

**MASSACHUSETTS GENERAL HOSPITAL
HARVARD MEDICAL SCHOOL**

**RESIDENCY TRAINING PROGRAM IN
ANATOMIC AND CLINICAL PATHOLOGY**

INDEX

Philosophy and Educational Goals	1
Facilities and Personnel	2
Overview of Programs	3
Credentialing Year	4
Fellowship Opportunities	4
Sample of Typical Rotation Schedule	5
Description of Rotation - Anatomic Pathology	6
Description of Rotation - Clinical Pathology	18
Laboratory Research	28
Conferences	29
Conferences - Summary	
Extradepartmental Conferences	
National Course Offerings	
Opportunities for Teaching	32
Other Information	33
Evaluations	
Resident Selection Process	
Vacation	
Call Schedule	
Book and Travel Allowance	
Teaching Faculty - Current Responsibilities and Research Interests	34
Alumni List	43
Instructions to Applicants	46

Robert B. Colvin, M.D.

*Benjamin Castleman Professor of Pathology,
Harvard Medical School
Chief, Pathology Service
Massachusetts General Hospital
Pathology Service, Warren Building, Room 225
55 Fruit Street, Boston, Massachusetts 02114-2696
Telephone: (617)726-2966; FAX: (617) 726-7533
colvin@helix.mgh.harvard.edu*

Nancy Lee Harris, M.D.

*Professor of Pathology, Harvard Medical School
Director, Pathology Residency Training Program
Massachusetts General Hospital
Pathology Service, Warren Building, Room 211
55 Fruit Street, Boston, Massachusetts 02114-2696
Telephone: (617) 726-5515; FAX: (617)726-7474
nharris@partners.org*

Christopher P. Stowell, M.D., Ph.D.

*Associate Director, Pathology Residency Training Program
Chair, Pathology Residency Recruitment Committee
Director, Blood Transfusion Service
Massachusetts General Hospital
Blood Transfusion Service
Gray/Jackson Building, Room 212
55 Fruit Street, Boston, Massachusetts 02114-2696
Telephone: (617)726-2815; FAX: (617)726-6832
cstowell@partners.org*

Please address all correspondence and inquiries to:

Joan Carriere

*Coordinator, Pathology Residency Training Program
Massachusetts General Hospital
Pathology Service - Warren Building, Room 207A
55 Fruit Street, Boston, Massachusetts 02114-2696
Telephone: (617)726-5581; FAX: (617)726-7474
jcarriere@partners.org*

- Second Edition, 1999 -

TRAINING IN ANATOMIC AND CLINICAL PATHOLOGY AT THE MASSACHUSETTS GENERAL HOSPITAL

Robert B. Colvin, M. D., *Chief of Pathology*
Nancy Lee Harris, M. D., *Director, of Pathology Training Programs*

PHILOSOPHY AND EDUCATIONAL GOALS

The discipline of Pathology is devoted to the definitive diagnosis and the understanding of pathogenesis of human disease. In the Residency Program in Anatomic and Clinical Pathology at the Massachusetts General Hospital (MGH), we seek to train physicians who will become leaders in this field, whether in clinical practice, research, or a combination of these. We believe that a solid foundation of knowledge of human pathology and an understanding of disease mechanisms is essential for either career goal. Both practitioners and researchers must, in addition, be skilled at synthesizing information, communicating it to others, and teaching. Our program recognizes that each distinct career path in pathology has an optimal blend of training experiences, which should be customized as much as possible within the constraints of the American Board of Pathology requirements. We have recently introduced more options for the individual resident and reduced the number of required rotations and the volume of specimens to that considered optimal for the learning process.

The most important strengths of the MGH Pathology training programs are the high volume of challenging clinical material, the expertise and academic stature of the faculty, the daily involvement of the faculty in training the residents, the enthusiasm and high quality of our residents, the flexibility of our program for individual training pathways, and the strong international reputation of the MGH in both clinical and research activities.

The guiding principle of our program, as in most postgraduate medical education, is that young physicians learn best by having responsibility for patient care in a supervised, supportive setting. Responsibility motivates learning, which is focused on solving the challenging problems presented by each patient. Therefore, training in all MGH Pathology programs emphasizes active resident involvement in all diagnostic services, whether AP or CP, allowing the resident to take primary responsibility for evaluating clinical specimens and communicating results to clinicians, under the supervision of more senior pathologists. In addition to independent study through reading stimulated by the cases, learning occurs at daily signout sessions and at working and teaching conferences at which residents discuss their interpretation of pathologic findings and laboratory results with senior pathologists, present pathology and laboratory findings to clinicians, and review and present relevant literature. Formal lecture series are given by the faculty and fellows in both AP and CP. Critically important are the innumerable informal discussions with staff and fellow residents that refine and solidify the knowledge gained.

FACILITIES AND PERSONNEL

The Massachusetts General Hospital: The MGH founded in 1811, is Harvard Medical School's original teaching hospital. MGH has approximately 875 beds and 50,000 admission per year. Affiliated hospitals in the Partner's HealthCare System include the Brigham and Women's Hospital, North Shore Medical Center, and several community hospitals. In addition to the MGH, the MGH Pathology Department staff provides pathology services for the Massachusetts Eye and Ear Infirmary, Cambridge Hospital, Shriner's Hospital for Children, Spaulding Hospital, and Harvard and MIT Health Services.

The Pathology Service: The recently renovated (1993-8) Anatomic Pathology laboratories are located in approximately 30,000 ft² on six floors of the Warren Building and one floor of the adjacent Blake Building. The newly combined Clinical Laboratories are located mainly in the contiguous Jackson and Gray Buildings (approximately 30,000 ft²). The 8,000 ft² Immunopathology and Electron Microscopy Units are located on the fifth floor of the Cox Building. Research space includes over 40,000 sq. ft. divided among 4 main facilities at MGH and Charlestown.

Library Facilities: The Pathology Department's Mallory Library contains current pathology journals, Nature, Science, Cell and others. A library for the use of the clinical pathology residents is adjacent to the Clinical Pathology residents' office. Both are open 24 hours a day. The hospital's Treadwell Library is well equipped with a large and wide range of journal titles, as well as textbooks, bibliographic search capacities, and is open until late every evening. Harvard Medical School's Countway Library is 3 miles away and is one of the nation's largest medical reference libraries.

Information Management: Anatomic Pathology uses the CoPath computer system for specimen and data management. The Clinical Laboratories use the SunQuest system. All anatomic and clinical laboratory results are available on the Patient Care Information System (PCIS) of MGH. Seven desktop computers are available for the use of the residents. All are equipped to access CoPath and PCIS and most have Internet access. BRS Colleague and other Medline and information search tools are available via these computers.

Photography and Text Slide Preparation: The Photography Unit in the Pathology Department takes gross photographs, photomicrographs, and prepares projection slides for conferences and lectures, including digital slides. The photographers also teach residents these skills and are available for consultation. Residents are encouraged to photograph interesting specimens and are given copies for their own collections.

Personnel: The Pathology Service has 73 full-time M.D. and/or Ph.D. faculty. The APCP program has 30 residents. There are fellowships in Gynecologic Pathology, Cytopathology, Neuropathology, Dermatopathology, Immunopathology, Clinical Chemistry and Transfusion Medicine. At least five NIH supported laboratory research fellowship positions are available for two to three years each.

OVERVIEW OF PROGRAMS

Anatomic Pathology (AP)

The Anatomic Pathology program includes 24 consecutive months of structured training in surgical pathology, autopsy pathology, cytopathology, and cytogenetics/molecular pathology. Rotations on all AP services are weekly; the first 10 weeks introduce the resident to each of the major rotations in one week blocks, and the remaining rotations are generally 2-week blocks. Surgical Pathology at MGH is organized according to organ systems, and residents rotate through the specialty services (Bone and Soft Tissue, Breast, Dermatopathology, ENT, Gastrointestinal, Genitourinary, Gynecologic and Obstetric Pathology, Hematopathology, Immunopathology, Nephropathology, Neuropathology, Pulmonary and Cardiac Pathology), as well as in the Frozen Section Laboratory. The Autopsy Service is covered in 1- 3 week blocks in the first two years, including one 2-week Medical Examiner rotation. Residents spend 2 months in Cytopathology (4 weeks in each of the first 2 years). The rotations in the last 6 of the 24 months are chosen by the resident based on interests and career goals (subspecialization, community practice, or research). The third (flexible) year is structured according to career goals, which for AP subspecialization or community practice, typically includes supervisory and teaching responsibility for junior residents as well as subspecialty electives (see Third Year AP Resident, below). For those planning a research career, 2-3 years of laboratory research training is available via an NIH training grant. Qualified residents interested in Neuropathology or Dermatopathology may apply to enter either the Anatomic Pathology-Neuropathology or Anatomic Pathology-Dermatopathology training programs after two years of Anatomic Pathology training. The Chief AP Resident responsibilities are shared by two residents in their Credentialing year.

Clinical Pathology (CP)

The Clinical Pathology program includes 12 consecutive months of structured training with rotations in Clinical Chemistry, Microbiology, Hematology/Coagulation, Immunology, Transfusion Medicine, and Laboratory Management, followed by 6 months of advanced structured training in one or more of these laboratories. The remaining 6 months of the second year include the structured training in CP through elective rotations with an opportunity to participate in laboratory development projects. Chief CP Resident responsibilities are shared by two second-year Clinical Pathology residents or upper level AP/CP resident. The third (flexible) year may be either: 1) a third year of advanced clinical study or 2) one or more years of research training as in AP.

Anatomic and Clinical Pathology (APCP)

The combined APCP training consists of an 18-month core of structured AP and an 18 month core of CP, followed by 12 months of advanced training in AP or CP via elective rotations or in a research laboratory (as in the AP or CP only programs). The 18-month core AP training typically begins as a 12 month block, followed by 12 months of CP training. The most common pattern is AP1-> CP1-> AP2-> CP2; however, for various reasons, an individual schedule may differ, and many combinations are possible based on the desires of the resident and the needs of the program. Residents in the APCP program who have completed 24 months of AP may be eligible to take Senior Resident supervisory responsibility on the AP service.

Additional Clinical Training (Credentialing Year)

The American Board of Pathology requires an additional year of clinically related training for the qualifying examination (qualifying year or credentialing year). This year can be a clinical internship or a year of clinically-related research done prior to, during, or following the residency program. This requirement may also be fulfilled by a year of advanced training in either Anatomic or Clinical Pathology. All residents needing a credentialing year are guaranteed sufficient training to fulfill this requirement. Most residents in the AP or CP programs fulfill this requirement via the clinically-related research route (research in a laboratory that is directed at an aspect of human disease). Residents in the APCP or AP program who have not done a clinical internship or other clinical training are offered a 1-year fellowship in Anatomic Pathology (the "5th year"). This may include 6 months as Chief Resident in AP (see Chief Resident in AP, below), and includes additional responsibility for gross and microscopic examination of subspecialty surgical pathology and cytopathology specimens and supervised signout of surgical and autopsy pathology. (This fellowship training cannot be used towards certification in another specialty, such as Cytopathology, Neuropathology, Hematopathology, or Dermatopathology.)

Fellowship Opportunities

Up to three credentialing year residents are appointed as Surgical Pathology fellows, two of whom serve as Chief Residents in Anatomic Pathology. The fellows sign out surgicals and autopsies, supervise and teach residents, and work on projects. In addition, fellowships are available in Gynecologic Pathology (2 yrs.), Cytopathology (2 fellows/1 yr.), Neuropathology (2 fellows/2 yrs.), Dermatopathology (3 fellows/1 year), Immunopathology (1 fellow/1 yr.), Clinical Chemistry and Transfusion Medicine (1 fellow/1 yr.). At least five NIH supported laboratory research fellowship positions are available for two to three years each. MGH residents who wish to apply for one of these fellowships do so through the Program Director for each fellowship. Selections are done by Committees and are announced in the Spring of the year prior to the fellowship start date.

TYPICAL APCP-4 RESIDENT'S EDUCATIONAL PROGRAM

12 MONTHS

First Year in Program	10-week core AP#		Surgical Pathology*		Autopsy	Surgical Pathology*		Autopsy	Cytopath	CG MG Heme
Second Year in Program	Hemato-pathology		Hematology		Chemistry Management		Coagulation	Microbiology		Blood Bank
Third Year in Program	Neuro-path	Heme ME	Renal Impath EM	Surg. Path.	Autopsy	Cyto-path.	Surg. path.	AP "Selectives" **		Elective
Fourth Year in Program	CP "Selectives" ** and Electives					AP "Selectives"		Elective	Senior AP Resident	

- # 1-week each Autopsy, Frozen Section and major surgical subspecialties
- * 2-week rotations in subspecialties
- ** Additional experience in selected specialties

TYPICAL AP-3 RESIDENT'S EDUCATIONAL PROGRAM

12 MONTHS

First Year in Program	10-Week Core AP		CG MG		Surgical		Cyto-path.	Neuro-path.	Derm-path.	ME Heme	Renal Impath. EM
Second Year in Program	Autopsy	Surgical		Autopsy	Surgical		Cyto-path.	Elective		AP "Selectives"	
Third Year in Program	Senior Resident			Elective			AP "Selectives"				

TYPICAL CP-3 RESIDENT'S EDUCATIONAL PROGRAM

12 MONTHS

First Year in Program	Hematology		Hematopathology		Chemistry Management		Microbiology		Blood Bank		Coagulation
Second Year in Program	CP Chief Resident						CP "Selectives"			Elective	
Third Year in Program	- Research -										

ANATOMIC PATHOLOGY

In Anatomic Pathology, a central skill in diagnosis is the "training of the eye," which is best done by seeing a large number of well-characterized cases as unknowns, followed by one-on-one teaching by experts who provide the definitive answers to diagnosis and pathogenesis (or at least the current level of understanding). This is best accomplished by having the opportunity to see a large volume of specimens over as long as possible a period of time, and to be given responsibility for gross and microscopic analysis that is appropriate to the level of training. The best way to learn anatomic pathology is for the trainee to observe the specimen (gross and/or microscopic), formulate an opinion as to the disease process and further evaluation, commit to this opinion either verbally or in writing, and then to have the opportunity to review the case with a more experienced pathologist. At MGH, this is accomplished by placing the residents on the front lines of specimen handling: most surgical pathology specimens and all autopsies are first seen by a resident, who becomes ultimately responsible for their management, with the supervision of a senior staff pathologist or fellow. Exposure to additional specimens is provided by teaching conferences at which gross and microscopic features of virtually all the interesting, unusual, or difficult autopsy and surgical pathology cases as well as many cytopathology specimens are presented.

The AP laboratories of MGH are responsible for over 59,000 surgical specimens, 51,000 cytology preparations, and 400 autopsies per year. In addition, a joint cytogenetics laboratory with the Brigham and Women's Hospital performs over 4000 cytogenetic analyses/year and approximately 1000 molecular genetic tests/year. The core AP rotations include approximately 14 weeks of rotations in Autopsy, 40 weeks in Surgical Pathology, 8 weeks of Cytopathology, 3 weeks of Cytogenetics/Molecular Pathology, 2 weeks of Forensic Pathology, 3 weeks of Neuropathology, and 3 weeks of renal pathology, immunopathology and electron microscopy. Six additional months of Anatomic Pathology are devoted to "selective" rotations in which the resident desires or needs more experience. Two formally trained Pathologist's Assistants and 4 Surgical Pathology technicians process most small and many large specimens, once the resident has demonstrated competence. To optimize the workload of the residents, not all rotations have a resident at all times: up to 20% of rotations may be without a resident, with specimens being handled by a PA or technician and a staff pathologist. Over the course of 2 years in AP, each resident is eventually responsible for approximately 6,000 surgical specimens, 75 autopsies, and 2500 cytopathology specimens. Many additional cases will be seen at conferences and in consultation.

Supervision and Evaluation

Residents on the AP services are directly supervised by a staff pathologist (or occasionally a fellow) who bears ultimate responsibility for the correct handling and diagnosis of all specimens on the rotation. The staff pathologist reviews the gross specimens as necessary, and reviews all microscopic slides on all cases.

Residents on AP are evaluated each fall and spring. A form is distributed to all AP faculty, and is filled out by faculty who have worked with the resident in the past 6 months. The Program Director meets with the residents twice a year to review the evaluations and provide career counseling. Any serious or urgent problem with a resident's performance is addressed immediately, without waiting for the evaluation process.

Surgical Pathology

Goals and Objectives

1. To enable residents to become competent diagnostic pathologists
2. To learn the administrative and management procedures needed to ensure prompt and clinically useful reporting of diagnoses
3. To learn the basic principles of performing clinical research on surgical pathology materials

Supervisor: Robert H. Young, M.D.

Duration: 17-18 months (14-months core rotations, plus 3-4 months customized rotations, “selectives”)

Rotation Description:

The Surgical Pathology rotation is divided into organ subspecialties (Breast, Bone and Soft Tissue, Cardiac/Pulmonary, Dermatopathology, Ear, Nose, and Throat (ENT), Electron Microscopy /Renal/Immunopathology, Gastrointestinal (GI), Genitourinary (GU), Gynecological and Obstetric/Perinatal (GYN), Hematopathology, Neuropathology, and Frozen Sections). The first year begins with a 10-12 week introductory period of 1-week rotations on each of the major subspecialties. After this, residents rotate in 2- week blocks on each subspecialty. Pediatric specimens (4000/year) are included in the subspecialties, particularly Dermatopathology, GI, GYN, Hematopathology, and Bone/Soft Tissue. Core training includes 3-5 weeks’ experience in each area over 12 months; an additional 3-4 months are used for added experience (“selectives”) in any of these areas. The resident is responsible for the dissection, block selection, dictation, and microscopic diagnosis of all of the cases on a service, as well as any outside slides assigned to the service. The same resident does both the gross and microscopic examination of all cases. After the resident has demonstrated competence, technicians and pathologists assistants process most small and some large specimens. Residents receive the slides from their cases, review them and formulate a written diagnosis. All cases are signed out with either a staff pathologist or a fellow who has a staff-level appointment. Ten interesting or instructive cases are shown daily at the Surgical Pathology Conference. Lectures on selected topics are given by the Surgical Pathology faculty. Residents are encouraged to undertake clinicopathologic research projects.

1. Immunohistochemistry and Immunofluorescence: On each rotation, the residents learn the indications for, utility, and interpretation of special diagnostic techniques. They order and interpret all special stains and immunohistochemistry and review electron microscope prints on their cases. Immunofluorescence and EM are learned during the EM/Renal/Immunopathology rotation; in addition, this material is presented to residents at monthly Renal and EM Surgical Pathology conferences.

2. Consultation With Other Physicians: On Surgical Pathology rotations and in the Frozen Section laboratory, the resident has frequent contact with other physicians, and learns how to function as a member of a clinical team. The resident is the contact person on all cases, discusses any questions with clinicians, reviews slides with clinicians on urgent or interesting cases, and calls to report frozen section diagnosis or unexpected or important findings to physicians, under the supervision of a staff pathologist. On each specialty rotation, the resident attends the relevant clinical conferences and presents cases. Residents present selected cases to trainees on other services at regularly scheduled conferences. On-call residents answer calls concerning how to submit specimens for diagnosis.

3. Laboratory Management: Residents learn accessioning and reporting procedures; they are trained in the use of the Pathology computer system and the hospital information system. They learn the operation of the tissue processors and the organization of the Histology laboratory during

the introductory rotations in Anatomic Pathology. They have the opportunity to learn management of the Immunopathology and Electron Microscopy laboratories during the Renal/Immunopathology/EM rotation. Residents are responsible for solving problems in specimen transport, identification and labeling. Senior Residents assist in the running of the Surgical Pathology Gross Room, resolving questions about accessioning and allocation of specimens, and attend the monthly meetings of the AP Supervisors' committee. Residents are instructed in coding and computerized retrieval of surgical pathology diagnoses, as well as CPT and ICD-9 coding.

4. Graduated Responsibility: First-year AP residents learn the technical aspects of specimen handling and processing, learn to recognize all normal tissues and most common disease processes, and special handling of certain specimen types, such as breast and lymph node biopsies. By the end of the first year, they are expected to be able to perform complete gross and microscopic examinations of most common types of surgical pathology specimens and write a complete report according to Departmental guidelines. Second-year AP residents assume more responsibility for the diagnoses and for conveying information to clinicians. By the end of the second year of training it is expected that most of the residents' written diagnoses will not need to be changed, and that a correct interpretation will be rendered on all but the most challenging cases. Third year AP residents assume more responsibility for diagnosing cases and presenting them at clinical conferences. They may complete reports on their cases and turn them over to the supervising staff for review and cosignature, rather than signing out at a 2-headed microscope. They diagnose evening and weekend frozen sections, with backup from Chief Resident and staff pathologists. They teach first year residents on their initial rotations on each of the services.

5. Role of Fellows: There are fellows in Neuropathology, Dermatopathology, and Surgical Pathology. Residents have primary responsibility for all specimens. On Neuropathology and Dermatopathology, residents review slides on their cases independently, and both the fellow and the resident sign out with the staff neuropathologist or dermatopathologist. Surgical Pathology fellows supervise residents and sign out as junior staff pathologists.

Frozen Section Laboratory (Operating Room Consultations)

Goals and Objectives:

1. To become competent in frozen section diagnosis
2. To become competent in preparing frozen sections
3. To understand the limitations and indications for intraoperative consultations and learn to communicate effectively with surgeons and other clinicians to guide intraoperative patient management
4. To become familiar with the need for special tissue studies on various specimen types and to become proficient in selecting and preparing tissue for special studies

Supervisor: Robert H. Young, M.D.

Duration: 5 weeks (over 24 months)

Rotation Description

A resident covers the Frozen Section Laboratory from 8 a.m. to 6 p.m. each day on a weekly basis, together with a senior staff pathologist. The laboratory processes 25 to 30 specimens per day. The resident is responsible for accepting the specimen from the OR staff and making sure the indications for the frozen section are clear; the resident is responsible for the gross description, recording, and preparation of any special studies, and for selection of samples for frozen sections or other special studies in consultation with the staff pathologist. After the resident has demonstrated competence, technicians cut most of the frozen sections. The resident examines the slides with the staff member, formulates a diagnosis, and as he/she becomes more senior,

communicates that diagnosis to the surgeon. Many specimens come to this laboratory for gross examination and for evaluation for research procedures, which is also a responsibility of the resident in conjunction with the tissue bank technician.

Graduated Responsibility

First-year residents are responsible for developing and demonstrating proficiency in gross preparation of tissue for frozen section and for cutting and staining frozen sections of a sufficient quality for diagnosis, with acceptable speed. They acquire familiarity with the various special procedures for specific specimen types, such as breast biopsies and lymph node biopsies for lymphoma. They are also expected to be able to deal with the more common diagnostic questions that arise, such as metastatic cancers and evaluation of resection margins. Second year residents are expected to be skilled at preparing frozen sections, and should be able to handle most straightforward diagnostic situations, and to recognize when a case is unusual or needs consultation. Third-year residents in AP are expected to be able to handle all types of intraoperative consultation accurately; they supervise the junior residents on night and weekend call and are responsible for the diagnosis on all operating room consultations from 5 p.m. to 8 a.m. on weekdays and from 5 p.m. Friday through 8 a.m. Monday, with backup available from Chief Residents and senior staff as needed.

Autopsy Pathology

Goals and Objectives:

1. To acquire skills necessary for dissection of the human body
2. To learn to review the medical record and present a clear and concise clinical history
3. To recognize the gross and microscopic features of diseases, make clinicopathological correlations, and communicate the information to their clinical colleagues
4. To learn the proper reporting and handling of cases under the jurisdiction of the Medical Examiner
5. To learn the application of clinical pathology to the autopsy, particularly bacteriology and toxicology

Supervisor: Eugene J. Mark, M.D., Director of Autopsy Service, Deputy Medical Examiner;
Drucilla Roberts, M.D., Associate Director of Autopsy Service; Eva Patalas, M.D.,
Medical Examiner

Duration: 14 weeks (over 24 months)

Rotation Description:

On their first day in the Department, the residents are given two manuals on autopsy dissection and a book on death certification, which they read prior to beginning their rotation. They also watch 6 video tapes on the performance of the autopsy. After an intense introductory week during the first two months of training, residents spend 7 weeks on the Autopsy Service in their first year and 7 weeks in their second year, typically in 2-week blocks. During the introductory week, a full-time teaching resident is assigned to instruct in autopsy techniques; a staff pathologist is on duty each week, to advise on the dissection, review gross and microscopic pathology, and correlate with clinical issues. Two residents cover the Autopsy Service, taking cases in rotation. Typically, they assist each other with the dissection, particularly on weekends, thus increasing their exposure to case material. Residents are responsible for evaluation of the adequacy of the autopsy permission, reporting to the Medical Examiner as indicated, reviewing and abstracting the clinical record, consulting with clinicians to determine the clinical questions, performing and recording the gross dissection, reviewing the organs with the attending pathologist, presenting the case at Autopsy Conference, writing the Preliminary Anatomic Diagnosis with the attending, selecting blocks for microscopy, examining the slides, formulating a final diagnosis and preparing

a written report including clinicopathologic correlation, signing the case out with the staff pathologist, senior resident or fellow assigned to the service at the time of the autopsy, and communicating results to clinicians.

The resident and attending staff organize the twice-weekly Autopsy Conference, at which the clinical histories and organs on all cases are presented and selected microscopic slides are reviewed, inviting relevant pathology subspecialists and clinicians, selecting organs to demonstrate, and preparing 1-2 microscopic slides for correlation. The resident presents the clinical history and demonstrates the gross findings. Neuropathology findings are presented by Neuropathology fellows and staff. All AP residents attend the conference. During 2 years of AP training, they thus have the opportunity to see the gross organs and hear the clinical correlations pertaining to approximately 800 autopsies.

Graded Responsibility: First-year residents learn basic techniques of autopsy dissection and become familiar with normal anatomy and the gross and microscopic diagnosis of most common conditions encountered at autopsy, such as myocardial infarction, pneumonia, and malignant tumors. Second- and third-year residents are assigned responsibility for teaching and supervision of incoming residents and medical students, and third-year residents who have completed 24 months of Anatomic Pathology may function as senior attending on the Autopsy Service.

Consultation with Clinical Services: Residents discuss each case with an attending physician prior to beginning the autopsy, invite the clinician to attend the autopsy or its presentation at the twice-weekly conference, and answer questions from clinicians. Residents present completed autopsies, including gross photographs and photomicrographs, at selected clinical conferences as requested by the clinical services. The Chief Resident presents cases at the weekly Medical Morbidity and Mortality Conference, where autopsies comprise the major component of the conference. Senior Residents may present autopsy findings and clinical correlations as part of the weekly Clinicopathologic Conferences, which are published in the New England Journal of Medicine.

Role of Fellows: Fellows in AP may take rotations as senior pathologist on the Autopsy service, supervising residents in the gross and microscopic and signing out the cases.

Multi-prosector Autopsies: Multi-prosector autopsies are not formally used, except that Neuropathology fellows frequently remove and examine the brains on combined autopsies. Autopsies may be shared in two ways: 1. teaching residents assisting first-year residents, and 2. senior residents signing out cases with junior residents. The teaching resident typically has 2 weeks of duty, reviewing the chart, helping in the dissection, and reviewing the slides with the junior resident on about 16 cases. The Senior Resident serves as the signout staff for 2 weeks, reviewing both gross and microscopic and signing the final report on another 16 cases. This, when added to the 50 cases that each resident performs as primary prosector, gives a total of 82 autopsies in which a resident has been actively and directly involved in both dissection and microscopic examination. In addition, prosectors often work together when more than one case is being performed at a time, assist each other in the dissection, observe the organs, and discuss clinical correlations. These cases do not count in the formal number of autopsies for the residents.

Forensic Pathology:

Goals and Objectives:

1. To become familiar with the range of forensic autopsies and the types of problems encountered, including the rules of evidence, and to appreciate the differences between Forensic Pathology and hospital-based Autopsy Pathology

2. To learn to prepare death certificates that accurately reflect death by accident, suicide and homicide
3. To learn the basics of the pathology of trauma, including motor vehicle accidents, burns, fractures and ballistics
4. To become familiar with the specialized techniques used in forensic pathology and to be exposed to aspects of forensic science, such as photography and ballistics
5. To appreciate how the findings at autopsy merge with police work and legal procedure, by observing crime scenes and court testimony
6. To learn the appropriate level of suspicion of the unexpected in seemingly self-evident death

Supervisor: Eugene Mark, M.D, Autopsy Director

Teaching Staff: Dr. Stanton Kessler (Medical Examiner's Office), Dr. Eva Patalas, and Dr. Leonard Atkins.

Duration: 1) Selected cases during autopsy rotations at MGH; 2) 2 weeks at the Office of the Chief Medical Examiner, Boston; 3) Residents may elect to take this rotation at another Medical Examiner's Office with approval of the Program Director.

Rotation Description

Massachusetts General Hospital:

The Office of the Chief Medical Examiner selects autopsies to be done by MGH residents at MGH under the supervision of two deputy ME's who are MGH staff members (Dr. Eugene Mark and Dr. Eva Patalas). The resident is listed as one of the pathologists present at the autopsy and performs the dissection at the discretion of the Deputy Medical Examiner. These cases are typically not criminal cases in which court appearances are anticipated; they include accidental deaths and, often, deaths of patients in the Burn Unit at the Shriners Hospital. Approximately 50 such cases/year are done. Thus, each resident should perform 3-4 complete forensic cases/year. In addition, all forensic cases are presented at the Autopsy conference, and whenever interesting in-situ findings are present, all AP residents are notified and encouraged to come to the autopsy room for demonstration.

Lecture Series: Residents attend a monthly didactic series of lectures on forensic pathology, given for the most part by board certified forensic pathologists and other members of the Office of the Chief Medical Examiner of the Commonwealth of Massachusetts. These include: Introduction to Forensic Pathology, Forensic Neuropathology, Blunt Force Trauma, Sudden Cardiac Death, Stab Wounds and Air Embolism, Spectroscopy in Forensics, Gunshot Wounds (Handguns), DNA in Forensics, Traumatic Asphyxia, SIDS, Special Asphyxia, Therapeutic Misadventures, Death in Fire and CO, Forensic Anthropology, Child Abuse, Drugs of Abuse, Poisoning (general) and Alcohol, Forensic Dentistry, and Testifying in Court.

Consultative Reports/Activities: Residents are responsible for preparing the Autopsy Report on their cases under the supervision of the Deputy Medical Examiner.

Role of Residents and Fellows: There are currently no Forensic Pathology fellows at MGH.

Office of the Chief Medical Examiner:

Residents spend 2 weeks during their second AP year at the OCME in downtown Boston. Under the direction of Dr. Richard Evans, Chief Medical Examiner, this office performs 5-10 autopsies a day. Residents assigned to this rotation have had previous hospital autopsy experience during their first year. They assist with approximately 50 cases during the 2-week rotation. Residents attend the daily morning conference, review documents and issues on all planned cases

for the day, attend and participate in the dissections, discuss the findings with the M.E., and help to prepare the death certificate. Residents assist in all types of forensic cases, including accidents, suicides, homicides, and natural deaths. All cases are supervised and reviewed by experienced forensic pathologists. Forensic topics (i.e., cause and manner of death, traumatic wounds, toxicology, forensic histopathology, neuropathology, trace evidence and evaluation of vitreous) are discussed as they pertain to cases. Results of forensic laboratory studies are reviewed with the resident. Two or 3 cases/day are assigned to the resident to prepare a brief report. The residents keep a list of the ages, diagnoses, and other information on each of their cases in order to receive credit for the autopsies. Up to 25 autopsies may be credited to the resident's total autopsy number. (These are not counted in the 50 cases for which the resident is prosector at MGH.) As opportunities arise, they observe the identification unit (forensic anthropologist and odontologist), the crime scene unit, attend a court preparation meeting, observe court testimony, and observe a crime scene. Residents may be assigned topics to review and research. References on medical forensics are available. The resident may be involved in preparation of an unusual case for journal publication.

Graduated Responsibility: At MGH, the resident is expected to take increasing responsibility for the ME cases with increasing experience. Due to the short duration of the rotation at OCME, it is not feasible for them to take significant responsibility. They are encouraged to return for more advanced training if interested.

Scene Investigations and Court Appearances: Residents are invited to participate in these when they occur during their rotation. They are also invited to accompany Dr. Patalas or Dr. Kessler to court appearances while at MGH.

Elective Rotations in Forensic Pathology:

1. An elective rotation is available at the OCME, allowing increased autopsy participation and opportunities to become familiar with the broader range of responsibilities and technological tools of the forensic pathologist (e.g., crime scene investigation, SEM/EDAX, court testimony, forensic laboratories).

2. Residents may elect to spend 2-4 weeks of autopsies at other Medical Examiners' offices across the country; this experience may substitute for the 2-week OCME rotation, with the approval of the Program Director.

Evaluation: The Medical Examiner is asked to fill out an evaluation sheet for all residents completing the rotation. Evaluations are also sent to any other M.E. office at which a resident does a rotation.

Cytopathology

Goals and Objectives

1. To recognize the range of cytologic patterns manifested in tissues routinely sampled for cytologic diagnosis
2. To distinguish benign proliferative changes from malignancy in cytologic specimens
3. To recognize the cytologic features of inflammation, infection, hormonal changes, and antineoplastic therapy
4. To appreciate the significance of various cytologic collection techniques and make appropriate clinical recommendations
5. To distinguish between satisfactory and unsatisfactory cytologic specimens
6. To correlate all of the above and make accurate cytologic diagnoses
7. To perform and interpret fine needle aspiration biopsies

Supervisor: Debra A. Bell, M.D.

Duration: 8 weeks in 24 months

Rotation Description and Graduated Responsibility:

Residents have 8 weeks of assigned cytopathology training, and may spend additional elective time. The initial four-week rotation in the first year focuses on basic techniques and diagnosis. The residents meet with a senior cytotechnologist once or twice a day for didactic microscopic sessions, use the study sets to supplement material shown to them during the day, and attend the afternoon Cytology Consensus conference. They also attend the weekly Cytopathology conference at which a variety of topics are covered in detail by a technologist or staff member. The first week of the rotation covers negative, atypical and dysplastic gynecologic material through carcinoma-in-situ; the second week, invasive carcinoma and treatment effect; the third week, respiratory and fluid specimens including cerebrospinal fluids; the fourth week, gastrointestinal tract, breast, urinary tract and miscellaneous cytologic material. Their service work assignments consist of screening unknown current cases and reviewing these with the cytotechnologists and double scoping selected cases with the attending cytopathologist.

In the second 4-week block, in the second year of AP, residents assume greater responsibility for their cases. They actively participate in rapid interpretations performed by the radiologists and fine needle aspiration biopsies performed by the Cytopathology staff. The residents look at current cases that have been prescreened by cytotechnologists, formulate a diagnosis, diagnose associated cell blocks, obtain any necessary follow-up or clinical information on the case and sign these cases out with an attending cytopathologist.

Fine Needle Aspiration Biopsies: During the second-year rotation, residents are trained in the performance and interpretation of FNA's by observing and then performing the procedure. During the observation process, the residents learn to inform the patient about the procedure and its risks, localize lesions, set up the equipment, perform the procedure, make smears, stain the slides for rapid interpretation and interpret them. After sufficient training, usually 1 week, the residents do the procedure themselves and render a preliminary diagnosis under close staff supervision. By the end of the month, residents have typically participated in approximately 35 aspirations (including those observed and performed). The residents also provide preliminary rapid interpretations for aspirations performed by radiologists, under staff supervision.

Additional elective time spent in cytology after the initial two months of training continues with a similar level of responsibility. The elective period is tailored according to the interests, strengths and weaknesses of the individual resident.

Consultative Reports/Activities: Cytopathology consultations consist of 1. Discussion of interpretive reports with physicians, and 2. Advising physicians on the submission of specimens, the implications of diagnoses and on subsequent steps that can be taken to obtain a definitive diagnosis. The residents participate in discussing with physicians difficult cases that they have worked up, reporting and explaining fine needle aspirations, both those performed with the attending cytopathologist and those done by the radiologists. They also advise physicians on the preparation and submission of cytopathology specimens when they are on call in AP.

Correlation of Surgical and Cytologic Specimens: 1. When residents rotate on the gynecologic pathology biopsy service, they compare all of the prior week's biopsies with the corresponding Pap smear results (required CLIA cytology-biopsy correlation); 2) Residents routinely examine the cell block and needle core tissue associated with cytologic specimens; 3) They examine study sets, which contain unusual and abnormal cytologic specimens of all types with confirming tissue biopsies or resections; 4) At surgical and cytology conferences, cases are presented with

corresponding histology confirmation; and (5) Residents review cytologic specimens associated with their interesting cases when they rotate through the various surgical subspecialty rotations.

Role of Fellows: The residents and fellows in the Division of Cytopathology have substantially different roles. After an initial training period of several months, fellows act independently, signing out their own cases, performing fine needle aspirations, and attending rapid interpretations of deep-seated lesions. The fellow assumes an attending level responsibility for the teaching of residents. Fellows review the CLIA-mandated correlation of Pap smears and biopsies with the residents, bringing non-correlating and difficult cases for review with the attending cytopathologist at a multi-headed microscope.

Cytogenetics

Goals and Objectives:

1. To understand the preparation and analysis of cytogenetic specimens from blood, bone marrow, amniotic fluid and tissues
2. To become familiar with the role of cytogenetics in the diagnosis of congenital abnormalities
3. To become familiar with the role of cytogenetics in the diagnosis and classification of malignancies

Director: Cynthia C. Morton, Ph.D.

Supervisor: Frederick R. Bieber, Ph.D.

Duration: 2-weeks with Molecular Genetics

Rotation Description:

Residents learn preparation and interpretation of cytogenetic specimens by rotating for two weeks at the consolidated Cytogenetics service of the Brigham and Women's Hospital, Massachusetts General Hospital, Children's Hospital Medical Center, and Dana Farber Cancer Institute. The laboratory is run by the Pathology Department and is located in juxtaposition to Anatomic Pathology and Laboratory Medicine, occupying 3000 sq. ft. of space. Residents are exposed to the full spectrum of specimens including amniotic fluids, chorionic villous biopsies, peripheral bloods, umbilical cord bloods, solid tissue, bone marrow, and solid tumors. Residents observe banding techniques including GTG, QFQ, NOR, as well as fluorescence in situ hybridization (FISH) in both interphase and metaphase cytogenetic analysis for aneuploidy detection and for gene deletion studies. Residents attend a weekly 1.5 hour working case conference, during which all abnormal cases are discussed. This case conference reviews patient history, pathology findings, ancillary test results (including ultrasound, etc.), cytogenetic test results, impact on diagnosis, and genetic counseling implications. Karyotypes are distributed and discussed, along with discussion of the rationale for choosing specific staining techniques, use of FISH probes, and unanswered questions. Residents also attend individualized signout sessions with the Senior Staff, at which interpretive reports are issued. These sessions include discussion of laboratory techniques, microscopy and imaging technology, review of selected patient folders, and review of karyotypes on instructive cases. These teaching sessions also include discussion of how to correlate results with pathology gross and microscopic findings, other laboratory testing and cost-effectiveness. Ethical and legal issues including genetic privacy are also addressed. Through the conferences and teaching sessions, the residents learn basic aspects of cytogenetics and the interpretation and clinical correlation of the results. Independent reading and review of a binder of reading materials and instructive abnormal karyotypes with their reports and accompanying pathology reports provides another mechanism for the residents to understand the

importance of clinical cytogenetics in modern pathology. Residents can attend genetic counseling sessions during which patients are counseled regarding abnormal pathology and cytogenetic findings.

Integration of Cytogenetic Studies and Test Results with Anatomic and Clinical Pathology

Data: This is done on an ongoing basis throughout the residency education. The residents select tissues from tumors and from autopsy cases to be sent for cytogenetic testing, and the cytogenetic test results become part of their formal reports or as addenda. The residents perform autopsies on many malformed fetuses with known or suspected chromosome anomalies. These matters are discussed as part of the review and signout of each case. On the Hematopathology rotation, both AP and CP residents review the results of cytogenetics testing of bone marrows for leukemia and myelodysplasia. These results form part of the final Pathology report. Karyotypes are provided to the residents on all cases analyzed. These results are discussed with the staff hematopathologist and are saved in a teaching file together with the Pathology report. In Clinical Pathology, serum screening (for amniotic fluid AFP, uE3, and hCG) identifies pregnancies at-risk for aneuploidy, and the laboratory provides follow-up on these cases.

Consultative Activities: Residents are invited to attend genetic counseling sessions during the rotation.

Graduated Responsibility: Interested residents may elect additional rotations in Cytogenetics, during which they may take a more active role in analyzing and interpreting results.

Fellows: There is a fellowship in Cytogenetics. Fellows assist in the teaching of residents rotating in the laboratory.

Molecular Pathology

Goals and Objectives:

1. To learn the fundamentals of molecular biology as they relate to the study of human variation and disease diagnosis
2. To appreciate the heterogeneity, variability and natural history of human genetic disease and neoplastic disorders amenable to scrutiny using techniques of molecular biology
3. To understand the range of molecular laboratory methods used in clinical diagnosis
4. To understand the issues of quality assurance, risk management and cost effectiveness as they relate to molecular testing

Institution: Brigham and Women's Hospital

Director: Jeffrey Sklar, M.D.

Supervisor: Janina Longtine, M.D.

Duration: 3 weeks (with Cytogenetics)

Rotation Description:

Residents spend 3 weeks at the Molecular Diagnostics Laboratory at the Brigham and Women's Hospital, concurrent with the Cytogenetics rotation. The Molecular Diagnostic Laboratory (Dr. Jeffrey Sklar, Director) performs about 1000 tests annually, and pioneers new techniques in this area. This two-week rotation is integrated with the Cytogenetics rotation and exposes the resident to the theoretical and practical fundamentals of applied molecular biology. The laboratory tests assist in the diagnosis of neoplasia by assessing T and B-cell clonality through antigen receptor gene rearrangements (300/year) or by identifying specific chromosomal translocations at the molecular level: bcr-abl, PML-RARa (200/year). In addition, the laboratory performs tests for Factor V-Leiden mutations associated with risk of thrombophilia (500/year). The techniques employed include Southern blot hybridization and the polymerase chain reaction.

Specimens processed in the laboratory include blood, bone marrow and tissue biopsies. As a result of the varied experience many residents have from prior research utilizing molecular biology techniques and concepts, there is considerable latitude in formulating a meaningful rotation. Residents who need exposure observe and/or perform a Southern blot hybridization and polymerase chain reaction assay. Skill in interpreting the laboratory results is acquired through tutorial sessions with the professional staff, which address the specific technical issues and interpretive pitfalls inherent in each of the assays. In addition the residents participate in the weekly laboratory sign-out with the attending staff. The residents are encouraged to independently review the results prior to the signout sessions. At these sessions, the assays are reviewed and interpreted, the correlation of these tests with other clinical and pathologic data is stressed, the wording of the resultant interpretive reports is discussed with the resident, and the report is written by the senior pathologist. Issues of quality assurance and cost-effectiveness are also discussed. The residents are provided with a packet of pertinent literature for independent reading.

Consultative Activities: In this introductory rotation, residents do not serve as consultants.

Graduated Responsibility is not possible in this introductory rotation. Interested residents may spend additional time in the laboratory as an elective, to acquire advanced skills and take on more responsibility.

Fellows: There are no clinical fellows in Molecular Pathology.

Correlation with Anatomic and Clinical Pathology Data: During the Hematopathology rotation, both AP and CP residents are involved in decisions to send lymph node and bone marrow or blood specimens for molecular genetic analysis; results are reviewed with the residents when they are received, and incorporated into the pathology report. Residents learn both the indications for and interpretation and correlation of the results with morphologic and immunophenotypic results. These results and their interpretation are also discussed at Surgical Pathology conference when hematopathology cases are presented.

Other Laboratories: Molecular Pathology techniques are used in the Microbiology and HLA laboratories and are taught in those rotations (see separate laboratory descriptions).

Journal Club/Literature Review: A bi-weekly Molecular Pathology Journal club is organized by the residents and hosted by the Service Chief (Dr. Colvin). The residents and fellows present and critique a recently published scientific article and review the relevant literature. These are typically organized by topics over 2-4 month periods and are attended by interested residents throughout their training.

Senior Resident in Anatomic Pathology

The third year of AP includes 3 months as Senior Resident in AP, 2-3 months of teaching gross pathology to junior residents, 3-4 months of Anatomic Pathology service work, and 2-3 months of elective time, during which they may do additional rotations in the specialty of their choice, or may pursue a program of clinical or laboratory research under the direction of a member of the faculty. All elective time must be planned in advance and a written description of the program or project submitted to the Program Director for approval. Residents who have completed 24 months of Anatomic Pathology are eligible to sign out autopsies. They have the option of writing up their own surgical pathology cases and leaving them with the staff pathologist for signout, rather than reviewing every case at the two-headed microscope. The Senior Resident in AP is responsible for the supervision and teaching of junior residents involved in gross surgical dissections, selection of the weekly CPC cases, organization of the daily Surgical Pathology conference, and intraoperative consultations at night and on the weekend (in rotation with the Chief Resident). The Senior AP resident typically has the opportunity to discuss one or more CPC cases for publication in the New England Journal of Medicine.

Chief Resident in Anatomic Pathology

The Chief Resident in Anatomic Pathology is selected from residents who have completed 36 months in the AP program or 48 months in the APCP program. In general, there are two Chief Residents per year. The responsibilities include the AP residents' daily schedule, orientation of new residents, interviewing applicants, resident representation on departmental committees, evening and weekend frozen section call (in rotation with AP-3 residents), presentation of cases at Medical and Surgical Rounds and teaching of medical students and residents. Chief Residents rotate as staff on subspecialty services, doing both gross examination and supervised signout, according to their interests, and on the Autopsy Service. Opportunities to discuss CPC's are provided. Non-service time can be spent in research or advanced training in an Anatomic Pathology subspecialty.

LABORATORY MEDICINE (CLINICAL PATHOLOGY)

Director: Michael Laposata, M.D., Ph.D.

The Clinical Laboratories are responsible for more than four million laboratory examinations per year. Training in Laboratory Medicine is accomplished by a combination of practical and didactic training, with approximately twenty lectures delivered and interpretative signout rounds in each of the six core rotations. The Laboratory Medicine residents carry a beeper for each area at all times and are the first line of consultation for the clinical staff.

The first 12 months are spent in the basic rotations. Clinical Immunology, and Laboratory Management). For CP only residents, the second 12 months include a structured in-depth experience in one of the laboratory areas selected by the resident and an introduction to research (clinical or basic) which will be continued into and throughout the third year.

Core Rotations: 2 months each - Clinical Chemistry and Laboratory Management, Microbiology, Blood Banking and Transfusion Medicine, Coagulation, Hematopathology, and Hematology/Immunology/Flow Cytometry.

Training in Laboratory Medicine for residents pursuing combined Anatomic and Clinical Pathology certification (AP/CP) consists of an 18-month core of Laboratory Medicine, including 12 months of basic rotations and 6 additional months of structured training devoted to specializing in one or more of the basic areas of Laboratory Medicine. The first 24 months of training include 12 months each of Anatomic and Clinical Pathology.

For straight CP residents, the first year is identical to that of APCP residents. The second year includes 6 months of additional rotations in core laboratories, in which the resident assumes more responsibility for laboratory management and clinical consultations, and supervises junior residents. Six months of the second year is typically spent as CP Chief Resident.

Clinical Chemistry

Goals and Objectives

1. To become acquainted with basic principles of assay development and evaluation, including sensitivity, specificity, precision, accuracy, and variation
2. To become familiar with laboratory testing in various clinical settings such as endocrinology and acute care testing (blood gases and electrolytes)
3. To become proficient in clinical toxicology by reviewing and interpreting clinical cases and understanding laboratory methodologies
4. To become acquainted with current issues in laboratory management such as cost effectiveness, information systems assessment, and reengineering
5. To become familiar with problems in laboratory redesign and consolidation

Supervisor: James G. Flood, Ph.D., Director of Clinical Chemistry Laboratory

Teaching Staff: Kent Lewandrowski, M.D. and Jane Yang, M.D.

Duration: 2 months

Rotation Description:

Basic training in Chemical Pathology consists of a 2-month rotation in the Chemistry Laboratory, a lecture series, rounds in Endocrinology and Toxicology, a 24-hour beeper consult service, and project involvement. This is also a time when residents learn management skills that will prepare them to become laboratory directors. Residents become familiar with each area of the

Clinical Chemistry Laboratory. Each Monday for two hours residents participate in laboratory tours. These are either in-depth tours of each of the clinical chemistry sections or discussions of other areas of interest with Dr. Yang. Residents also rotate through Reproductive Endocrinology, Gastroenterology, and Neurochemistry (inborn errors testing) laboratories. A general introduction to each of these laboratories is given by the laboratory director or the chief technologist, and in addition, these areas are taught in the lecture series and during General Chemistry rounds. The residents attend daily Toxicology Signout and a weekly Toxicology Conference. Interesting cases in both toxicology and therapeutic drug monitoring are discussed and interpreted. Laboratory Endocrinology Conference occurs biweekly. Endocrinology Case Rounds are attended four days a week for one month.

Interpretive Reports: Fifteen to twenty toxicology interpretive reports are signed out each week. Residents attend daily Toxicology Signout at which these cases are discussed and reports issued, participating in the discussion and helping in formulating the report.

Consultative Reports/Activities: After an introductory period, residents are on call 24 hours/day by beeper for 2 months to serve as hospital consultant in Clinical Chemistry. Residents are paged by clinicians with questions concerning the proper ordering and interpretation of Chemistry tests, including those performed in Endocrinology, Reproductive Endocrinology, Neurochemistry, and Toxicology laboratories. Additional consultations are referred from the laboratory and the laboratory phone service to the resident. The Chemistry Fellow provides back-up to the resident. Consult cases are presented weekly at beeper rounds with the Clinical Pathology Chief Resident.

Graduated Responsibility: As the rotation progresses, residents achieve more independence in answering beeper consultations. They also take more responsibility for working up toxicology cases prior to signout. In the second year of CP, the resident takes supervisory responsibility for the junior resident on the service and may take a more active role in clinical consultations.

Role of Fellows: The Chemistry Fellow provides supervision and informal teaching for the resident in the Chemistry laboratory.

Laboratory Management

Goals and Objectives

1. To become acquainted with current issues in laboratory management such as cost effectiveness, information systems assessment, and reengineering.
2. To become familiar with problems in laboratory redesign and consolidation.

Supervisor: Kent Lewandrowski, M.D., Assistant Director of Clinical Laboratories

Duration: 2 months

Residents receive specific instruction in laboratory management through a series of 23 lectures on Medical Informatics and Laboratory Management during their Clinical Pathology rotations. During this series, the residents become familiar with all aspects of laboratory management, including Hospital Administration and Regulation, Laboratory Information Systems, Aspects and Impact of Managed Care, Laboratory Safety, Quality Assurance, Robotics and Automation, Budgets, Personnel, Risk Management, Laboratory Statistics and Management. Lectures on Risk Management and Infection Control/Laboratory Safety are presented annually during Pathology Grand Rounds. Residents are instructed in safety and infection control during an orientation session at the beginning of their first year. For interested residents, there are specific management opportunities during each laboratory rotation. These may include operations improvement, quality assurance studies, or systems management. Residents may participate in CAP inspections.

In Anatomic Pathology, residents spend a week in the Histology Laboratory learning the management and operation of the Histology Laboratory. During their rotations in Electron Microscopy and Immunopathology, they are exposed to management issues in those laboratories. Residents participate in the quality assurance activities of Anatomic Pathology by 1. Performing the CLIA mandated review of Pap smears when reviewing cervical biopsy specimens on the Gynecologic Pathology rotation, 2. Filling out a QA form on every autopsy signed out, indicating unexpected findings, 3. Attending staff meetings at which results of QA reviews are presented. On both AP and CP services, cost-effective laboratory use is repeatedly stressed in daily activities, including signout and conferences. Residents responding to queries from clinicians advise them on the most cost-effective approach to obtaining a diagnosis.

Information Systems and Medical Informatics: Residents have access to and are instructed in the use of the Clinical Laboratory Information System, the patient care information of the MGH, the Blood Transfusion Service Information System, and the Anatomic Pathology Information system. The residents use the patient care information system for assistance in clinical consultations and for clinicopathological and radiology correlations, as well as to obtain information necessary to sign out an individual case. They also use the systems to gather data for specific projects in the Clinical or Anatomical laboratories. The residents may be involved in discussions for modifying and updating the laboratory information systems.

There are 7 computers in the Residents' Rooms (4 in AP and 3 in CP), specifically for the use of the residents, which are connected to the AP and CP laboratory information systems and the hospital information system. These computers have Internet access, BRS-Colleague, and Microsoft Office, as well as PowerPoint, Filemaker, and other programs. Other computers throughout the Anatomic and Clinical laboratories with similar access are available for the use of the residents in these laboratories. All residents have e-mail accounts. Residents are instructed in the use of all the computer systems and may take advanced training courses offered by the Hospital either through Information Services or the Treadwell library. They typically perform literature searches in preparation for conferences and in order to gather information relevant to interesting cases. In addition, they use literature searches in gathering background information for projects and publications.

Microbiology Laboratory

Goals and Objectives

1. To become acquainted with the basic microbiological characteristics of the principal pathogenic bacteria, fungi, viruses and parasites encountered in infectious diseases
2. To become familiar with the strategies employed in the Microbiology Laboratory for the diagnosis of infectious diseases, including methods for specimen processing; culture, identification and susceptibility testing of pathogenic microorganisms; and non-cultural methods such as serological studies and direct detection of microorganisms via microscopic and molecular genetic methods
3. To gain an appreciation for the concepts of laboratory management as applied to operations in a microbiology laboratory

Supervisor: Mary Jane Ferraro, Ph.D., Director of Microbiology Laboratories

Duration: 2 months

Rotation Description:

Basic resident training in Medical Microbiology consists of a two month rotation in the Clinical Microbiology Laboratories. Residents become familiar with clinically important microorganisms and their roles in infectious diseases through a combination of bench work, smear and plate rounds twice weekly, lectures given by the Microbiology staff, and Infectious Disease Unit rounds and conferences. The rotation encompasses experience in all areas of the Clinical Microbiology Laboratories: general bacteriology (including antimicrobial susceptibility testing and blood cultures), anaerobic bacteriology, mycology, mycobacteriology, serology, virology, parasitology, and molecular diagnostics. Residents learn basic techniques during laboratory bench work in each area, for which they are paired with a senior technician or supervisor each morning. Lectures (20) are given by Microbiology Laboratory staff covering microbiology diagnostic and molecular techniques as well as a wide range of clinical infectious disease topics. Residents attend Bench Rounds and Molecular Diagnostics rounds with laboratory directors twice weekly, where clinical cases are reviewed in real time. Residents attend the Microbiology Journal Club, and present at least one paper. Other resident responsibilities include assisting the CP Chief Resident with Medical Microbiology cases for daily Laboratory Medicine rounds, presenting conferences to medical technologists, and handling laboratory consultations. For interested residents, there are research opportunities and laboratory management-oriented projects. Electives may be arranged by residents for greater in-depth experience in Medical Microbiology. No interpretive reports are currently generated by residents in Medical Microbiology.

Activities of the Infectious Disease Division: Residents attend weekly Infectious Disease Unit Case Rounds, where recent challenging cases are discussed, and weekly Intercity Joint Infectious Disease Rounds. They do not currently participate in the Infection Control Committee meetings. CP residents attend daily Microbiology Rounds with a staff clinical pathologist or microbiologist. Residents will handle consultations, review microscopic smears, and actively participate in microbiologic interpretations.

Consultative Activities: Clinical consultations are provided by twice-weekly teaching rounds and plate rounds with the Infectious Disease fellows and staff. As stated above, CP residents will attend daily Microbiology Rounds with a staff clinical pathologist or microbiologist. Residents will handle consultations, review microscopic smears, and actively participate in microbiologic interpretations. Residents are on-call by pager to handle consultations regarding specimen handling, test selection, and test interpretation.

Graduated responsibility is assumed by residents by handling laboratory consultations and cases for Laboratory Medicine rounds with increasing independence.

Blood Transfusion Service

Goals and Objectives

1. To become familiar with blood donor qualifications and the operation of a donor facility
2. To become competent managing the complications of blood donation and transfusion
3. To understand the applications, limitations, and complications of therapeutic apheresis
4. To acquire a basic understanding of transfusion therapy and immunohematology

Supervisor: Christopher P. Stowell, M.D., Ph.D., Director of Blood Transfusion Service

Duration: 2 months

The Massachusetts General Hospital has one of the largest hospital-based blood transfusion services in the United States. Approximately 20,000 whole blood donations are collected on site or on our mobile unit and over 50,000 components are transfused annually. This rotation (2

months) includes 20 lectures and hands-on experience in all areas of transfusion medicine. During this rotation, each resident has direct experience with all aspects of blood banking, including recruitment and initial evaluation of donors, drawing blood units, blood component preparation and storage, and use of the information system. The Blood Transfusion Service is an FDA licensed blood collection facility. Residents actively participate in evaluation of donors and blood collection. The resident participates in laboratory testing for transfusion compatibility as well as ABO/Rh typing, antibody screening and testing for infectious diseases. Experience is gained in all aspects of blood component transfusion, from indications for transfusion to evaluation and treatment of potential major or minor reactions. The resident evaluates and manages the transfusion therapy of outpatients as well as therapeutic apheresis.

Interpretative reports generated by the resident include transfusion reaction work-ups (approximately 30 per resident) and serology work-ups (approximately 110 per resident). In addition, the residents are responsible for consult notes for new apheresis patients (approximately 8 per resident) and apheresis procedure notes (approximately 100 per resident), new outpatient interview notes (approximately 45 per resident) and outpatient transfusion notes (approximately 100 per resident).

Consultative Activities: The resident carries the Blood Transfusion Service beeper and is backed up by the fellow and a staff member every day unless arrangements are made to sign it out to the fellow. Calls from the clinical staff usually relate to appropriate component utilization, referrals for apheresis, techniques for limiting allogenic blood use, or management issues, especially in patients with coagulopathies or massive transfusion.

Graduated Responsibilities: During the first week of the rotation, the resident does not carry the Blood Transfusion Service consult beeper, which is assigned to the fellow or staff physician. During the second week, the resident only carries the beeper during the day. By the third week, the resident can usually handle a reasonable portion of the calls and begins to carry the beeper full time. As noted above, there is always back-up by a fellow or Senior Resident and a staff physician. The resident's written work is always reviewed by a staff physician. Initially, the resident always works with the fellow or resident present, but as the rotation progresses and the resident demonstrates competence in specific tasks, s/he begins to function more independently.

Role of Fellows: The resident is usually first call for consults (after the phase-in period) whereas the fellow's role is to back up the resident. The fellow may supervise some activities of the resident and is expected to function with a greater degree of independence. The fellow is often the one to instruct the resident about practical patient management tasks (e.g. how to call in a consult, how to get a line placed, how to get a "wet read" from radiology, etc.). The fellow spends a year in the Blood Transfusion Service and is expected to be able to formulate plans for managing more complex patient care problems.

Computer System: The residents are instructed on the use of the Blood Transfusion Service information system and the role it plays, particularly in such key functions as blocking the collection and issue of unsafe or inappropriate blood components.

Special Coagulation Laboratory

Goals and Objectives

1. To become competent in the diagnosis of complex coagulopathies
2. To become familiar with the management of hemorrhagic and thrombotic disorders
3. To have a basic understanding of the disorders associated with excess bleeding and clotting.

Supervisor: Michael Laposata, M.D., Ph.D., Director of Clinical Laboratories
Duration: 2 months

Rotation Description:

Residents learn to diagnose and manage coagulation and bleeding disorders by performing the preliminary interpretation of 20-30 coagulation panels daily and signing out at interpretive Coagulation Rounds with Drs. Laposata and Van Cott. Tests include antiphospholipid and antifactor antibodies, platelet aggregation and genetic testing for thrombosis risk factors. There are 12 lectures in coagulation, given by the Laboratory Director.

Consultative Services: Clinicians whose patients are under study often attend Coagulation rounds. Drs. Laposata and Van Cott have a unique consultation service with consults from all over the United States.

Histocompatibility Laboratory

Goals and Objectives

1. To become familiar with the structure and function of the different classes of human MHC molecules, especially as they pertain to transplantation
2. To become familiar with the techniques involved in HLA typing using both serologic and molecular assays, and to be aware of how each may be used and interpreted
3. To become familiar with the techniques involved in HLA antibody screening and the interpretation of the results so that the type and specificities of the antibodies may be defined
4. To become familiar with the techniques used for crossmatch before transplantation of various solid organs and/or bone marrow, and to learn the relevance of results obtained using different techniques
5. To learn about the rules and procedures involved in recipient and living donor workups, and in allocation of cadaver donor organs at the MGH and across the United States

Supervisor: Susan Saidman, Ph.D.
Duration: 1 week

Rotation Description:

Before and during their rotation through the Histocompatibility Laboratory, residents receive the following lectures: The Immune Response, Transplantation Immunology, Histocompatibility Testing-Serological Methods, Clinical Applications of HLA Typing, MGH Protocols for Typing and Crossmatching, Molecular HLA Typing Techniques, Cellular Tissue Type Assays - The MLC, etc.

While in the laboratory, residents perform a Class I serological typing on themselves, and thaw a panel cell and screen multiple patients' sera using the AHG cytotoxicity technique. The results of the typing are discussed, and they spend time analyzing antibody screens performed on a series of potential transplant recipients. They spend one day observing molecular techniques and learn how to interpret the results of those assays. They review a number of case studies involving cytotoxic and cellular assays.

No interpretive reports are produced in this laboratory. However, the HLA Laboratory provides informal consultations to a variety of clinical services. Residents participate in these through attending the conferences at which these consultations occur, including: renal patient

“Family Meeting”, Transplant Inpatient Rounds, Transplant/Dialysis Rounds, and the Bone Marrow Patient Conference. Residents wishing to specialize in histocompatibility testing, immunopathology or Blood Banking are encouraged to acquire graduated responsibilities in the laboratory through additional elective rotations.

Hematology

Goals and Objectives:

1. To become competent in interpreting peripheral blood smears, hemoglobin electrophoresis and quantitation, hemogram data, hematology-related chemistry and immunology tests, and quantitative flow cytometry
2. To acquire the ability to generate useful differential diagnoses for patients with red blood cell or white blood cell disorders by integrating the laboratory data with the clinical history
3. To learn to effectively recommend efficient diagnostic testing based on the hematologic differential diagnosis
4. To learn to perform bone marrow aspiration and biopsy

Supervisors: Timothy Skelton, M.D., Ph.D. Assistant Director of Hematology and Special Hematology, Elizabeth Van Cott, M.D., Director of Coagulation Laboratory;

Duration: 2 months (with Immunology)

Rotation Description:

The resident learns blood cell morphology by reviewing all abnormal peripheral blood smears (~5/week) and signing them out with the Assistant Director at interpretive rounds. The resident learns to recognize most types of hemoglobinopathy by reviewing all hemoglobin electrophoreses (~25/week) and relevant clinical data prior to interpretive signout with the Assistant Director. The resident learns the use of hematology analyzers (cell counter instruments), the flag policy for hemogram data and differential, flow cytometry (CD4/CD8 counts), examination of body fluids, coagulation testing and automated urinalysis analyzers, as well as microscopic examination of urine sediments through a series of laboratory bench sessions conducted by technologists. The rotation includes 8 lectures on Hematology and Medical Microscopy.

Bone Marrow Aspirations: Residents perform at least 10 bone marrow aspirations/biopsies with Drs. Thomas Spitzer (anesthetized patients undergoing bone marrow harvesting) and David Scadden (volunteer donors) of the Hematology/Oncology Unit. They may perform additional procedures with the Hematology/Oncology fellows.

Consultations: After an introductory period, the residents carry a beeper for hematology laboratory consultations (review of abnormal results or appropriate test orders, etc.).

Graduated Responsibility: The resident is expected to take increasing responsibility for beeper consultations, interpretive analysis of smears and electrophoresis, and reporting results to clinicians. In the second year of CP, the resident may return to the laboratory and take on supervisory responsibility for junior residents

Hematopathology

Goals and Objectives:

1. To learn the technical aspects of bone marrow and lymph node biopsy processing
2. To become proficient in recognizing normal hematopoietic and lymphoid cell and tissue morphology
3. To recognize the morphologic features of common diseases of the hematopoietic system, including myelodysplasia, myeloproliferative disorders, myeloid and lymphoid leukemias and lymphomas, as well as reactive processes
4. To understand the indications for and interpretation of hematopoietic cell marker studies (flow cytometry and immunohistochemistry) and genetic studies (cytogenetics and molecular genetics) in the diagnosis of hematologic malignancies

Supervisor: Nancy Lee Harris, M.D.

Teaching Staff: Judith A. Ferry, M.D., Lawrence R. Zukerberg, M.D., and
Frederic I. Preffer, Ph.D.

Duration: 2 months

Rotation Description:

Residents develop skills in hematopoietic tissue and lymph node morphology by participation in the Hematopathology diagnostic service. The CP resident is responsible for independently reviewing all bone marrow biopsy specimens and related peripheral blood and bone marrow smears, and obtaining relevant clinical and laboratory data. Residents perform differential counts on marrow aspirates, and formulate and write their diagnosis for each case prior to signout with an attending Hematopathologist. Flow cytometry and immunohistochemistry results are reviewed and signed out with the cases. Karyotypes are reviewed on all leukemias and myelodysplasias. An AP resident on the service is responsible for lymph node and other tissue biopsies. The CP resident has the opportunity to review these cases, as well as outside consultations submitted to Drs. Harris and Ferry. There are 9 lectures in Hematopathology. Residents attend the monthly Hematopathology Surgical Pathology Conference where 10 instructive cases are discussed.

Consultative Activities: Clinicians interact with the resident on a daily basis, discussing clinical data and pathology results. The resident carries a beeper and advises clinicians on submission of specimens and ordering special studies. The resident attends and presents cases (1-3/week) at the weekly Lymphoma Conference.

Graduated Responsibility: By the second month, residents are expected to perform a correct differential count, fill out the bone marrow report with minimal corrections, present all cases at Lymphoma Conference, and handle most telephone consultations independently. Second year CP residents may return to Hematopathology and take responsibility for outside consults and acquire additional skills in flow cytometry.

Immunology/Immunopathology:

Goals and Objectives

1. To become familiar with the performance and interpretation of agarose gel electrophoresis, immunoelectrophoresis, and immunofixation applied to serum, spinal fluid, and urine
2. To become familiar with nephelometry for the quantitation of immunoglobulins, complement proteins, and acute phase reactants
3. To become familiar with performance and interpretation of indirect immunofluorescence for the detection auto-antibodies and immunofluorescence for the diagnosis of renal disease

4. To become familiar with assays for complement activity and its inhibitors; analysis of cryoprecipitable proteins and serum viscosity

Supervisors:

Immunology: Kurt J. Bloch, M.D., Director of Clinical Immunology

Immunopathology: Atul K. Bhan, Director of Immunopathology

Duration: 2 Months with Hematology

Rotation Description

Immunology Laboratory: The resident is instructed in the performance and interpretation of: Immunoelectrophoresis, agarose gel electrophoresis, immunofixation applied to serum, urine, and cerebrospinal fluid; indirect immunofluorescence for antinuclear antibodies, ELISA to detect the specific antibodies responsible for certain patterns of nuclear fluorescence; measurement of serum viscosity and the differential diagnosis of diseases that elevate it; nephelometry for the measurement of serum IgG, IgA, IgM, alpha-1-antitrypsin, ceruloplasmin, haptoglobin, kappa and lambda epitope-bearing proteins, complement proteins; measurement of total hemolytic complement; detection and identification of cryoproteins and antibodies involved in hypersensitivity pneumonitis; measurement of cancer antigens, including PSA, CEA, CA-125; measurement of IgE. Residents participate in daily interpretive signout of protein electrophoresis, immunofixations, and ANAs with the laboratory director (100 cases/week). They obtain clinical information as needed, and suggest further diagnostic testing. Three lectures are given in immunology, covering ANA, immunoelectrophoresis, and complement testing.

Immunopathology Laboratory: Residents review all ANCA and renal immunofluorescence cases with the technical supervisor. They attend the weekly Renal Pathology Working Conference and report immunofluorescence results to the Renal Pathology team. They attend the weekly Renal Pathology Clinical Conference and the monthly Renal Surgical Pathology conference. A lecture is given on renal immunofluorescence.

Consultative Activities: Residents interact with clinicians by responding to beeper calls for advice on ordering and interpreting tests, with the supervision of the laboratory director. They present results of flow cytometry at the weekly Lymphoma Conference.

Graduated Responsibility: During these rotations, residents achieve greater independence in the consultation service and take a more active role in the interpretive rounds. Interested residents may take additional electives, achieving greater technical and interpretive competence, as well as teaching junior residents.

Flow Cytometry

Goals and Objectives:

1. To become familiar with the technical aspects of flow cytometry for immunophenotyping and DNA analysis
2. To understand the role of immunophenotyping in immunodeficiency and lymphoma/leukemia diagnosis
3. To interpret and apply the results of flow cytometry to diagnostic problems

Supervisor: Frederic Preffer, Ph.D. , Director of Flow Cytometry

Duration: 1 week (with Hematopathology)

Rotation Description:

Residents learn to perform and interpret flow cytometry in two ways. 1. The Hematology laboratory provides CD4/CD8 monitoring of HIV+ and other immunodeficiency patients. On the Hematology rotation, the residents learn to operate the flow cytometer and interpret the results. 2. The Clinical Flow Cytometry Laboratory provides leukocyte immunophenotyping and DNA-ploidy analyses, including evaluation of immune deficiency, stem cell monitoring, and immunophenotyping for lymphoma and leukemia. Specimens include blood and bone marrow, fine needle aspirations from cytopathology, body fluids, and tissue specimens. During the Hematopathology rotation (on AP and CP) residents have an introductory session with the laboratory director, with instruction in basic principles and interpretation of scattergrams. Residents spend 1 week in the Flow Cytometry laboratory. They perform a basic analysis of their own blood, and have access to a teaching file of past clinical cases. Current cases are reviewed at daily Hematopathology signout and an interpretive report is generated. Residents learn the indications for and interpretation of flow cytometry during Hematopathology signout, and are involved in the decision to obtain specimens for flow cytometry. A lecture on flow cytometry is included in the Hematology/Immunology/Immunopathology lecture series. Flow cytometry results are often presented in the monthly Hematopathology Surgical Pathology conference and at Lymphoma Conference.

Senior Resident in Clinical Pathology

The second year of Clinical Pathology includes 6-12 months of advanced rotations in areas of the Clinical Laboratories. Choice and length of rotations are determined by specific interests of the residents and by the Residency Program Director and the Director of the Clinical Laboratories. Second year residents provide beeper coverage for the service on which they are rotating, when no first year resident is available.

Chief Resident in Clinical Pathology

Residents who have completed 12 months of core clinical pathology training are eligible for selection as Chief Resident. The Chief Resident is responsible for the residents' daily schedule, interviewing residency applicants, the supervision and teaching of junior residents, and serving as a backup to junior residents on the Clinical Pathology consultation service. The Chief Resident also conducts Laboratory Medicine Rounds for Medical House Staff 4 days/week.

LABORATORY RESEARCH

Goals and Objectives:

1. To encourage residents to undertake a research project
2. To prepare residents for an academic career

Supervisor: Robert B. Colvin, M.D.

Associate Chief for Research: Ivan Stamenkovic, M.D.

The optimal training for a career that will combine funded research with clinical service is to follow the required two years of AP or CP clinical training (three years if APCP) with a two or three year fellowship in basic or translational research. Residents interested in laboratory research consult with Dr. Colvin or Stamenkovic early in their training to obtain advice on selecting a laboratory and a research mentor. Research may be done in any of the Pathology Department research laboratories, in other laboratories at MGH, Harvard, or M.I.T. They work with the mentor to develop a research plan and typically apply for an individual NIH fellowship. Research may begin after 2-3 years of AP, CP or APCP training. Residents are supported by the departmental NIH Training Grant (5 positions) or individual fellowships. Residents and fellows regularly present their research results at national and international meetings and publish their studies in respected peer-reviewed journals. Pathology Grand Rounds highlights the research opportunities at MGH and at other institutions by visiting faculty. The biweekly Molecular Pathology Journal Club meets with Dr. Colvin to learn skills of reviewing the scientific literature and stimulate innovation and topics for resident/fellow research.

Research Facilities

The department has over 40,000 square feet of research laboratory space, divided among four major facilities in the Cox Cancer Management Building, the Shriners' Burns Institute, the Hematology Research Laboratories, and the Lawrence A. Martin Research Laboratories in Charlestown (15 minutes by shuttle bus). These areas are well-equipped for ultrastructural, immunological, molecular, and biochemical studies. This work is supported by an annual budget of over \$4,000,000 in research and training grants, principally from the NIH, awarded to members of the department. The research staff includes 21 faculty and over 20 postdoctoral fellows. Additional clinical investigations are carried out in the Anatomic and Clinical Pathology units of the department.

Major areas of investigation include the molecular pathogenesis of neoplasia, including clinical-pathologic correlation, molecular genetics, and cell biology of malignant lymphomas and CNS tumors; the classification and evaluation of prognostic factors in ovarian carcinoma, lymphoproliferative diseases, bladder cancer, pulmonary tumors, bone and soft tissue malignancies, malignant melanomas; oncogene expression and flow cytometric analysis of human tumors; immunological mechanisms in diseases of the kidney and GI tract; the pathogenesis and therapy of allograft rejection; T cell differentiation pathways; function of adhesion molecules, and other T cell surface components; the biologic function of dendritic cells, Kupffer cells, and alveolar macrophages; basic and applied wound healing studies (cultured skin, matrix components, and recombinant growth factors); lipid metabolism in platelets; ethanol induced esterification; biology of cell junctions; molecular biological probes in human disease (*in situ* hybridization, polymerase chain reaction, laser capture microdissection, DNA expression array analysis); cell biology of lung cells and accessory cell function of dendritic cells; molecular etiology and pathogenesis of Alzheimer's and Huntington's diseases and pituitary and brain tumors. These programs often involve collaborative research with investigators in other departments at the MGH, Harvard Medical School or the Massachusetts Institute of Technology. The specific interests of individual investigators is given in the appended list. More than 250 peer reviewed studies by members of the department were published in 1997.

CONFERENCES

Departmental Conferences

Pathology Grand Rounds (weekly): Invited speakers, Pathology staff members, and Senior Residents.

Surgical Pathology Conference (daily): AP residents and staff. Ten interesting current surgical specimens are put out in advance for the residents to review as unknowns. Several 1/2 hour sessions each week are set aside for concentrated focus on subspecialty areas on a rotating basis.

Clinicopathologic Conferences (Case Records of the MGH - New England Journal of Medicine) (weekly): A clinician is invited to discuss the case history and give a differential diagnosis. A pathologist (AP or CP staff, Senior Resident or Fellow) presents the diagnostic pathology or laboratory results. These conferences are published weekly.

Clinical Pathology Case Conference (weekly): The conference is presented by CP residents and attended by all CP and APCP residents as well as the CP staff.

Autopsy Gross Conference (twice per week). The conference is attended by all residents on the Anatomic Pathology service, as well as AP staff on the Autopsy Service and subspecialists on request (including AP and CP).

Surgical Pathology Gross Conference (ad hoc): The Senior AP Resident elects interesting gross specimens for presentation to residents and staff.

Cytopathology Conference (weekly): Current diagnostic material is presented as unknowns, as well as didactic reviews of topics of interest. The conference is attended by Cytopathology staff, fellows, residents, and technologists.

Dermatopathology Conference (weekly): This is a systematic review of dermatopathology, attended by Dermatopathology staff, Dermatopathology fellows, Pathology, and Dermatology residents.

Neuropathology Case Review (weekly): All cases seen in the preceding week are presented to the prosectors and other residents and staff.

Neuropathology Gross Conference (2/week): At these conferences, the brains from the previous day's autopsies are examined. Residents are expected to be responsible for the neuropathological examination of at least 12 of their autopsies during their residency.

Neuropathology Pediatric Conference (Second Sat. of the Month): Neuropathology and Anatomic Pathology residents and staff are encouraged to attend.

Serology/Blood Bank Rounds (daily): Rounds are attended by Clinical Pathology residents and staff.

Research Conferences (2/week): Informal conferences reporting ongoing research within the department are held at MGH East in Charlestown and in the Cox 5 Conference Room.

Conferences - Summary

Name of Conference/Journal Club	Frequency Held	Individual(s) or Department Responsible for Organization of Sessions
Departmental Conferences:		
Pathology Grand Rounds	1/Week	Robert Young, M.D. and Chief Resident
Surgical Pathology	5/Week	Robert Young, M.D. and AP Senior Residents
Autopsy Pathology	2/Week	Eugene Mark, M.D. and AP Senior Residents
Gross Surgical Pathology	1-5/Week	Robert Young, M.D. and AP Senior Residents
Introduction to Surgical Pathology	1-2/Week, 12 Wks.	Robert Young, M.D. and AP Staff
Neuropathology Gross Pathology	2/Week	E. Tessa Hedley-Whyte, M.D.
Neuropathology Case Review	1/Week	E. Tessa Hedley-Whyte, M.D.
Neuropathology - Pediatric	2nd Sat. of Mo.	E. Tessa Hedley-Whyte, M.D.
Dermatopathology - Lever Series	1/Week	Dermatopathology Faculty
Cytology CME	1/Week	Debra Bell, M.D.
Clinicopathologic (CPC)	1/Week	Robert Scully, M.D., Eugene Mark, M.D. and Sr. Residents
Laboratory Medicine	1/Week	CP Chief Resident
Coagulation Rounds	5/Week	Michael Laposata, M.D., Ph.D. and Elizabeth Van Cott, M.D.
Serology/Transfusion Rounds	5/Week	Zbigniew Szczepiorkowski M.D., Ph.D.
Laboratory Endocrinology Rounds	2/Month	Chemical Pathology Fellow
Toxicology Rounds	1/Week	Jane Yang, M.D.
Journal Clubs:		
Molecular Pathology	2/Month	Robert Colvin, M.D. and Senior Residents
Immunopathology	1/Week	Atul Bhan, M.D.
Cytopathology	1/Week	Debra Bell, M.D.
Dermatopathology	1/Week	Thomas Flotte, M.D.
Coagulation	1/Week	Michael Laposata, M.D., Ph.D.
Microbiology	2/Month	Kathryn L. Ruoff, Ph.D.
Blood Bank	2/Month	Zbigniew Szczepiorkowski, M.D., Ph.D.
Clinical Conferences:		
Medical Mortality	1/Week	Medicine and AP Chief Resident
Surgical Mortality	1/Week	Surgery and AP Chief Resident
Pediatric Mortality	1/Month	Drucilla Roberts, M.D.
CP Laboratory Medical Rounds	4/Week	CP Chief Resident and Medical Residents
Lymphoma	1/Week	Nancy Lee Harris, M.D.
Neurooncology	1/Week	E. Tessa Hedley-Whyte, M.D.
GYN Tumor Board	1/Week	Robert Young, M.D.
Sarcoma	1/Week	Andrew Rosenberg, M.D.
Renal Pathology	1/Week	Robert Colvin, M.D.
Radiology Pathology	1/Week	Second Year AP Residents
Pulmonary Pathology	1/Week	Second Year AP Residents
Oncology Pathology	1/Week	Second Year AP Residents
Breast Pathology	1/Week	Frederick Koerner, M.D.
OB Perinatal	1/Week	Drucilla Roberts, M.D.

Extradepartmental Conferences

Numerous lectures and conferences occur frequently at the Massachusetts General Hospital, as well as at the Harvard Medical School. Residents are encouraged to attend these insofar as their duties allow.

National Course Offerings

The department offers annual courses in surgical pathology, gynecological and obstetric pathology, dermatopathology, gastrointestinal pathology, and dermatopathology, sponsored by the Harvard Medical School and open to registrants from around the world. Residents are invited to attend these courses, and departmental conferences are canceled during these times to permit residents to attend. The department organizes and conducts the weekly New England Journal of Medicine Clinicopathological Conference.

OPPORTUNITIES FOR TEACHING

Conferences for Other Services

1. On the AP Service, residents are assigned to present Surgical Pathology cases at conferences for other services, including the Surgical, Radiology, Gynecology, Orthopedic, Hematology/Oncology and Breast services. Residents are responsible for preparing and presenting pathology material, with supervision of a senior staff person. Chief Residents present cases at the weekly Department of Medicine Morbidity and Mortality Conference and at Surgery House Staff Rounds. Daily Laboratory Medicine Rounds are organized by the Chief Resident in CP to discuss interesting current cases with the Medicine residents.

2. The Pathology Chief and Senior Residents usually have the opportunity to present the pathology at one of the weekly Clinicopathologic Conferences (published in the New England Journal of Medicine).

3. Residents on both the AP and CP services present regular conferences to the Department, based on interesting cases. Residents review the recent literature and basic science as well as the clinical aspects of the disease, and make a formal, didactic presentation to other residents and staff.

Teaching Residents

During the first several weeks of the year, full-time teaching residents supervise new residents on both the Autopsy and Surgical Pathology services. The teaching residents are generally selected from among those in their third year of training at the MGH. Second-year clinical pathology residents supervise junior Clinical Pathology residents as well as medical students.

Medical Students

Residents may participate in the laboratory teaching of pathology at the Harvard Medical School and the Harvard-MIT Health Science and Technology program. Residents also teach medical students who rotate through the department.

OTHER INFORMATION

Evaluations

Each resident's performance is evaluated, documented, and reviewed with the Program Director twice a year. In Anatomic Pathology, each staff member who has worked with a resident is requested to fill out an evaluation form. These forms are summarized by the Residency Training Committee and the summary reviewed with the individual resident. Evaluations at the end of each 4-month Clinical Pathology rotation are reviewed with Dr. Laposata and subsequently by the Program Director. The summary evaluations are reviewed with the individual resident and placed in his/her file. Residents have the opportunity to complete an anonymous written evaluation of the program annually.

Resident Selection

Residents are selected by a committee composed of representatives from Anatomic Pathology, Clinical Pathology and residents. Candidates are interviewed by at least two members of the committee and one or more other members of the staff. The committee then votes and ranks the individual applicants. First-year (PGY-1) residents are selected through the NRMP. Four to six places per year are available through the Match. Two to three residents are usually appointed off-match.

Vacation

All residents are entitled to 3 weeks of vacation per year.

Call Schedule

The call schedule varies depending on the rotation. In Anatomic Pathology, residents can expect to be on call 7-8 weekends per year. Residents on service are on call approximately 1 night every 2 weeks. They are expected to be in the hospital until 8:00 p.m.; after that, call is by beeper. Clinical Pathology residents carry the beeper of the laboratory service through which they are rotating. The beeper is covered one day each weekend by the fellow, Chief Resident or Attending Staff.

Book and Travel Allowance

Residents will be reimbursed for travel and books based on a graded system listed below. This fringe benefit is available based on the academic year (July-June). Residents have the option of allocating the funds (i.e., they may spend the entire amount on books or on a combination of travel and books). Unused balances will not be carried forward.

First Year Resident in Pathology:	\$300
Second Year Resident in Pathology:	\$400
Third Year Resident in Pathology:	\$500
Fourth Year (and up) Resident in Pathology:	\$600

TEACHING FACULTY

Giuseppe Andres, M.D. Molecular Pathology Research. Renal pathology. Research: Pathogenesis of renal and pulmonary lesions induced by immunological mechanisms; interaction of antibodies with cell surface antigens relevant to xenotransplantation.

David M. Andrews, M.D. Research: Study of hematopoietic chimeras in both humans and a *Cynomolgus* monkey model system. In humans, Dr. Andrews is studying erythropoiesis following non-myeloablative bone marrow transplantation, with an emphasis on bone marrow transplantation across major ABO blood group barriers. In the monkey model system, Dr. Andrews has developed an assay to measure low levels of donor hematopoietic cells following combined solid organ and bone marrow transplantation. The long-term goal of this project is to develop donor-specific tolerance regimen for use in human transplantation, so that patients may avoid complications associated with immunosuppressive drugs.

H. Thomas Aretz, M.D. Head of Cardiovascular Pathology. Sign out: Cardiac, pulmonary, autopsy and frozen section pathology. Major research interests: Pathology of cardiovascular intervention; pathology of acute events in coronary artery disease (plaque rupture); myocarditis; transplant arteriopathy. Dr. Aretz is the Director of International Educational Programs for Harvard Medical School. Dr. Aretz also heads a second-year pathophysiology course at Harvard Medical School and welcomes resident participation.

Leonard Atkins, M.D. Cytogenetics Laboratory; Medical Examiner. Responsible for cytogenetics education of residents in joint laboratory at BWH. Research interests: chromosomal changes in leukemia.

Debra A. Bell, M.D. Director of Cytopathology Unit. Cytopathology and gynecologic pathology. Sign out: GYN surgicals and cytology, flow cytometry. Studies predictors of the biologic behavior of borderline epithelial neoplasms of the ovary using morphologic, immunohistochemical and quantitative methods. Collaborating with a group of investigators at the Brigham & Women's Hospital on genetic alterations in borderline tumors. Dr. Bell is also involved in flow cytometric DNA content analysis and its relation to prognosis and treatment factors in various malignant tumors in collaboration with Drs. Frederic Preffer. Additional interests: Cytopathology of unusual lesions of the female genital tract.

Atul K. Bhan, M.D. Director of the Immunopathology Unit. Sign out: Liver transplantation and gastrointestinal surgical pathology. Dr. Bhan's major research interests are the biology of mucosal lymphocytes and pathogenesis of inflammatory bowel disease and the role of lymphocyte subsets in cell-mediated reactions, including allograft rejection. Dr. Bhan directs the clinical immunocytochemistry service and has made many contributions in the clinico-pathologic analysis of tumor-associated differentiation antigens.

W. Stephen Black-Schaffer, M.D. Associate Chief of the Department for Administration; Cytopathology and gynecological pathology. Sign out: Cytopathology and gynecological surgical pathology. Research: 1) Diagnostic pulmonary cytopathology, particularly the cytomorphological distinction of primary from secondary malignant disease; 2) General thoracic cytopathology, particularly primary mediastinal diseases; 3) Telepathology, including optical and electronic aspects of image acquisition and transmission, and validation of remote pathology diagnosis of digitized images.

Kurt Bloch, M.D. Director, Clinical Immunology Laboratory; Chief, Clinical Immunology and Allergy Units. Sign out: Serum, urine and CSF electrophoretic patterns, antinuclear antibodies detected by indirect immunofluorescence and ELISA, complement assays, viscosimetry, detection of cryoproteins and cancer antigens. Research: 1) Immunobiology of sensorineural hearing loss, 2) Clinical significance of low concentration monoclonal immunoglobulins, 3) Unusual causes of angioedema/urticaria.

Dennis Brown, Ph.D. Associate Professor of Pathology; Director, MGH Program in Membrane Biology. Research: Membrane structure, function and polarity in renal and epididymal epithelial cells; mechanisms of intracellular vesicular trafficking and membrane protein targeting (e.g., aquaporin water channels and proton pumping ATPases); vesicle and membrane protein endo- and exocytosis; techniques include light and EM immunocytochemistry (including confocal microscopy) on tissues and on transfected cells expressing membrane proteins coupled to epitope tags or green-fluorescent protein, immunoprecipitation, vesicle isolations, molecular biology, freeze-fracture EM.

Robert B. Colvin, M.D. Chief of the Department; renal pathology, immunopathology. Sign out: Renal and Genito-Urinary pathology, autopsies. Research: Dr. Colvin has a major interest in the mechanisms of allograft rejection, particularly the kidney. Ongoing projects are the pathogenesis of chronic vascular rejection and xenograft rejection, the development of new immunotherapeutic strategies to achieve tolerance, and a new program in mechanisms of islet rejection and autoimmune injury. Techniques in use include flow cytometry, immunohistochemistry, and *in situ* hybridization, laser capture microdissection and DNA expression array analysis.

Carolyn C. Compton, M.D., Ph.D. Head of Gastrointestinal Pathology; Chief of Pathology, Shriners' Hospital for Children. Sign out: Gastrointestinal pathology. Research: In the burn field, Dr. Compton is studying cultured human epithelial grafts, clinical applications, and mechanisms of action. In gastrointestinal pathology, her research interests include neoplastic transformation in inflammatory bowel disease, prognostic markers in colon cancer, and molecular genetics of pancreatic cancer.

Teri L. Cooper, M.D. Associate Director, Cytopathology. Sign out: Cytopathology, ENT pathology, performance and interpretation of fine needle aspiration biopsies. Research: Fine needle aspiration biopsy of lesions of the breast and head and neck.

G. Richard Dickersin, M.D. Director of the Diagnostic Electron Microscopy Unit. The EM Unit provides diagnostic electron microscopic studies on selected specimens in surgical and autopsy pathology, and engages in clinicopathological research involving electron microscopy.

Thaddeus Dryja, M.D. Head of Eye Pathology (MEEI/MGH). Sign out: Eyes and periocular tissues, including orbital tissues, the lacrimal drainage apparatus, eyelids, and the periocular skin. Laboratory; MEEI. Research: Molecular genetics studies of hereditary diseases of the retina, including retinoblastoma, retinitis pigmentosa and allied diseases, macular degeneration, and Norrie disease. Major efforts are devoted to identifying disease genes, to elucidating the mechanisms by which gene defects cause disease, and to developing therapies.

Lyn M. Duncan, M.D. Dermatopathology Unit. Director of Dermatopathology Training Program. Sign out: Dermatopathology. Research Interests: 1) Pathobiology of melanoma and its precursor lesions; 2) Cutaneous lymphoma. Immunohistochemical and DNA techniques are being used to investigate differential gene expression in melanocytic tumor progression and cutaneous lymphoid proliferations.

Walter H. Dzik, M.D. Co-Director, Blood Transfusion Service. Research Interests: Biologic effects of recipient exposure to allogenic leukocytes; cytokine-mediated transfusion reactions; alloimmunization; T-cell depletion of hematopoietic progenitors.

John H. Eichhorn, M.D. Gynecologic and breast pathology. Cytopathology. Sign out: Gynecologic surgicals, breast surgicals, frozen sections, and cytopathology. Research: Prognostic factors in surface epithelial malignancies of the ovary and unusual lesions of the female genital tract.

William C. Faquin, M.D., Ph.D. ENT Pathology and Cytopathology. Sign out: ENT pathology, Cytopathology, Frozen Sections, and the FNA service. Research: 1) Microsatellite instability and papillary thyroid carcinogenesis. 2) Molecular differentiation of thyroid adenomas from carcinomas 3) Morphologic and genetic features of salivary gland neoplasms.

Mary Jane Ferraro, Ph.D., M.P.H. Director, Microbiology Laboratories. Research: Methods for early, direct detection of microorganisms in clinical specimens; automation of diagnostic methods in the Clinical Microbiology Laboratory; utilization and cost-effectiveness of diagnostic tests in Clinical Microbiology; development and validation of new approaches to antimicrobial susceptibility testing; and *in vitro* susceptibility studies of new antimicrobial agents.

Judith A. Ferry, M.D. Hematopathology and gynecological pathology. Sign out: Hematopathology, small and large GYN surgicals and frozen sections. Research: 1) subclassification and immunopathology of Hodgkin's disease and non-Hodgkin's lymphoma, reactive lymphoid hyperplasias and lymphoid proliferations in abnormal immune states; 2) gynecological pathology; in particular, unusual lesions of the uterine cervix ("adenoid cystic" carcinoma, adenoid basal carcinoma, and lesions derived from Wolffian duct remnants).

James G. Flood, Ph.D. Director, Clinical Chemistry Laboratories. Research: Analytical method development in toxicology and therapeutic drug monitoring; pharmacokinetics of psychotropic drugs; computer and chemometric applications in the clinical laboratory.

Thomas J. Flotte, M.D. Director, Dermatopathology Unit. Sign out: Dermatopathology. Research: 1) Laser-tissue interactions. Current efforts involve laser-based methods for drug and gene therapy. 2) Biology and treatment of lupus. 3) Biology and diagnosis of pigmented lesions of the skin.

Matthew P. Frosch, M.D., Ph.D. Neuropathology. Sign out: Neuropathology surgicals and autopsies. Research: Animal models of neurodegenerative diseases.

John Grabbe, M.D. Based at Cambridge Hospital; provides a broad range of AP and CP services there. Sign out at MGH: Cambridge Hospital autopsies.

Fiona Graeme-Cook, MB, MRCPI. Hepatic and GI pathology. Sign out: Hepatic and GI pathology. Leads Telepathology program. Research: Clinical; colonic dysmotility, lymphoid and neuroendocrine disease of liver and GIT, development of telepathology protocols.

Nancy Lee Harris, M.D. Director of Residency Training Program and Head of Hematopathology. Sign out: Hematopathology, frozen sections, and autopsy. Research: Immunologic features of lymphoproliferative disorders, with an emphasis on characterization of non-Hodgkin's lymphomas and non-neoplastic lymphoid tissue with monoclonal antibodies. Co-director of the annual postgraduate course in surgical pathology.

E. Tessa Hedley-Whyte, M.D. Director of Neuropathology Unit. Sign out: Neuropathology surgicals, frozen sections, and autopsies. Research: Major areas of interest are: 1) Degenerative disorders of the nervous system, particularly Alzheimer's disease, as part of the Massachusetts Alzheimer's Disease and Related Disorders Program; 2) Immunocytochemical analysis of pituitary tumors and normal pituitary, at both the ultrastructural and the light microscopic level; 3) Quantitative analysis of the histological characteristics of brain tumors; and 4) Clinicopathological correlative studies of various diseases. Methods used include traditional light microscopy, morphometry, light and ultrastructural immunocytochemistry. Fellowship support is available for studies of Huntington's and Alzheimer's diseases.

Suzanne B. Keel, M.D. Bone and soft tissue pathology. Sign out: Bone and soft tissue, ENT, and frozen sections. Research: Clinicopathological studies of bone tumors and skull base tumors.

Wolfgang Klietmann, M.D. Director, Reference Laboratory operations for pathology. Promotion of international reference laboratory and post-graduate education activities. Research: Detection of mycobacteria in clinical specimens and susceptibility testing. Application of novel methods for rapid and direct testing.

Frederick C. Koerner, M.D. Head of Breast Pathology. Sign out: Small and large surgicals, frozen sections, and autopsies. Research: The role of viruses in the etiology of human breast cancer, and the use of monoclonal antibodies to identify patients at high risk for systemic disease.

Katharine Kosinski, M.D. Director of Pathology at Cambridge Hospital, Harvard and MIT Health Services. MGH Sign out: Cambridge Hospital autopsies.

Richard L. Kradin, M.D. Immunopathology and Pulmonary Units. Sign out: Autopsies, lung and cardiac pathology. Research: 1) T-lymphocytes in inflammation and neoplasia, particularly the activities of pulmonary dendritic cells, and 2) clinical cancer trials in tumor immunotherapy. Techniques utilized include tissue culture and immunochemistry, flow cytometry, Northern blotting, and immunocytochemistry.

James T. Kurnick, M.D. Molecular Pathology Research. Sign out: Autopsies. Research: Dr. Kurnick's activities in cellular immunology are focused on propagation and characterization of *in vivo* activated human T-lymphocytes. In addition, cell sorting and cell cloning are being employed in order to dissect the local inflammatory response to tumors, allografts, and infectious diseases. Techniques used include tissue culture, cell-surface phenotyping, T-cell receptor analysis by molecular techniques, and development of new monoclonal antibodies. Both *in vitro* and *in vivo* models are employed.

Michael Laposata, M.D., Ph.D. Director of Laboratory Medicine. Sign out: Clinical coagulation. Research: Fatty acid ethyl esters, esterification products of fatty acids, and ethanol are the focus of the research efforts. Fatty acid ethyl esters are mediators of ethanol-induced organ damage. Projects range from basic biochemistry to clinical studies on human subjects.

Lisa Lerner, M.D. Dermatopathology. Research: Role of nitric oxide in normal skin and severe cutaneous drug reactions. Significance of IgA deposits in cutaneous vasculitis. Sign out: Vulvar disease and inflammatory skin disease.

Kent B. Lewandrowski, M.D. Associate Director, Laboratory Medicine. Research: Pathology of the pancreas including chemical and histopathologic features of pancreatic neoplasms; pathology of acute experimental pancreatitis; point-of-care diagnostics.

David N. Louis, M.D. Co-Director of the Molecular Neuro-Oncology Laboratory. Sign out: Neuropathology surgicals and autopsies. Research: Pathology and biology of primary central nervous system tumors. The Molecular Neuro-Oncology Laboratory is engaged in molecular genetic and biological studies of human gliomas, and hereditary brain tumor syndromes.

Eugene J. Mark, M.D. Director of Autopsy Service. District Medical Examiner for the Commonwealth of Massachusetts. Head of pulmonary pathology. Sign out: Pulmonary pathology, cardiac pathology, frozen sections, and autopsies. Research: Clinical and pathological correlations of pulmonary interstitial disease, infections, pneumoconioses, and neoplasms of the lung and pleura. Consultation series of 6000 lung biopsies available for review. Associate Editor, Case Records of the MGH.

Robert T. McCluskey, M.D. Molecular Pathology Research. Renal pathology. Former Chief of the Pathology Service (emeritus). Research: Immunopathogenetic mechanisms in human and experimental renal disease, with emphasis on identification of antigens involved in antibody mediated glomerulonephritis and on effector mechanisms in experimental glomerulonephritis; also, analysis of receptor function of gp330/megalin, a member of the LDL receptor family.

Grace McKee, M.D. Cytopathology. Research interests: All aspects of breast carcinoma, particularly cytological grading and typing, differentiating between *in-situ* and invasive disease on cytological samples, refining the diagnosis of atypia and fluorescence *in-situ* hybridization using cytology specimens to detect gene overamplification. Other interests include the categorization of various types of benign proliferative lesions on cytology.

James Michaelson, Ph.D. Cancer Center. Research: 1) Studies on cellular heterogeneity of hepatocytes in the liver, and the role of cellular selection in determining the specific mix of these specialized cells, 2) Studies on the shape of the liver lobule, 3) The mathematical modeling of mitotic control and multicellular organization and, 4) The biochemical analysis of minor histocompatibility molecules in the mouse.

Martin C. Mihm, Jr., M.D. Senior Dermatopathologist. Sign out: Dermatopathology cases and consults. Research: Biology and pathology of malignant melanoma and the evolution of the delayed hypersensitivity reaction and allograft rejection in man. He established the Dermatopathology Residency Training Program at MGH and spearheaded the development of diagnostic immunofluorescence of the skin at MGH. He also studies the manifestations of cutaneous lymphoma and leukemia.

Joseph Misdraji, M.D. Gastrointestinal, breast and cytopathology. Research: Aspects of cytopathology, pancreatic pathology and lymphoma.

Marvin R. Natowicz, M.D., Ph.D. Director of Medical Genetics, Shriver Center. Runs diagnostic reference laboratory on inherited metabolic diseases. Research: Phenotype and mechanisms of inherited metabolic diseases.

G. Petur Nielsen, M.D. Bone and soft tissue pathology and genitourinary pathology. Sign out: Bone and soft tissue surgicals, genitourinary surgicals and frozen sections. Research: Mesenchymal tumors of the female genital tract. Pathology and biology of bone and soft tissue tumors.

John L. Niles, M.D. Immunopathology. Research: Immunopathology of renal disease and vasculitis with particular interest in antineutrophil cytoplasmic antibodies (ANCA) and their role in disease.

Esther Oliva, M.D. Gynecologic, obstetric, and urologic Pathology. Sign out: Gynecologic, obstetric, urologic Pathology and frozen sections. Research interests: Pathology and biology of ovarian and uterine tumors.

Eva Patalas, M.D. Forensic and Autopsy Pathology. Medical examiner. Sign out: Autopsy, cardiac and pulmonary pathology. Research: Sudden cardiac death, myocarditis, forensic applications of spectrophotometry.

Ben Z. Pilch, M.D. Chief, ENT, Head and Neck Pathology (MEEI/MGH). Sign out: ENT, head and neck, surgicals, and frozen sections. Research interests: Surgical pathology of the head and neck.

Martha B. Pitman, M.D. Cytopathology (Head of Fine Needle Aspiration Service) and gastrointestinal pathology, with a special interest in fine needle aspiration biopsy. Research: Clinical investigation of FNA diagnosis, particularly hepatocellular carcinoma.

Frederic Preffer, Ph.D. Director, Flow Cytometry Laboratory. The laboratory provides analysis of cell surface markers as well as DNA ploidy and cell cycle analysis, including four color diagnostic analysis of leukemias and lymphomas, immunodeficiencies and therapeutic monitoring of monoclonal antibody treatment and detection of stem cells. Research: 1) five-color cell sorting of progenitor cells from the blood of normal adult donors, and culturing the resulting highly purified cells in the presence of a variety of cytokines, resulting in the generation of both lymphoid and myeloid cells; 2) Analysis of patients' blood receiving mis-matched HLA-transplants.

Drucilla J. Roberts, M.D. Head of Perinatal and Pediatric Pathology. Sign out: Obstetric pathology - products of conception, fetuses, placentas, and perinatal autopsies. Research: molecular biology of pattern formation in vertebrate viscera (currently, the morphogenesis of chick hindgut). Clinical Research: dysmorphology - H&E diagnostic findings supportive of karyotypic anomalies in non-karyotyped cases; placental pathology of AIDS; placental pathology of confined placental mosaicism.

Andrew E. Rosenberg, M.D. Head of Bone and Soft Tissue Pathology. G.I. Pathology. Sign out: Small and large surgicals and frozen sections. Research: Clinical and pathological correlations of metabolic, inflammatory, degenerative, congenital, and neoplastic diseases of the musculoskeletal system. The application and diagnostic utility of immunohistochemistry and flow cytometry in bone and soft tissue tumors.

Kathryn L. Ruoff, Ph.D. Microbiology. Research: Identification and classification of clinically important streptococci and other Gram-positive cocci; use of molecular methods for detection of microbial pathogens.

Susan Saidman, Ph.D. Director, Histocompatibility Laboratory. Research: Transplant immunology and histocompatibility testing. Analysis of VNTR loci to evaluate engraftment or disease relapse after bone marrow transplant; molecular assays to study mixed chimerism and transplantation tolerance; alloantibodies in liver transplantation; HLA and disease association studies.

Eveline E. Schneeberger, M.D. Renal pathology. Director of Lung Biology and Immunology Laboratory. Sign out: Renal. Research: Immune function of accessory cells in the lung. Characterization, regulation and function of pulmonary dendritic cells in different tissue compartments of the lung using *in vivo* and *in vitro* culture techniques and assays; biochemical and structural basis for the permeability properties of the air-blood barrier, specifically, the structure, regulation and biochemical composition of intercellular tight junctions and the role of membrane lipids in their function.

Robert E. Scully, M.D. Clinicopathological aspects of gynecological and testicular disease. Research: Ovarian and testicular neoplasms. Co-director, annual national course on gynecological pathology. Editor, Case Records of the Massachusetts General Hospital, published in the New England Journal of Medicine. Dr. Scully gives many invited lectures and seminars in the U.S. and abroad. He spends much of his time looking at unusual cases sent to him in consultation. These cases are made available for resident review. Dr. Scully is the senior author of the Third Series Fascicle on Tumors of the Ovary and Fallopian Tube, and the author of the W.H.O. Histological Typing of Ovarian Tumours (1999).

Dennis Sgroi, M.D. Molecular Pathology Research. Breast pathology. Sign out: Breast pathology. Research: 1) molecular pathogenesis of breast cancer, using laser capture microdissection and cDNA array analysis; 2) role of macrophage adhesion molecule, Sialoadhesin, in macrophage activation.

Sheffer, Eric, M.D. Based at Cambridge Hospital. Provides a broad range of diagnostic and laboratory management services.

Timothy Skelton, M.D., Ph.D. Molecular Pathology Research. Director of Clinical Hematology Laboratory. Research: Role and structure of carbohydrates in cell adhesion molecules. Glycosylation has recently been identified as a major regulator of adhesion molecule function. He is identifying the specific oligosaccharide synthetic enzymes (glycosyltransferases) involved in generating the functionally important modifications of adhesion molecules using a combination of traditional molecular and cell biology techniques and a novel biochemical approach utilizing capillary electrophoresis technology. In addition, he is exploring the potential of using glycosyltransferase inhibitors to modulate adhesion molecule function; a potential therapeutic approach for metastatic disease.

Rex Neal Smith, M.D., Ph.D. Cardiovascular, immunopathology, pulmonary and transplantation pathology. Clinical service and sign out includes cardiovascular and pulmonary surgical pathology, autopsy pathology, ANCA, and flow cytometry. Research interests include transplantation pathology and the immunopathology of diabetes as a member of the JDF-Harvard Center for Islet Transplantation.

Ivan Stamenkovic, M.D. Molecular Pathology Research and Cancer Center. Program Director, Departmental NIH Institutional Training Grant on Molecular Immunology and Tumors. Research: 1) molecular mechanisms of cell-cell and cell-matrix interaction in tumor cell growth and metastasis and lymphocyte activation and trafficking. The hyaluronate (HA) receptor CD44 plays an important role in cell-cell as well as in cell matrix adhesion. He has shown that CD44-HA interaction enhances tumor growth and metastasis in vivo, both of which can be blocked by CD44-IG fusion proteins and by HA. 2) Regulation of apoptotic cell death. via superoxide anion concentration and Fas-mediated apoptosis. He is developing approaches which will enable selective elimination or protection of specific cell populations. Such approaches would provide a major step to controlling tumor growth, autoimmune disease, and potentially preventing or delaying degenerative diseases.

Christopher P. Stowell, M.D., Ph.D. Director, Blood Transfusion Service. Clinical pathology and blood banking. Research: 1) clinical applications of therapeutic apheresis and immunoadsorption; 2) perioperative use of hemoglobin substitutes; and 3) perioperative use of erythropoietin.

Wanda Szyfelbein, M.D. Cytopathology and GYN pathology. Sign out: General cytopathology, GYN pathology, and thyroid pathology. Research: Dr. Szyfelbein has a special interest in fine needle aspiration of thyroid and liver, and is currently reviewing thyroid cases for

clinicopathological studies. In addition, she has been reviewing a large number of cases of struma ovarii from Dr. Robert E. Scully's consult files in order to document unusual features, a project which has resulted in two recent publications.

Zbigniew M. Szczepiorkowski, M.D., Ph.D. Assistant Director, Blood Transfusion Service. Laboratory Medicine and Transfusion Medicine. Research: Fatty acid ethyl esters. Clinical studies in apheresis based therapies, including peripheral stem cell based therapies.

Rosemary Tambouret, M.D. Cytopathology and GYN Pathology. Sign out: Cytopathology and GYN pathology. Research: GYN and non-GYN cytology, GYN pathology.

Elizabeth M. Van Cott, M.D. Director of Coagulation Laboratory. Sign out: Clinical coagulation and lipids. Research: Platelet lipids and fatty-acid acylation. Clinical studies in thrombosis and hemostasis.

James Versalovic, M.D., Ph.D. Assistant Director, Microbiology Laboratory. Sign out: Molecular microbiology - HIV, HSV, *mycoplasma*, *chlamydia/Neisseria gonorrhoeae*. Research: *Helicobacter* pathogenesis, molecular mechanisms of antimicrobial resistance, molecular epidemiology and rep-PCR genotyping of bacterial pathogens, sequence-based identification of microbial pathogens, contributions of gastrointestinal flora to inflammatory bowel disease (IBD).

Jean-Paul G. Vonsattel, M.D. Laboratory: Neurogenetic Unit. Neuropathology. Sign out: Neuropathology surgicals and autopsies. Research: Molecular biology and clinicopathological correlations of Huntington's disease. Neuropathologist for the McLean Hospital Brain Bank (500 cases/year).

Johnson Wong, M.D. Dr. Wong's laboratory focuses on developing and applying T cell immunomodulators to the study and treatment of HIV-associated disease, allograft rejection, and autoimmunity. His laboratory has created families of T cell specific bispecific monoclonal antibodies (BSMAB) that has two different antigen binding sites sharing a common Fc region. Many of these BSMABs have unusual properties, enhanced specificity, and lower toxicity than the parent monoclonal antibodies. The efficacy of these BSMABs are at least equal to, and often exceed, the efficacy of the parent mAbs. These antibodies are used in pre-clinical and basic research to improve immunotherapy of AIDS, since they can purify and expand selected populations of T cells *in vitro* and *in vivo*.

Chin-Lee Wu, M.D., Ph.D. Urology Research Laboratory. Sign out: Genitourinary pathology and head and neck pathology. Research: basic mechanism of cell cycle regulation and oncogenesis; tumorigenesis and prognosis of prostate cancer.

Jane Yang, M.D. Clinical chemistry and toxicology. Research interests include: 1) Pharmacology and toxicity of various agents especially cyclic antidepressants, neuroleptics and benzodiazepines; ethylene glycol, its metabolism, and the correlation with clinical toxicity. Studies of the predictive value of toxicology screens and prognostic factors in tricyclic drug overdose in collaboration with emergency medicine physicians. 2) Basic science research in the area of peroxisomal lipid metabolism with Dr. Michael Laposata. Study of the pathogenesis of various neurologic disorders such as Refsum disease, Zellweger syndrome, and adrenoleukodystrophy which are associated with defective peroxisomes and the accumulation of unusual fatty acids in the central nervous system, plasma and other tissues. Neuroglial cell culture lines and gas

chromatography-mass spectrometry are used to study the effects of abnormal fatty acid distribution and to examine potential therapeutic agents such as Lorenzo's oil in order to elucidate their mechanisms of action and to identify potential toxicity.

Robert H. Young, M.D. Director of Surgical Pathology. Gynecological and genitourinary pathology. Sign out: GYN and GU surgicals and frozen sections. Research: Clinicopathological studies in the field of gynecological and urological pathology. Dr. Young with Dr. Scully has written a book on testicular tumors, and Dr. Young is the editor of a book on the pathology of the urinary bladder and uterus. He is co-author with Dr. Scully of the 3rd Series Fascicle on Tumors of the Ovary and Fallopian Tube, and is co-author of the two 3rd Series Fascicles on Tumors of the Male Genital System. Co-director of annual national courses on surgical pathology and gynecological pathology.

Lawrence R. Zukerberg, M.D. Hematopathology-Gastrointestinal Pathology. Sign out: Gastrointestinal pathology, hematopathology and frozen sections. Research: 1) molecular pathology and protein chemistry of cell cycle kinases, cyclins, and related inhibitor molecules in neoplasia, 2) clinicopathological studies of gastrointestinal tract including liver and pancreas; immunohistology and molecular biology of lymphoproliferative disorders.