

Division of Hematopathology

Weill Cornell Medicine/NewYork-Presbyterian Hospital

At a Glance



- **>30 laboratory and ancillary staff**
- **All faculty, fellows, and IHC/flow staff located on the 7th floor of NYP-Hospital, alongside bone marrow morphology, flow cytometry, immunohistochemistry, and digital pathology operations**
- **Approximate annual specimen volumes:**
 - 2000 bone marrow biopsies
 - 1600 lymph node and extra-nodal tissues
 - 7000 flow cytometry studies
 - 400 cases in consultation/for secondary review
- **6 primary clinical faculty (8, as of Aug. 2024) & 6 affiliated faculty in research, molecular hematopathology, and cytogenetics divisions**
- **>50 peer-reviewed publications authored by core hematopathology division and affiliated faculty since Jan. 2023**



Flow Cytometry Laboratory



**FACSCanto (4)
[10 color]**



**FACSMelody
(Clinical flow sorter)**



FACSLytic (12 color)



Fortessa (20 color)





Leica BOND-III (8) & BOND-RX



Leica BOND-PRIME

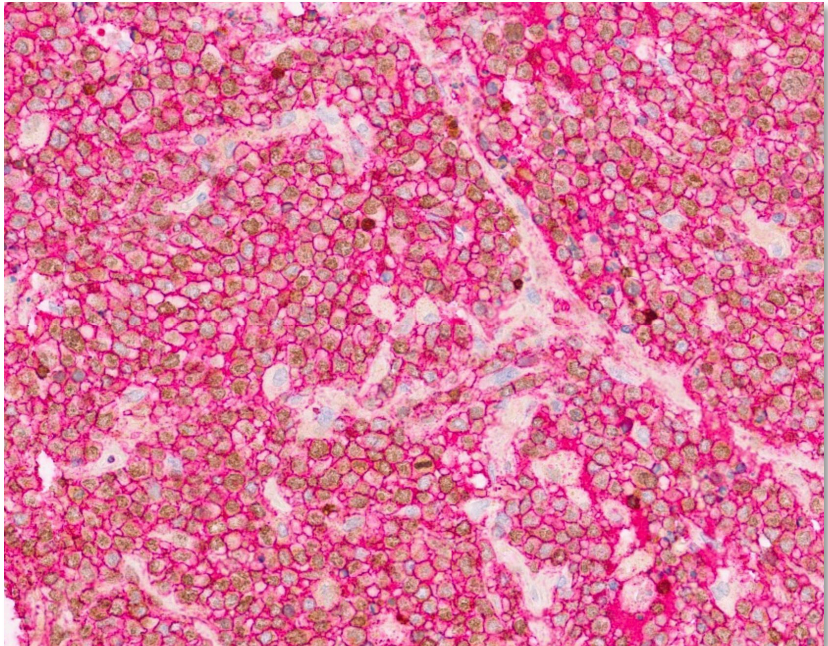
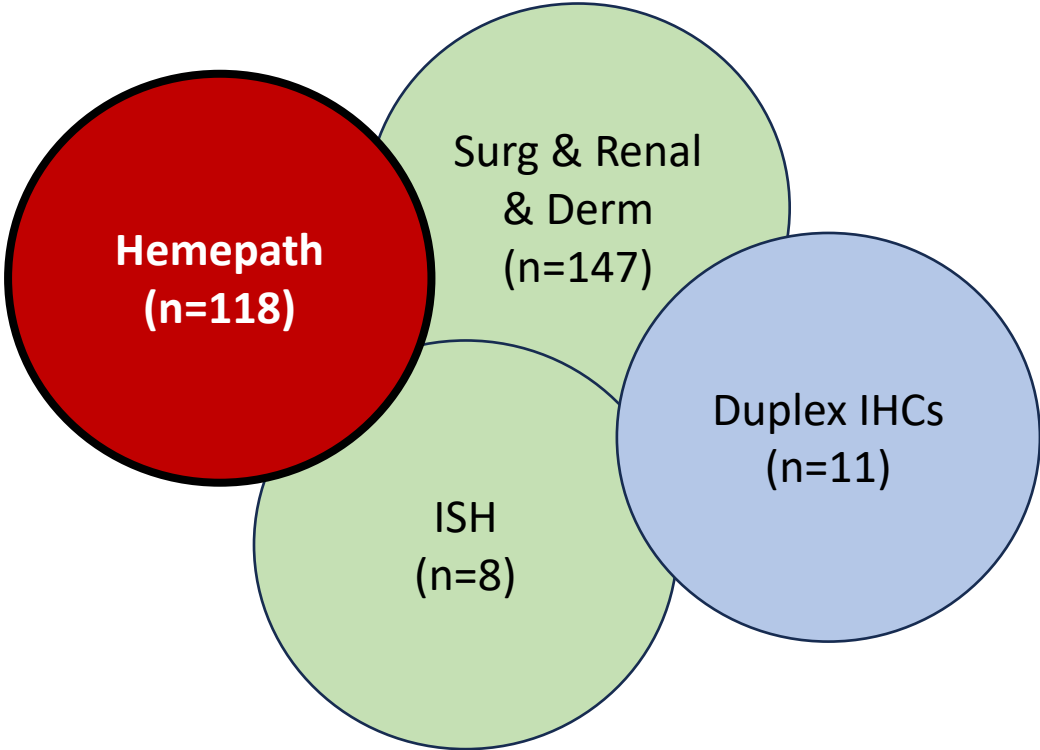


Ventana Discovery Ultra (2)

Median 79,794 tests performed annually (2019-2023)



Complete Test Menu (n=265 Antibodies)

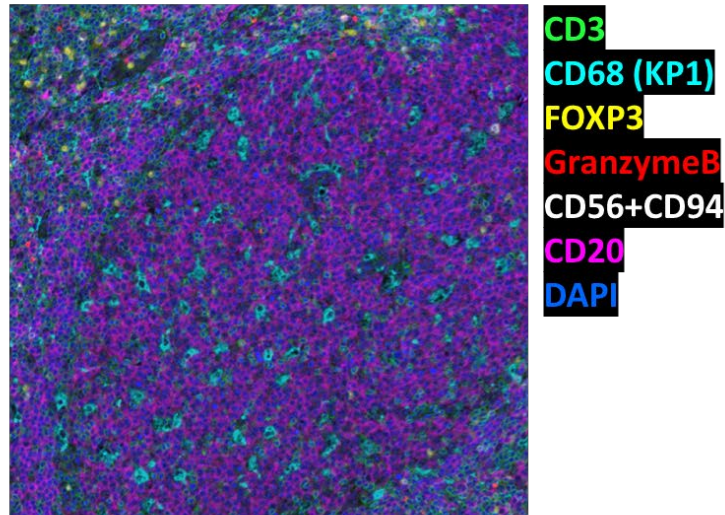


Ki-67 & CD20



Immunohistochemistry Laboratory (R&D)

Immunohistochemistry 7-Color Immunofluorescent Panel

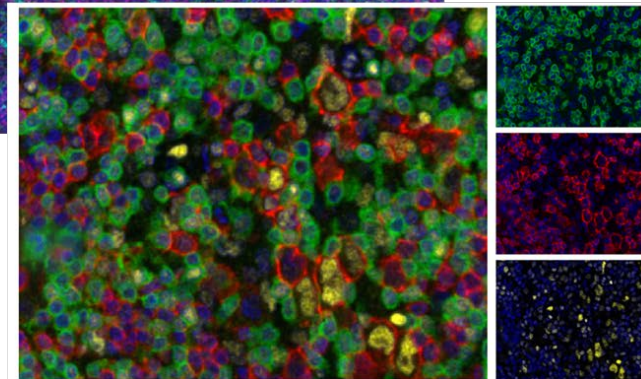


CD3
CD68 (KP1)
FOXP3
GranzymeB
CD56+CD94
CD20
DAPI

Clinically validated immunostains are stained sequentially using tyramide-based fluorescent detection. Principle is the same as diaminobenzidine chromogenic staining where precipitate are covalently bonded with tyrosine residues within the proximity of the antigen of interest.

Benefits of doing multicolor fluorescent staining:

- Less tissue material needed to test for multiple markers
- Be able to test up to 6 biomarkers using the same tissue section
- Visualization of multiple targets seeing co-localization and interaction of cells
- Accurate quantification of co-expressing cells using third party software



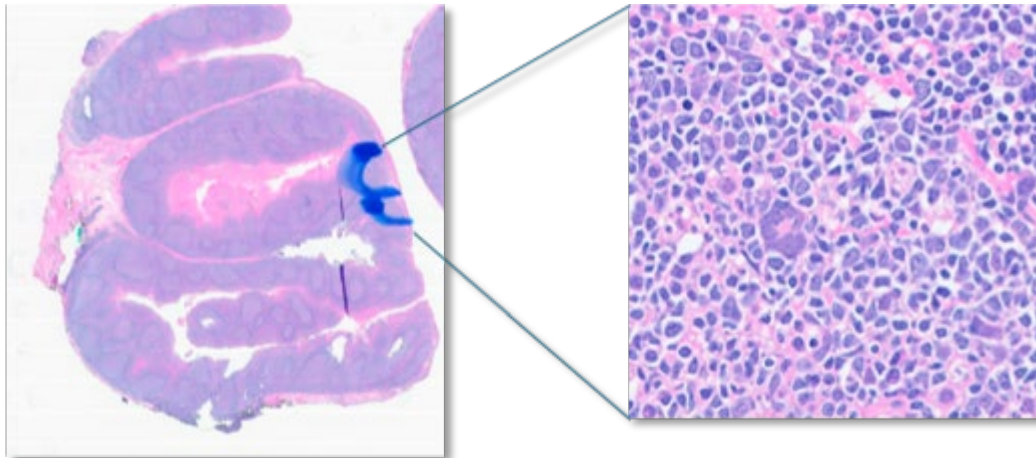
CD3
pSTAT3
CD20
DAPI



Hematopathology Digital Pathology Program

Digital Slides Scanned			
	2022	2023	
January	701	1237	
February	829	1455	
March	771	1410	
April	892	1141	
May	579	1477	
June	566	1426	
July	497	916	
August	602	3071	
September	953	2443	
October	2811	3142	
November	776	4287	
December	19	5873	
Totals	9996	27878	279% Increase

Approx. 68,000 slides scanned in 2024 (as of Feb. 2024)



Digitized slides used for conference presentations

**Leica
GT450**



**Leica
AT2**



Fellowship Program



Our fantastic 2023-24 fellows:
James and Nadia!



Overview

- 40 weeks on core rotations (“A” & “B”)
 - A = bone marrow pathology
 - B = Lymph node/tissues and non-BM flow cytometry
- 8 weeks on elective rotations
- 4 weeks vacation
- Teaching opportunities
- Conference Participation
 - Lymphoma
 - Myeloma
 - MPN
 - MDS/AML
- Book (\$500), travel (\$1500), & funds for membership dues (e.g. USCAP)

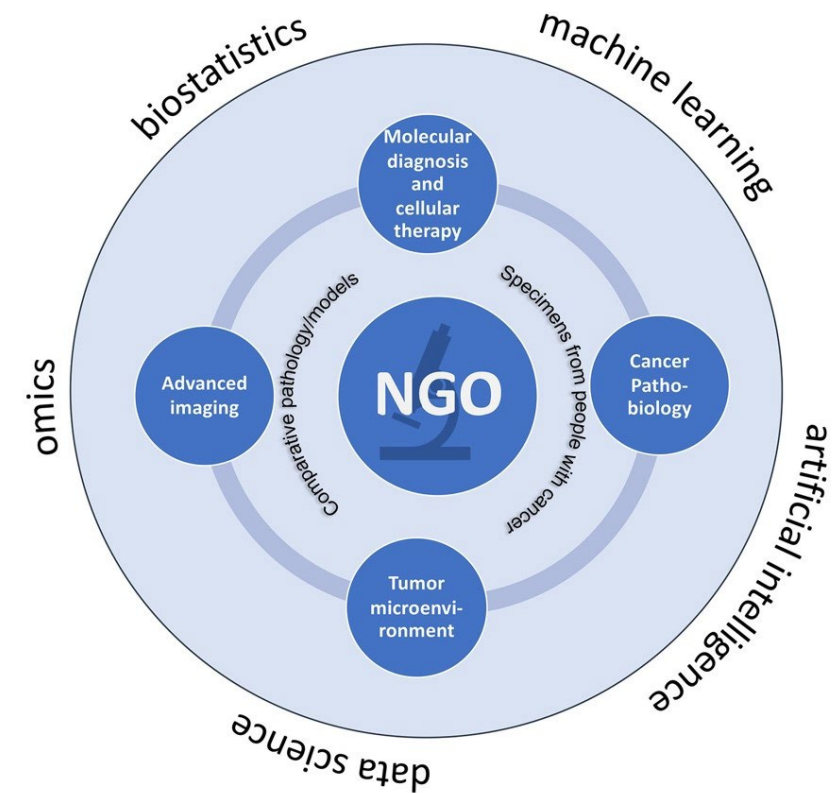
- Nearby hospital-affiliated housing
 - <https://www.nyp.org/realestate/east-campus-housing>
- Food stipend (\$180/mo. meal card)

Example Schedule

		Inghirami	Simonson	Patel	Fellow	Fellow
		Geyer	Chadburn	Ouseph	Fellows	
		Call	A Service/ BM consu	B service/ tissue const	A	B
Sat	1-Jul	JG				
Sun	2-Jul	JG				
Mon	3-Jul	JG	MMO	JG	Fellow	Fellow
Tue	4-Jul	JG		YAG		
Wed	5-Jul	AC	SP	AC	Fellow	Fellow
Thu	6-Jul	AC	SP	AC	Fellow	Fellow
Fri	7-Jul	AC	SP	AC	Fellow	Fellow
Sat	8-Jul	AC				
Sun	9-Jul	AC				
Mon	10-Jul	AC	SP	AC	Fellow	Fellow
Tue	11-Jul	AC	SP	AC	Fellow	Fellow
Wed	12-Jul	MMO	JG	MMO	Fellow	Fellow
Thu	13-Jul	MMO	JG	MMO	Fellow	Fellow
Fri	14-Jul	MMO	JG	MMO	Fellow	Fellow
Sat	15-Jul	MMO				
Sun	16-Jul	MMO				
Mon	17-Jul	MMO	JG	MMO	Fellow	Fellow
Tue	18-Jul	MMO	JG	MMO	Fellow	Fellow
Wed	19-Jul	JG	PXS	JG	Fellow	Fellow
Thu	20-Jul	JG	PXS	JG	Fellow	Fellow
Fri	21-Jul	JG	PXS	JG	Fellow	Fellow
Sat	22-Jul	JG				
Sun	23-Jul	JG				
Mon	24-Jul	JG	PXS	JG	Fellow	Fellow
Tue	25-Jul	JG	PXS	JG	Fellow	Fellow
Wed	26-Jul	AC	MMO	AC	Fellow	Fellow
Thu	27-Jul	AC	MMO	AC	Fellow	Fellow
Fri	28-Jul	AC	MMO	AC	Fellow	Fellow
Sat	29-Jul	AC				
Sun	30-Jul	AC				
Mon	31-Jul	AC	MMO	AC	Fellow	Fellow

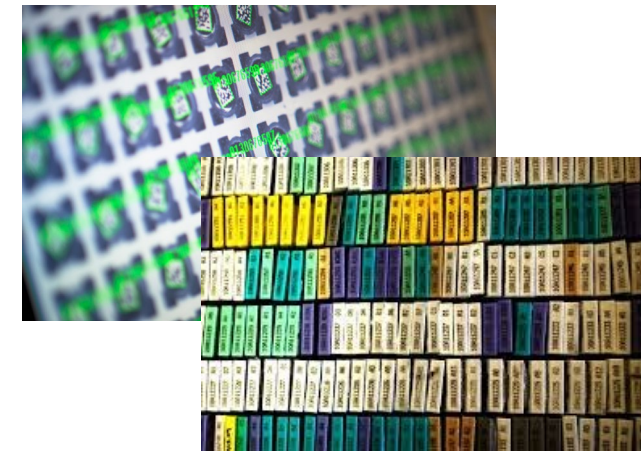
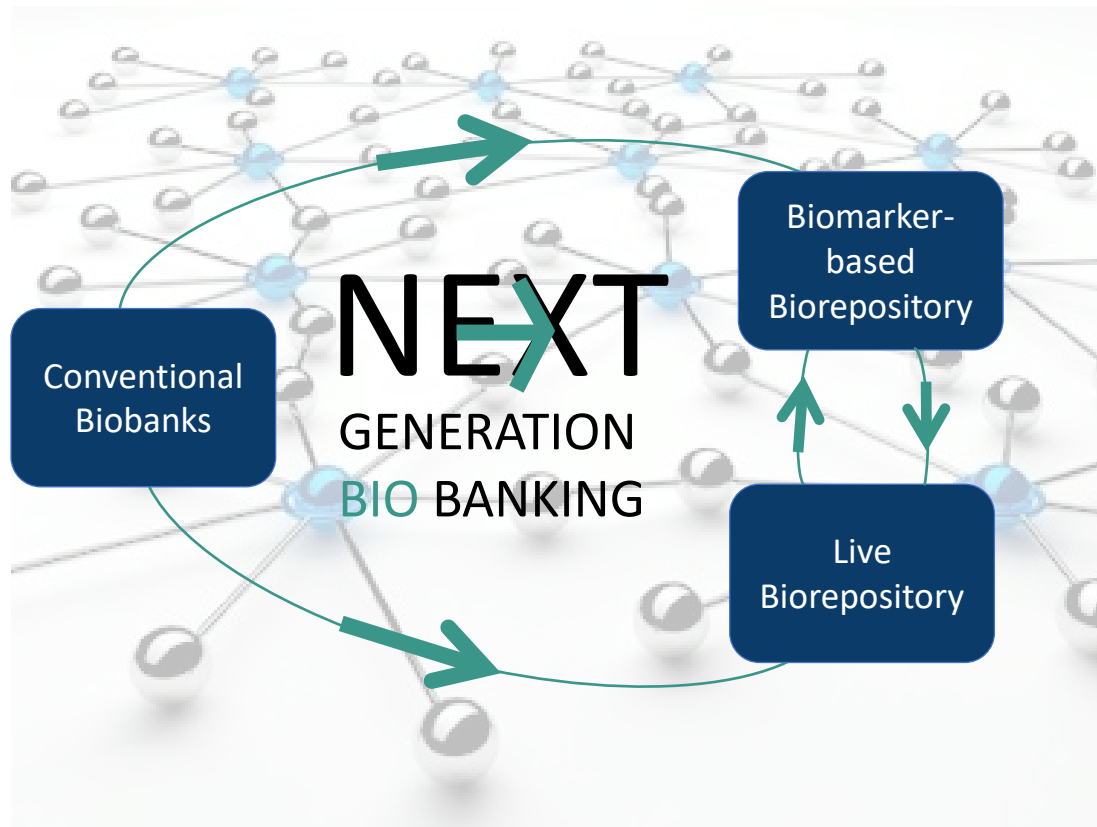
Next-Generation Onco-pathology (T32 Program)

- Post-doctoral research training program for academically-oriented residents and fellows
- Funding for 2 years of wet and/or dry lab-based research
- 2 *new* positions per year
- Emphasis on training in emerging methods relevant for a successful translational research career in pathology
 - Multiparameter in situ tissue imaging
 - Genomics
 - Transcriptomics
 - Proteomics
 - Metabolomics
 - Computational pathology

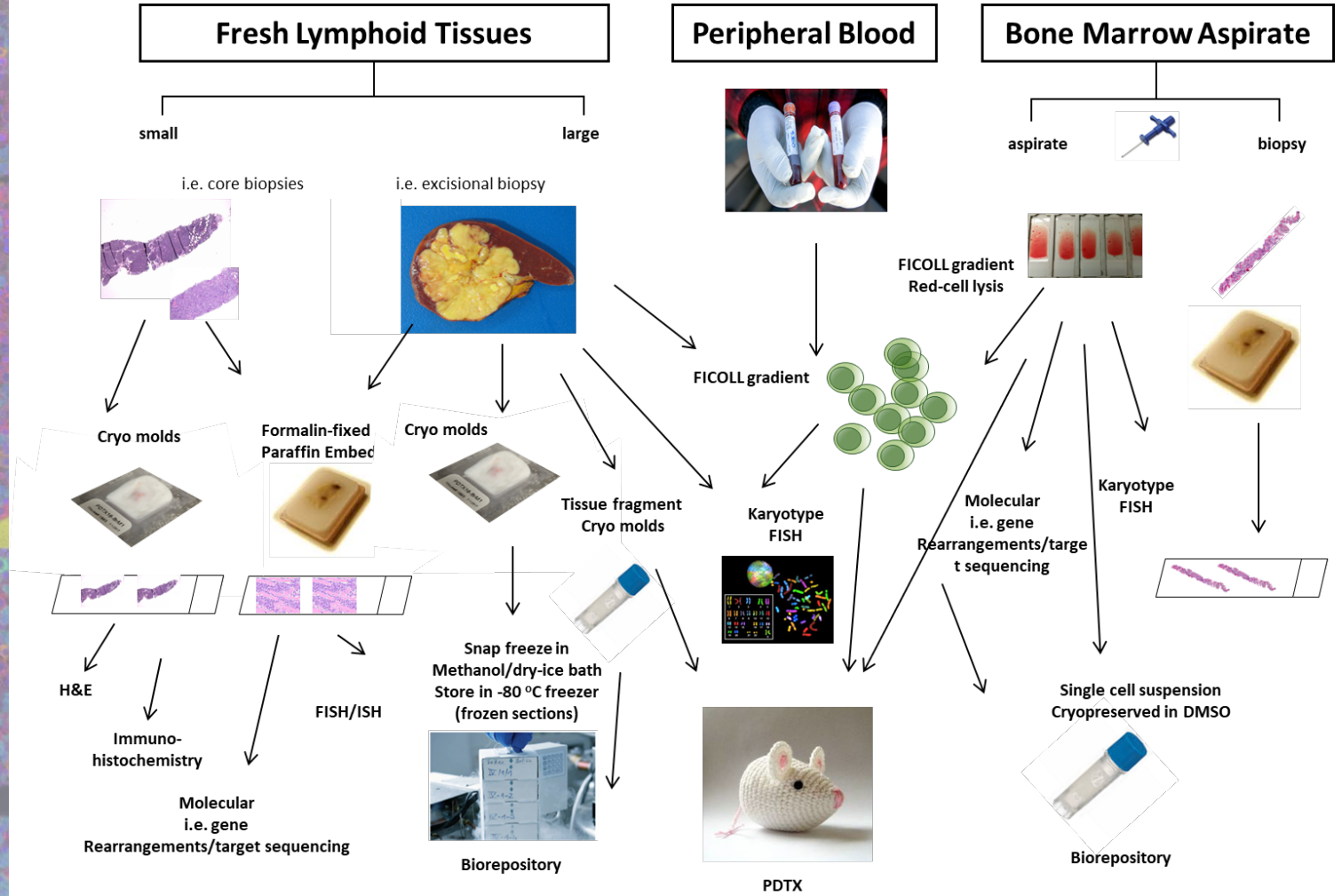




Clinical Hematopathology Biobank



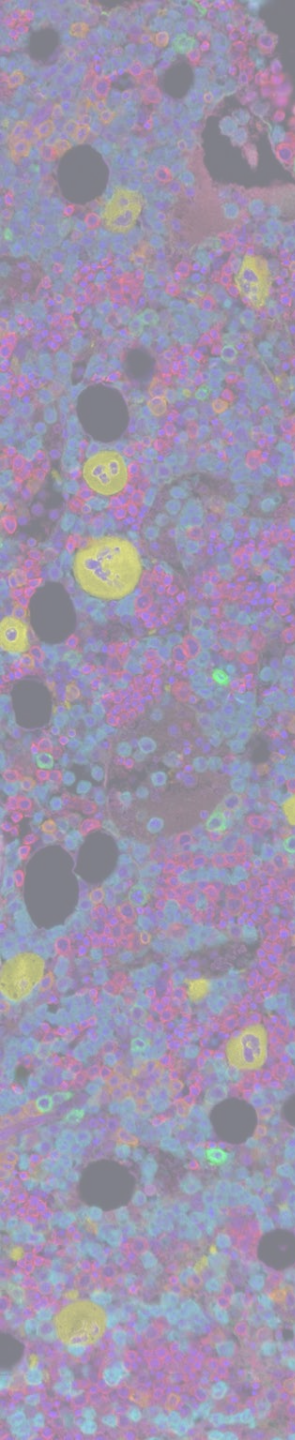
Hematopathology Biobank (as of January 2024)



Approx. 100,000 samples since 1991

- Single cell suspensions
- Viable tissue fragments
- Frozen tissues

All samples available for trainee research projects



Core Division Faculty





Dr. Giorgio Inghirami, M.D., Vice Chair for Hematopathology
Professor of Pathology and Laboratory Medicine

Areas of focus: T-cell lymphomas, CAR-T cell therapy, PDX modeling

Involvement in national/international organizations: Leukemia/Lymphoma Molecular Profiling Project (LLMPP)

Highlighted recent publication:

- 1) Cappelli L., et al. Endothelial cell-leukemia interactions remodel drug responses, uncovering T-ALL vulnerabilities. *Blood* 2023
- 2) Fiore, D., et al. Peripheral T cell lymphomas: from the bench to the clinic. *Nat Rev Cancer*. 2020



Dr. Amy Chadburn, M.D., Vice Chair for Clinical Operations and Quality
Professor of Pathology and Laboratory Medicine

Areas of focus: Immunodeficiency and immune dysregulation-related LPDs

Involvement in national/international organizations: USCAP, ASCP, ASH, Castleman Disease Collaborative Network Advisory Board, Alliance Pathology Cadre, AIDS Malignancy Consortium

Highlighted recent publication:

Carbone A., et al. Immune deficiency/dysregulation – associated lymphoproliferative disorders. Revised classification and management. *Blood Rev* 2024



Dr. Julia Geyer, M.D., Director, Hematopathology Fellowship Program
Associate Professor of Pathology and Laboratory Medicine

Areas of focus: Bone marrow pathology, myeloproliferative neoplasms

Involvement in national/international organizations: Latin American Society for Hematopathology (SOLAHP), Society for Hemepath (SH), European Assoc. for Haematopathology (EAHP), Bone Marrow Pathology Study Group (BMPSG), ASCP

Highlighted recent publication:

van den Akker TA, et al. Myeloid Proliferations Associated with Down Syndrome: Clinicopathologic Characteristics of Forty Cases from Five Large Academic Institutions. *Pathobiology* 2024



Dr. Sanjay Patel, M.D., M.P.H., Associate Director, Hematopathology Fellowship Program & Director, MISI Laboratory
Assistant Professor of Pathology and Laboratory Medicine

Areas of focus: Multiplex tissue imaging, hematopoiesis, *NPM1*-mutated myeloid neoplasms

Involvement in national/international organizations: Society for Hemepath (EHP Committee), CAP (PCEC), USCAP (Abstract Review Committee), NY Path Society (Program Committee)

Highlighted recent publication:

Sarachakov et al. Spatial mapping of human hematopoiesis at single cell resolution reveals topographic remodeling associated with aging. *Blood* 2023



Dr. Madhu Ouseph, M.D., Ph.D., Director, Clinical Hematopathology Integration
Assistant Professor of Pathology and Laboratory Medicine

Areas of focus: Molecular basis of myeloid neoplasms, focus on myeloproliferative neoplasms and megakaryocyte pathobiology

Involvement in national/international organizations: Committee member in several organizations (Society for Hemepath, AMP, CAP, ClinGen)

Highlighted recent publication:

Ouseph MM, et al. Genomic alterations in patients with somatic loss of the Y chromosome as the sole cytogenetic finding in bone marrow cells. *Haematologica* 2021



Dr. Paul Simonson, M.D., Ph.D.,
Assistant Professor of Pathology and Laboratory Medicine

Areas of focus: Machine learning for flow cytometry diagnostics, multiparametric fluorescence imaging, digital image analysis

Involvement in national/international organizations: CAP Artificial Intelligence Committee, AIDS Malignancy Consortium Emerging Technologies Subcommittee

Highlighted recent publication: Simonson PD, et al. Potential for Process Improvement of Clinical Flow Cytometry by Incorporating Real-Time Automated Screening of Data to Expedite Addition of Antibody Panels. *Am J Clin Pathol* 2022

Faculty Contributions to WHO5 and ICC Schema

WHO5

Leukemia www.nature.com/leu

REVIEW ARTICLE OPEN Check for updates

LYMPHOMA

The 5th edition of the World Health Organization Classification of Haematolymphoid Tumours: Lymphoid Neoplasms

Rita Alaggio ¹, Catalina Amador ², Ioannis Anagnostopoulos ³, Ayoma D. Attygalle ⁴, Iguarayra Barreto de Oliveira Araujo ⁵, Emilio Berti ⁶, Govind Bhagat ⁷, Anita Maria Borges ⁸, Daniel Boyer ⁹, Marilarita Calaminici ¹⁰, Amy Chadburn ¹¹, John K. C. Chan ¹², Wah Cheuk ¹², Wee-Joo Chng ¹³, John K. Choi ¹⁴, Shih-Sung Chuang ¹⁵, Sarah E. Coupland ¹⁶, Magdalena Czader ¹⁷, Sandeep S. Dave ¹⁸, Daphne de Jong ¹⁹, Ming-Qing Du ^{20,21}, Kojo S. Elenitoba-Johnson ²¹, Judith Ferry ^{22,23}, Julia Geyer ¹¹, Dita Gratzinger ²³, Joan Guiltart ²⁴, Sumeet Gujral ²⁵, Marian Harris ²⁶, Christine J. Harrison ²⁷, Sylvia Hartmann ²⁸, Andreas Hochhaus ²⁹, Patty M. Jansen ³⁰, Kennosuke Karube ³¹, Werner Kempf ³², Joseph Khoury ³³, Hiroshi Kimura ³⁴, Wolfram Klapper ³⁵, Alexandra E. Kovach ³⁶, Shaji Kumar ³⁷, Alexander J. Lazar ³⁸, Stefano Lazzi ³⁹, Lorenzo Leoncini ³⁹, Nelson Leung ⁴⁰, Vasiliki Leventaki ⁴¹, Xiao-Qiu Li ⁴², Megan S. Lim ²¹, Wei-Ping Liu ⁴³, Abner Louissaint Jr. ⁴⁴, Andrea Marcogliese ⁴⁴, L. Jeffrey Medeiros ³⁵, Michael Michal ⁴⁵, Roberto N. Miranda ⁴⁶, Christina Mitterdorf ⁴⁶, Santiago Montes-Moreno ⁴⁷, William Morice ⁴⁸, Valentina Nardi ²², Kikkeri N. Naresch ⁴⁹, Yasodha Natkunam ²³, Siok-Bian Ng ⁵⁰, Ilse Oschlies ³⁵, German Ott ^{51,52}, Marie Parrens ⁵², Melissa Pulitzer ⁵³, S. Vincent Rajkumar ⁵⁴, Andrew C. Rawstron ²⁵, Karen Rech ⁴⁸, Andreas Rosenwald ⁵, Jonathan Said ⁵⁶, Clémentine Sarkozy ⁵⁷, Shahin Sayed ⁵⁸, Caner Saygin ⁵⁹, Anna Schuh ⁶⁰, William Sewell ⁶¹, Reiner Siebert ^{62,63}, Aliyah R. Sohani ²², Reuben Tooze ⁶⁴, Alexandra Traverse-Glehen ⁶⁴, Francisco Vega ³³, Beatrice Vergier ⁶⁵, Ashutosh D. Wechalekar ⁶⁶, Brent Wood ³⁶, Luc Xerri ⁶⁷ and Wenbin Xiao ⁵³



ICC

International Consensus Classification of Myeloid Neoplasms and Acute Leukemias: integrating morphologic, clinical, and genomic data

Section on “Acute myeloid leukemia with mutated *NPM1*”
Patel, S., Wei, A., and Weinberg, O.



Faculty in the News



HEMATOPOIESIS AND STEM CELLS

Spatial mapping of human hematopoiesis at single-cell resolution reveals aging-associated topographic remodeling

Aleksandr Sarachakov,¹ Arina Varlamova,¹ Viktor Svekolkina,¹ Margarita Polyakova,¹ Itzel Valencia,² Caitlin Unkenholz,² Tania Pannellini,² Iliia Galkin,¹ Pavel Ovcharov,¹ Dmitrii Tabakov,¹ Ekaterina Postovalova,¹ Nara Shin,¹ Isha Sethi,¹ Alexander Bagaev,¹ Tomer Itkin,³ Genevieve Crane,⁴ Michael Kluk,⁵ Julia Geyer,⁵ Giorgio Inghirami,⁵ and Sanjay Patel^{2,5}

TheScientist
EXPLORING LIFE, INSPIRING INNOVATION

[READ THIS ARTICLE ONLINE](#)



Advanced Spatial Tools Map Hematopoietic Stem Cell Niches

New technologies and archival tissue biopsy samples enable exploration of changes in the bone marrow as people age.



Affiliated Faculty





Dr. Neal Lindeman, M.D., Vice Chair, Laboratory Medicine and Molecular Pathology
Professor of Pathology and Laboratory Medicine

Areas of focus: Molecular assay development/validation, clinical chemistry

Involvement in national/international organizations: ACLPS (past-president), CAP (Chair, Molecular Oncology Committee), AMP, ADLM (formerly AACC)

Highlighted recent publication:

- 1) AlJabban, A., et al. Optimization of Advanced Molecular Genetic Testing Utilization in Hematopathology: A Goldilocks Approach to Bone Marrow Testing. *JCO Oncol Pract* 2024
- 2) Zhang, BM., et al. An Overview of Characteristics of Clinical Next-Generation Sequencing-Based Testing for Hematologic Malignancies. *Arch Pathol Lab Med* 2021



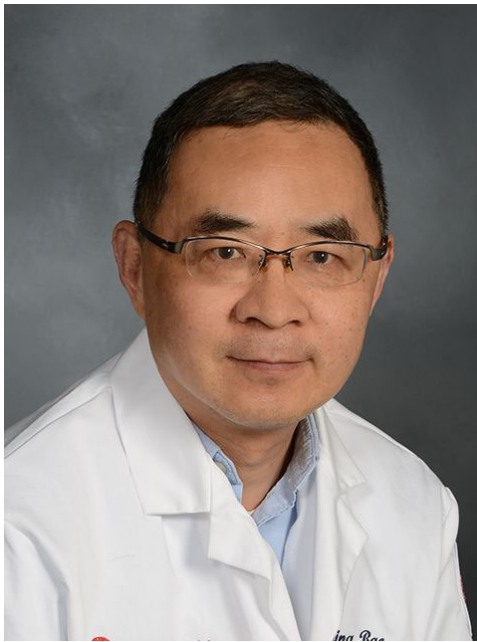
Dr. Michael Kluk, M.D., Ph.D., Director, Molecular Hematopathology Laboratory
Associate Professor of Pathology and Laboratory Medicine

Areas of focus: Molecular hematopathology in myeloid neoplasia

Involvement in national/international organizations: AMP, USCAP, CAP Abstract Review Committee

Highlighted recent publication:

- Lopez et al. Comparison of multiple clinical testing modalities for assessment of *NPM1*-mutant AML. *Front Oncol* 2021



Dr. Liming Bao, M.D., Director, Cytogenetics Laboratory
Professor of Pathology and Laboratory Medicine

Areas of focus: Cancer cytogenetics

Involvement in national/international organizations: American Cytogenomics Conference, CAP

Highlighted recent publication:

Priest et al. Evolution of acquired resistance in a ROS1+ KRAS G12C+ NSCLC through the MAPK pathway. *NPJ Precision Oncology* 2023



Dr. Madhulatha Pantrangi, Ph.D., Associate Director, Cytogenetics Laboratory
Assistant Professor of Pathology and Laboratory Medicine

Areas of focus: Cancer and constitutional cytogenetics, genetics of inherited ocular disorders

Involvement in national/international organizations: ClinGen (Expert panel member)

Highlighted recent publication:

Pantrangi, M., et al. Clinical sequencing of the retinitis pigmentosa gene RPGR in over 1,000 cases of vision loss. *Molecular Vision* 2024



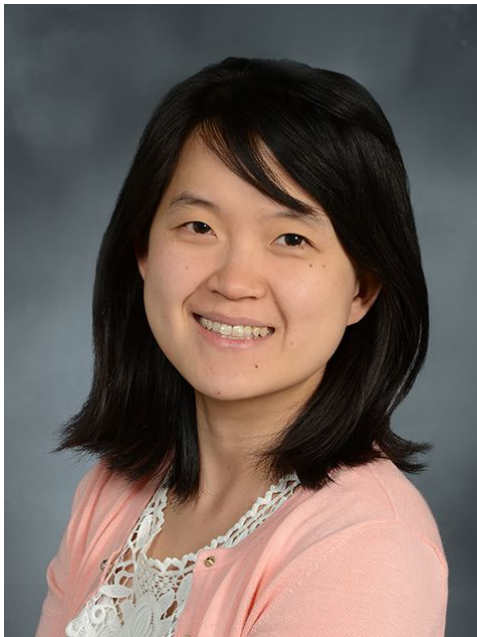
Dr. Ethel Cesarman, M.D., Ph.D.,
Professor of Pathology and Laboratory Medicine

Areas of focus: HIV & EBV-associated lymphoproliferative disorders

Involvement in national/international organizations: AIDS Malignancy Consortium

Highlighted recent publications:

- 1) Cesarman E., et al. KSHV/HHV8-mediated hematologic diseases. *Blood* 2022
- 2) Yusufova N., et al. Histone H1 loss drives lymphoma by disrupting 3D chromatin architecture. *Nature* 2021
- 3) Cesarman E., et al. Kaposi sarcoma. *Nat Rev Dis Primers* 2019



Dr. Anna Nam, M.D.
Assistant Professor of Pathology and Laboratory Medicine

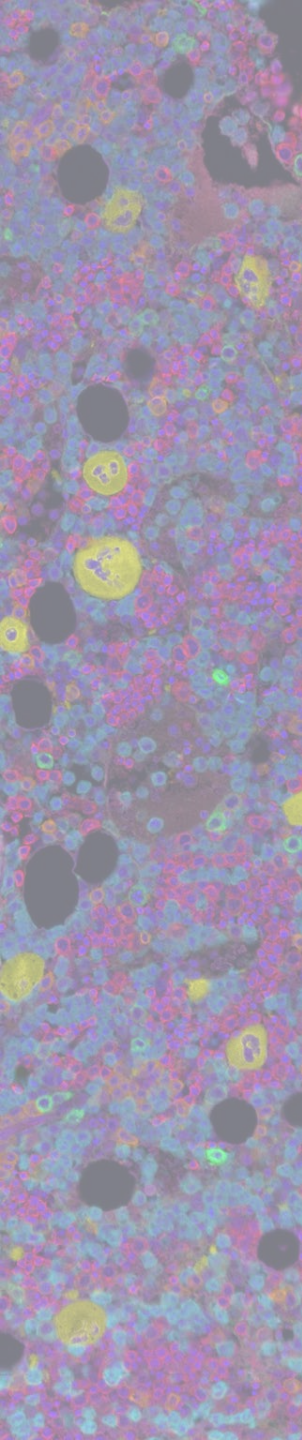
Areas of focus: Single cell multi-omics for dissection of hematologic malignancies

Involvement in national/international organizations: American Society of Hematology

Highlighted recent publications:

- 1) Nam AS, et al. Single-cell multi-omics of human clonal hematopoiesis reveals that DNMT3A R882 mutations perturb early progenitor states through selective hypomethylation. *Nat Genet* 2022
- 2) Nam, AS. et al. Somatic mutations and cell identity linked by Genotyping of Transcriptomes. *Nature* 2019

Alumni



Graduated Fellows (last several years):

Academia

- James Yip (Current position: North Shore-Long Island Jewish Hospital)
- Nadia Demko (Current position: McGill University, Montreal, QC)
- Paul Barone (Current position: PGY4, WCM → Hematopathology faculty, July 2024)
- Andrew Plata (Current position: Charleston Area Medical Center, West Virginia)
- Miguel Cantu (Current position: UT-Southwestern, Dallas, TX)
- Kran Suknuntha (Current position: Mahidol University, Bangkok, Thailand)
- Tayler van den Akker (Current position: Mount Sinai Hospital, NY)
- Yahya Al-Ghamdi (Current position: King Abdullah Medical Center, Saudi Arabia)
- Mustafa al-Kawaaz (Current position: University of Louisville, Kentucky)

Private Practice

- Minh Mays (Current position: private practice, Nebraska)
- Shane Berman (Current position: St. Barnabas Medical Center, NJ)
- Sergei Guma (Current position: Valley Pathologists, Inc., Dayton, OH)
- Daher Hajje (Current position: Pathology Consultants of South Broward, Miramar, FL)

Industry

- Shajo Kunnath (Current position: Johnson & Johnson Innovative Medicine)

