but neuroendocrine tumors that arise in other parts of the body.

"Ultimately, the goal of pathology isn't just to understand the disease process, but to use those insights to make sure our patients are getting the best possible treatments."

David S. Klimstra, MD and Wendy L. Frankel, MD

TOWARD THE FUTURE OF PATHOLOGY

Dr. Klimstra says that advances in genomic techniques and other technologies are now providing pathologists with a remarkable amount of new information. "Ten years ago, the primary role of the pathologist was to make the diagnosis and then provide any additional information that might help with prognosis," he explains. "By and large, that was done using traditional morphologic techniques. But as genetic sequencing technology has evolved and become more affordable, we are now generating enormous amounts of information about mutations and other genetic alterations that may provide additional insights into how to best diagnose and treat these cancers."

From left to right: Drs. Marcia Edelweiss, Gloria Young, Laura Tang, David S. Klimstra, Olca Basturk and Hui Chen

In addition to generating data on the alterations in tumor DNA, we are now analyzing gene expression, epigenetic alterations such as methylation, and protein profiles using mass spectrometry. These studies are generating an unprecedented amount of data that can help us better understand cancer biology. But only if they can make sense of all that data. That's why, as Dr. Klimstra noted in his Maude Abbott lecture, one of the greatest challenges facing pathology in the future is how to integrate and interpret these vast amounts of complex data.

"To a certain extent, we are starting to do this today," he says. "But we aren't integrating all this information as well as we could be. The future will require us to develop better methods for data integration, including the possibility of using machine learning and artificial intelligence to augment our abilities. We also need to consider ways to potentially automate some of that integration as well so we can make our practice more efficient."

> "Here at MSK, we are sitting at the cutting edge of cancer pathology. What we are learning is not only shaping our own discipline but also cancer care at a global level. Working in this field has been and continues to be an enormous privilege. I'm really very lucky."

He adds that, with big data analytics on the horizon, it will be more important for pathologists to become comfortable with computational methods as well as a wide variety of "-omic" data.

"We have a major program here at MSKCC where we can use digital representations of a microscopic slide or three-dimensional images of tissue and then use machine learning to do mathematical calculations on the images," he says. "These tools can help us more easily recognize features we currently use for diagnosis today. But the real excitement is that the data embedded in these morphologic representations can be integrated with data from molecular and protein-based assays so we can understand a lot more about cancers than we do today. These new technologies hold enormous promise for the impact pathology can have on the rest of cancer medicine."

As Dr. Klimstra reflects on his long career and his ongoing research program, he hopes that more medical students will consider pathology, particularly oncologic pathology, as a specialty. All successful cancer treatments, he says, spring from a foundation of accurate pathologic diagnosis.

"As pathologists, we not only recognize what the disease is and predict how it's likely to behave, but we also provide information about what drugs are best to treat it," he notes. "Unfortunately, the pathology that medical students experience is not really related to the daily practice of pathology. They don't see how truly multidisciplinary the field is, how closely you work with the rest of the clinical team, and the kind of impact you can actually have on an individual patient's care."

Despite his love for his microscope, Dr. Klimstra said that he hopes future practitioners understand that cancer pathologists don't just sit in a laboratory all day: they work closely with the rest of the clinical care team and play a pivotal role in diagnosis, treatment selection, and overall patient outcomes. When he looks at both his own work and that of his colleagues, he has found this line of work to be incredibly rewarding. "The opportunity that I have being chairman of this department and working with such an extraordinary group of faculty, trainees, technologists, and others, has been remarkable," he says. "Here at MSKCC, we are sitting at the cutting edge of cancer pathology. What we are learning is not only shaping our own discipline but also cancer care at a global level. Working in this field has been and continues to be an enormous privilege. I'm really very lucky."

Warren Alpert Center for Digital and Computational Pathology

Highlights Research Advances in Digital and Computational Pathology

By Julie Grisham

In May 2019, Memorial Sloan Kettering's Warren Alpert Center for Digital and Computational Pathology welcomed speakers and attendees to the Zuckerman Research Center Auditorium for its Second Annual Digital and Computational Pathology Spring Symposium. The meeting featured talks from faculty, research fellows and staff on the latest research initiatives at MSK in digital and computational pathology.

"Over the last 5 years, MSK has embraced new technologies that enable a truly digital workflow. The benefits of this investment have come to fruition in that we now have unparalleled resources for the integration of machine learning technologies in the review, diagnosis, and prognostic assessment of digital whole slide and tissue images. The work highlighted in the symposium showcases just that," says Dr. Yukako Yagi, Director of Digital Pathology at MSK.

The symposium was created to feature research that is ongoing and to highlight the collaborations between pathologists and the digital and computational laboratories that have the potential to positively and substantively impact clinical cancer care. Attendees have the opportunity to ask questions, meet with research staff and learn about the latest digital and computational advances within the department.

Presentations focused on topics ranging from the use of artificial intelligence in histopathology to the latest methods in microscopy and other imaging techniques. These new enhancements to cancer diagnoses offer a more in-depth analysis than is currently available.

"Pathology is in the midst of a revolution, from a qualitative to a fundamentally quantitative discipline. This transformation will be driven by the next generation of scientific leaders who will be able to combine a deep understanding of machine learning, histology and oncology to impact patient care," says Dr. Thomas Fuchs, Director of Computational Pathology.

The Warren Alpert Center for Digital and Computational Pathology was established in 2017 as an innovation center to facilitate novel research and development in digital pathology and algorithmic computational pathology for clinical cancer care and research. It also serves as a hub for existing digital pathology efforts to establish a fully digital workflow in MSK's Department of Pathology. Please see page 18-19 for a full list of lectures and posters from the 2019 Second Annual Warren Alpert Center For Digital And Computational Pathology Spring Symposium.

Research Presentations
Selected Fellows, Students & Faculty
Moderators: Drs. Yukako Yagi and Thomas J. Fuchs

Introduction to Digital Pathology Imaging
Dr. Yukako Yagi

Learning Histopathology Patterns Using Spatial Point Process
Chao Feng, PhD Candidate

Correlating Micro-Computed Tomography (Micro-CT) of Endoscopic Resected Gastrointestinal Specimens with Histopathology
Dr. Makoto Nishimura

Lung Immuno-Oncology
Dr. Chad Vanderbilt

Assessment of HER2 Amplification Status in Invasive Breast Cancer Using Bright-Field In Situ Hybridization and Digital Pathology
Dr. Dara S. Ross

Automated Cancer Segmentation of Histopathology Images Using Convolutional Neural Networks
Dr. David J. Ho

Precise Detection of PDL1 and PDL2 Amplification in Classical Hodgkin's Lymphoma Using a Confocal Microscope and the Simultaneous Visualization of Immunophenotypes and FISH Signals
Dr. Yanming Zhang

Towards Unsupervised Cancer Subtyping: Predicting Prognosis Using a Histopathology Visual Dictionary
Hassan Muhammad, PhD Candidate

Closing Remarks on the Future of Pathology
Dr. Thomas J. Fuchs
Director, Medical Machine Learning & Computational Pathology

FELLOWSHIP GRADUATION
Class of 2018-2019

DAVID KLIMSTRA, MD

Chair, Department of Pathology;
James Ewing Alumni Chair of Pathology

It has been a privilege for us to work with all of you this past year. Teaching fellows is certainly part of the core mission of our department, and it is very rewarding to work with bright pathologists who challenge our concepts and keep us sharp every day. We also understand that training here as a fellow involves a lot of hard work! You have shown outstanding dedication and professionalism - it is no understatement that our jobs and your jobs have been so intertwined, it is hard to conceive of them separately - it has been a true partnership. I hope that the experience you have gained - both from the unusual cases you encountered here and from the more routine case material - will help you transition from trainee to attending and develop the confidence you will need as you go out into the "real world" of independent practice. Wherever you go, you will carry this fellowship experience with you. Don't be surprised if, in your first few weeks of practice, your new senior colleagues seek your opinion about challenging cases. You have trained at Memorial, and everyone knows that you now bring a higher level of expertise to the diagnosis of cancer. So, with thanks, I bid you best wishes for your future, and I hope we will see all of again at our alumni reunions and other professional events.

VICTOR REUTER, MD

Vice Chair, Department of Pathology; Director, Genitourinary Pathology; Director, Genitourinary Pathology Fellowship; Director, Pathology Core Facility

Dear fellows, you worked hard on behalf of our patients, Department and Center. Without your efforts it would be impossible to fulfill our mission. I am certain your hard work and dedication will serve you well as you continue in your journey. We are proud to have had you among us and wish you success. You are now part of our family and we are here to help you in any way we can. Don't forget to come back and visit.

MEERA HAMEED, MD

Chief, Surgical Pathology Service

Congratulations to all!

Where are they now?

ONCOLOGIC PATHOLOGY

Laurence Briski - *Pulmonary Pathology Fellowship–Univ of Michigan, MI*

Su Roychoudhury - *Women's Health Pathology Fellowship–NYU Langone, NY*

Rami Alhassan - *Cytology Fellowship–Univ of Utah, UT*

M. Rizwan Haroon Al-Rasheed - *Renal/GU Fellowship–Mt. Sinai, NY*

Nicholas Bercovici
Breast/GYN Fellowship–Univ of Mass, MA

Angel de Dios Quintero
Asst Pathologist - Morristown Pathology Associates, NJ

Mohsin Jamal
Molecular Fellowship–Univ of Pittsburgh, PA

Pallavi Khattar
Asst. Professor, Hematopathology–Icahn School of Med at Mount Sinai, NY

Pavel Kopach
Genitourinary Fellowship–MSK

Nicolas Lopez-Hisijos
Hematopathology Fellowship–Loyola Univ Med Ctr, IL

Christopher Metter
Renal/Solid Organ Transplant Fellowship–Univ of Texas Southwestern Dallas, TX

Reza Setoodeh
Instructor–Cedar Sinai, CA

Alpa Shah
Breast Pathologist–Aurora Diagnostics, Las Vegas, NV

Wenjing Shi
Cytology Fellowship–Univ of Southern California, CA

James Van Gurp
Hematopathology Fellowship–MSK

Hai Wang
Cytology Fellowship–Baystate Health/Univ of Mass, MA

Lisi Yuan
Cytology Fellowship–Cleveland Clinic, OH

BREAST PATHOLOGY

Elena Salagean
Sabbatical

Jennifer Zeng
Asst Attending Pathologist–Montefiore Med Ctr, NY

Jin Xu
Asst Professor–UW Madison Sch of Med and Public Health, WI

CYTOPATHOLOGY

Brie Kezlarian
Asst Attending Pathologist (Cytology)–MSK

Stephanie Muller
Pathologist–Private Hospital, CA

Daniel Lubin
Pathologist (H/N & Cytopathology)–Emory University, GA

DERMATOPATHOLOGY

Amin Hedayat
Dermatopathology–Private Practice

Jad Saab
Pathologist (SurgPath, Derm, Molecular)–Canada

GASTROINTESTINAL PATHOLOGY

Monika Vyas
Attending Pathologist–Beth Israel Deaconess Med Ctr/ Harvard Med Sch, MA

GENITOURINARY PATHOLOGY

Sounak Gupta
Faculty Position–Mayo Clinic, MN

Liwei Jia
Asst Professor–Univ of Texas Southwestern Med Ctr, TX

GYNECOLOGIC PATHOLOGY

Sheila Segura
Surgical Pathologist–Indiana Univ, IN

HEMATOPATHOLOGY

Alexander Chan
Asst Attending Pathologist (Hematopathology)–MSK

Ramya Gadde
Cytopathology Fellowship–Dartmouth-Hitchcock Med Ctr, NH

Priyadarshini Kumar
Attending Hematopathologist– St. Jude Children's Research Hospital, TN

Ying Liu
Molecular Genetic Pathology Fellowship–MSK

Hammad Tashkandi
Molecular Genetic Pathology Fellowship– Univ of Pittsburgh, PA

MOLECULAR PATHOLOGY

Amir Momeni Boroujeni
Gynecologic Pathology Fellowship–MSK

Edwin Gandia
United States Army–Walter Reed Med Ctr, MD

James Solomon
Asst. Director of the Clinical Genomics Laboratory– Weill Cornell Med Ctr, NY

Efsevia Vakiani
Associate Attending Pathologist (GI & Molecular Pathology)–MSK

Menglei Zhu
Hematopathology Fellowship–MSK

THORACIC PATHOLOGY

Andrew Golden
Pathologist–Kaiser Permanente, MD

New Mentoring Program HIGHLIGHTS CAREERS IN LABORATORY SCIENCE

By Julie Grisham

The Memorial Sloan Kettering Department of Pathology has announced the launch of mScope (Mentoring Scientific Careers with Opportunities in Pathology Excellence) — a new program that pairs students with laboratory specialists. Its goal is to educate high school and undergraduate students about careers in the laboratory sciences.

Under the direction of Sarah Virgo and Christina White, the mScope program seeks to encourage the next generation of laboratory professionals by bringing them into the lab environment and educating them about educational and career opportunities. It was designed to enable participating students to share connections with laboratory scientists while fostering tomorrow's laboratory workforce.

"We've had so much success with bringing students from STEM [science, technology, engineering, and math]-focused high schools into the lab for field trips that we decided to increase the opportunities for them to learn about careers in laboratory science," says Christina White. "The truth is that there is a lack of exposure to opportunities that exist in the lab. By connecting students who may have an interest in science but haven't officially decided on a career with our laboratory staff, we have a real opportunity to address the critical staff shortages that exist not only in our labs, but across the US." adds Sarah Virgo.

The program is designed to provide students with exposure to a full range of pathology specialties including histology, surgical pathology, cytology, hematopathology, and molecular pathology. Participants will gain a unique, real-time introduction to the world of pathology and its connection to patient care. The program offers one-on-one, recurring mentoring from working experts and familiarity with laboratory science careers through observation of the critical work done by MSK's scientists.

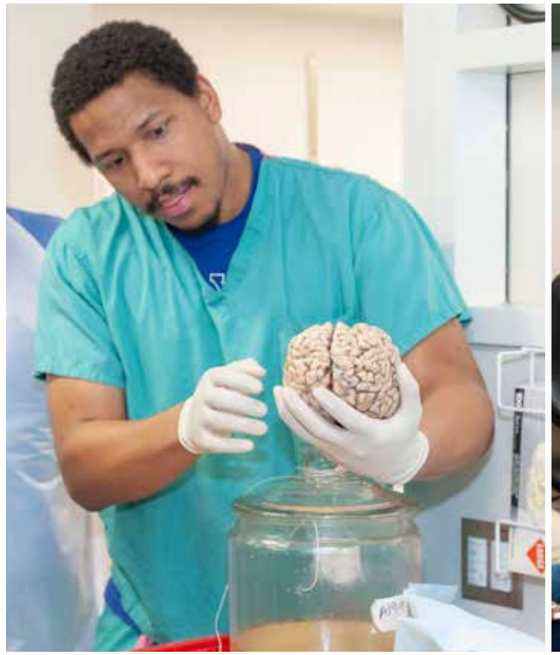
The first group of mScope participants will start in June 2020. High school and undergraduate students who are interested in applying must have at least a 3.0 GPA and an interest in laboratory sciences.They must be willing to commit at least one hour a week for eight weeks. Participants will do two-week rotations through four different areas within the Department of Pathology.

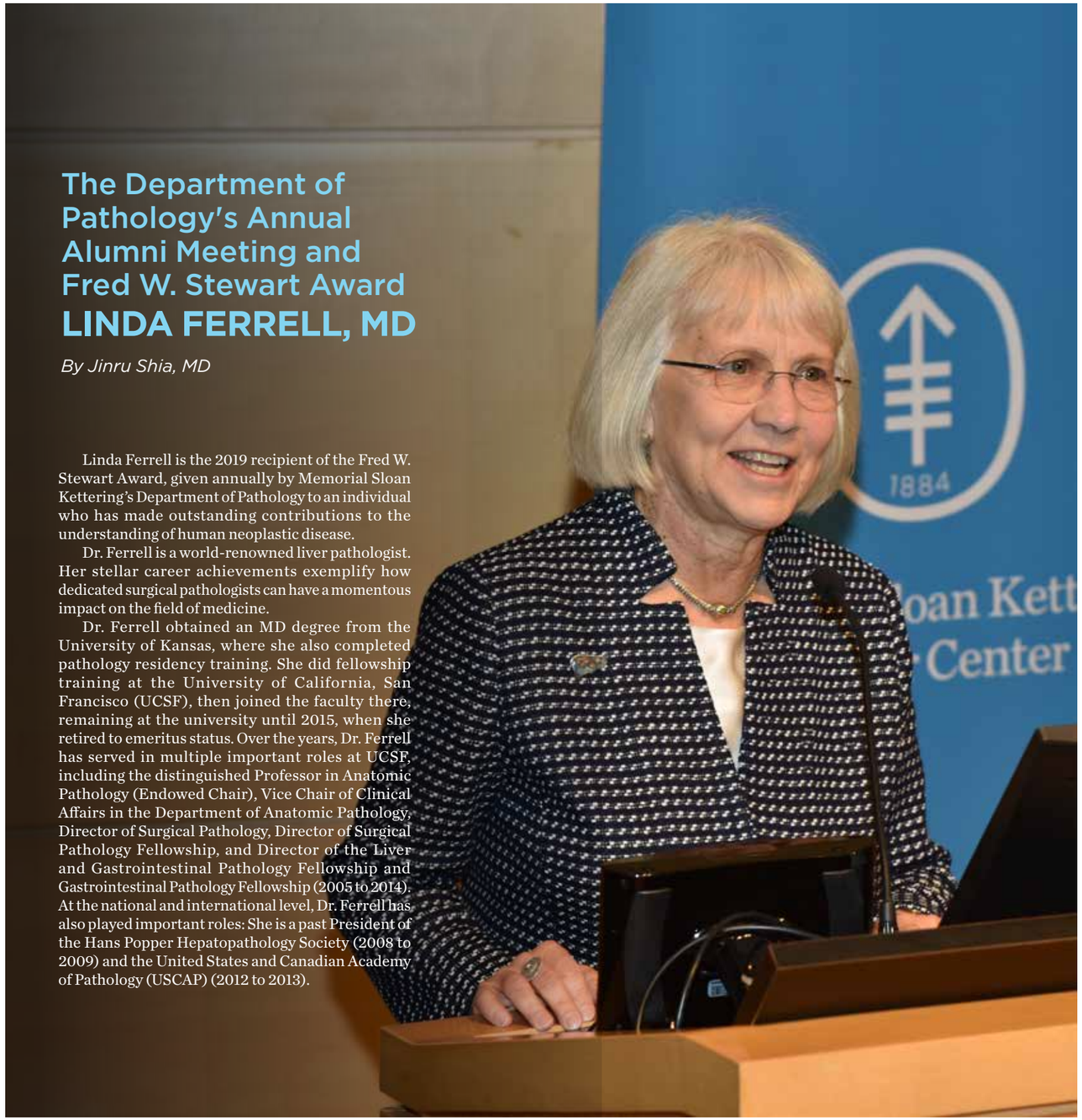
HOW TO APPLY

Applicants need to submit a complete application and participate in an on-site interview. To learn more about the mScope program,

visit www.mskcc.org/departments/pathology/mscope-program

Visiting students from East Orange STEM Academy





The Department of Pathology's Annual Alumni Meeting and Fred W. Stewart Award
LINDA FERRELL, MD

By Jinru Shia, MD

Linda Ferrell is the 2019 recipient of the Fred W. Stewart Award, given annually by Memorial Sloan Kettering's Department of Pathology to an individual who has made outstanding contributions to the understanding of human neoplastic disease.

Dr. Ferrell is a world-renowned liver pathologist. Her stellar career achievements exemplify how dedicated surgical pathologists can have a momentous impact on the field of medicine.

Dr. Ferrell obtained an MD degree from the University of Kansas, where she also completed pathology residency training. She did fellowship training at the University of California, San Francisco (UCSF), then joined the faculty there, remaining at the university until 2015, when she retired to emeritus status. Over the years, Dr. Ferrell has served in multiple important roles at UCSF, including the distinguished Professor in Anatomic Pathology (Endowed Chair), Vice Chair of Clinical Affairs in the Department of Anatomic Pathology, Director of Surgical Pathology, Director of Surgical Pathology Fellowship, and Director of the Liver and Gastrointestinal Pathology Fellowship and Gastrointestinal Pathology Fellowship (2005 to 2014). At the national and international level, Dr. Ferrell has also played important roles: She is a past President of the Hans Popper Hepatopathology Society (2008 to 2009) and the United States and Canadian Academy of Pathology (USCAP) (2012 to 2013).

Dr. Ferrell has devoted her academic career to the study of liver pathology. As evidenced by her numerous publications (more than 200 original articles), she has made great contributions to the understanding of the pathology of liver tumors, particularly of well-differentiated liver tumors, including hepatocellular adenoma variants, focal nodular hyperplasia-like lesions, vascular lesions, and malformations in the liver. Through participation in major organizations, such as the Clinical Research Network in Nonalcoholic Steatohepatitis (a National Cancer Institute–sponsored consortium) and the International Liver Pathology Study Group (of which she was a founding member), Dr. Ferrell worked relentlessly to ensure the most effective integration of pathology into the various studies of liver diseases. Her seminal works on liver pathology in recurrent hepatitis C after transplantation and on the diagnosis of dysplastic nodules have gained worldwide attention, and a number of these studies have been recognized internationally as leading papers in the field.

Dr. Ferrell is also an ardent educator. She has nurtured generations of pathology residents and fellows. She chaired two major annual courses for pathologists for multiple years: at UCSF for 33 years and for the California Society of Pathologists for eight years. Through the years, she has served a wide variety of teaching roles via USCAP. Her numerous book chapters and major liver pathology textbooks (including the premier text, *MacSween's Pathology of the Liver*, fifth, sixth, and seventh editions) have benefitted liver pathologists everywhere. Her contribution as the lead editor of *Liver Pathology* (part of the consultant pathology series from Demos Publishers), which emphasizes difficult diagnostic problems in liver pathology, has similarly offered invaluable guidance. Dr. Ferrell has lectured extensively both nationally and internationally. Her lectures are always very well received.

It is no surprise that numerous awards have been bestowed on Dr. Ferrell in recognition of her achievements. These include the 2008 Gold Headed Cane Award, the 2015 F. K. Mostofi Distinguished Service Award from USCAP, the 2016 Harvey Goldman Master Teacher Award from USCAP, the 2017 President's Award from the Arthur Purdy Stout Society of Surgical Pathologists, and numerous UCSF teaching awards for resident and medical student teaching.

Today, as we celebrate the memory of Dr. Stewart, a man who early on brought surgical pathology to the front lines of oncology, it is most fitting that the medal in his name be given to an individual who has dedicated her career to the practice of surgical pathology and contributed monumentally to the continued advancement of this discipline in modern times. We congratulate Dr. Ferrell on this well-deserved award.

"Today, as we celebrate the memory of Dr. Stewart, a man who early on brought surgical pathology to the front lines of oncology, it is most fitting that the medal in his name be given to an individual who has dedicated her career to the practice of surgical pathology and contributed monumentally to the continued advancement of this discipline in modern times."

2019 MSK Pathology Alumni Dinner










MEERA HAMEED, MD

Embracing the Future of Pathology

By Kayt Sukel

Musculoskeletal tumors, or cancers of the bone and soft tissues, are both rare and complex. Which is exactly what sparked the professional interest of Meera R. Hameed, MD, Chief of the Surgical Pathology Service at Memorial Sloan Kettering Cancer Center, who was drawn to the challenge of specializing in this type of cancer.

"Compared to other types of cancers, there are fewer numbers of cases of bone and soft tissue," explains Dr. Hameed. "Because of that rarity, there is a lot we still have to learn about these tumors. There are a host of challenges from diagnosis to treatment, and pathologists who work in this area have a unique opportunity to explore these cancers especially in this era of advancing technology.

Since coming to MSK in 2009, Dr. Hameed has worked to embrace new technologies, including molecular diagnostics and digital and computational pathology, to help her and her colleagues better serve patients with rare cancers.

"The bone is a very difficult organ to access and treat," she says. "With many of the bone and soft tissue cancers, if the tumor comes back after surgery, there are not many therapeutic options left. Being able to make the right diagnosis, which include working closely with our radiology, surgery and oncology colleagues, is of vital importance so that the right treatment is given from the start. It is important that all the modern technology tools are available and used appropriately to enhance diagnostic accuracy. For this, one has to start with even basic tissue preparation such as EDTA which allows preservation of DNA and RNA.

A SEARCH FOR UNDERSTANDING

Dr. Hameed and her colleagues have worked on a variety of musculoskeletal cancer types, including some of the more common of these rare cancers in bone such as chondrosarcoma, which starts in the cartilage cells; and osteosarcoma, a childhood cancer that develops from cells which make bone (osteoblasts). While osteosarcoma is sensitive to chemotherapy, she explains, chondrosarcomas are not sensitive to chemotherapy or radiation treatments — which is why it is imperative to get a better grasp of their underlying biology. Genetic studies are helping to do that. "We are learning that some of these cancers have specific genetic alterations," says Dr. Hameed. "By studying the incidence of these alterations, as well as the outcomes in patients, we are learning about those that may have clinical relevance — there are even some clinical trials now for specific inhibitors related to some of the alterations.".

For example, through next generation sequencing, my colleagues and I have found certain alterations in osteosarcoma which may be of benefit for patients who have relapsed or refractory to conventional therapy. In chondrosarcoma, a driver mutation in the IDH gene has impact on recurrence free and metastases free survival."

Dr. Hameed is also interested in very rare tumors, like chordomas, which are tumors that develop from notochordal cells which play an important role in spine development. Chordomas remain difficult to treat with complex surgeries and there are not many options for patients who have recurrent disease. In preliminary studies Dr. Hameed and colleagues have found that chordomas are tumors with predominantly copy number alterations and chromatin remodeling genes may play a role in their biology, and she is pursuing further studies to explore the epigenetic mechanisms in collaboration with other experts in the field.

"There are many challenges when we are talking about diagnosis, prognosis, and treatment for rare cancers," she says. "But if we can understand the biology of how they develop and the genetic changes involved, we may be able to find better diagnostic and prognostic markers, as well as treatments that can provide a better outcome for our patients."

THE ROLE OF COMPUTATIONAL PATHOLOGY AND ARTIFICIAL INTELLIGENCE

Dr. Hameed has been a stalwart champion of implementing digital pathology and promoting computational pathology in the department of pathology at MSK. While many pathologists may be wary of new artificial intelligence (AI) or machine-learning algorithms coming to the field, Dr. Hameed sees them as a way of augmenting her and her colleagues' abilities in ways that will benefit patients.

"Pathology is a field in which we look for patterns, and recognize those patterns that are indicative of disease," she explains. "But there's so much data on a particular slide, more than what the pathologist sees. These computational tools may offer us information that can be applied to further our diagnosis, prognosis, or in future how to treat an individual patient."

With osteosarcomas, pathologists rely on their eyes to assess tumor necrosis following pre-operative chemotherapy as an indicator of prognosis and survival after therapy. This is a subjective measurement and can have interobserver disagreement as to the degree or percentage of necrosis. Dr. Hameed and Dr. Agaram (Bone and Soft Tissue team) are working with computational pathology colleagues (Dr.Fuchs' laboratory) to develop machine learning tools and algorithms that can be trained to recognize necrosis in tumors. These algorithms will provide a more objective and quantitative measure than the unaided human eye. This will give the treating clinicians a more accurate assessment of how patients are responding to therapy.

"I think that as we adopt more of these algorithms, the field of pathology will become more objective," she says. "We will be able to better assess prognostic factors in tumors. The computer algorithms will be able to pull data out of an image that we have not been able to by visual means. Then we, as pathologists, can analyze that information and determine how it relates to a particular patient's disease."

> "the combination of advanced molecular genetic techniques, new ways of imaging tumors, and new ways to harness the power of the computer to integrate and analyze the mass of data we collect from patient specimens will lead to significant improvements in patient care"

Dr. Hameed says that as pathology evolves to incorporate new technologies and tools in various cancers and rare tumors like the ones she studies, the specialty will benefit in a variety of ways. Put them together under the seasoned eye of a trained pathologist and the data will be more pertinent to the individual patient with the disease and will help inform clinical decisions for optimal treatment. She notes that "the combination of advanced molecular genetic techniques, new ways of imaging tumors, and new ways to harness the power of the computer to integrate and analyze the mass of data we collect from patient specimens will lead to significant improvements in patient care".

The Pathology of NEOPLASTIC DISEASES COURSE
April 29 - May 3, 2019

2019 Course Directors


Meera Hameed, MD


Jinru Shia, MD


Victor Reuter, MD


William Travis, MD

Lung Cancer Classification
William D. Travis, MD

Molecular Pathology of Lung Cancer
Jason C. Chang, MD

Emerging Issues in Lung Adenocarcinoma
William D. Travis, MD

Immunohistochemistry for Lung Tumor Diagnosis and Biomarker Testing: An Update
Natasha Rekhtman, MD, PhD

Diagnosis of Lung Cancer in Cytology and Small Biopsies
Darren J. Buonocore, MD

Neuroendocrine Tumors of the Lung
Natasha Rekhtman, MD, PhD

Pleural Tumors
Jennifer L. Sauter, MD

Frozen Section Diagnosis of Thoracic Tumors
Darren J. Buonocore, MD

Mediastinal Tumors
Jason C. Chang, MD

Pulmonary Lymphoproliferative Disorders
Ahmet Dogan, MD, PhD

Ductal Adenocarcinoma of the Pancreas
Olca Basturk, MD

Solid Nonductal Neoplasms of the Pancreas
David Klimstra, MD

Cystic Neoplasms of the Pancreas
Olca Basturk, MD

Cytology of Pancreas Neoplasms
Carlie Sigel, MD

Neuroendocrine Neoplasms of the GI Tract – Conundrums and Caveats
Laura Tang, MD

Molecular Diagnostics of GI Tumors
Jaclyn Hechtman, MD

Appendiceal Epithelial Neoplasms - Bewildering Between Goblet and Bucket of Mucin
Laura Tang, MD

Gastroesophageal Adenocarcinoma and Their Precursor Lesions - The Barrett's Anxiety
Laura Tang, MD

Gastric Polyps and Other Epithelial Neoplasms
Michael Roehrl, MD

Biomarker Testing in Upper GI Tumors
Michael Roehrl, MD

Selected Issues in Colorectal Tumor Pathology
Jinru Shia, MD

GI Tumor Diagnosis: Lessons from Prior Mistakes
Jinru Shia, MD

Biopsy Diagnosis of Hepatic Tumors
David Klimstra, MD

Ductal, Intraductal and Cribriform, Oh My! The Differential Diagnosis of Large Gland Lesions of the Prostate and its Clinical Import
Samson Fine, MD

Essential Data Elements for Prostate Cancer Reporting in 2019
Samson Fine, MD

Risk Stratification in Prostate Cancer; the Role of Contemporary Tissue,Urine and Serum-Based Assays
Anu Gopalan, MD

Two Cases to Remember: Presentation by the Genitourinary Pathology Subspecialty Fellows
Liwei Jia, MD, Sounak Gupta, MD

Mimics of Urothelial Carcinoma
Victor Reuter, MD

Prognostic and Predictive Factors in Urothelial Carcinoma; Grading, Staging and Beyond
Hikmat Al-Ahmadie, MD

Urothelial Tumors of the Upper Urinary Tract
Hikmat Al-Ahmadie, MD

A Practical Approach to the Morphological Evaluation of Tumors of the Testis and Its Adnexa
Satish Tickoo, MD

Renal Neoplasia: Morphologic Spectrum and Differential Diagnosis
Satish Tickoo, MD, Yingbei Chen, MD

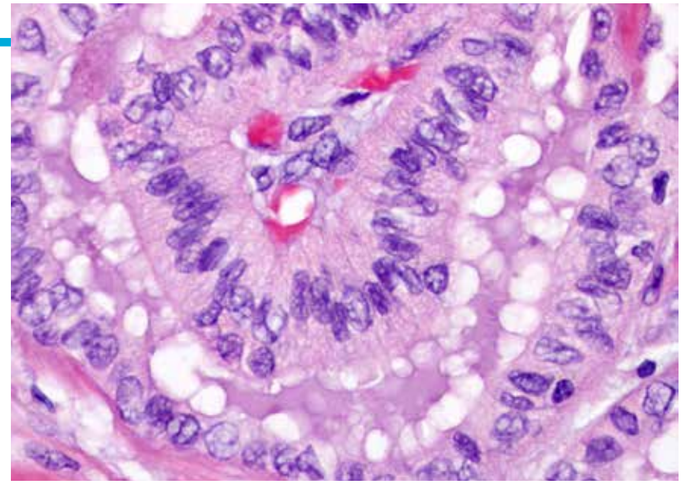
Germline Mutations in Urogenital Tumors; Disease Spectrum and Clinical Implications
Maria Carlo, MD

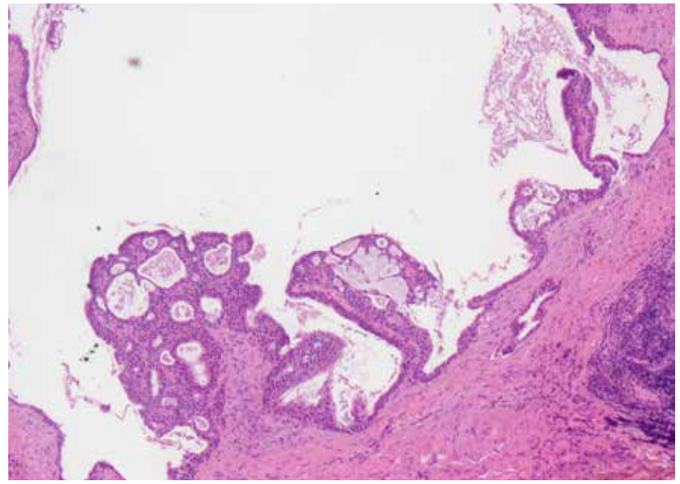
New and Emerging Variants of Renal Neoplasms
Yingbei Chen, MD

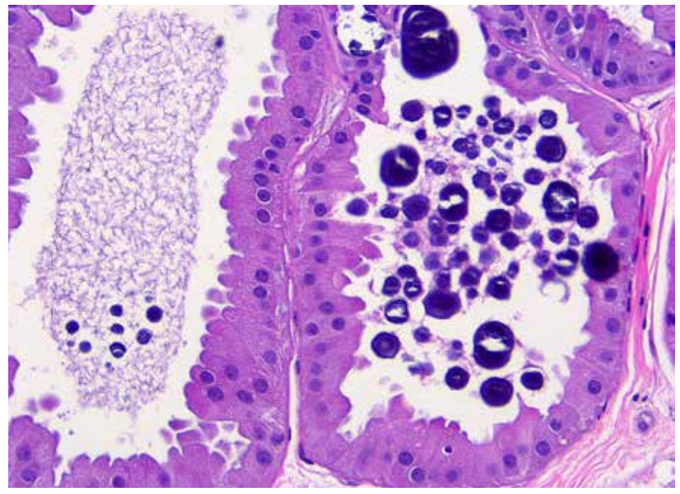
Implementation of Whole Slide Imaging in Your Laboratory; Challenges and Opportunities
J. Sirintrapun, MD

The 2020 Pathology of Neoplastic Diseases Course will take place from Monday, April 27- Friday, May 1 and will feature Head and Neck Pathology, Breast Pathology and Gynecological Pathology under the direction of Drs. Hameed, Ghossein, Brogi, Wen and Ellenson.

For more information or to register for the course, please visit: www.mskcc.org/neoplasticdiseases2020







2019-2020 FELLOWS

Oncologic Surgical Pathology Fellows


Cameron Beech, MD


Wissam Dahoud, MD


Liz Edmund, MD


Leonel Maldonado Gonzalez, MD
Chief Fellow


Yan Huang, MD, MS


Yiang Hui, MD


Rami Imam, MD


Elizabeth Kertowidjojo, MD, PhD, MPH
Chief Fellow


Anna Lee, MD


Fanni Ratzon, MD

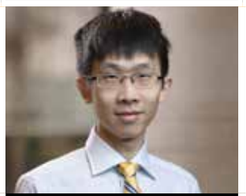

Abeer Salama, MBBS


Christopher Schwartz, DO


Shenon Sethi, MBBS


Brandon Umphress, MD


Alan Xinyu Wu, MD, PhD


Chen Yang, MBBS


Lingxin Zhang, MBBS

Specialty Fellows


Raza Hoda, MD
Breast Pathology


Marjorie Perron, MD, PhD
Breast Pathology


Willard Wong, MBBS
Breast Pathology


Jose Scarpa Carniello, MD
Cytopathology


Bogdan Isaila, MD
Cytopathology


Roshan Raza, MBBS
Cytopathology


Laura Battle, MD
Dermatopathology


Kevin Yen Chen Ko, MD, DMD
Dermatopathology


Mahra Nourbaksh, MD, PhD
Gastrointestinal Pathology


John Kennedy, MD
Genitourinary Pathology


Pavel Kopach, MD
Genitourinary Pathology


Amir Momeni Boroujeni, MD
Gynecologic Pathology

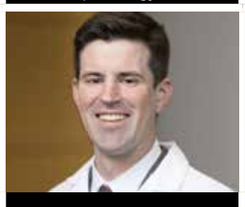

Akanksha Gupta, MBBS, MD
Hematopathology

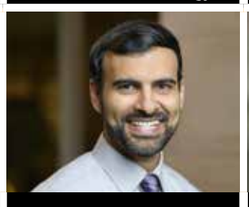

James Van Gurp, DO
Hematopathology


Menglei Zhu, MD, PhD
Hematopathology


Donna Ferguson, MD
Molecular Pathology


Ying Liu, MD, PhD
Molecular Pathology


Douglas Mata, MD, PhD
Molecular Pathology


Rohit Sharma, MD
Molecular Pathology


Stewart Soo Ryum Yang, MD
Molecular Pathology


Marina Baine, MD, PhD
Thoracic Pathology

MSK CELEBRATES LAB WEEK 2019

By Julie Grisham

Medical Laboratory Professionals Week is a national celebration that takes place every year during the last full week of April. It was established to recognize the medical laboratory professionals who play a vital role in every aspect of health care.

At Memorial Sloan Kettering, Lab Week activities are jointly sponsored by the Department of Pathology and the Department of Laboratory Medicine. This event has incorporated events like "Family Feud: Lab Week Challenge" and "The Great Escape" provide an extra level of fun and bonding.

"Lab Week is full of great team-building events," says Sarah Virgo, Assistant Manager and Chair, Laboratory Professionals Week Committee. "So much of what our two departments do is behind the scenes, so it's great to celebrate everyone and highlight the important work that they do. Without the essential work being done in the lab by our wonderfully talented staff, our patients couldn't receive the excellent care they receive here at MSK."

In 2019, Lab Week featured scientific talks from researchers throughout MSK, career-building sessions, and activities ranging from scavenger hunts to trivia to kickball. The week was rounded out on Friday with a luncheon held in the Rockefeller Research Laboratories building.

LAB WEEK WINNERS

LAB WEEK TABOO
Rochelle Lopez
Laura Coyoy
Christina Lugo

LAB WEEK COSTUME CONTEST
Janet Guthrie
Judy Zhu
Luciana Kimmel
Kimberly Lauderman
Sylvie Wiener- Fedus
Nora Plante
Camille Ramkaran
Lily Zhuo

LAST PERSON STANDING TRIVIA
Viktor Moroz

LAB WEEK FAMILY FEUD CHALLENGE
Jean Allen
Madeline Cioffi
Nora Plante
Jessica Bautista
Joann Rittersbach
Ana Perez
Cathy Tan
Tasfina Yousuf
Matthew Brady
Richmond Serofica
David Puma

LAB WEEK GREAT ESCAPE
David Puma
Melissa Fonseca
Utsav Patel
Meiyi Wang
Anita Yun
Roger
Gavin Guy
Laura Coyoy
Christina Logo
Jonatan MontesDe Oca
Dondre Clarke
Rochelle Lopez
Bryan Lu
Julia Im
Judy Zhu
Yessica Saenz

LAB WEEK PERIODIC TABLE BINGO
David Puma
Rachel Oconnor
Doris Wong
Linda Moody Brow
Michael Sandino
Kerry Mullaney
Debby Melgar

LAB WEEK PHOTO CONTEST
Kerry Mullaney
Ana Perez
Kelsy Merck

MUSIC VIDEO
Cytogenetics
Koch Center

EXTRA EFFORT AWARDS
Bryan Lu
Madeline Cioffi
Kerry Mullaney
Gloria Flamenco
Janet Guthrie

LAB WEEK AMAZING RACE SCAVENGER HUNT
Dondre Clarke
Melissa Fonseca
David Puma

Lab Week Family Feud Challenge 2nd Place Winners (from left to right): Cathy Tan, Tasfina Yousuf , Ana Perez, David Puma, Matthew Brady, Richmond Serofica

Lab Week Family Feud Challenge 1st Place Winners (from left to right): Joann Rittersbach, Jean Allen , Madeline Cioffi, Nora Plante, Jessica Bautista

Towards Predictable Immune Reconstruction After Allo-Hematopoieric Cell Transplantation and Cellular Therapies
Dr. Jaap J. Boelens

Modalities and Applications for Quantitative Multiplexed Immunostaining in Immuno-Oncology
Dr. Travis Hollmann

Laboratory Professionals: Keynote Speaker
Dr. Sergio Giralt

Mass Spectrometry Assays for Detecting Monoclonal Immunoglobulins
Dr. Katie Thoren

Artificial Intelligence and the Clinical Lab
Dr. Jamal Benhamida

GASTROINTESTINAL PATHOLOGY

Jinru Shia, MD
Director, Gastrointestinal Pathology
Attending Pathology

David S. Klimstra, MD
Chair, Department of Pathology
Attending Pathologist

Laura H. Tang, MD, PhD
Attending Pathologist

Christine Iacobuzio-Donahue MD, PhD
Director, David M. Rubenstein Chair for Pancreatic Cancer Research
Attending Pathologist

Michael H. Roehrl, MD, PhD
Director, Precision Pathology Biobanking Center
Associate Attending Pathologist

Jaclyn F. Hechtman, MD
Assistant Attending Pathologist

Olca Basturk, MD
Associate Attending Pathologist

Carlie S. Sigel, MD
Associate Attending Pathologist

Efsevia Vakiani, MD, PhD
Associate Attending Pathologist

Setting the Standards

The Gastrointestinal Pathology team strives to provide the most accurate and relevant diagnostic information clinicians use to make treatment decisions for patients, and researches promising avenues that inform the future of that care.

By Kayt Sukel

Gastrointestinal (GI) cancers, which include esophageal, gastric, colorectal, liver, gallbladder, and pancreatic cancers, are among the most commonly diagnosed cancers across the globe. Over the past decade, the incidence rates for many of these cancers, including colorectal and liver cancer, have significantly grown. That is one of the main reasons Jinru Shia, MD, Director of the GI Pathology team, and her team stay so busy at Memorial Sloan Kettering Cancer Center.

"The GI service here is one of the busiest in the pathology department," says Dr. Shia. "When we looked at our service load for the year recently, we saw that our group had already signed out more than 14,000 cases for 2019. That accounted for more than 16% of the total service volume."

Those cases include in-house biopsies and resections, and consultation cases from other hospitals. It is a lot of work, Dr. Shia acknowledges — but in her view, such a heavy volume is a "welcome challenge" — one that she and her colleagues meet head on.

"Our main goal, always, is to stay at the forefront of clinical service, by both providing accurate pathology information for all the cases we see and ensuring effective integration of that information into clinical treatment decision-making," she says, "The service work may seem like regular, routine kind of work, but we make sure each case is done in the right way — the best way — so we can set the standards for the best pathology practice; our team is committed to that."

AN EVOLVING SERVICE

When Dr. Shia came to MSK Pathology in 1998 as a fellow, there were 2 attending pathologists that had a special interest in GI. Today, there are 9 dedicated GI pathologists, forming the GI pathology team and working nimbly together, integrating new technologies that have enabled them to provide ever more valuable and targeted information that, in turn, helps inform treatment selection and disease management for the MSK patients. Everyone in the service, says Dr. Shia, shares the same dedication. "We all love what we do — and are passionate about doing really good work."

Within the subspecialty of GI pathology, the team has further sub-subspecialized. Each team member is focused on a particular part of the GI system: upper GI tract, lower GI tract, or hepato-pancreato-biliary system. "For each of those three major areas, we have dedicated expert pathologists who can take our pathology diagnosis and help translate it to the best clinical effect," explains Dr. Shia.

While most people think of pathologists working hard behind the scenes, spending more time with their microscope than with clinical colleagues, members of the GI pathology team play key roles within MSK's signature disease management teams (DMTs), helping zero in on treatment selections that best benefit individual patients.

"Our approach ensures that we can have close communication with the clinical team early on and play a major part in the process of determining care," says Dr. Shia. "We meet regularly to discuss ongoing cases — and treatment decisions are made during that meeting. All the different disciplines at MSK contribute to these clinical-based DMT meetings. By working together and sharing our expertise, we can help ensure the best possible outcome for our patients."

BIOMARKER REPORTING

When asked about specific examples of innovative approaches the GI pathology team has brought on in the arena of clinical service, Dr. Shia mentions biomarker reporting as an example. "In the current era of precision oncology and targeted therapy, accurate reporting of biomarkers is of great importance," Dr. Shia explains. And she is particularly referring to what is known as predictive biomarkers, tumor tests that can predict whether the tumor is likely to respond to a given targeted therapy or not.

"Immunotherapy is particularly pertinent to GI tumors," says Dr. Shia. "One of the predictive markers for immunotherapy is the tumor's microsatellite instability (MSI) status. So, today, every patient with a GI tract carcinoma gets tested for MSI markers (as well as some other markers). To effectively report the results of the various biomarkers, the GI team has worked closely with MSK's medical oncologists, and together they implemented standardized biomarker reporting systems for both upper and lower GI tract malignancies. Such systems not only offer the data that is needed for the oncologists to make treatment decision based on current guidelines, they also capture additional information that can benefit future retrospective studies, and can potentially help further improve our understanding of tumor behavior and how best to achieve better treatment response.

WORLD-CLASS RESEARCH

While Dr. Shia is undeniably pleased to speak about the robust clinical services her team provides at MSK, she's also proud of her colleagues' contributions on the research front.

"Using the phrase 'world-class' to describe what they do is not an exaggeration," she says. "The World Health Organization recently updated its GI tumor classifications. Many of our team members directly participated in this new, fifth edition of these classifications. And if you open the book and look at the different tumor subtypes, you'll see that, quite often, the references that serve as evidence for each came from members of our group. It feels good to see what a difference we are making."

Similarly, her team members' great work as evidenced by the numerous publications has also earned them authorships and co-authorships of other major text books as well including several *AFIP* fascicles. Dr. Shia was particularly proud to mention that one of the team members, Dr. Christine Iacobuzio-Donahue, also the Director of MSK's David M. Rubenstein Center for Pancreatic Cancer Research, was recently named a recipient of the Ruth Leff Siegel Award from Columbia University Irving Medical Center as the investigator with the most impactful contribution to the understanding of pancreatic cancer over the past year.

> "The service work may seem like regular, routine kind of work, but we make sure each case is done in the right way–the best way–so we can set the standards for the best pathology practice; our team is committed to that."

Dr. Shia is also anticipating the ways in which the team's research will enhance the standard of care for GI tumors worldwide, and seeing what sort of insights future investigations may spark. "Many exciting research projects are being carried out by our team members", she says. Some examples she has provided are: the heterogeneity of MSI cancers at both the molecular and phenotypical level and how that may translate to tumor response to immunotherapy; the role of gut microbiome on tumor development and behavior; and the clinical and diagnostic application of digital and computational pathology. "All such efforts carry the promise of providing meaningful data and ultimately helping advance the field of GI oncology".

THE NEXT GENERATION

Dr. Shia says she and the GI team greatly enjoy working with their fellows. "The fellows' unique perspective brings on views that we would otherwise have not seen; such views often help improve the way we work and teach," Dr. Shia says. For the fellows – both the first-year fellows and the GI subspecialty fellows, the GI service provides a nurturing and supportive environment that allows them to freely absorb knowledge and grow.

Dr. Shia has served as Director of the Gastrointestinal Pathology Fellowship Program at MSK for the past 10 years. In 2020, her teammate Dr. Carlie Sigel will take over this role. "Carlie has already been an integral part of our GI Fellowship Program for many years. Carlie is a wonderful teacher and has mentored many fellows on various research projects," says Dr. Shia.

Whether she is discussing the past, present, or future, Dr. Shia exhibits great pride in the work that the GI pathology team contributes to MSK. There is good reason she's remained in her post at MSK for more than two decades: the kind of work the service does is simply unparalleled. "GI pathology at MSK has always performed at a very high level. Between our clinical service, research, and educational efforts, you can count on it always being that way," Dr. Shia concludes.

14,000

> "When we looked at our service load for the year recently, we saw that our group had already signed out more than 14,000 cases for 2019. That accounted for more than 16% of the total service volume."

SHADI HADDAD

1982-2019

By Carlie S. Sigel

The Cytology Service is nested within the Pathology Department and the services it provides require consistent trust and interconnectedness among the cytology staff. We are tethered to each other by Vocera, we cover those taking lunch, delayed by transit, or away on unexpected absences, and we suffer such intimacies as having to recognize and decipher the worst of our colleagues' handwriting. Bonded in this way, we frequently choose to gather by circling around the office, eating cake by the cubicles in the spirit of celebration for life's milestones such as new students, marriages, baby showers, holidays, promotions, and retirements. We are a close-knit group, and when Shadi dropped out of our lives so tragically sudden, I felt unraveled and deeply sad.

I've been keeping his spirit alive in my mind and in my heart since June by remembering the qualities I admired most in him. He was a model of positivity. Shadi was never simply present and working for the sake of completing a task. He aimed to be as helpful and available as possible and he always had a good attitude. Another one of his admirable qualities was his accountability. Consistently, he was free to admit uncertainty or his role in a mishap. Incapable of lying, he would never obscure any details. I knew I could trust anything he said even if I couldn't trust that the words he used were present in the dictionary. He told me his wife Meghan called his language, "Shadanese" and the entry I will make in that lexicon is "subsequental" which means the thing that happened after the one we were talking about. And if Chloe, his daughter, ever finds herself having trouble pronouncing names, it is safe to say she inherited that from her father. Shadi deeply cared about his family. They understood his work family was an extension of theirs and gathered from near and far to attend the MSK memorial. My favorite memories of him will be when he would poke his head into my office and ask me if I was busy. "Of course, but c'mon in," I'd say, and then he'd bound over to my desk with his phone out and show me the latest cute Chloe pic. The pureness of his excitement and joy in being a dad and loving his baby girl was endlessly uplifting. Shadi had an awesome sense of humor and an innate sense of when to be serious and when it was okay to cut loose a little.

I count myself among the many who think of Shadi frequently. I will honor his life by trying to embody in myself these traits that left such a deep impression on me and those of us who continue to grieve. If you want to add a little Shadanese to your life, just say "cool beans" when you agree with something and I guarantee it will help you smile through the sadness.

"The sudden passing of cytotechnologist Shadi Haddad on May 31, 2019 shocked and saddened all of his extended 'work family', who he touched both professionally and personally." - *David Klimstra, MD*

“I will always remember Shadi’s laugh – it was like no other laugh I have ever heard. He will always be in our hearts.”

MARIA MAUGERI

“A Bosnian and a Jordanian walk into a bar..... No, it’s not the beginning of a joke, but the beginning of a friendship! Shadi and I, with a couple of other members of the cytology service, had a tradition of going to a local bar before our yearly departmental Christmas party. Early on, our conversations focused on craft beers and cars. He loved Volvo’s. As the years progressed, our conversations turned to married life, our kids, family, and Bitcoin. Shadi enjoyed discussing the intricate details of the cryptocurrency process. Shadi was genuine and caring. He loved his family. We will miss his laid-back attitude, his laugh, and helpful nature.”

RUSMIR FERATOVIC

“Shadi was always calm, humble, and cordial towards other people. He brought positive attitude and effort every day in our Cytology Service. Amazing colleague. ″

HANDY OEN

“I had the privilege of working with Shadi at MSK. He was a kind, smart, friendly soul. My deepest condolences to Shadi's family. He will be dearly missed.”

LORRAINE CORSALE

“Dearest Shadi- One of the sayings that has always struck a cord in my heart is “Only the good die young”. Some things in life are not meant to be explained, just accepted, and your passing is certainly one of them. We miss you, today and always.”

VERONICA KIM

QUALITY IMPROVEMENT FAIR XVI

Pathology Project Recognized at MSK Quality Improvement Fair

By Julie Grisham

Every year, Memorial Sloan Kettering's Quality Improvement (QI) Fair showcases various improvement efforts and initiatives across the Center. The institution-wide event is hosted by the Division of Quality and Safety.

The QI Fair was created to increase awareness of various projects and initiatives, improve collaboration, and emphasize patient safety and quality of care as top priorities, among other objectives.

In April 2019, a project from the Department of Pathology won two of the three awards at the QI Fair: the Judges' Choice Award and the Patients'/Caregivers' Choice Award.

The project, called "Pathology Consultations 2.0: Empowering Users, Improving Turn Around Time, and Embracing the Digital Age", was aimed at improving workflow in the acquisition and analysis of pathology specimens obtained through MSK's personal consultation (PC) service. These specimens are sent by non-MSK patients and physicians located anywhere in the world who are seeking a second opinion from MSK's expert team of sub-specialized pathologists. They make up about 10% of the department's volume.

"I've spent my entire career at MSK in the Department of Pathology and received cancer care as a patient here; therefore I understand the unique perspective of both needing an expert opinion and being acutely aware of the knowledge my colleagues offer to the world. Perfecting our personal consultation service while increasing awareness of options available to patients, augmenting our revenue streams and making the overall cancer care process easier for our patients has been incredibly rewarding. I'm very proud of the team that allowed these goals to come to fruition." says Sarah Virgo, Project Lead and Assistant Manager, Pathology Communications for the Department of Pathology.

The project identified several areas for improvement in the PC service, including common reasons that these cases are delayed and issues with communication, billing, and workflow. The leaders of the project focused on specific measures for improvement.

The initiative included implementing a new digital portal for the electronic submission of PC cases, streamlining workflows for easy submission of PC cases, and increasing marketing efforts to solicit more PC submissions and recruit new patients to MSK. The goals were to increase overall volume of PC cases, change the way billing information is collected, and establish a revenue stream through the portal.

As presented at the QI Fair, the results of these efforts were a reduction in overall turnaround time for these samples as well as in the number of misdirected cases or cases with missing information or material. In addition, the portal greatly exceeded the anticipated number of PC portal submissions — by 433% — and increased overall annual volume by 12%.

The portal also increased web traffic and revenue for the Pathology Department. As a result of the project, 224 non-MSK patients chose to receive care at MSK after using the portal and more than $20 million in revenue was generated as a result of these new patients.

2019 Quality Improvement Fair

Pathology Consultations 2.0

Empowering Users, Improving Turn Around Time and Embracing the Digital Age

Sarah Cook Virgo • Christine England • Shadia Carlo • Thanayi Levy • Andrew Roth• Sarah Milana • Shirley Vargas • Allix Mazzella • Tracy Lynch • Maria Blanco • Izabella Rosado • Nina Gunhouse • Alba Rosario • Eric Sod • Johnny Leung• Jennifer Sambov• Michael Singer • Jordana Shapiro • Michael Hannon • Stacey Fox • Joy Macheda • Nicole Marino • Elizabeth Zannetti

BACKGROUND:
The Department of Pathology provides an essential service to patients and physicians of Memorial Sloan Kettering Cancer Center by providing timely and vital diagnoses that guide treatment decisions. While the majority of cases evaluated by MSK Pathology are fresh specimens procured and processed directly at MSK, roughly 10% of the department's volume is generated by our personal consultation (PC) service – cases sent by non-MSK patients and physicians located anywhere in the world seeking second opinion from our expert team of sub-specialized pathologists.

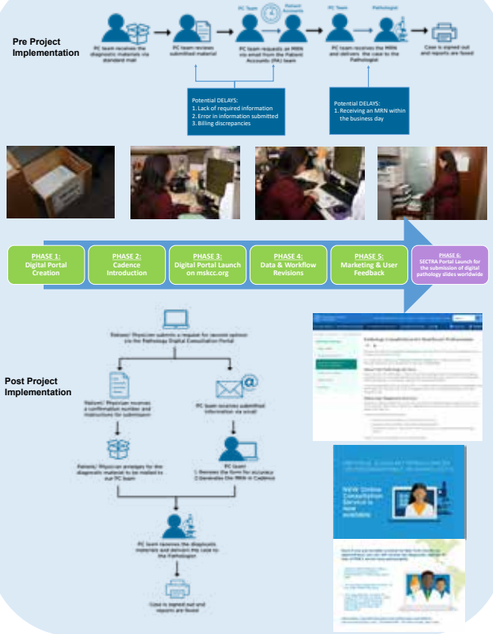
AREAS FOR IMPROVEMENT:

1. Errors in submitted material or missing information
2. Billing discrepancies
3. Delays in receiving an MRN
4. Average TAT: 1-3 business days
5. Often ineffective workflows and communication
6. Potential for augmented revenue stream not taken advantage of
7. Lack of web visibility

PROJECT GOALS:

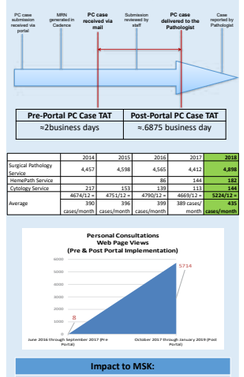
1. Implement a new digital portal for the electronic submission of personal consult cases
2. Streamline workflows for easy submission of PC cases
3. Reduce average TAT: less than 1 business day
4. Establish billing information prior to receiving cases
5. Introduce marketing efforts to solicit more PC submissions and recruit new patients to MSK
6. Increase overall PC case volume
7. Establish a reliable MSK revenue stream from the Pathology portal

Pre Project Implementation



Post Project Implementation

Pathology's Digital Consult Portal (TAT):



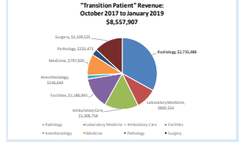
Pre-Portal PC Case TAT	Post-Portal PC Case TAT
≈2business days	≈.6875 business day

	2014	2015	2016	2017	2018
Surgical Pathology Service	4,457	4,598	4,565	4,412	**4,898**
HemePath Service			86	144	**182**
Cytology Service	237	153	139	113	**144**
Average	4674/12 = 390 cases/month	4751/12 = 396 cases/month	4790/12 = 399 cases/month	4669/12 = 389 cases/ month	**5224/12 = 435 cases/month**

Impact to MSK:

238 new MSK patients

$8,557,907 additional revenue



Improving Preparedness for Emergencies in the Laboratory Setting

Cytogenetics Laboratory, Department of Pathology

Christina Li • Dory Londoño-Sanchez • Tishome Persaud • Pedro Flores

Objective

To expand emergency preparedness and training within the laboratory to deal with unforeseen emergencies; such as fire, chemical spills, water intrusion, power outages, and other events. In our project we:

1. Reviewed possible emergencies
2. Consolidated current emergency plans specifically for the laboratory
3. Expanded on current policies, training and equipment for the laboratory
4. Raised awareness in conjunction with Emergency Management

Four Phases of Emergency Preparedness

Mitigation Phase: Minimizing the likelihood of incidents

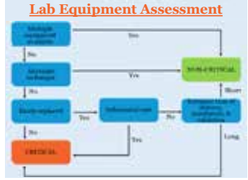
Preparedness Phase: Developing plans on how to handle incidents when they arise

Response Phase: Manage emergencies as they occur

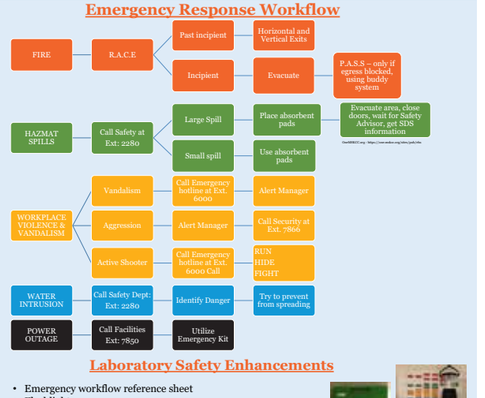
Recovery Phase: Steps to restore affected area back to normal

Lab Risk Assessment: Danger to Staff and Patient Care

Lab Equipment Assessment



Emergency Response Workflow



Laboratory Safety Enhancements

- Emergency workflow reference sheet
- Flashlights
- Tarp
- First Aid Kit
- Chemical Treatment Kit
- Enhanced laboratory floor plan

Laboratory Impact

1. Summarized a lab specific "Emergency Response Workflow" for highest occurring emergencies
2. Allows laboratory to have a faster and more efficient response and recovery time.
3. In conjunction with Emergency Management to bring awareness to other labs of possible emergencies that can happen. Planning is key.

Laboratory Implementations

Emergency	Implementations
Fire	• Additional Fire Code Charts by Exits • Biannual Training • Fire Extinguisher Training • New Employee walkthrough • Update Emergency Contact List
Hazmat/Spill	• Absorbent Pads • SDS/ChemTracker website training
Loss of Equipment	• Critical vs. non-critical equipment log
Water Intrusion	• Tarps • Elevation of equipment and wiring off the floor
Power Outage	• Glow in the dark tape • Ensure critical equipment connected to emergency outlets • Lanterns and flashlights purchased
Violence	• Safe Room • Notification of staffing changes in the lab
Limited Staffing	• Priority Workflow list • Tech training chart • Cross-training

Flood preparedness

Project Development Timeline

Review Possible Emergencies → Improve Laboratory Specific Plans → Lab Specific Training & Drills

Special Acknowledgements: Cytogenetics Laboratory • Anirban Sikdar• Monika Kamalska • Edwin Rodriguez •

The Life Changing Magic of Tidying Up HR Files: A Paperless Personnel File Management System

Monika Kamalska-Cyganik • Robert Cimera • Rose Khoobyar • Brian Murphy • Justyna Sadowska • Paulo Salazar • Angela Scalise • Joshua Somar • Nicole DeGroat • Maria A. Friedlander
Molecular Diagnostic Service, Department of Pathology

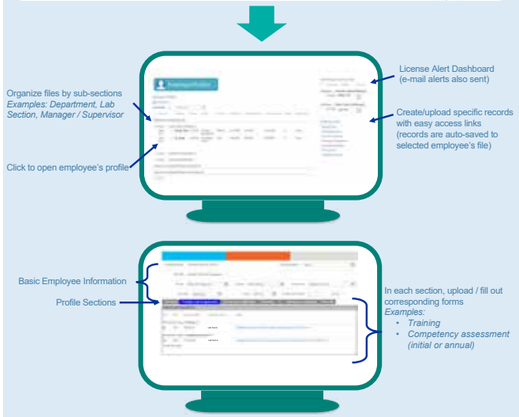
Goals and Objectives:

- Transition to paperless-based personnel files
- Minimize misfiled HR records
- Enhance HR file access for relevant staff while maintaining security and confidentiality
- Engage alert notifications for records associated with expiration dates
- Utilize current available resources (no additional software cost)
- Enhance compliance with HR-personnel records maintenance

Implementation steps:

- Designed user-friendly employee profile template on MSK's SharePoint platform
- Employee profile tailored to include dedicated areas to archive various HR record requirements
- Secure and access controlled site
- Incorporated email alert notifications for relevant records
- Trained lab managers/ supervisors in a use of the new portal
- Solicited user feedback and modified the portal accordingly

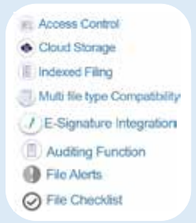
Paper-based Personnel File Management System



Paperless Personnel File Management System

Key features

Available and customizable when designing the Employee Files Management Portal:



Impact to MSK:

- Positive feedback from managers/supervisors using the portal to maintain personnel files
- Enhanced compliance with HR regulatory, accreditation & institutional requirements
- Gain in physical space previously used for file storage
- Potential use and customization by other MSK departments challenged with HR personnel file management with current available platform
- Sparking joy

Sustainability/Green Impact:

- 15,000 pages saved per ~116 employees
- Elimination of plastic binders and dividers used to store paper HR records

MSK Pathology Scan Operations

Journey to a Full Digital Workflow

Radhanglie Seenauth • Lorraine Corsale • Shirley Vargas • Christine England • Jennifer Samboy • Chris Attard • Jamaal Spencer • John Mcdonough • Cindy McCollum

Problem Statement

The Pathology department's scan operations consists of many manual steps resulting in ample delays. In an 8 hour shift Digital Scanning Assistants spend 50% of the time adjusting and reprinting labels adding non-value added time to the process. Labeling issues prevent streamlined scan operations which limits the pathologists' ability to consult more quickly on complex cases, correlate outside diagnoses to a patient's MSK diagnoses, and support the department's transition to full digital sign-out.

Smart Goal

Reduce percent of current clinical slides that require relabeling by 50% and increase the number of current clinical slides submitted weekly from 8,000 slides to 10,000 slides per week by April 30th, 2019.

Benefits

- Use of Digital Pathology to Support OR Operations
- Telecommunication
- Improvement in Pathology Material Management
- Opportunity for Savings in Vendor Services

Background

- In 2015, pathology's clinical workflow was introduced to Digital Scanning.

-DIRECTLY IMPACTS PATIENT CARE

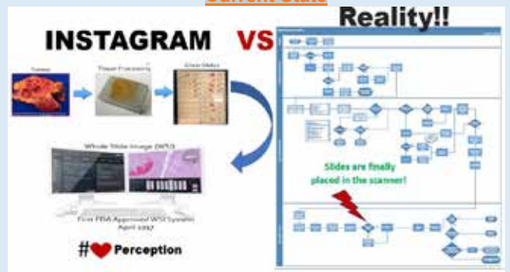
Scan Operations 2019 YTD Volume - Monthly Scan Updates

2019	Current	Archive	Total
Jan	38,774	29,082	67,856
Feb	34,614	27,955	62,569
Mar	30,353	23,802	54,155
Apr			-
May			-
Totals	103,741	80,839	184,580

Scan Volume Totals:

Inception - 2018	830,262
Jan - YTD 2019	184,580
Grand Total:	**1,014,842**

Current State



Long Term Goal

# of slides generated by the Histology Lab daily = approx. 3,000 slides/day

Lab ⇨ Scanner ⇨ DIGITAL IMAGES ⇨ Pathologist ⇨ Diagnosis

Root Cause Analysis

Common Themes:

- ❑Barcodes on Slide Labels
- ❑Placement of Labels
- ❑Reprinting of Barcoded Labels
- ❑Quality Control (Pre & Post Scan)
- ❑Scanner Software Limitations
- ❑LIS (CoPath) Limitation
- ❑Lack of Education

Propose & Test Solutions

Implement & Sustain

MSKCC@USCAP 2019

PLATFORMS

Agaram, Zhang, Antonescu– Bone and Soft Tissue Pathology. *GLI1-Amplified Soft Tissue Neoplasm: A Novel Entity Showing Morphologic Overlap with Tumors with GLI1 Gene Fusions*

Al-Ahmadie–Genitourinary Pathology Society. *Pathology and Molecular Features with Clinical Implications: Lower Tract Urothelial Tumors*

Al-Ahmadie, Fine, Gopalan, Sirintrapun, Tickoo, Chen, Reuter–Genitourinary Pathology. *Revisiting Prognostic Significance of ClinicoPathological Features in Type 1 Papillary Renal Cell Carcinoma*

Antonescu–International Society of Bone and Soft Tissue Pathology. *Epithelioid Hemangioendothelioma–Histologic and Clinical Spectrum and New Genetic Variants*

Antonescu–Pathobiology. *Genomic Progression in PDG-FRA-Mutant Gastrointestinal Stromal Tumors (GISTs)*

Antonescu–Genitourinary Pathology. *BCOR-Overexpressing Malignant Renal/Perirenal Solitary Fibrous Tumor: A Close Mimic of Clear Cell Sarcoma of the Kidney*

Arcila–*Biocartis–Potential of Ultra-Rapid Mutational Analysis in Oncology-Based Applications: Ultra-Rapid Mutational Analysis Complementing NGS Workflows in High-Volume Laboratories*

Arcila–*Practical Molecular Diagnostics for the Practicing Surgical Pathologist*

Basturk–*Surgical Pathology and CytoPathology of the Pancreas and Ampulla*

Boroujeni, Arcila, Ladanyi, Dogan–Pathobiology. *Genomic Profiling of Mucinous Adenocarcinomas Can Assist in Determination of Site of Origin*

Chen–International Society of Urological Pathology. *The Importance of Pathologic Evaluation in Active Surveillance of Small Renal Masses*

Chen–International Society of Urological Pathology Special Conference on Molecular Pathology of Urogenital Cancers–Molecular Pathology Kidney Cancer Working Group. *Eosinophilic Solid and Cystic Renal Cell Carcinoma and Renal Tumors Associated with TSC-mTOR Pathways; Distinguishing Papillary Renal Cell Carcinoma and Mucinous Tubular Spindle Cell Carcinoma*

Chen–*Diagnostic Approach to Renal Tumors with Papillary Architecture: Updates Using 2016 WHO Classification*

Chen, Fine, Gopalan, Sirintrapun, Tickoo, Reuter, Al-Ahmadie–Genitourinary Pathology. *Expression of Insulinoma-Associated Protein 1 (INSM1) in Small Cell Carcinoma of the Bladder*

D' Alfonso–*Challenging Frozen Sections: When Do I Stick My Neck Out…and How Far?*

Fine–*Large Gland Lesions of the Prostate on Needle Biopsy*

Fine, Al-Ahmadie, Chen, Gopalan, Sirintrapun, Tickoo, Reuter–Genitourinary Pathology. *Practice Patterns in Reporting Tertiary Grades at Radical Prostatectomy: Survey of a Large Group of Experienced Urologic Pathologists*

Fine–*Dynamic Evolution in Prostate Cancer Diagnosis and Reporting: What the Pathologist Needs to Know*

Fuchs–International Society of Breast Pathology. *Artificial Intelligence (AI) in Breast Pathology*

Fine, Tickoo, Al-Ahmadie, Chen, Sirintrapun, Ladanyi, Reuter, Gopalan–Genitourinary Pathology. *Immunohistochemical Detection of Androgen Receptor in Metastatic Castrate Resistant Prostate Cancer*

Grabenstetter, Brogi–Breast Pathology. *Flat Epithelial Atypia (FEA) in Breast Core Needle Biopsy (CNB): Is Excision Necessary?*

Hechtman–*Incorporating TRK Inhibition into the Treatment Paradigm: The Pathologist's Role–What Methods are Appropriate for Detecting TRK Fusion Cancer in Daily Practice*

Hechtman, Vakiani, Klimstra, Shia–Gastrointestinal Pathology. *Inter-Tumoral Discordance in Mismatch Repair Protein Expression in Synchronous or Metachronous Gastrointestinal Tumors: Biological Significance and Clinical Implications*

Ho–HematoPathology. *Clinico- Pathologic and Genetic Characterization of non-AML NPM1-Mutated Myeloid Neoplasms*

Jungbluth, Katabi, Xu– Genitourinary Pathology. *Expanded Characterization of the Immune Microenvironment in High-Grade Urothelial Carcinoma of the Bladder*

Katabi, Jungbluth, Xu– Quality Assurance. *Inter- and Intra-Observer Agreement of PD-L1 Scoring in Hypopharyngeal Squamous Cell Carcinoma (HSCC), Urothelial Carcinoma (UC), and Breast Carcinoma (BC)*

Kezlarian, Dogan, Lin– CytoPathology. *CytoPathologic Characterization of SMARCB1-Deficient Malignancies of the Head and Neck Region*

Klimstra–*Acini, Islets, and Associated Pancreatic Neoplasia: A Journey of Technological Evolution in Research and Diagnostics*

Nafa, Hameed–Bone and Soft Zissue Pathology. *Comprehensive Genomic Profiling of the Primary Craniofacial Osteosarcomas*

Pareja, Jungbluth, Giri, Weigelt, Reis-Filho, Brogi–Breast Pathology. *Immunohistochemical Analysis of IDH2 R172 Hotspot Mutations in Breast Papillary Neoplasms*

Park–International Society of Gynecological Pathology. *HPV- Independent Cervical Adenocarcinomas (Including Relationship to Silva Classification and Molecular Abnormalities)*

Rekhtman–Pulmonary Pathology Society. *Update on SMARCB4 Deficient Lung Tumors*

Reuter–Arthur Purdy Stout Society of Surgical Pathologists. *The Disease Doesn't Know Your Age: Adults and Children with the "Wrong Affliction"? GU Pathology*

Soslow–Gynecologic Pathology. *ClinicoPathologic Analysis of MMR-Deficient Endometrial Carcinosarcomas*

Shia, Gopalan, Chen, Fine, Sirintrapun, Arcila, Tickoo, Berger, Reuter, Al-Ahmadie– Genitourinary Pathology. *Detailed Morphologic and Genetic Features of Urothelial Carcinoma in Patients with Lynch Syndrome*

Sigel, Basturk–CytoPathology. *Fine Needle Aspiration Findings in Pancreatoblastoma (PBL): An Analysis of 10 Cases Reveals Helpful Cytologic Criteria in Their Distinction from Common Mimics*

Sirintrapun–Association for Pathology Informatics. *Robotic Telecytology for Remote Diagnosis*

Soslow–GYN Pathology. *The Evolving Landscape of Endocervical Adenocarcinoma, What Matters?*

Tang–Pancreatobiliary Pathology Society. *Pancreatic Neuroendocrine Neoplasms–Landscape and Horizon*

Travis–Pulmonary Pathology Society. *Lung Adenocarcinoma: Emerging Histologic Patterns*

Travis–Pulmonary Pathology. *Importance of Distinguishing Adenocarcinoma and Squamous Cell Carcinoma in Assessment of Pathologic Response After Neoadjuvant Chemotherapy*

Travis, Sauter–Pulmonary Pathology. *Pericardial Mesothelioma: A Multi-Institutional Study of 61 Cases*

Vakiani, Shia, Klimstra– Gastrointestinal Pathology. *Massive Parallel Sequencing of Neuroendocrine Carcinomas of the Large Bowel Reveals Distinct Molecular Subsets and Patterns of Genomic Evolution*

Weigelt–*Molecular Diagnostic & Genomic Applications in Cancer: A Primer for the Pathologist*

Weigelt–*Molecular Advances in Gynecologic Pathology: An Update for the Anatomic Pathologist*

Wen–*Uncommon Histologic Subtypes of Triple Negative Breast Cancer*

Xu–Genitourinary Pathology. *Protein and Transcriptomic Characterization of the Immune Milieu of High-Grade Bladder Cancer*

Zhang, Antonescu–Bone and Soft Tissue Pathology. *Novel Recurrent PHF1-TFE3 Fusions in a Subset of Ossifying Fibromyxoid Tumors*

Zhou, Tanaka, Hendrickson, Wang, Roehrl–Techniques. *Developing a Robust Sample Preparation Procedure for Depp Fourier- Transform Mass Spectrometric Profiling of Formalin-Fixed Paraffin-Embedded Clinical Tissue Specimens*

POSTERS

Al-Ahmadie–Genitourinary Pathology. *Urothelial Carcinoma in Situ Versus Early High-Grade Papillary Urothelial Carcinoma: A Survey of Pathologist and Urologist Interpretations*

Antonescu–Bone and Soft Tissue Pathology. *Pericytoma with t(7;12) and ACTB-GLI1 Fusion Involving the Musculoskeletal System and Ovary: A Report of Three Cases*

Arcila, Nafa, Ho, Roshal– HematoPathology. *Sensitive and Ultra-Rapid BRAF V600E Mutation Assessment in Hairy Cell Leukemia from Stained Smear Slides, Blood and Bone Marrow without Pre-Extraction*

Askan, Olca Basturk–*Pancreas Pathology. Do We Still Really Need to Count Mitoses for Pan-NETs? Proper Ki67 Counting Negates the Need for the Cumbersome and Problematic Mitotic Count Required in the Current WHO-2017 Grading Scheme*

Basturk–Pancreas Pathology. *Frequency of Dysplasia/Carcinoma and Foveolar Atypia Associated with Gallbladder Cancer Risk: Comparative Analysis in Mapped/Totally Sampled Gallbladders from High-Risk Versus Low-Risk Regions*

Basturk–Pancreas Pathology. *Field Risk ("Field-Effect"/"Field-Defect") in the Gallbladder and Biliary Tree: An Under-Recognized Phenomenon with Major Implications for Management and Carcinogenesis*

Benayed, Ladanyi, Hechtman– Pathobiology. *NTRK Fusion Detection Across Three Assays and 29,000 Tumors*

Bhanot, Roehrl–Informatics. *Digital Imaging for Systematic Validation of Spatially Annotated Mirror-Image Simultaneous Flash Frozen and FFPE Tissue Banking for Research*

Boroujeni, Al-Ahmadie, Reuter, Gopalan, Arcila, Fine, Ladanyi, Yao–*Pathobiology. Genomic Profiling of Prostate Cancer with EGFR Family Gene Alterations-Potential of Clinical and Therapeutic Implications*

Boroujeni, Arcila, Ladanyi, Soslow, Chang–Gynecologic Pathology. *Evaluation of Copy Number Alterations of MYC Family of Genes, RB1 Gene and AURKA in Endometrial Carcinomas*

Brogi, Pareja, Murray, Weigelt, Reis-Filho, Wen–Breast Pathology. *Secretory Carcinoma of the Breast: ClinicoPathologic Profile of 14 Cases Emphasizing Distant Metastatic Potential*

Brogi, Murray–Breast Pathology. *Core Needle Biopsy Diagnosis of Fibroepithelial Lesions: Features Predictive of Upgrade to Phyllodes Tumor at Excision*

Chan, Lewis, Arcila, Zhang, Roshal, Xia–HematoPathology. *Blast to Plasmacytoid*

Dendritic Cell Ratio is Predictive of Progression in Low Grade Myelodysplastic Syndromes

Chen, Al-Ahmadie, Fine, Gopalan, Sirintrapun, Tickoo, euter–Genitourinary Pathology. *SMARCB1 Alterations and Protein Expression in Non-Medullary Renal Cell Carcinoma*

Chen–Genitourinary Pathology. *Clear Cell Renal Cell Carcinoma with a Poorly-Differentiated Component: A Novel Variant Causing Potential Diagnostic Difficulty*

Chen, Tickoo, Fine, Gopalan, Al-Ahmadie, Sirintrapun, Antonescu, Ladanyi, Arcila, Reuter–Genitourinary Pathology. *TFEB Expression Profiling in Renal Cell Carcinomas*

Dogan, Xu, Vanderbilt, Berger–Head and Neck Pathology. *Genomic Analysis of 134 Squamous Cell Carcinomas Arising in the Base of Tongue Diagnosed from 1985 to 2017*

Dogan, Arcila, Katabi, Ladanyi, Benayed– Head and Neck Pathology. *NovelRearrangements in Salivary Gland Tumors Detected by an RNA-Based Targeted Next-Generation Sequencing Assay*

Dogan, Ghossein, Reis-Filho, Xu, Katabi–Head and Neck Pathology. *Inter-Observer Variation in the Histologic Classification of Polymorphous Adenocarcinoma (PAC) and Cribriform Adenocarcinoma of Salivary Gland (CASG)*

Fine, Al-Ahmadie, Chen, Gopalan, Sirintrapun, Tickoo, Reuter–Genitourinary Pathology. *In Organ-Confined Prostate Cancer at Radical Prostatectomy, neither Total Tumor Volume nor Maximum Tumor Diameter of the Index Lesion Aids in Prediction of Biochemical Recurrence*

Fine, Reuter–Genitourinary Pathology. *Reporting Practices and Resource Utilization in the Era of Intraductal Carcinoma of the Prostate (IDCP): A Survey of Genitourinary (GU) Subspecialists*

Rekhtman, Travis, Sauter– Pulmonary Pathology. *Acute Lung Injury Pattern is a Frequent Histologic Finding in Lung Tissue Following Immune Checkpoint Inhibitor Therapy*

Jungbluth, Zhang, Zhang, Chen, Tickoo, Fine, Gopalan, Al-Ahmadie, Sirintrapun, Berger, Arcila, Ross, Ladanyi, Reuter–Genitourinary Pathology. *JAK2/PD-L1/PD-L2 (9p24.1) Amplified Renal Cell Carcinoma: Implications for Clinical Management*

Jia, Al-Ahmadie, Fine, Gopalan, Sirintrapun, Tickoo, Reuter, Chen–Genitourinary Pathology. *Expanding the Morphologic Spectrum of Sporadic Renal Cell Carcinoma (RCC) Harboring Somatic TSC or MTOR Alterations: Analysis of 8 Cases with Clear Cytoplasm and Leiomyomatous Stroma*

Kezlarian, Sauter, Travis, Ladanyi, Rekhtman–Pulmonary Pathology. *Evaluation of H3K27me3 Expression as a Marker of EZH2 Activation in SMARCA4/SMARCA2-Deficient Tumors and Candidate Biomarker for Trials of EZH2 Inhibitors*

Muller, Rekhtman–CytoPathology. *Sclerosing Pneumocytoma of Lung: CytoMorphologic Findings and Immunoprofile of a Rare Entity*

Muller, Agaram–CytoPathology. *Fine Needle Aspiration Cytology of Benign and Malignant Soft Tissue and Bone Tumors: An Institutional Experience Over a 10-Year Period*

Murray, Pareja, Weigelt, Brogi, Reis-Filho, Zhang–Breast Pathology. *Recurrent MED12 Exon 2 Mutations in Complex Fibroadenomas of the Breast*

Pareja, Katabi, Weigelt, Reis-Filho–Head and Neck Pathology. *Recurrences and High-Grade Forms of Polymorphous Adenocarcinoma are Underpinned by Genetic Alterations Affecting PRKD Genes*

Pareja, Brogi, Wen, Weigelt, Reis-Filho–Pathobiology. *Are Metaplastic Breast Carcinomas and Uterine Carcinosarcomas Genetically Related*

Pareja, Wen, Jungbluth, Brogi, Weigelt, Reis-Filho– Breast Pathology. *Immunohistochemical Assessment of HRAS Q61R Mutations in Breast Adenomyoepitheliomas*

Pareja, Murray, Giri, Weigelt, Reis-Filho, Brogi–Breast Pathology. *Recurrent MED12 Exon 2 Mutations in Benign Breast Fibroepithelial Lesions in Adolescents and Young Adults*

Pareja, Chiang, Reis-Filho, Weigelt–Gynecologic Pathology. *Uterine Rhabdomyosarcomas: Targeted Capture and RNA Sequencing Analyses of Three Cases*

Pareja, Xu, Ghossein, Weigelt, Reis-Filho, Katabi–Head and Neck Pathology. *Histologic Spectrum of Polymorphous Adenocarcinoma of the Salivary Gland Harbor Genetic Alterations Affecting PRKD Genes*

Reis-Filho, Mandelker, Weigelt– Gynecologic Pathology. *Are Endometrial Cancers Arising in BRCA1/BRCA2 Germline Mutation Carriers True BRCA1/BRCA2 Cancers?*

Rekhtman, Hameed, Travis, Yagi–Pulmonary Pathology. *Whole Block Imaging (WBI) by MicroCT of Lung Carcinoid Tumors: 3-Dimensional Morphometric Analysis of Spread Through Air Spaces (STAS)*

Roehrl–Informatics. *Machine Learning-Based Natural Language Processing for Automated Extraction and Standardized Annotation of IHC Results from Free Text Pathology Reports*

Salagean, Grabenstetter, Brogi–Breast Pathology. *Atypical Ductal Hyperplasia (ADH) in Breast Core Needle Biopsies (CNB): Is Excision Always Warranted? Review of the Experience at a Tertiary Care Center*

Sigel–CytoPathology. *Biliary Tract Involvement by Hepatocellular Carcinoma (HCC): An Under-Appreciated Phenomenon and Potential Diagnostic Pitfall in the Evaluation of Bile Duct Brushings*

Soslow, Jia, Chiang–Gynecologic Pathology. *Evaluation of Criteria for Distinguishing Uterine Smooth Muscle Tumors of Uncertain Malignant Potential (STUMP) from Mimics and Improved Prediction of Patient Outcome: A Multi-Institutional Study of 51 Cases*

Tashkandi, Xiao, Roshal, Zhang, Arcila, Benayed, Sen, Ho, Dogan, Petrova-Drus– HematoPathology. *PICALM-MLLT10 Fusion Commonly Presents with Extramedullary Acute Leukemia and Often with a Mixed Phenotype (MPAL)*

Tanaka, Zhou, Roehrl– Pathobiology. *Deep Proteomics of Colorectal Cancer Liver Metastases Uncovers Prognostic Factors and Highly Promising Therapeutic Targets*

Tanaka, Zhou, Roehrl– Pathobiology. *Deep Proteomics of Gastrointestinal Cancers an Distinguish Tumor Location, Histology, and New Post-Genomic Subtypes*

Tickoo–Genitourinary Pathology. *ClinicoPathological Findings in End Stage Kidneys Resected for Mass Lesions: A Single Institution Experience*

Vyas, Vakiani, Hechtman, Klimstra, Shia–Gastrointestinal Pathology. *Residual Neoplasia Limited to the Mucosa in Rectal Resections for Adenocarcinoma Post-Neoadjuvant Therapy: Frequency, Morphological Spectrum and Potential Clinical Implications*

Wen, Xu, Ross, Brogi–Breast Pathology. *Impact of the 2018 ASCO/CAP HER2 Guideline Updates on HER2 Assessment in Breast Cancer with HER2 Immunohistochemistry Equivocal Results*

Xiao, Kumar, Arcila, Zhang, Roshal–HematoPathology. *Abnormal Immature B-Lymphoblast Population in MDS and Non-CML MPN: Diagnostic Implications*

Xu–Genitourinary Pathology. *Gleason Grade Patterns in Nodal Metastasis and Corresponding Prostatectomy Specimens: Impact on Patient Outcome*

Xu–Genitourinary Pathology.*ClinicoPathologic and Transcriptomic Predictors of Fast Urothelial Carcinoma Relapse Post-Radical Cystectomy*

Xu–Genitourinary Pathology. *Morphologic Features in Urothelial Carcinoma Correlate with Intrinsic Molecular Subtypes*

Xu–Breast Pathology. *Mammary Adenoid Cystic Carcinoma: A Multi-Institutional Canadian Study*

Xu, Dogan, Ghossein, Katabi– Head and Neck Pathology. *ClinicoPathologic Features and Outcome of Head and Neck Spindle Cell Squamous Cell Carcinoma (SpC-SCC)*

Xu, Vanderbilt, Berger, Dogan– Head and Neck Pathology. *Integrative Clinical and Genomic Analysis of Tonsillar Squamous Cell Carcinoma (T-SCC)*

Xu–Quality Assurance. *The Impact of Pre-Analytical Parameters on PD-L1 Immunohistochemistry: Concordance Across Four Tissue Processing Protocols Using Two PD-L1 Clones in Multiple Tumor Types*

Xu, Katabi, Ghossein– Endocrine Pathology. *The Prognostic Impact of Percentage of Papillae in Unifocal Encapsulated Papillary Thyroid Carcinoma: Implications for Noninvasive Follicular Thyroid Neoplasm with Papillary-Like Nuclear Features (NIFTP) Diagnosis*

Xu–Genitourinary Pathology. *PD-L1 Expression and Associated Immune Alterations in High-Grade Urothelial Carcinoma of the Bladder*

Xu, Brogi, Ross, Wen–Breast Pathology. *ClinicoPathologic Features of Breast Cancers with HER2/CEP17 Ratio <2, HER2 Copy Number >4 and <6 Signals/Cell*

Xu, Antonescu, Ghossein, Jungbluth, Katabi–Head and Neck Pathology. *Utility of Pan-TRK Immunohistochemistry (IHC) as an Ancillary Tool in Diagnosing Secretory Carcinoma (SC) of Salivary Gland and Detecting ETV6-NTRK3 Fusion*

Xu, Vanderbilt, Berger, Dogan– Head and Neck Pathology. *The Mutational Profile of 50 Squamous Cell Carcinomas of the Soft Palate*

Zeng, Edelweiss, Ross, Brogi, D' Alfonso–Breast Pathology. *Triple-Positive Breast Carcinoma: A HistoPathologic and Clinical Study of Patients Treated with Neoadjuvant Chemotherapy*

Zhang–HematoPathology. *An Integrative Approach Reveals Genetic Complexity and Epigenetic Perturbation in Acute Promyelocytic Leukemia*

Zhang, Hameed, Yagi– Informatics. *Toward an Automated Scoring Algorithm of Fluorescence in Situ Hybridization (FISH) on Formalin-Fixed Paraffin-Embedded (FFPE) Tissues Using a Confocal Whole Slide Image Scanner and Image Analysis Software*

Zhou, Tanaka, Roehrl– Pathobiology. *Understanding the Metastatic Process by Deep Proteomic Analysis of Primary Colon Cancers and Matched Liver Metastases Using Clinical FFPE Tissues*

Zhu, Hechtman, Arcila, Vanderbilt–Gastrointestinal Pathology. *Appendectomy Status is Associated with Distinct Molecular and Microbiota Profiles in Colorectal Carcinomas Based on Comprehensive Molecular Testing by Hybridization Capture Next-Generation Sequencing*

FACULTY PUBLICATIONS

Abida W, Cyrta J, Heller G, Prandi D, Armenia J, Coleman I, Cieslik M, Benelli M, Robinson D, Van Allen EM, Sboner A, Fedrizzi T, Mosquera JM, Robinson BD, De Sarkar N, Kunju LP, Tomlins S, Wu YM, Nava Rodrigues D, Loda M, **Gopalan A, Reuter VE,** Pritchard CC, Mateo J, Bianchini D, Miranda S, Carreira S, Rescigno P, Filipenko J, Vinson J, Montgomery RB, Beltran H, Heath EI, Scher HI, Kantoff PW, Taplin ME, Schultz N, deBono JS, Demichelis F, Nelson PS, Rubin MA, Chinnaiyan AM, Sawyers CL. Genomic correlates of clinical outcome in advanced prostate cancer. *Proc Natl Acad Sci U S A.* 2019;116(23):11428-36.

Agaram NP, Zhang L, Dickson BC, Swanson D, Sung YS, Panicek DM, **Hameed M,** Healey JH, **Antonescu CR.** A molecular study of synovial chondromatosis. *Genes Chromosomes Cancer.* 2020;59(3):144-51.

Agaram NP, Zhang L, Sung YS, Singer S, Stevens T, Prieto-Granada CN, Bishop JA, Wood BA, Swanson D, Dickson BC, **Antonescu CR.** GLI1-amplifications expand the spectrum of soft tissue neoplasms defined by GLI1 gene fusions. *Mod Pathol.* 2019;32(11):1617-26.

Aguilar EJ, Ricciuti B, Gainor JF, Kehl KL, Kravets S, Dahlberg S, Nishino M, Sholl LM, Adeni A, Subegdjo S, Khosrowjerdi S, Peterson RM, Digumarthy S, Liu C, **Sauter J,** Rizvi H, Arbour KC, Carter BW, Heymach JV, Altan M, Hellmann MD, Awad MM. Outcomes to first-line pembrolizumab in patients with non-small-cell lung cancer and very high pd-l1 expression. *Ann Oncol.* 2019;30(10):1653-9.

Al-Azzawi M, Misdraji J, van Velthuysen MF, **Shia J,** Taggart MW, Yantiss RK, Svrcek M, Carr N. Acellular mucin in pseudomyxoma peritonei of appendiceal origin: What is adequate sampling for histopathology? *J Clin Pathol.* 2019 [E-pub ahead of print].

Alborelli I, Generali D, Jermann P, Cappelletti MR, Ferrero G, Scaggiante B, Bortul M, Zanconati F, Nicolet S, Haegele J, Bubendorf L, Aceto N, **Scaltriti M,** Mucci G, Quagliata L, Novelli G. Cell-free DNA analysis in healthy individuals by next-generation sequencing: A proof of concept and technical validation study. *Cell Death Dis.* 2019;10(7):534.

Allen A, Qin ACR, Raj N, Wang J, Uddin S, Yao Z, **Tang L,** Meyers PA, Taylor BS, **Berger MF,** Yaeger R, Reidy-Lagunes D, Pratilas CA. Rare BRAF mutations in pancreatic neuroendocrine tumors may predict response to RAF and MEK inhibition. *PLoS One.* 2019;14(6):e0217399.

Aly RG, **Rekhtman N,** Li X, Takahashi Y, Eguchi T, Tan KS, Rudin CM, Adusumilli PS, **Travis WD.** Spread through air spaces (STAS) is prognostic in atypical carcinoid, large cell neuroendocrine carcinoma, and small cell carcinoma of the lung. *J Thorac Oncol.* 2019;14(9):1583-93.

Antonescu CR, Dickson BC, Swanson D, **Zhang L,** Sung YS, Kao YC, Chang WC, Ran L, Pappo A, Bahrami A, Chi P, Fletcher CD. Spindle cell tumors with ret gene fusions exhibit a morphologic spectrum akin to tumors with NTRK fusions. *Am J Surg Pathol.* 2019;43(10):1384-91.

Argani P, **Zhang L,** Sung YS, Bacchi C, Swanson D, Dickson BC, **Antonescu CR.** Novel SS18-NEDD4 gene fusion in a primary renal synovial sarcoma. *Genes Chromosomes Cancer.* 2020;59(3):203-8.

Argani P, **Zhang L,** Sung YS, White MJ, Miller K, Hopkins M, Small D, Pratilas CA, Swanson D, Dickson B, **Antonescu CR.** A novel RBMX-TFE3 gene fusion in a highly aggressive pediatric renal perivascular epithelioid cell tumor. *Genes Chromosomes Cancer.* 2019 [E-pub ahead of print].

Argyropoulos KV, **Pulitzer M,** Perez S, Korkolopoulou P, Angelopoulou M, Baxevanis C, Palomba ML, Siakantaris M. Tumor-infiltrating and circulating granulocytic myeloid-derived suppressor cells correlate with disease activity and adverse clinical outcomes in mycosis fungoides. *Clin Transl Oncol.* 2019 [E-pub ahead of print].

Armand P, **Chen YB,** Redd RA, Joyce RM, Bsat J, Jeter E, Merryman RW, Coleman KC, Dahi PB, Nieto Y, LaCasce AS, Fisher DC, Ng SY, Odejide OO, Freedman AS, Kim AI, Crombie JL, Jacobson CA, Jacobsen ED, Wong JL, Patel SS, Ritz J, Rodig SJ, Shipp MA, Herrera AF. PD-1 blockade with pembrolizumab for classical hodgkin lymphoma after autologous stem cell transplantation. *Blood.* 2019;134(1):22-9.

Armenia J, Wankowicz SAM, Liu D, Gao J, Kundra R, Reznik E, Chatila WK, **Chakravarty D,** Han GC, Coleman I, Montgomery B, Pritchard C, Morrissey C, Barbieri CE, Beltran H, Sboner A, Zafeiriou Z, Miranda S, Bielski CM, Penson AV, Tolonen C, Huang FW, Robinson D, Wu YM, Lonigro R, Garraway LA, Demichelis F, Kantoff PW, Taplin ME, Abida W, Taylor BS, Scher HI, Nelson PS, de Bono JS, Rubin MA, Sawyers CL, Chinnaiyan AM, Team PSCIPCD, Schultz N, Van Allen EM. Publisher correction: The long tail of oncogenic drivers in prostate cancer. *Nat Genet.* 2019;51(7):1194.

Attiyeh MA, Chakraborty J, McIntyre CA, Kappagantula R, Chou Y, Askan G, Seier K, Gonen M, **Basturk O,** Balachandran VP, Kingham TP, D'Angelica MI, Drebin JA, Jarnagin WR, Allen PJ, **Iacobuzio-Donahue CA,** Simpson AL, Do RK. Ct radiomics associations with genotype and stromal content in pancreatic ductal adenocarcinoma. *Abdom Radiol (NY).* 2019;44(9):3148-57.

Barrio AV, Downs-Canner S, **Edelweiss M,** Van Zee KJ, Cody HS, 3rd, Gemignani ML, Pilewskie ML, Plitas G, El-Tamer M, Kirstein L, Capko D, Patil S, Morrow M. Microscopic extracapsular extension in sentinel lymph nodes does not mandate axillary dissection in z0011-eligible patients. *Ann Surg Oncol.* 2019 [E-pub ahead of print].

Bartlett EK, Curtin CE, Seier K, Qin LX, **Hameed M,** Yoon SS, Crago AM, Brennan MF, Singer S. Histologic subtype defines the risk and kinetics of recurrence and death for primary extremity/truncal liposarcoma. *Ann Surg.* 2019 [E-pub ahead of print].

Basaran D, Bruce S, Aviki EM, Mueller JJ, Broach VA, Cadoo K, **Soslow RA,** Alektiar KM, Abu-Rustum NR, Leitao MM, Jr. Sentinel lymph node mapping alone compared to more extensive lymphadenectomy in patients with uterine serous carcinoma. *Gynecol Oncol.* 2020;156(1):70-6.

Basnet H, Tian L, Ganesh K, Huang YH, Macalinao DG, **Brogi E,** Finley LW, Massague J. Flura-seq identifies organ-specific metabolic adaptations during early metastatic colonization. *Elife.* 2019;8.

Basturk O, Weigelt B, Adsay V, **Benhamida JK,** Askan G, Wang L, **Arcila ME,** Zamboni G, Fukushima N, Gularte-Merida R, Da Cruz Paula A, Selenica P, Kumar R, **Pareja F,** Maher CA, Scholes J, Oda Y, Santini D, Doyle LA, Petersen I, Flucke U, Koelsche C, Reynolds SJ, Yavas A, Deimling AV, **Reis-Filho JS, Klimstra DS.** Sclerosing epithelioid mesenchymal neoplasm of the pancreas - a proposed new entity. *Mod Pathol.* 2019 [E-pub ahead of print].

Bates DDB, Mazaheri Y, Lobaugh S, Golia Pernicka JS, Paroder V, **Shia J,** Zheng J, Capanu M, Petkovska I, Gollub MJ. Evaluation of diffusion kurtosis and diffusivity from baseline staging mri as predictive biomarkers for response to neoadjuvant chemoradiation in locally advanced rectal cancer. *Abdom Radiol (NY).* 2019;44(11):3701-8.

Bavi P, Siva M, Abi-Saab T, Chadwick D, Dhani N, Butany J, Joshua AM, **Roehrl MH.** Developing a pan-cancer research autopsy programme. *J Clin Pathol.* 2019;72(10):689-95.

Beca F, Lee SSK, **Pareja F,** Da Cruz Paula A, Selenica P, Ferrando L, Gularte-Merida R, **Wen HY,** Zhang H, Guerini-Rocco E, Rakha EA, **Weigelt B, Reis-Filho JS.** Whole-exome sequencing and rna sequencing analyses of acinic cell carcinomas of the breast. *Histopathology.* 2019;75(6):931-7.

Bello DM, Panageas KS, Hollmann T, Shoushtari AN, Momtaz P, Chapman PB, Postow MA, Callahan MK, Wolchok JD, Brady MS, Coit DG, Ariyan CE. Survival outcomes after metastasectomy in melanoma patients categorized by response to checkpoint blockade. *Ann Surg Oncol.* 2019 [E-pub ahead of print].

Benayed R, Offin M, Mullaney K, Sukhadia P, Rios K, Desmeules P, Ptashkin R, Won H, **Chang J,** Halpenny D, Schram AM, Rudin CM, Hyman DM, **Arcila ME, Berger MF, Zehir A,** Kris MG, Drilon A, **Ladanyi M.** High yield of RNA sequencing for targetable kinase fusions in lung adenocarcinomas with no mitogenic driver alteration detected by DNA sequencing and low tumor mutation burden. *Clin Cancer Res.* 2019;25(15):4712-22.

Benhamida JK, Hechtman JF, Nafa K, Villafania L, Sadowska J, Wang J, Wong D, **Zehir A, Zhang L, Bale T, Arcila ME, Ladanyi M.** Reliable clinical MLH1 promoter hypermethylation assessment using a high-throughput genome-wide methylation array platform. *J Mol Diagn.* 2019 [E-pub ahead of print].

Bhardwaj P, Ikeda T, Zhou XK, Wang H, Zheng XE, **Giri DD,** Elemento O, Verma A, Miyazawa M, Mukherjee S, Falcone DJ, Wendel NK, Scherr DS, Dannenberg AJ. Supplemental estrogen and caloric restriction reduce obesity-induced periprostatic white adipose inflammation in mice. *Carcinogenesis.* 2019;40(7):914-23.

Bhattarai S, Graham RP, **Sigel CS,** Shi J, Gonzalez RS, Xue Y, Krasinskas AM, HooKim K, Adsay V, Reid MD. Bile duct involvement by hepatocellular carcinoma: A rare occurrence and poor prognostic indicator in bile duct brushing samples. *Cancer Cytopathol.* 2019;127(11):691-9.

Bledea R, Vasudevaraja V, Patel S, Stafford J, Serrano J, Esposito G, Tredwin LM, Goodman N, Kloetgen A, Golfinos JG, Zagzag D, **Weigelt B,** Iafrate AJ, Sulman EP, Chi AS, **Dogan S, Reis-Filho JS, Chiang S,** Placantonakis D, Tsirigos A, Snuderl M. Functional and topographic effects on DNA methylation in IDH1/2 mutant cancers. *Sci Rep.* 2019;9(1):16830.

Boolbol SK, Harshan M, Chadha M, Kirstein L, **Cohen JM,** Klein P, Anderson J, Davison D, Jakubowski DM, Baehner FL, Malamud S. Genomic comparison of paired primary breast carcinomas and lymph node macrometastases using the oncotype dx breast recurrence score((r)) test. *Breast Cancer Res Treat.* 2019;177(3):611-8.

Buonocore DJ, Fowle E, **Lin O, Xu, B, Katabi N, Cohen JM.** Cytologic evaluation of p16 staining in head and neck squamous cell carcinoma in cytolyt versus formalin-fixed material. *Cancer Cytopathol.* 2019;127(12):750-6.

Buonocore DJ, Konno F, **Jungbluth AA,** Frosina D, Fayad M, **Edelweiss M, Lin O, Rekhtman N.** Cytolyt fixation significantly inhibits MIB1 immunoreactivity whereas alternative Ki-67 clone 30-9 is not susceptible to the inhibition: Critical diagnostic implications. *Cancer Cytopathol.* 2019;127(10):643-9.

Campanella G, **Hanna MG,** Geneslaw L, Miraflor A, Werneck Krauss Silva V, **Busam KJ, Brogi E, Reuter VE, Klimstra DS, Fuchs TJ.** Clinical-grade computational pathology using weakly supervised deep learning on whole slide images. *Nat Med.* 2019;25(8):1301-9.

Carlo MI, Hakimi AA, Stewart GD, Bratslavsky G, Brugarolas J, **Chen YB,** Linehan WM, Maher ER, Merino MJ, Offit K, **Reuter VE,** Shuch B, **Coleman JA.** Familial kidney cancer: Implications of new syndromes and molecular insights. *Eur Urol.* 2019;76(6):754-64.

Carlo MI, Ravichandran V, Srinavasan P, Bandlamudi C, Kemel Y, **Ceyhan-Birsoy O,** Mukherjee S, **Mandelker D,** Chaim J, Knezevic A, Rana S, Fnu Z, Breen K, Arnold AG, Khurram A, Tkachuk K, Cipolla CK, Regazzi A, Hakimi AA, **Al-Ahmadie H,** Dalbagni G, Cadoo KA, Walsh MF, Teo MY, Funt SA, **Coleman JA,** Bochner BH, Iyer G, Solit DB, Stadler ZK, **Zhang L,** Rosenberg JE, Taylor BS, Robson ME, **Berger MF,** Vijai J, Bajorin DF, Offit K. Cancer susceptibility mutations in patients with urothelial malignancies. *J Clin Oncol.* 2019 [E-pub ahead of print]:JCO1901395.

Carlsson S, Benfante N, Alvim R, Sjoberg DD, Vickers A, **Reuter VE, Fine SW,** Vargas HA, Wiseman M, Mamoor M, Ehdaie B, Laudone V, Scardino P, Eastham J, Touijer K. Long-term outcomes of active surveillance for prostate cancer - The Memorial Sloan Kettering Cancer Center experience. *J Urol.* 2019 [E-pub ahead of print]

Casuscelli J, Becerra MF, Seier K, Manley BJ, Benfante N, Redzematovic A, Stief CG, Hsieh JJ, **Tickoo SK, Reuter VE, Coleman JA,** Russo P, Ostrovnaya I, Hakimi AA. Chromophobe renal cell carcinoma: Results from a large single-institution series. *Clin Genitourin Cancer.* 2019;17(5):373-9 e4.

Chan A, Dogan A. Prognostic and predictive biomarkers in diffuse large B-cell lymphoma. *Surg Pathol Clin*. 2019;12(3):699-707.

Chan AT, Fox J, Perez Johnston R, Kim J, Brouwer LR, Grizzard J, Kim RJ, Matasar M, **Shia J,** Moskowitz CS, Steingart R, Weinsaft JW. Late gadolinium enhancement cardiac magnetic resonance tissue characterization for cancer-associated cardiac masses: Metabolic and prognostic manifestations in relation to whole-body positron emission tomography. *J Am Heart Assoc*. 2019;8(10):e011709.

Chang JC, Alex D, Bott M, Tan KS, Seshan V, Golden A, **Sauter J**L, **Buonocore DJ, Vanderbilt CM,** Gupta S, Desmeules P, Bodd FM, Riely GJ, Rusch VW, Jones DR, **Arcila ME, Travis WD, Ladanyi M, Rekhtman N.** Comprehensive next-generation sequencing unambiguously distinguishes separate primary lung carcinomas from intrapulmonary metastases: Comparison with standard histopathologic approach. *Clin Cancer Res*. 2019;25(23):7113-25.

Chapman J, **Dogan A.** Fibrinogen alpha amyloidosis: Insights from proteomics. *Expert Rev Proteomics*. 2019;16(9):783-93.

Chen H, Thomas C, Munoz FA, Alexandrescu S, Horbinski CM, Olar A, McGuone D, Camelo-Piragua S, Wang L, Pentsova E, Phillips J, Aldape K, Chen W, Iafrate AJ, Chi AS, Zagzag D, Golfinos JG, Placantonakis DG, **Rosenblum M,** Ohman-Strickland P, **Hameed M,** Snuderl M. Polysomy is associated with poor outcome in 1p19q co-deleted oligodendroglial tumors. *Neuro Oncol*. 2019 [E-pub ahead of print].

Choi S, Wang D, Chen X, **Tang LH,** Verma A, Chen Z, Kim BJ, Selesner L, Robzyk K, Zhang G, Pang S, Han T, Chan CS, Fahey TJ, 3rd, Elemento O, Du YN. Function and clinical relevance of RHAMM isoforms in pancreatic tumor progression. *Mol Cancer*. 2019;18(1):92.

Cimic A, **Rekhtman N.** Cytojounal quiz case: Fine-needle aspiration of peripancreatic mass clinically mimicking a lymphoma. *Cytojournal*. 2019;16:11.

Cocco E, Lopez S, Santin AD, **Scaltriti M.** Prevalence and role of HER2 mutations in cancer. *Pharmacol Ther*. 2019;199:188-96.

Cocco E, Schram AM, Kulick A, Misale S, Won HH, Yaeger R, Razavi P, Ptashkin R, **Hechtman JF,** Toska E, Cownie J, Somwar R, Shifman S, Mattar M, Selcuklu SD, Samoila A, Guzman S, Tuch BB, Ebata K, de Stanchina E, Nagy RJ, Lanman RB, Houck-Loomis B, Patel JA, **Berger MF, Ladanyi M,** Hyman DM, Drilon A, **Scaltriti M.** Resistance to TRK inhibition mediated by convergent MAPK pathway activation. *Nat Med*. 2019;25(9):1422-7.

Cohen AD, Garfall AL, **Dogan A,** Lacey SF, Martin C, Lendvai N, Vogl DT, Spear M, Lesokhin AM. Serial treatment of relapsed/refractory multiple myeloma with different BCMA-targeting therapies. *Blood Adv*. 2019;3(16):2487-90.

Comen EA, Bowman RL, Selenica P, Kleppe M, Farnoud NR, **Pareja F, Weigelt B,** Hill CE, Alon A, Geyer FC, Akturk G, **Reis-Filho JS,** Norton L, Levine RL. Evaluating clonal hematopoiesis in tumor-infiltrating leukocytes in breast cancer and secondary hematologic malignancies. *J Natl Cancer Inst*. 2020;112(1):107-10.

Comperat E, Amin M, **Reuter V.** Reply re: Murali Varma, Brett Delahunt,Theodorus van der Kwast. Grading noninvasive bladder cancer: World Health Organisation 1973 or 2004 may be the wrong question. Eur Urol 2019;76:413-5: Two decades of world health organisation/international society of urological pathology bladder cancer grading: Time to reflect on accomplishments and plan refinement in the molecular era, not regress to readoption of a 45-year-old classification. *Eur Urol*. 2019;76(4):416-7.

Cornejo KM, Cosar EF, Paner GP, Yang P, Tomaszewicz K, Meng X, Mehta V, **Sirintrapun SJ,** Barkan GA, Hutchinson L. Mutational profile using next-generation sequencing may aid in the diagnosis and treatment of urachal adenocarcinoma. *Int J Surg Pathol*. 2020;28(1):51-9.

Cybulska P, Paula ADC, Tseng J, Leitao MM, Jr., Bashashati A, Huntsman DG, Nazeran TM, Aghajanian C, Abu-Rustum NR, DeLair DF, Shah SP, **Weigelt B.** Molecular profiling and molecular classification of endometrioid ovarian carcinomas. *Gynecol Oncol*. 2019;154(3):516-23.

Damerla RR, Lee NY, You D, Soni R, Shah R, Reyngold M, **Katabi N,** Wu V, McBride SM, Tsai CJ, Riaz N, Powell SN, Babady NE, Viale A, Higginson DS. Detection of early human papillomavirus-associated cancers by liquid biopsy. *JCO Precis Oncol*. 2019;3.

Dano H, Altinay S, Arnould L, Bletard N, Colpaert C, Dedeurwaerdere F, Dessauvagie B, Duwel V, Floris G, Fox S, Gerosa C, Jaffer S, Kurpershoek E, Lacroix-Triki M, Laka A, Lambein K, MacGrogan GM, Marchio C, Martinez DM, Nofech-Mozes S, Peeters D, Ravarino A, Reisenbichler E, Resetkova E, Sanati S, Schelfhout AM, Schelfhout V, Shaaban AM, Sinke R, Stanciu-Pop CM, Stobbe C, van Deurzen CHM, Van de Vijver K, Van Rompuy AS, Verschuere S, Vincent-Salomon A, **Wen H,** Bouzin C, Galant C, Van Bockstal MR. Interobserver variability in upfront dichotomous histopathological assessment of ductal carcinoma in situ of the breast: The DCISion study. *Mod Pathol*. 2019 [E-pub ahead of print].

Datta J, Da Silva EM, Kandoth C, Song T, Russo AE, Hernandez JM, Taylor BS, Janjigian YY, **Tang LH,** Solit DB, Strong VE. Poor survival after resection of early gastric cancer: Extremes of survivorship analysis reveal distinct genomic profile. *Br J Surg*. 2020;107(1):14-9.

Datta J, Smith JJ, Chatila WK, McAuliffe JC, Kandoth C, **Vakiani E,** Frankel TL, Ganesh K, Wasserman I, Lipsyc-Sharf M, Guillem J, Nash GM, Paty PB, Weiser MR, Saltz LB, **Berger MF,** Jarnagin WR, Balachandran V, Kingham TP, Kemeny NE, Cercek A, Garcia-Aguilar J, Taylor BS, Viale A, Yaeger R, Solit DB, Schultz N, D'Angelica MI. Coaltered RAS/B and TP53 is associated with extremes of survivorship and distinct patterns of metastasis in patients with metastatic colorectal cancer. *Clin Cancer Res*. 2019 [E-pub ahead of print].

De Angelis C, Nagi C, Hoyt CC, Liu L, Roman K, Wang C, Zheng Y, Veeraraghavan J, Sethunath V, Nuciforo P, Wang T, Tsimelzon A, Mao S, Hilsenbeck SG, Trivedi MV, Cataldo ML, Pavlick A, Wolff AC, **Weigelt B, Reis-Filho JS,** Prat A, Gutierrez C, Osborne CK, Rimawi MF, Schiff R. Evaluation of the predictive role of tumor immune infiltrate in patients with HER2-positive breast cancer treated with neoadjuvant anti-HER2 therapy without chemotherapy. *Clin Cancer Res*. 2019 [E-pub ahead of print].

Dickson BC, Chung CT, Hurlbut DJ, Marrano P, Shago M, Sung YS, Swanson D, **Zhang L, Antonescu CR.** Genetic diversity in alveolar soft part sarcoma: A subset contain variant fusion genes, highlighting broader molecular kinship with other MiT family tumors. *Genes Chromosomes Cancer*. 2019 [E-pub ahead of print].

DiNatale RG, Gorelick AN, Makarov V, Blum KA, Silagy AW, Freeman B, Chowell D, Marcon J, Mano R, Sanchez A, Attalla K, Weng S, Voss M, Motzer RJ, Russo P, **Coleman JA, Reuter VE, Chen YB,** Chan TA, Reznik E, **Tickoo SK,** Hakimi AA. Putative drivers of aggressiveness in TCEB1-mutant renal cell carcinoma: An emerging entity with variable clinical course. *Eur Urol Focus*. 2019 [E-pub ahead of print].

Dogan S, Ng CKY, **Xu, B,** Kumar R, Wang L, **Edelweiss M,** Scott SN, **Zehir A,** Drilon A, Morris LGT, Lee NY, **Antonescu CR,** Ho AL, **Katabi N, Berger MF, Reis-Filho JS.** The repertoire of genetic alterations in salivary duct carcinoma including a novel HNRNPH-3-ALK rearrangement. *Hum Pathol*. 2019;88:66-77.

Dogan S, Vasudevaraja V, **Xu, B,** Serrano J, Ptashkin RN, Jung HJ, **Chiang S, Jungbluth AA,** Cohen MA, Ganly I, **Berger MF,** Momeni Boroujeni A, **Ghossein RA, Ladanyi M,** Chute DJ, Snuderl M. DNA methylation-based classification of sinonasal undifferentiated carcinoma. *Mod Pathol*. 2019;32(10):1447-59.

Dogan S, Xu, B, Middha S, **Vanderbilt CM,** Bowman AS, Migliacci J, Morris LGT, Seshan VE, Ganly I. Identification of prognostic molecular biomarkers in 157 HPV-positive and HPV-negative squamous cell carcinomas of the oropharynx. *Int J Cancer*. 2019;145(11):3152-62.

Downes MR, Slodkowska E, **Katabi N, Jungbluth AA, Xu, B.** Inter- and intraobserver agreement of programmed death ligand 1 scoring in head and neck squamous cell carcinoma, urothelial carcinoma and breast carcinoma. *Histopathology*. 2019 [E-pub ahead of print].

Drilon A, Schoenfeld AJ, Arbour KC, Litvak A, Ni A, Montecalvo J, Yu HA, Panora E, Ahn L, Kennedy M, Haughney-Siller A, Miller V, Ginsberg M, **Ladanyi M, Arcila M, Rekhtman N,** Kris MG, Riely GJ. Exceptional responders with invasive mucinous adenocarcinomas: A phase 2 trial of bortezomib in patients with KRAS G12D-mutant lung cancers. *Cold Spring Harb Mol Case Stud*. 2019;5(2).

Dunn LA, Riaz N, Fury MG, McBride SM, Michel L, Lee NY, Sherman EJ, Baxi SS, Haque SS, **Katabi N,** Wong RJ, Xiao H, Ho AL, Pfister DG. A phase Ib study of Cetuximab and BYL719 (Alpelisib) concurrent with intensity-modulated radiation therapy in stage III-IVB head and neck squamous cell carcinoma. *Int J Radiat Oncol Biol Phys*. 2019 [E-pub ahead of print].

Durham BH, Lopez Rodrigo E, Picarsic J, Abramson D, Rotemberg V, De Munck S, Pannecoucke E, Lu SX, Pastore A, Yoshimi A, **Mandelker D, Ceyhan-Birsoy O,** Ulaner GA, Walsh M, **Yabe M, Petrova-Drus K, Arcila ME, Ladanyi M,** Solit DB, **Berger MF,** Hyman DM, Lacouture ME, Erickson C, Saganty R, Ki M, Dunkel IJ, Santa-Maria Lopez V, Mora J, Haroche J, Emile JF, Decaux O, Geissmann F, Savvides SN, Drilon A, Diamond EL, Abdel-Wahab O. Activating mutations in CSF1R and additional receptor tyrosine kinases in histiocytic neoplasms. *Nat Med*. 2019;25(12):1839-42.

Edelweiss M, Sebastiao APM, Oen H, Kracun M, Serrette R, **Ross DS.** HER2 assessment by bright-field dual in situ hybridization in cell blocks of recurrent and metastatic breast carcinoma. *Cancer Cytopathol*. 2019;127(11):684-90.

Edwards JG, Chansky K, van Schil P, Nicholson AG, Boubia S, Brambilla E, Donnington J, Galateau-Salle F, Hoffman H, Infante M, Marino M, Marom E, Nakajima J, Ostrowski M, **Travis WD,** Tsao MS, Yatabe Y, Giroux DJ, Shemanski L, Crowley J, Krasnik M, Asamura H, Rami-Porta R, International Association for the Study of Lung Cancer S, Prognostic Factors Committee ABM, Participating Institutions. The IASLC lung cancer staging project: Analysis of resection margin status and proposals for residual tumor descriptors for non-small cell lung cancer. *J Thorac Oncol*. 2019 [E-pub ahead of print].

Eissa MAL, Lerner L, Abdelfatah E, Shankar N, Canner JK, Hasan NM, Yaghoobi V, Huang B, Kerner Z, Takaesu F, Wolfgang C, Kwak R, Ruiz M, Tam M, Pisanic TR, 2nd, **Iacobuzio-Donahue CA,** Hruban RH, He J, Wang TH, Wood LD, Sharma A, Ahuja N. Promoter methylation of ADAMTS1 and BNC1 as potential biomarkers for early detection of pancreatic cancer in *blood*. *Clin Epigenetics*. 2019;11(1):59.

Emoto K, Eguchi T, Tan KS, Takahashi Y, Aly RG, **Rekhtman N, Travis WD,** Adusumilli PS. Expansion of the concept of micropapillary adenocarcinoma to include a newly recognized filigree pattern as well as the classical pattern based on 1468 stage 1 lung adenocarcinomas. *J Thorac Oncol*. 2019;14(11):1948-61.

Epstein AS, Hamilton JG, Shuk E, Romano DR, Lynch K, Khan E, Genoff M, Michael C, **Iacobuzio-Donahue C.** Stakeholders' perceptions and information needs regarding research medical donation. *J Pain Symptom Manage*. 2019;58(5):792-804 e6.

Fine SW, Meisels DL, Vickers AJ, **Al-Ahmadie H, Chen YB, Gopalan A, Sirintrapun SJ, Tickoo SK, Reuter VE.** Practice patterns in reporting tertiary grades at radical prostatectomy: Survey of a large group of experienced urologic pathologists. *Arch Pathol Lab Med*. 2019 [E-pub ahead of print].

Flanagan MR, Stempel M, **Brogi E,** Morrow M, Cody HS, 3rd. Is sentinel lymph node biopsy required for a core biopsy diagnosis of ductal carcinoma in situ with microinvasion? *Ann Surg Oncol*. 2019;26(9):2738-46.

Fu X, Pereira R, De Angelis C, Veeraraghavan J, Nanda S, Qin L, Cataldo ML, Sethunath V, Mehravaran S, Gutierrez C, Chamness GC, Feng Q, O'Malley BW, Selenica P, **Weigelt B, Reis-Filho JS,** Cohen O, Wagle N, Nardone A, Jeselsohn R, Brown M, Rimawi MF, Osborne CK, Schiff R. FOXA1 upregulation promotes enhancer and transcriptional reprogramming in endocrine-resistant breast cancer. *Proc Natl Acad Sci U S A.* 2019 [E-pub ahead of print].

Funt SA, Patil S, Feldman DR, Motzer RJ, Bajorin DF, Sheinfeld J, **Tickoo SK, Reuter VE,** Bosl GJ. Impact of teratoma on the cumulative incidence of disease-related death in patients with advanced germ cell tumors. *J Clin Oncol.* 2019;37(26):2329-37.

Gandhi JS, Smith SC, Paner GP, McKenney JK, Sekhri R, Osunkoya AO, Baras AS, DeMarzo AM, Cheville JC, Rafael JE, Trpkov K, Colecchia M, Ro JY, Montironi R, Menon S, Hes O, Williamson SR, Hirsch MS, Netto GJ, **Fine SW,** Sirohi D, Kaushal S, Sangoi A, Robinson BD, Kweldam CF, Humphrey PA, Hansel DE, Schultz L, Magi-Galluzzi C, Przybycin CG, Shah RB, Mehra R, Kunju LP, Aron M, Kryvenko ON, Kench JG, Kuroda N, Tavora F, van der Kwast T, Grignon DJ, Epstein JI, **Reuter VE,** Amin MB. Reporting practices and resource utilization in the era of intraductal carcinoma of the prostate: A survey of genitourinary subspecialists. *Am J Surg Pathol.* 2019 [E-pub ahead of print].

Ganesh K, Wu C, O'Rourke KP, Szeglin BC, Zheng Y, Sauve CG, Adileh M, Wasserman I, Marco MR, Kim AS, Shady M, Sanchez-Vega F, Karthaus WR, Won HH, Choi SH, Pelossof R, Barlas A, Ntiamoah P, Pappou E, Elghouayel A, Strong JS, Chen CT, Harris JW, Weiser MR, Nash GM, Guillem JG, Wei IH, Kolesnick RN, Veeraraghavan H, Ortiz EJ, Petkovska I, Cercek A, Manova-Todorova KO, Saltz LB, Lavery JA, DeMatteo RP, Massague J, Paty PB, Yaeger R, Chen X, Patil S, Clevers H, **Berger MF,** Lowe SW, **Shia J,** Romesser PB, Dow LE, Garcia-Aguilar J, Sawyers CL, Smith JJ. A rectal cancer organoid platform to study individual responses to chemoradiation. *Nat Med.* 2019;25(10):1607-14.

Gao Y, Maria A, Na N, da Cruz Paula A, Gorelick AN, **Hechtman JF,** Carson J, Lefkowitz RA, **Weigelt B,** Taylor BS, Zhao H, **Reis-Filho JS,** de Stanchina E, Rosen N, Yao Z, Yaeger R. V211D mutation in MEK1 causes resistance to MEK inhibitors in colon cancer. *Cancer Discov.* 2019;9(9):1182-91.

Ged Y, **Chen YB,** Knezevic A, Casuscelli J, Redzematovic A, DiNatale RG, Carlo MI, Lee CH, Feldman DR, Patil S, Hakimi AA, Russo P, Motzer RJ, Voss MH. Metastatic chromophobe renal cell carcinoma: Presence or absence of sarcomatoid differentiation determines clinical course and treatment outcomes. *Clin Genitourin Cancer.* 2019;17(3):e678-e88.

Ged Y, **Chen YB,** Knezevic A, Donoghue MTA, Carlo MI, Lee CH, Feldman DR, Patil S, Hakimi AA, Russo P, Voss MH, Motzer RJ. Mucinous tubular and spindle-cell carcinoma of the kidney: Clinical features, genomic profiles, and treatment outcomes. *Clin Genitourin Cancer.* 2019;17(4):268-74 e1.

Geller S, **Hollmann TJ,** Horwitz SM, Myskowski PL, **Pulitzer M.** C-C chemokine receptor 4 expression in CD8+ cutaneous T-cell lymphomas and lymphoproliferative disorders, and its implications for diagnosis and treatment. *Histopathology.* 2020;76(2):222-32.

Geller S, Lebowitz E, **Pulitzer MP,** Horwitz SM, Moskowitz AJ, Dusza S, Myskowski PL. Outcomes and prognostic factors in African American / Black patients with mycosis fungoides and Sezary syndrome: Retrospective analysis of 157 patients from a referral cancer center. *J Am Acad Dermatol.* 2019 [E-pub ahead of print].

Ghafoor S, Lakhman Y, **Park KJ,** Petkovska I. Polypoid endometriosis: A mimic of malignancy. *Abdom Radiol (NY).* 2019 [E-pub ahead of print].

Gibbs DC, Orlow I, Vernali S, Powell HB, Kanetsky PA, Luo L, **Busam KJ,** Sharma A, Kricker A, Armstrong BK, Cust AE, Anton-Culver H, Gruber SB, Gallagher RP, Zanetti R, Rosso S, Sacchetto L, Dwyer T, Ollila DW, Begg CB, Berwick M, Thomas NE, Group GEMS. Inherited melanoma risk variants associated with histopathologically amelanotic melanoma. *J Invest Dermatol.* 2019 [E-pub ahead of print].

Grabenstetter A, Brennan S, Salagean ED, Morrow M, **Brogi E.** Flat epithelial atypia in breast core needle biopsies with radiologic-pathologic concordance: Is excision necessary? *Am J Surg Pathol.* 2020;44(2):182-90.

Grabenstetter A, Moo TA, Hajiyeva S, Schuffler PJ, Khattar P, Friedlander MA, McCormack MA, Raiss M, Zabor EC, Barrio A, Morrow M, **Edelweiss M.** Accuracy of intraoperative frozen section of sentinel lymph nodes after neoadjuvant chemotherapy for breast carcinoma. *Am J Surg Pathol.* 2019;43(10):1377-83.

Granlund KL, Tee SS, Vargas HA, Lyashchenko SK, Reznik E, **Fine S,** Laudone V, Eastham JA, Touijer KA, **Reuter VE,** Gonen M, Sosa RE, Nicholson D, Guo YW, Chen AP, Tropp J, Robb F, Hricak H, Keshari KR. Hyperpolarized MRI of human prostate cancer reveals increased lactate with tumor grade driven by monocarboxylate transporter 1. *Cell Metab.* 2020;31(1):105-14 e3.

Greally M, Agarwal R, El Dika I, Shamseddine A, El-Olayan A, Haibe Y, Paroder V, **Shia J,** Abou-Alfa GK, Ku GY. Maximizing response: A case report of salvage chemotherapy after immune checkpoint inhibition in a patient with previous chemo-refractory metastatic esophageal carcinoma. *J Gastrointest Oncol.* 2019;10(2):367-72.

Greally M, Chou JF, Chatila WK, Margolis M, Capanu M, **Hechtman JF,** Tuvy Y, Kundra R, Daian F, **Ladanyi M,** Kelsen DP, Ilson DH, **Berger MF, Tang LH,** Solit DB, Diaz LA, Jr., Schultz N, Janjigian YY, Ku GY. Clinical and molecular predictors of response to immune checkpoint inhibitors in patients with advanced esophagogastric cancer. *Clin Cancer Res.* 2019;25(20):6160-9.

Grkovski M, Kohutek ZA, Schoder H, Brennan CW, Tabar VS, Gutin PH, Zhang Z, Young RJ, Beattie BJ, Zanzonico PB, Huse JT, **Rosenblum MK,** Blasberg RG, Humm JL, Beal K. (18)F-Fluorocholine PET uptake correlates with pathologic evidence of recurrent tumor after stereotactic radio*surgery* for brain metastases. *Eur J Nucl Med Mol Imaging.* 2019 [E-pub ahead of print].

Guo R, DuBoff M, Jayakumaran G, Kris MG, **Ladanyi M,** Robson ME, **Mandelker D,** Zauderer MG. Brief report: Novel germline mutations in DNA damage repair in patients with malignant pleural mesotheliomas. *J Thorac Oncol.* 2019 [E-pub ahead of print].

Guo R, Schreyer M, **Chang JC,** Rothenberg SM, Henry D, Cotzia P, Kris MG, **Rekhtman N,** Young RJ, Hyman DM, Drilon A. Response to selective RET inhibition with LOXO-292 in a patient with RET fusion-positive lung cancer with leptomeningeal metastases. *JCO Precis Oncol.* 2019;3.

Gupta S, Argani P, **Jungbluth AA, Chen YB, Tickoo SK, Fine SW, Gopalan A, Al-Ahmadie HA,** Sanchez A, Hakimi AA, McFarlane T, Salazar PA, Williamson SR, Skala SL, Mehra R, Hes O, **Antonescu CR, Ladanyi M, Arcila ME, Reuter VE.** TFEB expression profiling in renal cell carcinomas: Clinicopathologic correlations. *Am J Surg Pathol.* 2019;43(11):1445-61.

Gupta S, Cheville JC, **Jungbluth AA, Zhang Y, Zhang L, Chen YB, Tickoo SK, Fine SW, Gopalan A, Al-Ahmadie HA, Sirintrapun SJ,** Blum KA, Lohse CM, Hakimi AA, Thompson RH, Leibovich BC, **Berger MF, Arcila ME, Ross DS, Ladanyi M, Antonescu CR, Reuter VE.** JAK2/PD-L1/PD-L2 (9p24.1) amplifications in renal cell carcinomas with sarcomatoid transformation: Implications for clinical management. *Mod Pathol.* 2019;32(9):1344-58.

Gupta S, **Fine SW, Chang J, Tickoo SK, Chen YB, Al-Ahmadie HA, Sirintrapun SJ,** Abida W, **Ladanyi M, Reuter VE, Gopalan A.** Morphologic and immunohistochemical assessment of CDH1 loss of function alterations in prostatic adenocarcinoma. *Am J Surg Pathol.* 2019 [E-pub ahead of print].

Gupta S, Ito T, Alex D, **Vanderbilt CM, Chang JC,** Islamdoust N, **Zhang Y, Nafa K,** Healey J, **Ladanyi M, Hameed MR.** RUNX2 (6p21.1) amplification in osteosarcoma. *Hum Pathol.* 2019;94:23-8.

Gupta S, Sosa CP, Kosari F, Folpe A, Bhinge KN, Yang L, Agahi A, Johnson SH, Frank I, Boorjian SA, Hansel DE, **Al-Ahmadie HA, Reuter VE,** Vasmatzis G, Jimenez RE, Herrera-Hernandez L, Cheville JC. A comparison of adult rhabdomyosarcoma and high-grade neuroendocrine carcinoma of the urinary bladder reveals novel PPP1R12A fusions in rhabdomyosarcoma. *Hum Pathol.* 2019;88:48-59.

Gupta S, Swanson AA, **Chen YB,** Lopez T, Milosevic D, Kipp BR, Leibovich BC, Thompson RH, Herrera-Hernandez L, Cheville JC, Jimenez RE. Incidence of succinate dehydrogenase and fumarate hydratase-deficient renal cell carcinoma based on immunohistochemical screening with SDHA/SDHB and FH/2SC. *Hum Pathol.* 2019;91:114-22.

Haggstrom I, Schmidtlein CR, Campanella G, **Fuchs TJ.** Deeppet: A deep encoder-decoder network for directly solving the PET image reconstruction inverse problem. *Med Image Anal.* 2019;54:253-62.

Haney NM, Faisal FA, Lu J, Guedes LB, **Reuter VE,** Scher HI, Eastham JA, Marchionni L, Joshu C, **Gopalan A,** Lotan TL. PTEN loss with ERG negative status is associated with lethal disease after radical prostatectomy. *J Urol.* 2020;203(2):344-50.

Hanna MG, Pantanowitz L. Feasibility of using the omnyx digital pathology system for cytology practice. *J Am Soc Cytopathol.* 2019;8(4):182-9.

Hanna MG, Reuter VE, Hameed MR, Tan LK, **Chiang S, Sigel C,** Hollmann T, **Giri D,** Samboy J, Moradel C, Rosado A, Otilano JR, 3rd, England C, Corsale L, Stamelos E, **Yagi Y,** Schuffler PJ, Fuchs T, **Klimstra DS, Sirintrapun SJ.** Whole slide imaging equivalency and efficiency study: experience at a large academic center. *Mod Pathol.* 2019 [E-pub ahead of print].

Hanna MG, Reuter VE, Samboy J, England C, Corsale L, **Fine SW, Agaram NP,** Stamelos E, **Yagi Y, Hameed M, Klimstra DS, Sirintrapun SJ.** Implementation of digital pathology offers clinical and operational increase in efficiency and cost savings. *Arch Pathol Lab Med.* 2019;143(12):1545-55.

Harries V, Wang LY, McGill M, **Xu, B,** Tuttle RM, Wong RJ, Shaha AR, Shah JP, **Ghossein R,** Patel SG, Ganly I. Should multifocality be an indication for completion thyroidectomy in papillary thyroid carcinoma? *Surgery.* 2020;167(1):10-7.

Hastings K, Yu HA, Wei W, Sanchez-Vega F, DeVeaux M, Choi J, Rizvi H, Lisberg A, Truini A, Lydon CA, Liu Z, Henick BS, Wurtz A, Cai G, Plodkowski AJ, Long NM, Halpenny DF, Killam J, Oliva I, Schultz N, Riely GJ, **Arcila ME, Ladanyi M,** Zelterman D, Herbst RS, Goldberg SB, Awad MM, Garon EB, Gettinger S, Hellmann MD, Politi K. EGFR mutation subtypes and response to immune checkpoint blockade treatment in non-small-cell lung cancer. *Ann Oncol.* 2019;30(8):1311-20.

Hechtman JF, Rana S, Middha S, Stadler ZK, Latham A, **Benayed R,** Soslow R, **Ladanyi M,** Yaeger R, **Zehir A, Shia J.** Retained mismatch repair protein expression occurs in approximately 6% of microsatellite instability-high cancers and is associated with missense mutations in mismatch repair genes. *Mod Pathol.* 2019 [E-pub ahead of print].

Hedayat AA, Lefferts JA, Atkinson AE, **Busam KJ,** Linos K. BAP1-deficient tumor/nevus with germline aberration: A potential pitfall in assessing melanocytic neoplasms with single nucleotide polymorphism array. *J Cutan Pathol.* 2019;46(9):672-7.

Hickman R, Leeman-Neill R, **Rosenblum M,** Anderson R, Goldman J. Co-existent pilocytic astrocytoma with acute B-cell leukemia within the cerebellum. *Neuropathology.* 2019;39(5):394-7.

Ho AS, Ochoa A, Jayakumaran G, **Zehir A,** Valero Mayor C, Tepe J, Makarov V, Dalin MG, He J, Bailey M, Montesion M, Ross JS, Miller VA, Chan L, Ganly I, **Dogan S, Katabi N,** Tsipouras P, Ha P, Agrawal N, Solit DB, Futreal PA, El Naggar AK, **Reis-Filho JS, Weigelt B,** Ho AL, Schultz N, Chan TA, Morris LG. Genetic hallmarks of recurrent/metastatic adenoid cystic carcinoma. *J Clin Invest.* 2019;129(10):4276-89.

Ho AY, Barker CA, Arnold BB, Powell SN, Hu ZI, Gucalp A, Lebron-Zapata L, **Wen HY,** Kallman C, D'Agnolo A, Zhang Z, Flynn J, Dunn SA, McArthur HL. A phase 2 clinical trial assessing the efficacy and safety of pembrolizumab and radiotherapy in patients with metastatic triple-negative breast cancer. *Cancer.* 2019 [E-pub ahead of print].

Hoda RS, **Brogi E, Pareja F,** Nanjangud G, **Murray MP, Weigelt B, Reis-Filho JS, Wen HY.** Secretory carcinoma of the breast: Clinicopathologic profile of 14 cases emphasising distant metastatic potential. *Histopathology.* 2019;75(2):213-24.

Hodgson A, Howitt BE, **Park KJ,** Lindeman N, Nucci MR, Parra-Herran C. Genomic characterization of HPV-related and gastric-type endocervical adenocarcinoma: Correlation with subtype and clinical behavior. *Int J Gynecol Pathol*. 2019 [E-pub ahead of print].

Hodgson A, **Jungbluth AA, Katabi N, Xu, B,** Downes MR. Evaluation of cancer testis antigen (CT10, PRAME) and MHC I expression in high-grade urothelial carcinoma of the bladder. *Virchows Arch*. 2019 [E-pub ahead of print].

Horvat JV, Iyer A, Morris EA, Apte A, Bernard-Davila B, Martinez DF, Leithner D, Sutton OM, Ochoa-Albiztegui RE, **Giri D,** Pinker K, Thakur SB. Histogram analysis and visual heterogeneity of diffusion-weighted imaging with apparent diffusion coefficient mapping in the prediction of molecular subtypes of invasive breast cancers. *Contrast Media Mol Imaging*. 2019;2019:2972189.

Hossain MS, **Hanna MG,** Uraoka N, Nakamura T, **Edelweiss M, Brogi E, Hameed MR,** Yamaguchi M, **Ross DS, Yagi Y.** Automatic quantification of HER2 gene amplification in invasive breast cancer from chromogenic in situ hybridization whole slide images. *J Med Imaging (Bellingham)*. 2019;6(4):047501.

Hruban RH, **Klimstra DS,** Zamboni G, Kloppel G. A semicentennial of pancreatic pathology: The genetic revolution is here, but don't throw the baby out with the bath water! *Hum Pathol.* 2019 [E-pub ahead of print].

Hsiao SJ, **Zehir A,** Sireci AN, Aisner DL. Detection of tumor NTRK gene fusions to identify patients who may benefit from tyrosine kinase (TRK) inhibitor therapy. *J Mol Diagn.* 2019;21(4):553-71.

Huang YH, Hu J, Chen F, Lecomte N, Basnet H, David CJ, Witkin MD, Allen PJ, Leach SD, **Hollmann TJ, Iacobuzio-Donahue CA,** Massague J. ID1 mediates escape from TGFbeta tumor suppression in pancreatic cancer. *Cancer Discov*. 2019; [E-pub ahead of print].

Hutchings D, Jiang Z, Skaro M, Weiss MJ, Wolfgang CL, Makary MA, He J, Cameron JL, Zheng L, **Klimstra DS,** Brand RE, Singhi AD, Goggins M, Klein AP, Roberts NJ, Hruban RH. Histomorphology of pancreatic cancer in patients with inherited ATM serine/threonine kinase pathogenic variants. *Mod Pathol.* 2019;32(12):1806-13.

Iacobuzio-Donahue CA, Michael C, Baez P, Kappagantula R, Hooper JE, **Hollman TJ.** Cancer biology as revealed by the research autopsy. *Nat Rev Cancer*. 2019;19(12):686-97.

Ito Y, Vertosick EA, Sjoberg DD, Vickers AJ, **Al-Ahmadie HA, Chen YB, Gopalan A, Sirintrapun SJ, Tickoo SK,** Eastham JA, Scardino PT, **Reuter VE, Fine SW.** In organ-confined prostate cancer, tumor quantitation not found to aid in prediction of biochemical recurrence. *Am J Surg Pathol.* 2019;43(8):1061-5.

Jain D, Nambirajan A, Borczuk A, Chen G, Minami Y, Moreira AL, Motoi N, Papotti M, **Rekhtman N,** Russell PA, Savic Prince S, Yatabe Y, Bubendorf L, Committee IP. Immunocytochemistry for predictive biomarker testing in lung cancer cytology. *Cancer Cytopathol.* 2019;127(5):325-39.

Janku F, Diamond EL, Goodman AM, Raghavan VK, Barnes TG, Kato S, Abdel-Wahab O, **Durham BH,** Meric-Bernstam F, Kurzrock R. Molecular profiling of tumor tissue and plasma cell-free DNA from patients with non-langerhans cell histiocytosis. *Mol Cancer* Ther. 2019;18(6):1149-57.

Jansen P, Cosgarea I, **Murali R,** Moller I, Sucker A, Franklin C, Paschen A, Zaremba A, Brinker TJ, Stoffels I, Schadendorf D, Klode J, Hadaschik E, Griewank KG. Frequent occurrence of NRAS and BRAF mutations in human acral naevi. *Cancers (Basel).* 2019;11(4).

Jenkins TM, Rosenbaum J, Zhang PJ, Schwartz LE, Nayak A, Cooper K, **Tickoo SK,** Lal P. Thyroid-like follicular carcinoma of the kidney with extensive sarcomatoid differentiation: A case report and review of the literature. *Int J Surg Pathol*. 2019;27(6):678-83.

Jia L, Carlo MI, Khan H, Nanjangud GJ, Rana S, Cimera R, **Zhang Y,** Hakimi AA, Verma AK, **Al-Ahmadie HA, Fine SW, Gopalan A, Sirintrapun SJ, Tickoo SK, Reuter VE,** Gartrell BA, **Chen YB.** Distinctive mechanisms underlie the loss of SMARCB1 protein expression in renal medullary carcinoma: Morphologic and molecular analysis of 20 cases. *Mod Pathol.* 2019;32(9):1329-43.

Jo VY, **Antonescu CR,** Dickson BC, Swanson D, **Zhang L,** Fletcher CDM, Demicco EG. Cutaneous syncytial myoepithelioma is characterized by recurrent EWSR1-PBX3 fusions. *Am J Surg Pathol.* 2019;43(10):1349-54.

Johnston RP, Emoto K, Dux J, **Travis WD,** Adusumilli PS. Predicting spread through air spaces (STAS) preoperatively: Can imaging help? *J Thorac Dis.* 2019;11(Suppl 15):S1938-S41.

Jonsson P, Bandlamudi C, Cheng ML, Srinivasan P, Chavan SS, Friedman ND, Rosen EY, Richards AL, Bouvier N, Selcuklu SD, Bielski CM, Abida W, **Mandelker D,** Birsoy O, **Zhang L, Zehir A,** Donoghue MTA, Baselga J, Offit K, Scher HI, O'Reilly EM, Stadler ZK, Schultz N, Socci ND, Viale A, **Ladanyi M,** Robson ME, Hyman DM, **Berger MF,** Solit DB, Taylor BS. Tumour lineage shapes BRCA-mediated phenotypes. *Nature*. 2019;571(7766):576-9.

Jonsson P, Bandlamudi C, Cheng ML, Srinivasan P, Chavan SS, Friedman ND, Rosen EY, Richards AL, Bouvier N, Selcuklu SD, Bielski CM, Abida W, **Mandelker D,** Birsoy O, **Zhang L, Zehir A,** Donoghue MTA, Baselga J, Offit K, Scher HI, O'Reilly EM, Stadler ZK, Schultz N, Socci ND, Viale A, **Ladanyi M,** Robson ME, Hyman DM, **Berger MF,** Solit DB, Taylor BS. Author correction: Tumour lineage shapes BRCA-mediated phenotypes. *Nature*. 2020;577(7789):E1.

Jonsson P, Lin AL, Young RJ, DiStefano NM, Hyman DM, Li BT, **Berger MF, Zehir A, Ladanyi M,** Solit DB, Arnold AG, Stadler ZK, **Mandelker D,** Goldberg ME, Chmielecki J, Pourmaleki M, Ogilvie SQ, Chavan SS, McKeown AT, Manne M, Hyde A, Beal K, Yang TJ, Nolan CP, Pentsova E, Omuro A, Gavrilovic IT, Kaley TJ, Diamond EL, Stone JB, Grommes C, Boire A, Daras M, Piotrowski AF, Miller AM, Gutin PH, Chan TA, Tabar VS, Brennan CW, **Rosenblum M,** DeAngelis LM, Mellinghoff IK, Taylor BS. Genomic correlates of disease progression and treatment response in prospectively characterized gliomas. *Clin Cancer Res.* 2019;25(18):5537-47.

Kao YC, Lee JC, **Zhang L,** Sung YS, Swanson D, Hsieh TH, Liu YR, **Agaram NP,** Huang HY, Dickson BC, **Antonescu CR.** Recurrent YAP1 and KMT2A gene rearrangements in a subset of MUC4-negative sclerosing epithelioid fibrosarcoma. *Am J Surg Pathol.* 2019 [E-pub ahead of print].

Keung ES, Souers RJ, Bridge JA, Faquin WC, Graham RP, **Hameed MR,** Lewis JS, Jr., Merker JD, Vasalos P, Moncur JT. Comparative performance of high-risk human papillomavirus RNA and DNA in situ hybridization on College of American Pathologists proficiency tests. *Arch Pathol Lab Med*. 2019 [E-pub ahead of print].

Kezlarian B, Muller S, Werneck Krauss Silva V, Gonzalez C, Fix DJ, **Park KJ, Murali R.** Cytologic features of upper gynecologic tract adenocarcinomas exhibiting mesonephric-like differentiation. *Cancer Cytopathol.* 2019;127(8):521-8.

Kim HS, Hammill JT, Scott DC, **Chen Y,** Min J, Rector J, Singh B, Schulman BA, Guy RK. Discovery of novel Pyrazolo-pyridone DCN1 inhibitors controlling cullin neddylation. J Med Chem. 2019;62(18):8429-42.

Kim TH, **Buonocore D,** Petre EN, Durack JC, Maybody M, Johnston RP, **Travis WD,** Adusumilli PS, Solomon SB, Ziv E. Utility of core biopsy specimen to identify histologic subtype and predict outcome for lung adenocarcinoma. *Ann Thorac Surg*. 2019;108(2):392-8.

Kim TS, da Silva E, Coit DG, **Tang LH.** Intratumoral immune response to gastric cancer varies by molecular and histologic subtype. *Am J Surg Pathol*. 2019;43(6):851-60.

Klager S, Lacouture ME, Hannum M, Devlin SM, Maloy M, **Pulitzer M,** Jakubowski AA, Markova A. Drugs as a frequent cause of acute rash in patients after CD34(+)-selected peripheral blood stem cell transplantation. *Biol Blood Marrow Transplant*. 2019;25(11):2172-80.

Konishi T, Shimada Y, Hsu M, Wei IH, Pappou E, Smith JJ, Nash GM, Guillem JG, Paty PB, Garcia-Aguilar J, Cercek A, Yaeger R, Stadler ZK, Segal NH, Varghese A, Saltz LB, **Shia J, Vakiani E,** Gonen M, Weiser MR. Contemporary validation of a nomogram predicting colon cancer recurrence, revealing all-stage improved outcomes. *JNCI Cancer Spectr*. 2019;3(2):pkz015.

Kortekaas KE, Van de Vijver KK, van Poelgeest MIE, Gilks CB, Smit V, Arif S, Arora D, Faruqi A, Ganesan R, Griffin NR, Hale R, Hock YE, Horn LC, McCluggage WG, Mukonoweshuro P, **Park KJ,** Rous B, Tanchel B, Van Rompuy AS, van Schalkwyk G, Vella J, Vergine M, Singh N, Bosse T. Practical guidance for measuring and reporting surgical margins in vulvar cancer. *Int J Gynecol Pathol*. 2019 [E-pub ahead of print].

Krystel-Whittemore M, Xu J, **Brogi E,** Ventura K, Patil S, **Ross DS,** Dang C, Robson M, Norton L, Morrow M, **Wen HY.** Pathologic complete response rate according to HER2 detection methods in HER2-positive breast cancer treated with neoadjuvant systemic therapy. *Breast Cancer Res Treat*. 2019;177(1):61-6.

Kuba MG, Giess CS, Wieczorek TJ, Lester SC. Hyperechoic malignancies of the breast: Underlying pathologic features correlating with this unusual appearance on ultrasound. *Breast J*. 2019 [E-pub ahead of print].

Kumar A, Sha F, Toure A, **Dogan A,** Ni A, Batlevi CL, Palomba MLM, Portlock C, Straus DJ, Noy A, Horwitz SM, Moskowitz A, Hamlin P, Moskowitz CH, Matasar MJ, Zelenetz AD, Younes A. Patterns of survival in patients with recurrent mantle cell lymphoma in the modern era: Progressive shortening in response duration and survival after each relapse. *Blood Cancer J*. 2019;9(6):50.

Kumar A, Ying Z, Alperovich A, **Dogan A,** Hamlin P, Moskowitz C, Pichardo J, Portlock C, Sha F, Zelenetz AD, Zhang Z, Drill E, Woo K, Younes A. Clinical presentation determines selection of patients for initial observation in mantle cell lymphoma. *Haematologica*. 2019;104(4):e163-e6.

Kumar P, Uppal M, **Xiao W, Dogan A, Roshal M,** Gao Q, **Aypar U, Zhang Y, Arcila ME, Moung C, Yao J, Nafa K,** Yu W, Syed MH, Park J, Kumar A, **Ho C.** Clonally-related CD5+ CLL/SLL and CD10+ high grade B-cell lymphoma suggests common neoplastic progenitor with branched disease evolution, with therapeutic implications. *Leuk Lymphoma*. 2019 [E-pub ahead of print]:1-5.

Ladanyi M, Sanchez Vega F, Zauderer M. Loss of BAP1 as a candidate predictive biomarker for immunotherapy of mesothelioma. *Genome Med*. 2019;11(1):18.

Laddha SV, da Silva EM, Robzyk K, Untch BR, Ke H, **Rekhtman N,** Poirier JT, **Travis WD, Tang LH,** Chan CS. Integrative genomic characterization identifies molecular subtypes of lung carcinoids. *Cancer Res*. 2019;79(17):4339-47.

Landau H, Lahoud O, Devlin S, Lendvai N, Chung DJ, **Dogan A,** Landgren CO, Giralt S, Hassoun H. Pilot study of bortezomib and dexamethasone pre- and post-risk-adapted autologous stem cell transplantation in AL amyloidosis. *Biol Blood Marrow Transplant*. 2020;26(1):204-8.

Landgren O, Hofmann JN, McShane CM, Santo L, Hultcrantz M, Korde N, Mailankody S, Kazandjian D, Murata K, Thoren K, Ramanathan L, **Dogan A,** Rustad E, Lu SX, Akhlaghi T, Kristinsson SY, Bjorkholm M, Devlin S, Purdue MP, Pfeiffer RM, Turesson I. Association of immune marker changes with progression of monoclonal gammopathy of undetermined significance to multiple myeloma. *JAMA Oncol*. 2019 [E-pub ahead of print].

Lantuejoul S, Tsao MS, Cooper WA, Girard N, Hirsch FR, Roden AC, Lopez-Rios F, Jain D, Chou TY, Motoi N, Kerr KM, Yatabe Y, Brambilla E, Longshore J, Papotti M, Sholl LM, Thunnissen E, **Rekhtman N,** Borczuk A, Bubendorf L, Minami Y, Beasley MB, Botling J, Chen G, Chung JH, Dacic S, Hwang D, Lin D, Moreira A, Nicholson AG, Noguchi M, Pelosi G, Poleri C, **Travis W,** Yoshida A, Daigneault JB, Wistuba, II, Mino-Kenudson M. PD-L1 testing for lung cancer in 2019: Perspective from the IASLC Pathology Committee. *J Thorac Oncol.* 2019 [E-pub ahead of print].

Lazarus J, Oneka MD, Barua S, Maj T, Lanfranca MP, Delrosario L, Sun L, Smith JJ, D'Angelica MI, **Shia J,** Fang JM, Shi J, Di Magliano MP, Zou W, Rao A, Frankel TL. Mathematical modeling of the metastatic colorectal cancer microenvironment defines the importance of cytotoxic lymphocyte infiltration and presence of PD-L1 on antigen presenting cells. *Ann Surg Oncol.* 2019;26(9):2821-30.

Leon-Castillo A, Gilvazquez E, Nout R, Smit VT, McAlpine JN, McConechy M, Kommoss S, Brucker SY, Carlson JW, Epstein E, Rau TT, **Soslow RA,** Ganesan R, Matias-Guiu X, Oliva E, Harrison BT, Church DN, Gilks CB, Bosse T. Clinicopathological and molecular characterisation of 'multiple-classifier' endometrial carcinomas. *J Pathol*. 2019 [E-pub ahead of print].

Lepe M, Oltulu P, Canepa M, Wu RI, Deeken A, Alex D, Dinares C, Doxtader EE, Fitzhugh VA, Gibier JB, Jain D, Janaki N, Jelinek A, Labiano T, L'Imperio V, Michael C, Mukhopadhyay S, Pagni F, Panizo A, Pijuan L, Quintana LM, Roy-Chowdhuri S, Sanchez-Font A, Sansano I, **Sauter J,** Skipper D, Spruill LS, Torous V, Gardner JM, Jiang XS. #ebustwitter: Novel use of social media for conception, coordination, and completion of an international, multicenter pathology study. *Arch Pathol Lab Med*. 2019 [E-pub ahead of print].

Lezcano C, Pulitzer M, Moy AP, Hollmann TJ, Jungbluth AA, Busam KJ. Immunohistochemistry for PRAME in the distinction of nodal nevi from metastatic melanoma. *Am J Surg Pathol.* 2019 [E-pub ahead of print].

Li A, Geyer FC, Blecua P, Lee JY, Selenica P, Brown DN, **Pareja F,** Lee SSK, Kumar R, Rivera B, Bi R, Piscuoglio S, **Wen HY,** Lozada JR, Gularte-Merida R, Cavallone L, kConFab I, Rezoug Z, Nguyen-Dumont T, Peterlongo P, Tondini C, Terkelsen T, Ronlund K, Boonen SE, Mannerma A, Winqvist R, Janatova M, Rajadurai P, Xia B, Norton L, Robson ME, Ng PS, Looi LM, Southey MC, **Weigelt B,** Soo-Hwang T, Tischkowitz M, Foulkes WD, **Reis-Filho JS.** Erratum: Publisher correction: Homologous recombination DNA repair defects in PALB2-associated breast cancers. *NPJ Breast Cancer*. 2019;5:44.

Liu B, Li L, Yang G, Geng C, Luo Y, Wu W, Manyam GC, Korentzelos D, Park S, Tang Z, Wu C, Dong Z, Sigouros M, Sboner A, Beltran H, **Chen Y,** Corn PG, Tetzlaff MT, Troncoso P, Broom B, Thompson TC. Parp inhibition suppresses GR-MYCN-CDK5-RB1-E2F1 signaling and neuroendocrine differentiation in castration-resistant prostate cancer. *Clin Cancer Res.* 2019;25(22):6839-51.

Liu Y, **Roshal M, Xiao W, Zhang Y, Aypar U,** Yu W, **Nafa K, Arcila M, Moung C, Dogan A,** Park J, **Ho C.** The t(11;14)(q13;q32)/CCND1-IGH translocation in chronic lymphocytic leukaemia/small lymphocytic lymphoma: An unusual genetic aberration during the natural clinical course. *Histopathology.* 2019;75(2):291-4.

Loizou E, Banito A, Livshits G, Ho YJ, Koche RP, Sanchez-Rivera FJ, Mayle A, Chen CC, Kinalis S, Bagger FO, Kastenhuber ER, **Durham BH,** Lowe SW. A gain-of-function p53-mutant oncogene promotes cell fate plasticity and myeloid leukemia through the pluripotency factor FOXH1. *Cancer Discov*. 2019;9(7):962-79.

Lubin D, **Buonocore D,** Wei XJ, **Cohen JM, Lin O.** The Milan System at Memorial Sloan Kettering: Utility of the categorization system for in-house salivary gland fine-needle aspiration cytology at a comprehensive cancer center. *Diagn Cytopathol*. 2019 [E-pub ahead of print].

Luo X, Feurstein S, Mohan S, Porter CC, Jackson SA, Keel S, Chicka M, Brown AL, Kesserwan C, Agarwal A, Luo M, Li Z, Ross JE, Baliakas P, Pineda-Alvarez D, DiNardo CD, Bertuch AA, Mehta N, Vulliamy T, Wang Y, Nichols KE, Malcovati L, Walsh MF, Rawlings LH, McWeeney SK, Soulier J, Raimbault A, Routbort MJ, **Zhang L,** Ryan G, Speck NA, Plon SE, Wu D, Godley LA. Clingen myeloid malignancy variant curation expert panel recommendations for germline RUNX1 variants. *Blood Adv.* 2019;3(20):2962-79.

Lyapichev KA, Pina-Oviedo S, Medeiros LJ, Evans MG, Liu H, Miranda AR, Hunt KK, Clemens MW, Stewart JM, Amin MB, **Quesada AE,** Chai SM, Di Napoli A, Yoga A, Dave SK, Wistuba, II, Wu Y, Bueso-Ramos CE, Schlette EJ, Ferrufino-Schmidt MC, Loghavi S, Khoury JD, Young KH, Miranda RN. A proposal for pathologic processing of breast implant capsules in patients with suspected breast implant anaplastic large cell lymphoma. *Mod Pathol.* 2019 [E-pub ahead of print].

Mandal R, Samstein RM, Lee KW, Havel JJ, Wang H, Krishna C, Sabio EY, Makarov V, Kuo F, Blecua P, Ramaswamy AT, Durham JN, Bartlett B, Ma X, Srivastava R, Middha S, **Zehir A, Hechtman JF,** Morris LG, Weinhold N, Riaz N, Le DT, Diaz LA, Jr., Chan TA. Genetic diversity of tumors with mismatch repair deficiency influences anti-PD-1 immunotherapy response. *Science*. 2019;364(6439):485-91.

Mandelker D, Donoghue M, Talukdar S, Bandlamudi C, Srinivasan P, Vivek M, Jezdic S, Hanson H, Snape K, Kulkarni A, Hawkes L, Douillard JY, Wallace SE, Rial-Sebbag E, Meric-Bersntam F, George A, Chubb D, Loveday C, **Ladanyi M, Berger MF,** Taylor BS, Turnbull C. Germline-focussed analysis of tumour-only sequencing: Recommendations from the ESMO precision medicine working group. *Ann Oncol.* 2019;30(8):1221-31.

Mandelker D, Kumar R, Pei X, Selenica P, Setton J, Arunachalam S, **Ceyhan-Birsoy O,** Brown DN, Norton L, Robson ME, **Wen HY,** Powell S, Riaz N, **Weigelt B, Reis-Filho JS.** The landscape of somatic genetic alterations in breast cancers from CHEK2 germline mutation carriers. *JNCI Cancer Spectr*. 2019;3(2):pkz027.

Mao N, Gao D, Hu W, Hieronymus H, Wang S, Lee YS, Lee C, Choi D, **Gopalan A, Chen Y,** Carver BS. Aberrant expression of ERG promotes resistance to combined PIK3 and AR pathway inhibition through maintenance of AR target genes. *Mol Cancer Ther*. 2019;18(9):1577-86.

Marchio C, Da Cruz Paula A, Gularte-Merida R, Basili T, Brandes A, da Silva EM, Silveira C, Ferrando L, Metovic J, Maletta F, Annaratone L, **Pareja F,** Rubin BP, Hoschar AP, De Rosa G, La Rosa S, Bongiovanni M, Purgina B, Piana S, Volante M, **Weigelt B, Reis-Filho JS,** Papotti M. PAX8-GLIS3 gene fusion is a pathognomonic genetic alteration of hyalinizing trabecular tumors of the thyroid. *Mod Pathol.* 2019;32(12):1734-43.

Marchio C, **Scaltriti M, Ladanyi M,** Iafrate AJ, Bibeau F, Dietel M, **Hechtman JF,** Troiani T, Lopez-Rios F, Douillard JY, Andre F, **Reis-Filho JS.** ESMO recommendations on the standard methods to detect NTRK fusions in daily practice and clinical research. *Ann Oncol.* 2019;30(9):1417-27.

Mattar MS, **Chang J, Benayed R,** Halpenny D, Powers A, Kleiner DE, Drilon A, Kris MG. Complete pathological response to crizotinib in a patient with ALK-rearranged lung adenocarcinoma. *Clin Lung Cancer*. 2020;21(1):e25-e9.

Mazzu YZ, Armenia J, Chakraborty G, Yoshikawa Y, Coggins SA, Nandakumar S, Gerke TA, Pomerantz MM, Qiu X, Zhao H, Atiq M, Khan N, Komura K, Lee GM, **Fine SW,** Bell C, O'Connor E, Long HW, Freedman ML, Kim B, Kantoff PW. A novel mechanism driving poor-prognosis prostate cancer: Overexpression of the DNA repair gene, Ribonucleotide Reductase Small Subunit M2 (RRM2). *Clin Cancer Res.* 2019;25(14):4480-92.

Menge TD, Hibler BP, Mack LA, **Busam KJ,** Rossi AM. Rapidly enlarging neoplasm on the face. *Cutis*. 2019;103(6):E28-E30.

Middha S, Yaeger R, **Shia J,** Stadler ZK, King S, Guercio S, Paroder V, Bates DDB, Rana S, Diaz LA, Jr., Saltz L, Segal N, **Ladanyi M, Zehir A, Hechtman JF.** Majority of B2M-mutant and -deficient colorectal carcinomas achieve clinical benefit from immune checkpoint inhibitor therapy and are microsatellite instability-high. *JCO Precis Oncol*. 2019;3.

Miller ME, Muhsen S, Zabor EC, Flynn J, Olcese C, **Giri D,** Van Zee KJ, Pilewskie M. Risk of contralateral breast cancer in women with ductal carcinoma in situ associated with synchronous ipsilateral lobular carcinoma in situ. *Ann Surg Oncol.* 2019;26(13):4317-25.

Mimica X, **Katabi N,** McGill MR, Hay A, Zanoni DK, Shah JP, Wong RJ, Cohen MA, Patel SG, Ganly I. Polymorphous adenocarcinoma of salivary glands. *Oral Oncol*. 2019;95:52-8.

Mimica X, Yu Y, McGill M, Barker CA, McBride S, Ganly I, Cracchiolo JR, Dunn LA, **Katabi N,** Sine K, Mah D, Lee A, Lee N, Cohen MA. Organ preservation for patients with anterior mucosal squamous cell carcinoma of the nasal cavity: Rhinectomy-free survival in those refusing *surgery*. *Head Neck.* 2019;41(8):2741-7.

Miraflor AP, **Pulitzer MP,** Myskowski PL, Geller S. Scleromyxedematous changes in a patient with long-standing mycosis fungoides who progressed to Sezary syndrome. *Am J Dermatopathol.* 2019;41(11):e139-e43.

Moelans CB, de Ligt J, van der Groep P, Prins P, Besselink N, Hoogstraat M, Ter Hoeve N, Lacle M, Kornegoor R, van der Pol C, de Leng W, Barbe E, van der Vegt B, Martens J, Bult P, Smits VT, Koudijs M, Nijman I, Voest E, Selenica P, **Weigelt B, Reis-Filho J,** van der Wall E, Cuppen E, van Diest PJ. The molecular genetic make-up of male breast cancer. *Endocr Relat Cancer*. 2019 [E-pub ahead of print].

Momeni-Boroujeni A, **Chiang S.** Uterine mesenchymal tumours: Recent advances. *Histopathology.* 2020;76(1):64-75.

Mondaca S, Offin M, **Borsu L,** Myers M, Josyula S, Makhnin A, Shen R, Riely GJ, Rudin CM, **Ladanyi M,** Yu HA, Li BT, **Arcila ME.** Lessons learned from routine, targeted assessment of liquid biopsies for EGFR T790M resistance mutation in patients with EGFR mutant lung cancers. *Acta Oncol*. 2019;58(11):1634-9.

Moy RH, Dos Santos Fernandes G, Jonsson P, Chou JF, Basunia A, Ku GY, Chalasani SB, Boyar MS, Goldberg Z, Desai AM, Gabler A, **Berger MF, Tang LH, Hechtman JF,** Kelsen DP, Schattner M, Ilson DH, Solit DB, Taylor BS, Schultz N, Capanu M, Janjigian YY. Regorafenib in combination with first-line chemotherapy for metastatic esophagogastric cancer. *Oncologist*. 2020;25(1):e68-e74.

Muller S, Victoria Lai W, Adusumilli PS, Desmeules P, Frosina D, **Jungbluth A,** Ni A, Eguchi T, **Travis WD, Ladanyi M,** Zauderer MG, **Sauter J**L. V-domain Ig-containing suppressor of T-cell activation (VISTA), a potentially targetable immune checkpoint molecule, is highly expressed in epithelioid malignant pleural mesothelioma. *Mod Pathol.* 2019 [E-pub ahead of print].

Narayan RR, Harris JW, Chou JF, Gonen M, Bao F, **Shia J,** Allen PJ, Balachandran VP, Drebin JA, Jarnagin WR, Kemeny NE, Kingham TP, D'Angelica MI. Prediction of recurrence patterns from hepatic parenchymal disease after resection of colorectal liver metastases. *Ann Surg Oncol.* 2020;27(1):188-95.

Natal RA, Paiva GR, Pelegati VB, Marenco L, Alvarenga CA, Vargas RF, Derchain SF, Sarian LO, Franchet C, Cesar CL, Schmitt FC, **Weigelt B,** Vassallo J. Exploring collagen parameters in pure special types of invasive breast cancer. *Sci Rep*. 2019;9(1):7715.

Navarrete-Dechent C, Aleissa S, Ariyan C, **Busam KJ,** Nehal KS. Comment on "comparison of surgical margins for lentigo maligna versus melanoma in situ". *J Am Acad Dermatol.* 2019;81(4):e115-e6.

Navarrete-Dechent C, Cordova M, Aleissa S, Liopyris K, Dusza SW, Kose K, **Busam KJ,** Hollman T, **Lezcano C, Pulitzer M,** Chen CJ, Lee EH, Rossi AM, Nehal KS. Lentigo maligna melanoma mapping using reflectance confocal microscopy correlates with staged excision: A prospective study. *J Am Acad Dermatol.* 2019 [E-pub ahead of print].

Navarrete-Dechent C, Cordova M, Liopyris K, Rishpon A, Aleissa S, Rossi AM, Lee E, Chen CJ, **Busam KJ,** Marghoob AA, Nehal KS. Reflectance confocal microscopy and dermoscopy aid in evaluating repigmentation within or adjacent to lentigo maligna melanoma surgical scars. *J Eur Acad Dermatol Venereol*. 2020;34(1):74-81.

Navarrete-Dechent C, Nehal KS, **Busam KJ.** Tissue contamination causing incorrect diagnosis of breast carcinoma metastatic to skin: An underrecognized complication. *Australas J Dermatol.* 2019 [E-pub ahead of print].

Nicholson AG, **Sauter J**L, Nowak AK, Kindler HL, Gill RR, Remy-Jardin M, Armato SG, 3rd, Fernandez-Cuesta L, Bueno R, Alcala N, Foll M, Pass H, Attanoos R, Baas P, Beasley MB, Brcic L, Butnor KJ, Chirieac LR, Churg A, Courtiol P, Dacic S, De Perrot M, Frauenfelder T, Gibbs A, Hirsch FR, Hiroshima K, Husain A, Klebe S, Lantuejoul S, Moreira A, Opitz I, Perol M, Roden A, Roggli V, Scherpereel A, Tirode F, Tazelaar H, **Travis WD,** Tsao MS, van Schil P, Vignaud JM, Weynand B, Lang-Lazdunski L, Cree I, Rusch VW, Girard N, Galateau-Salle F. EURACAN/IASLC proposals for updating the histologic classification of pleural mesothelioma: Towards a more multidisciplinary approach. *J Thorac Oncol.* 2020;15(1):29-49.

Nierop PMH, Hoppener DJ, van der Stok EP, Galjart B, Buisman FE, Balachandran VP, Jarnagin WR, Kingham TP, Allen PJ, **Shia J,** Vermeulen PB, Groot Koerkamp B, Grunhagen DJ, Verhoef C, D'Angelica MI. Histopathological growth patterns and positive margins after resection of colorectal liver metastases. *HPB (Oxford).* 2019 [E-pub ahead of print].

Niknafs N, Zhong Y, Moral JA, **Zhang L,** Shao MX, Lo A, Makohon-Moore A, **Iacobuzio-Donahue CA,** Karchin R. Characterization of genetic subclonal evolution in pancreatic cancer mouse models. *Nat Commun*. 2019;10(1):5435.

Nishimura M, Saito Y, Nakanishi Y, **Shia J,** Lauwers GY, Wallace MB. Pathology definitions and resection strategies for early colorectal neoplasia: Eastern versus western approaches in the post-Vienna era. *Gastrointest Endosc*. 2019 [E-pub ahead of print].

Ntiamoah P, Monu NR, Abdulkareem FB, Adeniji KA, Obafunwa JO, Komolafe AO, Yates C, Kaninjing E, Carpten JD, Salhia B, Odedina FT, **Edelweiss M,** Kingham TP, Alatise OI. Pathology services in Nigeria: Cross-sectional survey results from three cancer consortia. *J Glob Oncol*. 2019;5:1-9.

Offin M, Chan JM, Tenet M, Rizvi HA, Shen R, Riely GJ, **Rekhtman N,** Daneshbod Y, Quintanal-Villalonga A, Penson A, Hellmann MD, **Arcila ME, Ladanyi M,** Pe'er D, Kris MG, Rudin CM, Yu HA. Concurrent RB1 and TP53 alterations define a subset of EGFR-mutant lung cancers at risk for histologic transformation and inferior clinical outcomes. *J Thorac Oncol.* 2019;14(10):1784-93.

Offin M, Guo R, Wu SL, Sabari J, Land JD, Ni A, Montecalvo J, Halpenny DF, Buie LW, Pak T, Liu D, Riely GJ, Hellmann MD, **Benayed R, Arcila M,** Kris MG, Rudin CM, Li BT, **Ladanyi M, Rekhtman N,** Drilon A. Immunophenotype and response to immunotherapy of RET-rearranged lung cancers. *JCO Precis Oncol*. 2019;3.

Olson N, Gularte-Merida R, Selenica P, Da Cruz Paula A, Alemar B, **Weigelt B,** Lefferts J, Linos K. Molecular characterization of a rare dedifferentiated liposarcoma with rhabdomyosarcomatous differentiation in a 24 year old. *Int J Surg Pathol*. 2019 [E-pub ahead of print].

O'Reilly EM, **Hechtman JF.** Tumour response to TRK inhibition in a patient with pancreatic adenocarcinoma harbouring an NTRK gene fusion. *Ann Oncol.* 2019;30(Supplement_8):viii36-viii40.

Ortiz MV, Ahmed S, Burns M, Henssen AG, **Hollmann TJ,** MacArthur I, Gunasekera S, Gaewsky L, Bradwin G, Ryan J, Letai A, He Y, Naranjo A, Chi YY, LaQuaglia M, Heaton T, Cifani P, Dome JS, Gadd S, Perlman E, Mullen E, Steen H, Kentsis A. Prohibitin is a prognostic marker and therapeutic target to block chemotherapy resistance in Wilms' tumor. *JCI Insight*. 2019;4(15).

Osmanbeyoglu HU, Shimizu F, Rynne-Vidal A, Alonso-Curbelo D, Chen HA, **Wen HY,** Yeung TL, Jelinic P, Razavi P, Lowe SW, Mok SC, Chiosis G, Levine DA, Leslie CS. Chromatin-informed inference of transcriptional programs in gynecologic and basal breast cancers. *Nat Commun*. 2019;10(1):4369.

Pareja F, Toss MS, Geyer FC, da Silva EM, Vahdatinia M, Sebastiao APM, Selenica P, Szatrowski A, **Edelweiss M, Wen HY,** Mihai R, Varga Z, Foschini MP, Rubin BP, Ellis IO, Chandarlapaty S, **Jungbluth AA, Brogi E, Weigelt B, Reis-Filho JS,** Rakha EA. Immunohistochemical assessment of HRAS Q61R mutations in breast adenomyoepitheliomas. *Histopathology.* 2019 [E-pub ahead of print].

Park KJ. Cervical adenocarcinoma: Integration of HPV status, pattern of invasion, morphology and molecular markers into classification. *Histopathology.* 2020;76(1):112-27.

Patel SS, **Ho C,** Ptashkin RN, Sadigh S, Bagg A, Geyer JT, Xu ML, Prebet T, Mason EF, Seegmiller AC, Morgan EA, Steensma DP, Winer ES, Wong WJ, Hasserjian RP, Weinberg OK. Clinicopathologic and genetic characterization of nonacute NPM1-mutated myeloid neoplasms. *Blood Adv.* 2019;3(9):1540-5.

Penson A, Camacho N, Zheng Y, Varghese AM, **Al-Ahmadie H,** Razavi P, Chandarlapaty S, **Vallejo CE, Vakiani E,** Gilewski T, Rosenberg JE, Shady M, **Tsui DWY,** Reales DN, Abeshouse A, Syed A, **Zehir A,** Schultz N, **Ladanyi M,** Solit DB, **Klimstra DS,** Hyman DM, Taylor BS, **Berger MF.** Development of genome-derived tumor type prediction to inform clinical cancer care. *JAMA Oncol*. 2019 [E-pub ahead of print].

Perera D, **Ghossein R,** Camacho N, Senbabaoglu Y, Seshan V, Li J, Bouvier N, Boucai L, Viale A, Socci ND, Untch BR, Gonen M, Knauf J, Fagin JA, **Berger M,** Tuttle RM. Genomic and transcriptomic characterization of papillary microcarcinomas with lateral neck lymph node metastases. *J Clin Endocrinol Metab*. 2019;104(10):4889-99.

Petrovic I, Ahmed ZU, Hay A, Rosen EB, Lu C, **Hameed M,** Shah JP. Sarcomas of the mandible. *J Surg Oncol*. 2019;120(2):109-16.

Pors J, Segura S, Cheng A, Ji JX, Tessier-Cloutier B, Cochrane D, Fix DJ, **Park K,** Gilks B, Hoang L. Napsin-A and AMACR are superior to HNF-1β in distinguishing between mesonephric carcinomas and clear cell carcinomas of the gynecologic tract. *Appl Immunohistochem Mol Morphol*. 2019 [E-pub ahead of print].

Pourmaleki M, Young JH, Socci ND, **Chiang S, Edelweiss M,** Li Y, Zhang M, Roshal L, Chi DS, **Busam KJ,** Mellinghoff IK, **Hollmann TJ.** Extramammary paget disease shows differential expression of B7 family members B7-H3, B7-H4, PD-L1, PD-L2 and cancer/testis antigens NY-ESO-1 and MAGE-A. *Oncotarget*. 2019;10(58):6152-67.

Prat A, Pascual T, De Angelis C, Gutierrez C, Llombart-Cussac A, Wang T, Cortes J, Rexer B, Pare L, Forero A, Wolff AC, Morales S, Adamo B, Braso-Maristany F, Vidal M, Veeraraghavan J, Krop I, Galvan P, Pavlick AC, Bermejo B, Izquierdo M, Rodrik-Outmezguine V, **Reis-Filho JS,** Hilsenbeck SG, Oliveira M, Dieci MV, Griguolo G, Fasani R, Nuciforo P, Parker JS, Conte P, Schiff R, Guarneri V, Osborne CK, Rimawi MF. HER2-enriched subtype and ERBB2 expression in HER2-positive breast cancer treated with dual HER2 blockade. *J Natl Cancer Inst*. 2019 [E-pub ahead of print].

Prockop S, Doubrovina E, Suser S, Heller G, Barker J, Dahi P, Perales MA, Papadopoulos E, Sauter C, Castro-Malaspina H, Boulad F, Curran KJ, Giralt S, Gyurkocza B, Hsu KC, Jakubowski A, Hanash AM, Kernan NA, Kobos R, Koehne G, Landau H, Ponce D, Spitzer B, Young JW, Behr G, Dunphy M, Haque S, Teruya-Feldstein J, **Arcila M, Moung C,** Hsu S, Hasan A, O'Reilly RJ. Off-the-shelf EBV-specific T cell immunotherapy for rituximab-refractory EBV-associated lymphoma following transplantation. *J Clin Invest*. 2019 [E-pub ahead of print].

Pulvirenti A, Javed AA, Landoni L, Jamieson NB, Chou JF, Miotto M, He J, Gonen M, Pea A, **Tang LH,** Nessi C, Cingarlini S, D'Angelica MI, Gill AJ, Kingham TP, Scarpa A, Weiss MJ, Balachandran VP, Samra JS, Cameron JL, Jarnagin WR, Salvia R, Wolfgang CL, Allen PJ, Bassi C. Multi-institutional development and external validation of a nomogram to predict recurrence after curative resection of pancreatic neuroendocrine tumors. *Ann Surg.* 2019 [E-pub ahead of print].

Rahimi N, **Zhang Y,** Mina A, Altman JK, Sukhanova M, Frankfurt O, Jennings L, Lu X, Behdad A, Chen Q, Chen YH, Gao J. An integrative approach reveals genetic complexity and epigenetic perturbation in acute promyelocytic leukemia: A single institution experience. *Hum Pathol.* 2019;91:1-10.

Raj N, Zheng Y, Kelly V, Katz SS, Chou J, Do RKG, Capanu M, Zamarin D, Saltz LB, Ariyan CE, Untch BR, O'Reilly EM, **Gopalan A, Berger MF,** Olino K, Segal NH, Reidy-Lagunes DL. PD-1 blockade in advanced adrenocortical carcinoma. *J Clin Oncol.* 2020;38(1):71-80.

Razanamahery J, Diamond EL, Cohen-Aubart F, Plate KH, Lourida G, Charlotte F, Helias-Rodzewicz Z, Goyal G, Go RS, **Dogan A,** Abdel-Wahab O, **Durham B,** Ozkaya N, Amoura Z, Emile JF, Haroche J. Erdheim-Chester disease with concomitant Rosai-Dorfman like lesions: A distinct entity mainly driven by MAP2K1. *Haematologica*. 2020;105(1):e5-e8.

Razavi P, Li BT, Brown DN, Jung B, Hubbell E, Shen R, Abida W, Juluru K, De Bruijn I, Hou C, Venn O, Lim R, Anand A, Maddala T, Gnerre S, Vijaya Satya R, Liu Q, Shen L, Eattock N, Yue J, Blocker AW, Lee M, Sehnert A, Xu H, Hall MP, Santiago-Zayas A, Novotny WF, Isbell JM, Rusch VW, Plitas G, Heerdt AS, **Ladanyi M,** Hyman DM, Jones DR, Morrow M, Riely GJ, Scher HI, Rudin CM, Robson ME, Diaz LA, Jr., Solit DB, Aravanis AM, **Reis-Filho JS.** High-intensity sequencing reveals the sources of plasma circulating cell-free DNA variants. *Nat Med.* 2019;25(12):1928-37.

Reid MD, Bhattarai S, Graham RP, Pehlivanoglu B, **Sigel CS,** Shi J, Saqi A, Shirazi M, Xue Y, **Basturk O,** Adsay V. Pancreatoblastoma: Cytologic and histologic analysis of 12 adult cases reveals helpful criteria in their diagnosis and distinction from common mimics. *Cancer Cytopathol*. 2019;127(11):708-19.

Reis H, Serrette R, Posada J, Lu V, **Chen YB, Gopalan A, Fine SW, Tickoo SK, Sirintrapun SJ,** Iyer G, Funt SA, Teo MY, Rosenberg JE, Bajorin DF, Dalbagni G, Bochner BH, Solit DB, **Reuter VE, Al-Ahmadie HA.** PD-L1 expression in urothelial carcinoma with predominant or pure variant histology: Concordance among 3 commonly used and commercially available antibodies. *Am J Surg Pathol*. 2019;43(7):920-7.

Reiter JG, Baretti M, Gerold JM, Makohon-Moore AP, Daud A, **Iacobuzio-Donahue CA,** Azad NS, Kinzler KW, Nowak MA, Vogelstein B. An analysis of genetic heterogeneity in untreated cancers. *Nat Rev Cancer*. 2019;19(11):639-50.

Rekhtman N, Desmeules P, Litvak AM, Pietanza MC, Santos-Zabala ML, Ni A, Montecalvo J, **Chang JC,** Beras A, Preeshagul IR, Sabari JK, Rudin CM, **Ladanyi M, Klimstra DS, Travis WD,** Lai WC. Stage IV lung carcinoids: Spectrum and evolution of proliferation rate, focusing on variants with elevated proliferation indices. *Mod Pathol.* 2019;32(8):1106-22.

Rekhtman N, Montecalvo J, **Chang JC,** Alex D, Ptashkin RN, Ai N, **Sauter J**L, **Kezlarian B, Jungbluth A,** Desmeules P, Beras A, Bishop JA, Plodkowski AJ, Gounder MM, Schoenfeld AJ, Namakydoust A, Li BT, Rudin CM, Riely GJ, Jones DR, **Ladanyi M, Travis WD.** SMARC4-deficient thoracic sarcomatoid tumors represent primarily smoking-related undifferentiated carcinomas rather than primary thoracic sarcomas. *J Thorac Oncol.* 2019 [E-pub ahead of print].

Rekhtman N, Travis WD. Large no more: The journey of pulmonary large cell carcinoma from common to rare entity. *J Thorac Oncol.* 2019;14(7):1125-7.

Richeldi L, Cottin V, Brown KK, Flaherty KR, Johannson KA, **Travis WD,** Collard HR. Which biopsy to diagnose interstitial lung disease? A call for evidence and unity. *Am J Respir Crit Care Med*. 2019;200(7):941-2.

Rosen EY, Goldman DA, **Hechtman JF, Benayed R,** Schram AM, Cocco E, Shifman S, Gong Y, Kundra R, Solomon JP, Bardelli A, **Scaltriti M,** Drilon A, Iasonos A, Taylor BS, Hyman DM. TRK fusions are enriched in cancers with uncommon histologies and the absence of canonical driver mutations. *Clin Cancer Res.* 2019 [E-pub ahead of print].

Rosenbaum E, Jadeja B, **Xu B, Zhang L, Agaram NP, Travis W,** Singer S, Tap WD, **Antonescu CR.** Prognostic stratification of clinical and molecular epithelioid hemangioendothelioma subsets. *Mod Pathol.* 2019 [E-pub ahead of print].

Roxburgh CSD, Strombom P, Lynn P, Cercek A, Gonen M, Smith JJ, Temple LKF, Nash GM, Guillem JG, Paty PB, **Shia J, Vakiani E,** Yaeger R, Stadler ZK, Segal NH, Reidy D, Varghese A, Wu AJ, Crane CH, Gollub MJ, Saltz LB, Garcia-Aguilar J, Weiser MR. Changes in the multidisciplinary management of rectal cancer from 2009 to 2015 and associated improvements in short-term outcomes. *Colorectal Dis*. 2019;21(10):1140-50.

Rustad EH, Misund K, Bernard E, Coward E, Yellapantula VD, Hultcrantz M, **Ho C,** Kazandjian D, Korde N, Mailankody S, Keats JJ, Akhlaghi T, Viny AD, Mayman DJ, Carroll K, Patel M, Famulare CA, Op Bruinink DH, Hutt K, Jacobsen A, Huang Y, Miller JE, Maura F, Papaemmanuil E, Waage A, **Arcila ME,** Landgren O. Stability and uniqueness of clonal immunoglobulin CDR3 sequences for MRD tracking in multiple myeloma. *Am J Hematol*. 2019;94(12):1364-73.

Samaratunga H, Judge M, Delahunt B, Srigley J, Brimo F, Comperat E, Koch M, Lopez-Beltran A, **Reuter V,** Shanks J, Tsuzuki T, van der Kwast T, Varma M, Grignon D. Data set for the reporting of carcinoma of the renal pelvis and ureter-nephroureterectomy and ureterectomy specimens: Recommendations from the International Collaboration on Cancer Reporting (ICCR). *Am J Surg Pathol.* 2019;43(10):e1-e12.

Sambade MJ, Prince G, Deal AM, Trembath D, McKee M, Garrett A, Keith K, Ramirez J, Midkiff B, Blackwell K, Sammons S, Leone JP, Brufsky A, Morikawa A, **Brogi E,** Seidman A, Ewend M, Carey LA, Moschos SJ, Hamilton RL, Vincent B, Anders C. Examination and prognostic implications of the unique microenvironment of breast cancer brain metastases. *Breast Cancer Res Treat*. 2019;176(2):321-8.

Sauter CS, Senechal B, Riviere I, Ni A, Bernal Y, Wang X, Purdon T, Hall M, Singh AN, Szenes VZ, Yoo S, **Dogan A,** Wang Y, Moskowitz CH, Giralt S, Matasar MJ, Perales MA, Curran KJ, Park J, Sadelain M, Brentjens RJ. CD19 CAR T cells following autologous transplantation in poor-risk relapsed and refractory B-cell non-hodgkin lymphoma. *Blood.* 2019;134(7):626-35.

Sauter JL, Lehrke H, Zhang X, Al Badri OT, Rodriguez-Gutierrez R, Delivanis DA, Singh Ospina N, Donegan D, Hamidi O, Iniguez-Ariza N, Sharma A, Kittah NEN, Tamhane SU, Hurtado Andrade MD, Kotwal A, Jenkins SM, Spears G, Rivera M, Dean DS, Henry MR. Assessment of the Bethesda System for reporting thyroid cytopathology. *Am J Clin Pathol.* 2019;152(4):502-11.

Schaff LR, Yan D, Thyparambil S, Tian Y, Cecchi F, **Rosenblum M,** Reiner AS, Panageas KS, Hembrough T, Lin AL. Characterization of MGMT and EGFR protein expression in glioblastoma and association with survival. *J Neurooncol.* 2019;146(1):163-70.

Schlappe BA, Zhou QC, O'Cearbhaill R, Iasonos A, **Soslow RA,** Abu-Rustum NR, Mueller JJ. A descriptive report of outcomes of primary mucinous ovarian cancer patients receiving either an adjuvant gynecologic or gastrointestinal chemotherapy regimen. *Int J Gynecol Cancer*. 2019 [E-pub ahead of print].

Scott AC, Dundar F, Zumbo P, Chandran SS, Klebanoff CA, Shakiba M, Trivedi P, Menocal L, Appleby H, Camara S, Zamarin D, Walther T, Snyder A, Femia MR, Comen EA, **Wen HY,** Hellmann MD, Anandasabapathy N, Liu Y, Altorki NK, Lauer P, Levy O, Glickman MS, Kaye J, Betel D, Philip M, Schietinger A. TOX is a critical regulator of tumour-specific T cell differentiation. *Nature*. 2019;571(7764):270-4.

Sebastiao APM, **Xu B,** Lozada JR, **Pareja F,** Geyer FC, Da Cruz Paula A, da Silva EM, **Ghossein RA,** Weinreb I, de Noronha L, **Weigelt B, Reis-Filho JS, Katabi N.** Histologic spectrum of polymorphous adenocarcinoma of the salivary gland harbor genetic alterations affecting PRKD genes. *Mod Pathol.* 2020;33(1):65-73.

Segura SE, Hoang L, Boros M, Terinte C, Pesci A, Aviel-Ronen S, Kiyokawa T, Alvarado-Cabrero I, Oliva E, **Park KJ, Soslow RA,** Stolnicu S. Clinicopathologic association and prognostic value of MELF pattern in invasive endocervical adenocarcinoma (ECA) as classified by IECC. *Int J Gynecol Pathol*. 2019 [E-pub ahead of print].

Selenica P, Raj N, Kumar R, Brown DN, Arques O, Reidy D, Klimstra D, Snuderl M, Serrano J, Palmer HG, **Weigelt B, Reis-Filho JS, Scaltriti M.** Solid pseudopapillary neoplasms of the pancreas are dependent on the WNT pathway. *Mol Oncol*. 2019;13(8):1684-92.

Sethunath V, Hu H, De Angelis C, Veeraraghavan J, Qin L, Wang N, Simon LM, Wang T, Fu X, Nardone A, Pereira R, Nanda S, Griffith OL, Tsimelzon A, Shaw C, Chamness GC, **Reis-Filho JS, Weigelt B,** Heiser LM, Hilsenbeck SG, Huang S, Rimawi MF, Gray JW, Osborne CK, Schiff R. Targeting the mevalonate pathway to overcome acquired anti-HER2 treatment resistance in breast cancer. *Mol Cancer Res*. 2019;17(11):2318-30.

Shanks JH, Srigley JR, Brimo F, Comperat E, Delahunt B, Koch M, Lopez-Beltran A, **Reuter VE,** Samaratunga H, Tsuzuki T, van der Kwast T, Varma M, Grignon D. Dataset for reporting of carcinoma of the urethra (in urethrectomy specimens): Recommendations from the International Collaboration on Cancer Reporting (ICCR). *Histopathology.* 2019;75(4):453-67.

Shantharam G, Huang C, Singla N, **Chen Y,** Russo P. Primary renal well-differentiated neuroendocrine tumor extending into the inferior vena cava. *Urology*. 2020;135:e2-e4.

Sherman EJ, Dunn LA, Schoder H, Ho AL, Baxi SS, **Ghossein RA,** Haque SS, Sima C, Tuttle RM, Pfister DG. Phase 2 study of vascular endothelial growth factor trap for the treatment of metastatic thyroid cancer. *Cancer.* 2019;125(17):2984-90.

Shi J, **Basturk O.** Whipple grossing in the era of new staging: Should we standardize? *Diagnostics* (Basel). 2019;9(4).

Silagy AW, Flynn J, Mano R, Blum KA, Marcon J, DiNatale RG, Sanchez A, Carlo MI, Motzer RJ, **Coleman JA,** Russo P, Ostrovnaya I, **Chen YB,** Hakimi AA. Clinicopathologic features associated with survival after cytoreductive nephrectomy for nonclear cell renal cell carcinoma. *Urol Oncol*. 2019;37(11):811 e9- e16.

Silagy AW, Mano R, Blum KA, DiNatale RG, Marcon J, **Tickoo SK,** Reznik E, **Coleman JA,** Russo P, Hakimi AA. The role of cytoreductive nephrectomy for sarcomatoid renal cell carcinoma: A 29-year institutional experience. *Urology*. 2019 [E-pub ahead of print].

Sinn BV, Fu C, Lau R, Litton J, Tsai TH, Murthy R, Tam A, Andreopoulou E, Gong Y, Murthy R, Gould R, **Zhang Y,** King TA, Viale A, Andrade V, **Giri D,** Salgado R, Laios I, Sotiriou C, Marginean EC, Kwiatkowski DN, Layman RM, Booser D, Hatzis C, Vicente Valero V, Fraser Symmans W. SETER/PR: A robust 18-gene predictor for sensitivity to endocrine therapy for metastatic breast cancer. *NPJ Breast Cancer*. 2019;5:16.

Smith JJ, Chatila WK, Sanchez-Vega F, Datta J, Connell LC, Szeglin BC, Basunia A, Boucher TM, Hauser H, Wasserman I, Wu C, Cercek A, **Hechtman JF,** Madden C, Jarnagin WR, Garcia-Aguilar J, D'Angelica MI, Yaeger R, Schultz N, Kemeny NE. Genomic stratification beyond RAS/B-RAF in colorectal liver metastasis patients treated with hepatic arterial infusion. *Cancer Med*. 2019;8(15):6538-48.

Smyth LM, Piha-Paul SA, Won HH, Schram AM, Saura C, Loi S, Lu J, Shapiro GI, Juric D, Mayer IA, Arteaga CL, de la Fuente MI, Brufksy AM, Spanggaard I, Mau-Sorensen M, Arnedos M, Moreno V, Boni V, Sohn J, Schwartzberg LS, Gonzalez-Farre X, Cervantes A, Bidard FC, Gorelick AN, Lanman RB, Nagy RJ, Ulaner GA, Chandarlapaty S, Jhaveri K, Gavrila EI, Zimel C, Selcuklu SD, Melcer M, Samoila A, Cai Y, **Scaltriti M,** Mann G, Xu F, Eli LD, Dujka M, Lalani AS, Bryce R, Baselga J, Taylor BS, Solit DB, Meric-Bernstam F, Hyman DM. Efficacy and determinants of response to HER kinase inhibition in HER2-mutant metastatic breast cancer. *Cancer Discov*. 2019 [E-pub ahead of print].

Snuderl M, Dolgalev I, Heguy A, Walsh MF, **Benayed R, Jungbluth AA, Ladanyi M,** Karajannis MA. Histone H3K36I mutation in a metastatic histiocytic tumor of the skull and response to sarcoma chemotherapy. *Cold Spring Harb Mol Case Stud.* 2019;5(5).

Solomon JP, **Benayed R, Hechtman JF, Ladanyi M.** Identifying patients with NTRK fusion cancer. *Ann Oncol.* 2019;30(Supplement 8):viii16-viii22.

Solomon JP, **Hechtman JF.** Detection of NTRK fusions: Merits and limitations of current diagnostic platforms. *Cancer Res*. 2019;79(13):3163-8.

Solomon JP, Linkov I, Rosado A, Mullaney K, Rosen EY, Frosina D, **Jungbluth AA, Zehir A, Benayed R,** Drilon A, Hyman DM, **Ladanyi M,** Sireci AN, **Hechtman JF.** NTRK fusion detection across multiple assays and 33,997 cases: Diagnostic implications and pitfalls. *Mod Pathol.* 2020;33(1):38-46.

Spanheimer PM, Ganly I, Chou J, Capanu M, **Ghossein RA,** Tuttle RM, Wong RJ, Shaha AR, Untch BR. Long-term oncologic outcomes after curative resection of familial medullary thyroid carcinoma. *Ann Surg Oncol.* 2019;26(13):4423-9.

Springer NL, Iyengar NM, Bareja R, Verma A, Jochelson MS, **Giri DD,** Zhou XK, Elemento O, Dannenberg AJ, Fischbach C. Obesity-associated extracellular matrix remodeling promotes a macrophage phenotype similar to tumor-associated macrophages. *Am J Pathol*. 2019;189(10):2019-35.

Springer S, Masica DL, Dal Molin M, Douville C, Thoburn CJ, Afsari B, Li L, Cohen JD, Thompson E, Allen PJ, **Klimstra DS,** Schattner MA, Schmidt CM, Yip-Schneider M, Simpson RE, Fernandez-Del Castillo C, Mino-Kenudson M, Brugge W, Brand RE, Singhi AD, Scarpa A, Lawlor R, Salvia R, Zamboni G, Hong SM, Hwang DW, Jang JY, Kwon W, Swan N, Geoghegan J, Falconi M, Crippa S, Doglioni C, Paulino J, Schulick RD, Edil BH, Park W, Yachida S, Hijioka S, van Hooft J, He J, Weiss MJ, Burkhart R, Makary M, Canto MI, Goggins MG, Ptak J, Dobbyn L, Schaefer J, Sillman N, Popoli M, Klein AP, Tomasetti C, Karchin R, Papadopoulos N, Kinzler KW, Vogelstein B, Wolfgang CL, Hruban RH, Lennon AM. A multimodality test to guide the management of patients with a pancreatic cyst. *Sci Transl Med*. 2019;11(501).

Stasenko M, Tunnage I, Ashley CW, Rubinstein MM, Latham AJ, Da Cruz Paula A, Mueller JJ, Leitao MM, Jr., Friedman CF, Makker V, **Soslow RA,** DeLair DF, Hyman DM, Zamarin D, Alektiar KM, Aghajanian CA, Abu-Rustum NR, **Weigelt B,** Cadoo KA. Clinical outcomes of patients with POLE mutated endometrioid endometrial cancer. *Gynecol Oncol.* 2020;156(1):194-202.

Stolnicu S, Hoang L, **Soslow RA.** Recent advances in invasive adenocarcinoma of the cervix. *Virchows Arch*. 2019;475(5):537-49.

Suehara Y, Alex D, Bowman A, Middha S, **Zehir A, Chakravarty D,** Wang L, Jour G, **Nafa K,** Hayashi T, **Jungbluth AA,** Frosina D, Slotkin E, Shukla N, Meyers P, Healey JH, **Hameed M, Ladanyi M.** Clinical genomic sequencing of pediatric and adult osteosarcoma reveals distinct molecular subsets with potentially targetable alterations. *Clin Cancer Res.* 2019;25(21):6346-56.

Sutton EJ, Dashevsky BZ, Watson EJ, Tyagi N, Bernard-Davila B, Martinez D, **Dogan A,** Horwitz SM, Cordeiro PG, Morris EA. Incidence of benign and malignant peri-implant fluid collections and masses on magnetic resonance imaging in women with silicone implants. *Cancer Med*. 2019 [E-pub ahead of print].

Suurmeijer AJ, Dickson BC, Swanson D, Sung YS, **Zhang L, Antonescu CR.** Novel SRF-ICA1L fusions in cellular myoid neoplasms with potential for malignant behavior. *Am J Surg Pathol.* 2020;44(1):55-60.

Suurmeijer AJ, Dickson BC, Swanson D, **Zhang L,** Sung YS, Huang HY, Fletcher CD, **Antonescu CR.** The histologic spectrum of soft tissue spindle cell tumors with NTRK3 gene rearrangements. *Genes Chromosomes Cancer.* 2019;58(11):739-46.

Suurmeijer AJH, Song W, Sung YS, **Zhang L,** Swanson D, Fletcher CDM, Dickson BC, **Antonescu CR.** Novel recurrent PHF1-TFE3 fusions in ossifying fibromyxoid tumors. *Genes Chromosomes Cancer.* 2019;58(9):643-9.

Suzawa K, Offin M, Schoenfeld AJ, Plodkowski AJ, Odintsov I, Lu D, Lockwood WW, **Arcila ME,** Rudin CM, Drilon A, Yu HA, Riely GJ, Somwar R, **Ladanyi M.** Acquired MET exon 14 alteration drives secondary resistance to epidermal growth factor receptor tyrosine kinase inhibitor in EGFR-mutated lung cancer. *JCO Precis Oncol*. 2019;3.

Tabata K, Uraoka N, **Benhamida J, Hanna MG, Sirintrapun SJ,** Gallas BD, Gong Q, Aly RG, Emoto K, Matsuda KM, **Hameed MR, Klimstra DS, Yagi Y.** Validation of mitotic cell quantification via microscopy and multiple whole-slide scanners. *Diagn Pathol*. 2019;14(1):65.

Takashima S, Martin ML, Jansen SA, Fu Y, Bos J, Chandra D, O'Connor MH, Mertelsmann AM, Vinci P, Kuttiyara J, Devlin SM, Middendorp S, Calafiore M, Egorova A, Kleppe M, Lo Y, Shroyer NF, **Cheng EH,** Levine RL, Liu C, Kolesnick R, Lindemans CA, Hanash AM. T cell-derived interferon-gamma programs stem cell death in immune-mediated intestinal damage. *Sci Immunol*. 2019;4(42).

Takeda T, Tin AL, Corradi RB, Alvim R, Hashimoto T, Ito Y, Nguyen DP, Mamoor M, Robertson NL, Vargas HA, Benfante NE, Sjoberg DD, Eastham JA, Scardino PT, **Fine SW,** Oya M, Touijer KA. Extensive disease among potential candidates for hemi-ablative focal therapy for prostate cancer. Int *J Urol.* 2019 [E-pub ahead of print].

Tashkandi H, **Petrova-Drus K,** Batlevi CL, **Arcila ME, Roshal M, Sen F, Yao J,** Baik J, Bilger A, Singh J, de Frank S, Kumar A, Aryeequaye R, **Zhang Y, Dogan A, Xiao W.** Divergent clonal evolution of a common precursor to mantle cell lymphoma and classic hodgkin lymphoma. *Cold Spring Harb Mol Case Stud.* 2019;5(6).

Taskin OC, Akkas G, Memis B, Seven IE, **Basturk O,** Jang KT, Roa JC, Araya JC, Bellolio E, Losada H, Sarmiento J, Balci S, Pehlivanoglu B, Reid MD, Koshiol J, Adsay V. Sarcomatoid carcinomas of the gallbladder: Clinicopathologic characteristics. *Virchows Arch*. 2019;475(1):59-66.

Taskin OC, Bellolio E, Dursun N, Seven IE, Roa JC, Araya JC, Villaseca M, Tapia O, Vance C, Saka B, Balci S, Bagci P, Losada H, Sarmiento J, Memis B, Pehlivanoglu B, **Basturk O,** Reid MD, Koshiol J, Cheng JD, Kapran Y, Adsay V. Non-neoplastic polyps of the gallbladder: A clinicopathologic analysis of 447 cases. *Am J Surg Pathol.* 2019 [E-pub ahead of print].

Taylor J, Haddadin M, Upadhyay VA, Grussie E, Mehta-Shah N, Brunner AM, Louissaint A, Jr., Lovitch SB, **Dogan A,** Fathi AT, Stone RM, Tallman MS, Rampal RK, Neuberg DS, Stevenson KE, Horwitz SM, Lane AA. Multicenter analysis of outcomes in blastic plasmacytoid dendritic cell neoplasm offers a pretargeted therapy benchmark. *Blood.* 2019;134(8):678-87.

Taylor J, Sendino M, Gorelick AN, Pastore A, Chang MT, Penson AV, Gavrila EI, Stewart C, Melnik EM, Herrejon Chavez F, Bitner L, Yoshimi A, Lee SC, Inoue D, Liu B, Zhang XJ, Mato AR, **Dogan A,** Kharas MG, **Chen Y,** Wang D, Soni RK, Hendrickson RC, Prieto G, Rodriguez JA, Taylor BS, Abdel-Wahab O. Altered nuclear export signal recognition as a driver of oncogenesis. *Cancer Discov*. 2019;9(10):1452-67.

Tchekmedyian V, Sherman EJ, Dunn L, Tran C, Baxi S, **Katabi N, Antonescu CR,** Ostrovnaya I, Haque SS, Pfister DG, Ho AL. Phase II study of lenvatinib in patients with progressive, recurrent or metastatic adenoid cystic carcinoma. *J Clin Oncol.* 2019;37(18):1529-37.

Tomasetti C, Poling J, Roberts NJ, London NR, Jr., Pittman ME, Haffner MC, Rizzo A, Baras A, Karim B, Kim A, Heaphy CM, Meeker AK, Hruban RH, **Iacobuzio-Donahue CA,** Vogelstein B. Cell division rates decrease with age, providing a potential explanation for the age-dependent deceleration in cancer incidence. *Proc Natl Acad Sci U S A.* 2019;116(41):20482-8.

Toska E, Castel P, Chhangawala S, Arruabarrena-Aristorena A, Chan C, Hristidis VC, Cocco E, Sallaku M, Xu G, Park J, Minuesa G, Shifman SG, Socci ND, Koche R, Leslie CS, **Scaltriti M,** Baselga J. PI3K inhibition activates SGK1 via a feedback loop to promote chromatin-based regulation of ER-dependent gene expression. *Cell Rep*. 2019;27(1):294-306 e5.

Touijer KA, Michaud L, Alvarez HAV, **Gopalan A,** Kossatz S, Gonen M, Beattie B, Sandler I, Lyaschenko S, Eastham JA, Scardino PT, Hricak H, Weber WA. Prospective study of the radiolabeled GRPR antagonist BAY86-7548 for positron emission tomography/computed tomography imaging of newly diagnosed prostate cancer. Eur *Urol Oncol*. 2019;2(2):166-73.

Troxell ML, Fulton RS, Swanson PE, Bellizzi AM, Fitzgibbons PL, Ambaye AB, Haas TS, Goldsmith JD, Loykasek PA, Miller DV, O'Malley D, Qiu J, Salama ME, Schaberg KB, Schwartz RA, **Shia J,** Summers TA, Jr., Wu Y. Predictive markers require thorough analytic validation. *Arch Pathol Lab Med*. 2019;143(8):907-9.

Tsuda Y, Dickson BC, Dry SM, Federman N, Suurmeijer AJH, Swanson D, Sung YS, **Zhang L,** Healey JH, **Antonescu CR.** Clinical and molecular characterization of primary sclerosing epithelioid fibrosarcoma of bone and review of the literature. *Genes Chromosomes Cancer.* 2019 [E-pub ahead of print].

Tsuda Y, Dickson BC, Swanson D, Sung YS, **Zhang L,** Meyers P, Healey JH, **Antonescu CR.** Ewing sarcoma with FEV gene rearrangements is a rare subset with predilection for extraskeletal locations and aggressive behavior. *Genes Chromosomes Cancer.* 2019 [E-pub ahead of print].

Tsui DWY, Barnett E, Scher HI. Toward standardization of preanalytical procedures for cell-free DNA profiling. Clin Chem. 2019 [E-pub ahead of print].

Tuncel D, **Basturk O,** Bradley KT, Kim GE, Xue Y, Reid MD, Balci S, Erbarut I, Adsay V. Poorly cohesive (signet ring cell) carcinoma of the ampulla of vater. *Int J Surg Pathol*. 2019 [E-pub ahead of print].

Turashvili G, Fix DJ, **Soslow RA, Park KJ.** Wilms tumor of the ovary: Review of the literature and report of 2 cases. *Int J Gynecol Pathol*. 2020;39(1):72-8.

Turashvili G, **Park KJ.** Cervical glandular neoplasia: Classification and staging. *Surg Pathol Clin*. 2019;12(2):281-313.

Turk AT, Asa SL, Baloch ZW, Faquin WC, Fellegara G, **Ghossein RA,** Giordano TJ, LiVolsi VA, Lloyd R, Mete O, Rosai J, Suster S, Thompson LDR, Wenig BM. Interobserver variability in the histopathologic assessment of extrathyroidal extension of well differentiated thyroid carcinoma supports the new American Joint Committee on Cancer Eighth Edition Criteria for Tumor Staging. *Thyroid*. 2019;29(5):619-24.

van der Kwast TH, Helleman J, Nieboer D, Bruinsma SM, Roobol MJ, Movember Foundation's Global Action Plan Prostate Cancer Active Surveillance C, Trock B, Ehdaie B, Carroll P, Filson C, Kim J, Logothetis C, Morgan T, Klotz L, Pickles T, Hyndman E, Moore CM, Gnanapragasam V, Van Hemelrijck M, Dasgupta P, Bangma C, Roobol M, Villers A, Rannikko A, Valdagni R, Perry A, Hugosson J, Rubio-Briones J, Bjartell A, Hefermehl L, Shiong LL, Frydenberg M, Kakehi Y, Chung BH, van der Kwast T, Obbink H, van der Linden W, Hulsen T, de Jonge C, Kattan M, Xinge J, Muir K, Lophatananon A, Fahey M, Steyerberg E, Nieboer D, **Zhang L,** Guo W, Benfante N, Cowan J, Patil D, Tolosa E, Kim TK, Mamedov A, LaPointe V, Crump T, Kimberly-Duffell J, Santaolalla A, Nieboer D, Olivier JT, Rancati T, Ahlgren H, Mascaros J, Lofgren A, Lehmann K, Lin CH, Hirama H, Lee KS, Jenster G, Auvinen A, Bjartell A, Haider M, van Bochove K, Carter B, Gledhill S, Buzza M, Bangma C, Roobol M, Bruinsma S, Helleman J. Consistent biopsy quality and Gleason grading within the global active surveillance global action plan 3 initiative: A prerequisite for future studies. *Eur Urol Oncol*. 2019;2(3):333-6.

VanderLaan PA, **Chen Y,** Alex D, Balassanian R, Cuda J, Hoda RS, Illei PB, McGrath CM, Randolph ML, Reynolds JP, Spiczka AJ, VandeHaar MA, van Zante A, **Sauter J**L, American Society of Cytopathology Clinical Practice C. Results from the 2019 American Society of Cytopathology survey on rapid on-site evaluation-Part 1: Objective practice patterns. *J Am Soc Cytopathol*. 2019;8(6):333-41.

Varma M, Srigley JR, Brimo F, Comperat E, Delahunt B, Koch M, Lopez-Beltran A, **Reuter V,** Samaratunga H, Shanks JH, Tsuzuki T, van der Kwast T, Webster F, Grignon D. Dataset for the reporting of urinary tract carcinoma-biopsy and transurethral resection specimen: Recommendations from The International Collaboration on Cancer Reporting (ICCR). *Mod Pathol.* 2019 [E-pub ahead of print].

Vasan N, Razavi P, Johnson JL, Shao H, Shah H, Antoine A, Ladewig E, Gorelick A, Lin TY, Toska E, Xu G, Kazmi A, Chang MT, Taylor BS, Dickler MN, Jhaveri K, Chandarlapaty S, Rabadan R, Reznik E, Smith ML, Sebra R, Schimmoller F, Wilson TR, Friedman LS, Cantley LC, **Scaltriti M,** Baselga J. Double PIK3CA mutations in cis increase oncogenicity and sensitivity to PI3K inhibitors. *Science*. 2019;366(6466):714-23.

Vasan N, Toska E, **Scaltriti M.** Overview of the relevance of PI3K pathway in HR-positive breast cancer. *Ann Oncol*. 2019;30(Supplement_10):x3-x11.

Veeraraghavan J, Angelis C, Mao R, Wang T, Herrera S, Pavlick AC, Contreras A, Nuciforo P, Mayer IA, Forero A, Nanda R, Goetz MP, **Chang JC,** Wolff AC, Krop IE, Fuqua SAW, Prat A, Hilsenbeck SG, **Weigelt B, Reis-Filho JS,** Gutierrez C, Osborne CK, Rimawi MF, Schiff R. A combinatorial biomarker predicts pathologic complete response to neoadjuvant lapatinib and trastuzumab without chemotherapy in patients with HER2+ breast cancer. *Ann Oncol.* 2019;30(6):927-33.

Viny AD, Bowman RL, Liu Y, Lavallee VP, Eisman SE, **Xiao W, Durham BH,** Navitski A, Park J, Braunstein S, Alija B, Karzai A, Csete IS, Witkin M, Azizi E, Baslan T, Ott CJ, Pe'er D, Dekker J, Koche R, Levine RL. Cohesin members STAG1 and STAG2 display distinct roles in chromatin accessibility and topological control of HSC self-renewal and differentiation. *Cell Stem Cell*. 2019;25(5):682-96 e8.

Vokes NI, Liu D, Ricciuti B, Jimenez-Aguilar E, Rizvi H, Dietlein F, He MX, Margolis CA, Elmarakeby HA, Girshman J, Adeni A, Sanchez-Vega F, Schultz N, Dahlberg S, **Zehir A,** Janne PA, Nishino M, Umeton R, Sholl LM, Van Allen EM, Hellmann MD, Awad MM. Harmonization of tumor mutational burden quantification and association with response to immune checkpoint blockade in non-small-cell lung cancer. *JCO Precis Oncol*. 2019;3.

Vyas M, **Hechtman JF, Zhang Y, Benayed R,** Yavas A, Askan G, **Shia J, Klimstra DS, Basturk O.** DNAJB1-PRKACA fusions occur in oncocytic pancreatic and biliary neoplasms and are not specific for fibrolamellar hepatocellular carcinoma. *Mod Pathol.* 2019 [E-pub ahead of print].

Walasek A, Gupta S, **Fine S,** Russo P. Juxtaglomerular cell tumor: A rare, curable cause of hypertension in a young patient. *Urology*. 2019;134:42-4.

Wang S, Mondal S, Zhao C, Berishaj M, Ghanakota P, Batlevi CL, **Dogan A,** Seshan VE, Abel R, Green MR, Younes A, Wendel HG. Noncovalent inhibitors reveal BTK gatekeeper and auto-inhibitory residues that control its transforming activity. *JCI Insight*. 2019;4(12).

Wang T, Askan G, Adsay V, Allen P, Jarnagin WR, Memis B, **Sigel C,** Seven IE, **Klimstra DS, Basturk O.** Intraductal oncocytic papillary neoplasms: Clinical-pathologic characterization of 24 cases, with an emphasis on associated invasive carcinomas. *Am J Surg Pathol.* 2019;43(5):656-61.

Wang T, Drill E, **Vakiani E,** Pak LM, Boerner T, Askan G, Schvartzman JM, Simpson AL, Jarnagin WR, **Sigel CS.** Distinct histomorphological features are associated with IDH1 mutation in intrahepatic cholangiocarcinoma. *Hum Pathol.* 2019;91:19-25.

Wang T, Lee LH, Vyas M, **Zhang L,** Ganesh K, Firat C, Segal NH, Desai A, **Hechtman JF,** Ntiamoah P, Weiser MR, Markowitz AJ, **Vakiani E, Klimstra DS,** Stadler ZK, **Shia J.** Colorectal carcinoma with double somatic mismatch repair gene inactivation: Clinical and pathological characteristics and response to immune checkpoint blockade. *Mod Pathol.* 2019;32(10):1551-62.

Won E, Basunia A, Chatila WK, **Hechtman JF,** Chou JF, Ku GY, Chalasani SB, Boyar MS, Goldberg Z, Desai AM, Tuvy Y, **Berger MF, Tang L,** Kelsen DP, Schattner M, Ilson DH, Capanu M, Solit DB, Schultz N, Janjigian YY. Efficacy of combined VEGFR1-3, PDGF alpha/beta, and FGFR1-3 blockade using nintedanib for esophagogastric cancer. *Clin Cancer Res.* 2019;25(13):3811-7.

Wong C, **Tang LH,** Davidson C, Vosburgh E, Chen W, Foran DJ, Notterman DA, Levine AJ, Xu EY. Two well-differentiated pancreatic neuroendocrine tumor mouse models. *Cell Death Differ.* 2020;27(1):269-83.

Xiao W, Gupta GK, **Yao J,** Jang YJ, Xi L, Baik J, Sigler A, Kumar A, Moskowitz AJ, **Arcila ME,** Raffeld M, Pittaluga S, **Dogan A,** Jaffe ES. Recurrent somatic JAK3 mutations in NK-cell enteropathy. *Blood.* 2019;134(12):986-91.

Xiao W, Petrova-Drus K, Roshal M. Optimal measurable residual disease testing for acute myeloid leukemia. *Surg Pathol Clin*. 2019;12(3):671-86.

Xu B, Dogan S, Haroon Al Rasheed MR, **Ghossein R, Katabi N.** Androgen receptor immunohistochemistry in salivary duct carcinoma: A retrospective study of 188 cases focusing on tumoral heterogeneity and temporal concordance. *Hum Pathol.* 2019;93:30-6.

Xu B, Ghossein R. Critical prognostic parameters in the anatomic pathology reporting of differentiated follicular cell-derived thyroid carcinoma. *Cancers (Basel).* 2019;11(8).

Xu B, Haroon Al Rasheed MR, **Antonescu CR,** Alex D, Frosina D, **Ghossein R, Jungbluth AA, Katabi N.** PAN-TRK immunohistochemistry is a sensitive and specific ancillary tool for diagnosing secretory carcinoma of the salivary gland and detecting ETV6-NTRK3 fusion. *Histopathology.* 2019 [E-pub ahead of print].

Xu B, Jungbluth AA, Frosina D, Alzumaili B, Aleynick N, Slodkowska E, Higgins K, Ho A, Morris L, **Ghossein R, Katabi N.** The immune microenvironment and expression of PD-L1, PD-1, PRAME and MHC in salivary duct carcinoma. *Histopathology.* 2019;75(5):672-82.

Xu B, Serrette R, Tuttle RM, Alzumaili B, Ganly I, **Katabi N,** Tallini G, **Ghossein R.** How many papillae in conventional papillary carcinoma? A clinical evidence-based pathology study of 235 unifocal encapsulated papillary thyroid carcinomas, with emphasis on the diagnosis of noninvasive follicular thyroid neoplasm with papillary-like nuclear features. *Thyroid*. 2019;29(12):1792-803.

Xu J, Reznik E, Lee HJ, Gundem G, Jonsson P, **Sarungbam J,** Bialik A, Sanchez-Vega F, Creighton CJ, Hoekstra J, **Zhang L,** Sajjakulnukit P, Kremer D, Tolstyka Z, Casuscelli J, Stirdivant S, Tang J, Schultz N, Jeng P, Dong Y, Su W, **Cheng EH,** Russo P, **Coleman JA,** Papaemmanuil E, **Chen YB, Reuter VE,** Sander C, Kennedy SR, Hsieh JJ, Lyssiotis CA, **Tickoo SK,** Hakimi AA. Abnormal oxidative metabolism in a quiet genomic background underlies clear cell papillary renal cell carcinoma. *Elife.* 2019;8.

Yagi Y, Aly RG, Tabata K, Barlas A, **Rekhtman N,** Eguchi T, Montecalvo J, **Hameed M,** Manova-Todorova K, Adusumilli PS, **Travis WD.** Three-dimensional histologic, immunohistochemical and multiplex immunofluorescence analysis of dynamic vessel co-option of spread through air spaces (STAS) in lung adenocarcinoma. *J Thorac Oncol.* 2019 [E-pub ahead of print].

Yang W, Lee KW, Srivastava RM, Kuo F, Krishna C, Chowell D, Makarov V, Hoen D, Dalin MG, Wexler L, **Ghossein R, Katabi N,** Nadeem Z, Cohen MA, Tian SK, Robine N, Arora K, Geiger H, Agius P, Bouvier N, Huberman K, Vanness K, Havel JJ, Sims JS, Samstein RM, Mandal R, Tepe J, Ganly I, Ho AL, Riaz N, Wong RJ, Shukla N, Chan TA, Morris LGT. Immunogenic neoantigens derived from gene fusions stimulate T cell responses. *Nat Med.* 2019;25(5):767-75.

Yang X, **Sen F,** Geyer MB. Inotuzumab ozogamicin as chemotherapy-sparing salvage in a 67-year-old man with primary refractory B-cell acute lymphoblastic leukemia with high-risk genomic features. *Leuk Res Rep*. 2019;12:100186.

Yellapantula V, Hultcrantz M, Rustad EH, Wasserman E, Londono D, Cimera R, Ciardiello A, Landau H, Akhlaghi T, Mailankody S, Patel M, Medina-Martinez JS, Arango Ossa JE, Levine MF, Bolli N, Maura F, **Dogan A,** Papaemmanuil E, **Zhang Y,** Landgren O. Comprehensive detection of recurring genomic abnormalities: A targeted sequencing approach for multiple myeloma. *Blood Cancer J.* 2019;9(12):101.

Yoon EC, Schwartz C, **Brogi E,** Ventura K, **Wen H,** Darvishian F. Impact of biomarkers and genetic profiling on breast cancer prognostication: A comparative analysis of the 8th edition of Breast Cancer Staging System. *Breast J*. 2019;25(5):829-37.

Yoshida H, Yokota H, Singh R, Kiyuna T, Yamaguchi M, Kikuchi S, **Yagi Y,** Ochiai A. Meeting report: The International Workshop on Harmonization and Standardization of Digital Pathology Image, held on April 4, 2019 in Tokyo. *Pathobiology*. 2019;86(5-6):322-4.

Yuan L, **Katabi N, Antonescu CR,** Golden A, **Travis WD, Rekhtman N.** Pulmonary myoepithelial tumors with exuberant reactive pneumocytes: Proposed reclassification of so-called pneumocytic adenomyoepithelioma. *Am J Surg Pathol.* 2020;44(1):140-7.

Zaremba A, **Murali R,** Jansen P, Moller I, Sucker A, Paschen A, Zimmer L, Livingstone E, Brinker TJ, Hadaschik E, Franklin C, Roesch A, Ugurel S, Schadendorf D, Griewank KG, Cosgarea I. Clinical and genetic analysis of melanomas arising in acral sites. *Eur J Cancer*. 2019;119:66-76.

Zauderer MG, Jayakumaran G, DuBoff M, **Zhang L,** Francis JH, Abramson DH, Cercek A, Nash GM, Shoushtari A, Chapman P, D'Angelo S, Arnold AG, Siegel B, Fleischut MH, Ni A, Rimner A, Rusch VW, Adusumilli PS, **Travis W, Sauter J**L, **Zehir A, Mandelker D, Ladanyi M,** Robson M. Prevalence and preliminary validation of screening criteria to identify carriers of germline BAP1 mutations. *J Thorac Oncol.* 2019;14(11):1989-94.

Zeng J, Piscuoglio S, Aggarwal G, Magda J, Friedlander MA, **Murray M,** Akram M, **Reis-Filho JS, Weigelt B, Edelweiss M.** Hormone receptor and HER2 assessment in breast carcinoma metastatic to bone: A comparison between FNA cell blocks and decalcified core needle biopsies. *Cancer Cytopathol.* 2019 [E-pub ahead of print].

Zhang L, Walsh MF, Jairam S, **Mandelker D,** Zhong Y, Kemel Y, **Chen YB,** Musheyev D, **Zehir A,** Jayakumaran G, Brzostowski E, Birsoy O, Yang C, Li Y, Somar J, DeLair D, Pradhan N, **Berger MF,** Cadoo K, Carlo MI, Robson ME, Stadler ZK, **Iacobuzio-Donahue CA,** Joseph V, Offit K. Fumarate hydratase FH c.1431_1433dupAAA (p.Lys477dup) variant is not associated with cancer including renal cell carcinoma. *Hum Mutat*. 2020;41(1):103-9.

Zhang W, Rho JH, **Roehrl MH,** Wang JY. A comprehensive autoantigen-ome of autoimmune liver diseases identified from dermatan sulfate affinity enrichment of liver tissue proteins. *BMC Immunol*. 2019;20(1):21.

Zhang W, Rho JH, Roehrl MW, **Roehrl MH,** Wang JY. A repertoire of 124 potential autoantigens for autoimmune kidney diseases identified by dermatan sulfate affinity enrichment of kidney tissue proteins. *PLoS One*. 2019;14(6):e0219018.

Zhou J, Sanchez-Vega F, Caso R, Tan KS, Brandt WS, Jones GD, Yan S, Adusumilli PS, Bott M, Huang J, Isbell JM, Sihag S, Molena D, Rusch VW, Chatila WK, **Rekhtman N,** Yang F, **Ladanyi M,** Solit DB, **Berger MF,** Schultz N, Jones DR. Analysis of tumor genomic pathway alterations using broad-panel next-generation sequencing in surgically resected lung adenocarcinoma. *Clin Cancer Res.* 2019;25(24):7475-84.

Zhu GG, **Nafa K,** Agaram N, **Zehir A, Benayed R,** Sadowska J, **Borsu L,** Kelly C, Tap WD, Fabbri N, Athanasian E, Boland PJ, Healey JH, **Berger MF, Ladanyi M, Hameed M.** Genomic profiling identifies association of IDH1/IDH2 mutation with longer relapse-free and metastasis-free survival in high-grade chondrosarcoma. *Clin Cancer Res.* 2020;26(2):419-27.

New Pathology Faculty

Lora Hedrick Ellenson, MD
Attending Pathologist
Director, Gynecologic Pathology

M. Herman Chui, MD
Assistant Attending Pathologist

Pallavi Galera, MD
Assistant Attending Pathologist

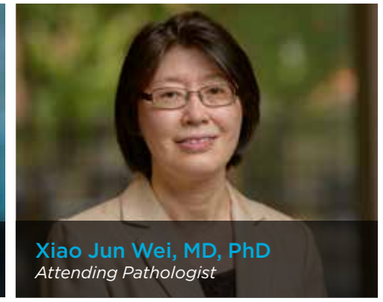
Brie Kezlarian, MD
Assistant Attending Pathologist

Alexander Chan, MD
Assistant Attending Pathologist

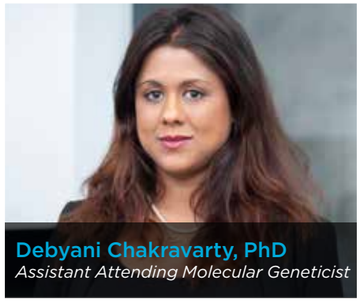
Andrea Moy, MD
Assistant Attending Pathologist

Maksym Misyura, PhD
Assistant Attending Molecular Geneticist

Judy Sarungbam, MD
Assistant Attending Pathologist

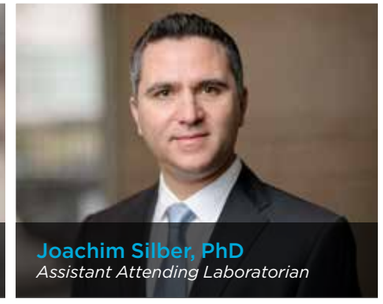


Xiao Jun Wei, MD, PhD
Attending Pathologist



Debyani Chakravarty, PhD
Assistant Attending Molecular Geneticist

Angela Rose Brannon, PhD
Assistant Attending Bioinformatician



Joachim Silber, PhD
Assistant Attending Laboratorian

Featured (Newly) Available IHC Protocols

DAXX

New Protocol: DAXX

Reagent: rabbit mA

Protein: DAXX (Death domain-associated protein 6)

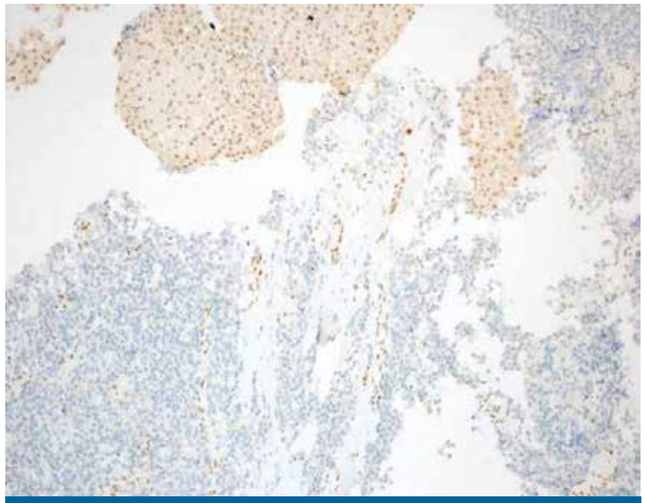
Protein Description: Corepressor of transcription that interacts with several transcription factors. It is part of the Histone remodeling complex ATRX/DAXX.

Manufacturer: Abcam (ab32140)

Clone: E94

Clinical Use: Loss of DAXX in pancreatic neuroendocrine tumors is associated with DAXX mutations, alternative lengthening of telomeres, and poor prognosis.

Reference:
https://www.ncbi.nlm.nih.gov/pubmed/30747827



DAXX (mAb E94), llver biopy, DAXX-mutated pancreatic NET metastatic to the liver

MUC5AC

New Protocol: MUC5AC

Reagent: mouse mAb

Protein: MUC5AC (Mucin 5AC, oligomeric mucus/ gel-forming)

Protein Description: Mucins are carbohydrate rich glycoproteins with a protein backbone linked to a wide variety of oligosaccharide side chains; so far 20 mucins have been identified, which are expressed in a tissue-specific manner. MUC5AC is expressed in surface-epithelial (foveolar) mucin of the gastro-intestinal tract, including the ampulla, as well as in other tissues.

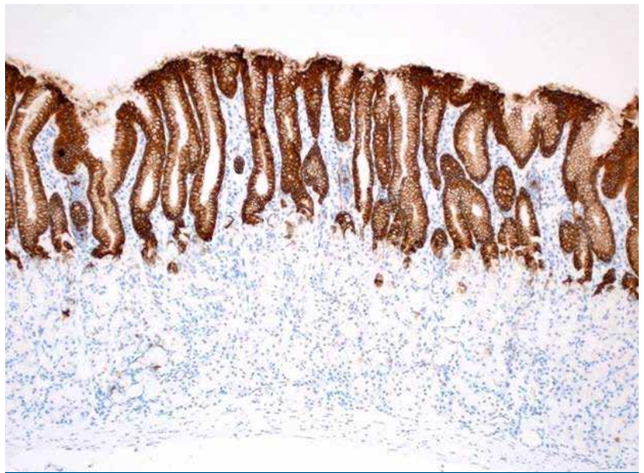
Manufacturer: Santa Cruz (SC-33667)

Clone: CLH2

HGNC: MUC5AC

Syn.: MUC5, TBM, leB, mucin, mucin 5AC, oligomeric mucus/gel-forming

Clinical Use: Differential diagnosis of pancreatic intraductal neoplasms; distinction of IPMNs from ITPNs (IPMNs usually positive for MUC5AC and negative for MUC6; ITPNs usually positive for MUC6 and negative for MUC5AC).



MUCSAC (mAb CJJLZ), stomach mucosa

References:
https://www.ncbi.nlm.nih.gov/pubmed/28776573
https://www.ncbi.nlm.nih.gov/pubmed/27984235

MUC6

New Protocol: MUC6

Reagent: mouse mAb

Protein: MUC6 (Mucin-6, oligomeric mucus/ gel-forming)

Protein Description: Mucins are carbohydrate rich glycoproteins with a protein backbone linked to a wide variety of oligosaccharide side chains; so far 20 mucins have been identified, which are expressed in a tissue-specific manner. MUC6 (pyloric type mucin) is expressed in gastric pyloric glands, Brunner glands as well as in other tissues.

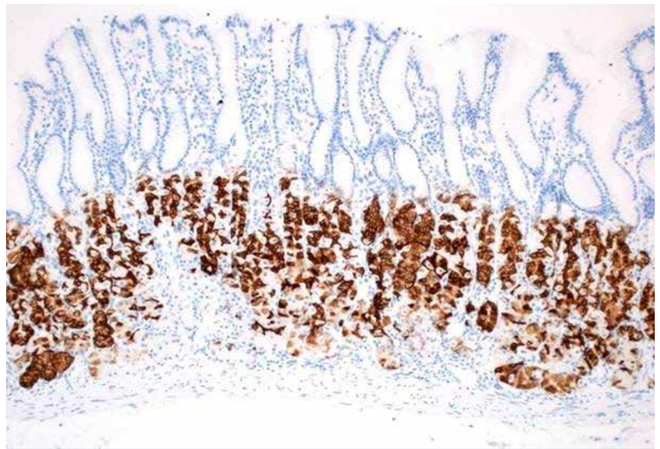
Manufacturer: Santa Cruz (SC-33668)

Clone: CLH5

HGNC: MUC6

Syn.: Muc-6, Gastric mucin6

Clinical Use: Differential diagnosis of pancreatic intraductal neoplasms; distinction of IPMNs from ITPNs (IPMNs usually positive for MUC5AC and negative for MUC6; ITPNs usually positive for MUC6 and negative for MUC5AC).



MUC6 (mAb CHL5), stomach mucosa

References:
https://www.ncbi.nlm.nih.gov/pubmed/27984235
https://www.ncbi.nlm.nih.gov/pubmed/28776573

EGFRvIIII

New Protocol: EGFRvIII

Reagent: rabbit mAb

Protein: EGFRvIII (Epidermal Growth Factor Receptor deletion mutation vIII)

Protein Description: Deletion mutation of EGFR with loss of exons 2-7; also called EGFRd2-7.

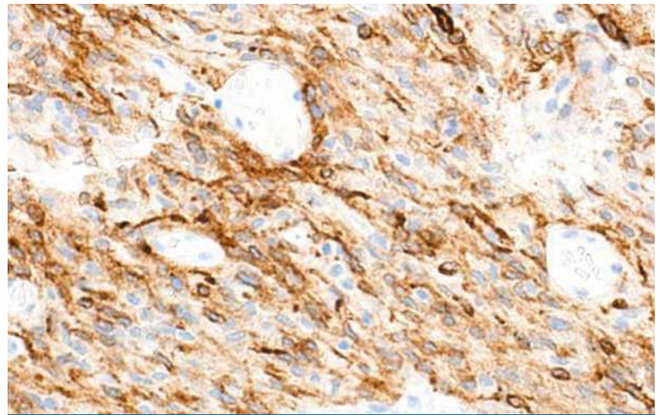
Manufacturer: Cell Signaling Technologies (CST), (#64952)

Clone: D6T2Q

HGNC: n/a

Syn.: EGFRd2-7

Clinical Use: EGFRvIII is a common mutation in glioblastoma (GBM). It involves the deletion of exons 2-7 and is associated with protein overexpression; it is thought to be a late event after amplification of EGFR. The present antibody detects EGFRvIII. While the pro-tumorigenic effects of EGFRvIII have been demonstrated in several model systems of GBM, it can also be rarely encountered in other tumor types, where its significance is less clear.



EGFRvIII (mAb D6T2Q), EGFRvIII-positive glioblastoma

References:
https://www.ncbi.nlm.nih.gov/pubmed/1584765
https://www.ncbi.nlm.nih.gov/pubmed/21170331
https://www.ncbi.nlm.nih.gov/pubmed/25255959
https://www.ncbi.nlm.nih.gov/pubmed/16672372

Q&A

ERIC KLEIN

Senior Financial Manager

By Kayt Sukel

Q What are you responsible for in your current role?

A My primary responsibility is ensuring the fiscal health of the department. It may sound simple, but it involves being aware of all the different priorities from all the different services and stakeholders here in Pathology and ensuring that they have the resources they need to meet their individual, departmental, and institutional goals. I also oversee all of the research administration within the department. That includes helping to prepare research and grant applications for faculty, reporting their progress to granting agencies, and working with other departments to help connect them with the right people in our department to meet their pathology needs.

Most people think my job is all about numbers on a spreadsheet. But they don't see the behind-the-scenes part where I work with clinicians, investigators, lab managers, suppliers, and administrators to make sure that all of the pieces of the puzzle come together in such a way that there's a seamless flow of resources when it's time to get the work done. If I've done my job well, it appears effortless to everyone else. But there's an enormous amount of work involved, and a large support structure to make sure that can happen. We work together closely to integrate finance, operations, clinical care, and research in a holistic way.

Q What brought you to Memorial Sloan Kettering?

A My father worked in hospital administration and I knew early on that I wanted to work in a hospital setting where there was a strong mission to help people as well as advance the field of medicine. MSK offers the pinnacle of cancer treatment, research, and education. It's an internationally renowned institution and I'm proud to have joined it two years ago. Pathology is a critical part of that mission. Without the clinical care going on in our department, the rest of cancer treatment falls apart. Pathology provides a unique way of understanding, identifying, and optimizing the treatment of cancer.

Q What's the most enjoyable part of your work?

A I get a lot of satisfaction out of working hand in hand with clinicians, lab managers, and investigators to understand what resources they need to perform clinical care or conduct their research and delivering those resources seamlessly so that they may focus on their work and not the support structure behind it. I work closely with them to help them understand what they need to do their work to treat and cure cancer as well as generate results that will further advance cancer insights and treatment in the future. I try to incorporate my personal interests in digital technology and efficiency when delivering support so that we can ensure high quality of care and optimization of resources to reduce patient costs and provide education for the different services in the Department of Medicine.

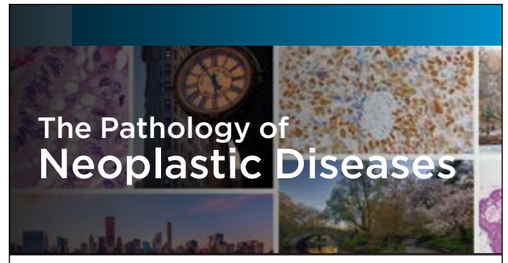
Another large part of my role is research. I help coordinate collaborations with industry, which involves working with them to determine the scope of work, preparing a budget, working with legal to review contracts, and coordinating the logistics of a study.

Q From your perspective, what sets MSK apart from other cancer centers?

A It's all about the translational science. We provide the best clinical care to our patients. We also have a strong research program and some of the brightest minds in the field. But our department is unique in bridging the two together. And that's important because one can't grow without the other. Our work is helping to not only advance the field through research or improving patient outcomes, but combining the two to advance the standards of cancer care across the industry. And in doing so, we create new and innovative technologies and treatments and quickly move them from the bench to the bedside to help our patients.

Additional Opportunities

March 26, 2020
Memorial Sloan Kettering Cancer Center
Zuckerman Research Center
www.mskcc.org/trs2020



April 27-May 1
Memorial Sloan Kettering Cancer Center
Rockefeller Research Laboratories
www.mskcc.org/neoplasticdiseases2020

June 24, 2020
Memorial Sloan Kettering Cancer Center
Zuckerman Research Center

April 19-25, 2020

DR. CHRISTINE IACOBUZIO-DONAHUE was named as the 2019 recipient of the Ruth Leff Siegel Award

The Pancreas Center of Columbia University has been entrusted by the Siegel family to identify the investigator who has had the most impactful contribution to the understanding/treatment/advancement of pancreatic cancer over the past year. Their research can be in any field of pancreatic cancer research, including but not limited to basic biology, population biology, public health, and/or translational science. Not only must the investigator have a track record of high quality work in this field, but also must have contributed to our understanding of pancreatic cancer in the past year, and will continue to do so for years to come.

@MSKPathology is excited to announce that workshop proposals for ICLR 2020 entitled "AI for Overcoming Global Disparities in Cancer Care" have been accepted! Congrats to **@marciaedelweiss** and Dr. Ntiamoah for their contributions! ai4cc.org

#GrandRounds2019 First lecture of the 2019-2020 academic year **@MSKPathology**: Dr. Jason Huse of **@MDAndersonNews** "Characterizing and Targeting Epigenetic Dysfunction in Malignant Glioma"

Congratulations to **@MSKPathology** faculty members Drs. Jorge Reis-Filho and Samson Fine (**@rovingatuscap**) for their inclusion in **@pathologistmag's** 2019 Power List which features 100 of the industry's top trailblazers!!

Our **#liquidbiopsy** test at **@sloan_kettering** has received NY State DOH approval for clinical use! MSK-ACCESS captures 129 genes, selected from MSK-IMPACT, for high sensitivity, non-invasive cancer genomic profiling and disease monitoring in plasma cell-free DNA **#ASC019**

INQUIRIES about the *MSK Pathology Review* should be addressed to:

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www.mskcc.org/departments/pathology

Twitter & Instagram:
@MSKPathology

1st Quarter 2020

Research Profile: Jennifer Sauter, MD

Research Profile: Maurizio Scaltriti, PhD

Research Profile: Mikhail Roshal, MD

Service Spotlight: Autopsy Service

Cover: Protein Based Diagnoses

Q & A with Jessica Chapman, PhD

MDs who tweet

Jackie Hechtman **@JackieHechtman**
Ahmet Zehir **@ahmetz**
Christine Iacobuzio- Donahue **@ciacobu**
Natasha Rekhtman **@natasharekhtman**
Michael Berger **@MFBerger1**
Ryma Benayed **@RymaBenayed**
Samson Fine **@rovingatuscap**
Jennifer Sauter **@JL_Sauter**
Marcia Edelweiss **@marciaedelweiss**
Thomas Fuchs **@ThomasFuchsAI**
Edi Brogi **@EdiBrogi**
Bin Xu **@BinXu16**
Marc Ladanyi **@MLadanyi**
Hikmat Al-Ahmadie **@h_alahmadie**
Hannah Wen **@HannahYWen**
Kay Park **@KayParkMD**
Olca Basturk **@OlcaBasturk**

Jamal Benhamida **@jamalbenhamida**
Ozge Birsoy **@BirsoyOzge**
Meera Hameed **@hameedm**
DanaTsui **@DNA_tsui**
Yukako Yagi **@YukakoYagi**
Matthew Hanna **@MGHannaMD**
Wenbin Xiao **@drwenbin_xiao**
Yingbei Chen **@Unclassified1**
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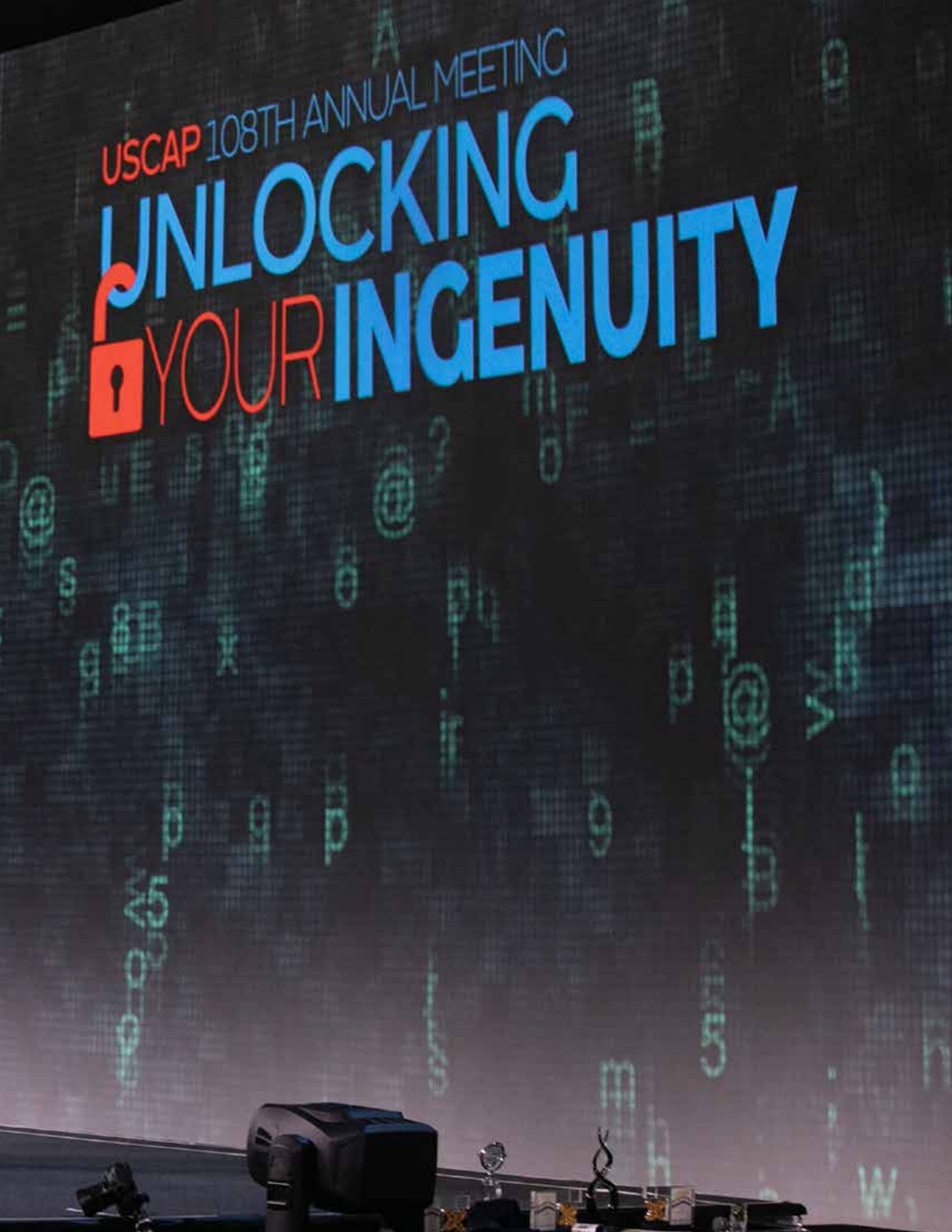
Ronald Ghossein **@ghosseir1**
Nora Katabi **@katabinmsk**
Timothy D'Alfonso **@tim_dalfonso**
Anne Grabenstetter **@AGrabenstetter**
Melissa Murray **@MelissaMurray17**
Andrea Moy **@aprimi**
Melissa Pulitzer **@MPulitzerMD**
Debyani Chakravarty**@CDebyaniPhD**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