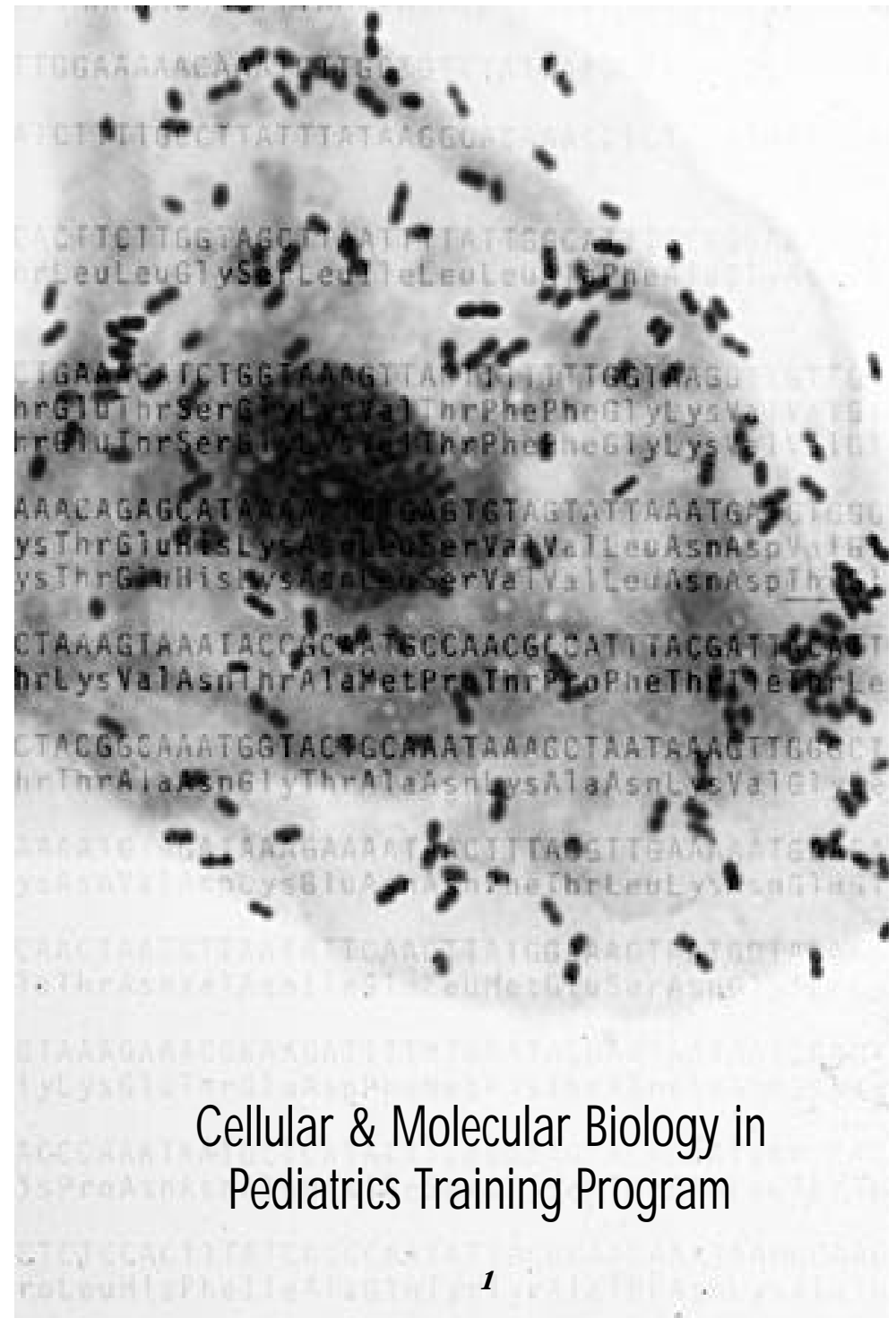


Contents

Cellular & Molecular Biology in Pediatric Training Program	1
Pediatric Cardiology Fellowship	6
Pediatric Critical Care Medicine Fellowship	12
Pediatric Endocrinology Fellowship	16
Pediatric Gastroenterology Fellowship	19
Medical Genetics Fellowship	23
Pediatric Hematology/Oncology Fellowship	26
Pediatric Infectious Diseases Fellowship	31
Neonatal-Perinatal Medicine Fellowship	35
Pediatric Nephrology Fellowship	40
Pediatric Neurology Fellowship	44
Pediatric Pulmonary Fellowship	47
Pediatric Rheumatology Fellowship	50
University of Michigan Medical Center	55
C.S. Mott Children's Hospital	58
Ann Arbor	59



Cellular and Molecular Biology in Pediatrics Training Program

The Cellular and Molecular Biology in Pediatrics Training Program is designed to prepare pediatricians for independent, research-oriented careers in academic medicine. Its specific goal is to provide new pediatric investigators with the powerful research tools of cellular and molecular biology that will allow them to explore, in depth, basic questions related to children's health.

The Training Program funds up to two years of research for fellows who have completed the clinical year of training in any of the pediatric clinical subspecialty areas. Application is made to one of the pediatric subspecialty fellowship programs at the University of Michigan, and, subsequently, the Program Director makes application for the fellow to receive research support from the Cellular and Molecular Biology in Pediatrics Training Program. In addition to completion of one year of clinical fellowship training in any pediatric clinical discipline, eligibility requirements include Pediatric Board certification or eligibility and, since this program is supported by the National Institutes of Health, U. S. citizenship or permanent resident status.

A very attractive feature of this Training Program is the intensive three-month lab/lecture course on basic cell and molecular biology techniques, specifically designed for trainees who have not had recent experience with these tools. This course is offered through the University of Michigan Medical School at the beginning of the research experience. Other features of the program include attendance at Pediatric Department and University-wide research seminars, presentation at work-in-progress seminars, and academic skills workshops at which the trainees will learn to use statistical analysis in analyzing their results, to write abstracts, grants, and manuscripts, to

make scientific presentations, and to understand the academic enterprise.

The goal of this Training Program is to educate the future leaders in academic pediatrics. Thus, fellows at this point in their training will focus on developing research skills around a project selected (by agreement with their mentors) to provide exposure to important cell and molecular techniques, to be able to be completed in the training period, to be the "fellow's project", and to take advantage of the expertise of the mentor and his/her collaborators.

The research project will be conducted in the laboratory of one of the Program mentors who have been chosen for their success as investigators and their excellence in teaching and mentoring. These research mentors may be selected from a large number of outstanding scientists either within the Department of Pediatrics or from one of the basic science or clinical science departments at the University of Michigan Medical School. Trainees will have access to the University of Michigan libraries, the animal facility, the statistical and computer consultation laboratories, and the Biomedical Research Core Facilities that offer services in DNA and protein analysis and synthesis, electron microscopy, hybridoma construction, transgenic mouse construction, flow cytometry, and vector and cell culture use.

Areas of Research

Developmental biology
Cancer biology
Structural biology
Neuroscience
Gene expression
Gene therapy
Immunology
Molecular genetics
Microbial pathogenesis
Pharmacology
Signal transduction
Receptor biology
Organogenesis

Features of Training Program

1. Pediatric-wide research seminars
2. Work-in progress seminars
3. Programmatic seminars
4. Academic skills workshops
 - statistics
 - abstract writing
 - grant writing
 - manuscript writing
5. Intensive 3-month lab/lecture course on basics of cell and molecular biology techniques
6. Access to Medical System Core Laboratories

University of Michigan-wide Faculty

Huda Akil, Ph.D., *Professor of Psychiatry*
Sally A Camper, Ph.D., *Professor, Depts. Human Genetics and Internal Medicine*
Victor J. DiRita, Ph.D., *Associate Professor of Microbiology and Immunology*
Joseph Fantone, M.D., *Professor of Pathology*
Eric Fearon, M.D., Ph.D., *Associate Professor of Internal Medicine*
Eva Feldman, M.D., Ph.D., *Professor of Neurology*
David A. Fox, M.D., *Professor of Internal Medicine*
Betsy Foxman, Ph.D., *Professor of Epidemiology*
Robert S. Fuller, Ph.D., *Professor of Biological Chemistry*
David Ginsburg, M.D., *Professor of Internal Medicine & Investigator, Howard Hughes Medical Institute*
Randal J. Kaufman, Ph.D., *Professor of Biological Chemistry & Investigator, Howard Hughes Medical Institute*
Ronald J. Koenig, M.D., Ph.D., *Professor of Internal Medicine*
Steven L. Kunkel, Ph.D., *Professor of Pathology*
John B. Lowe, M.D., *Professor of Pathology & Investigator, Howard Hughes Medical Institute*
Benedict R. Lucchesi, M.D., Ph.D., *Professor of Pharmacology*
Benjamin Margolis, M.D., *Associate Professor of Internal Medicine & Assistant Investigator, Howard Hughes Medical Institute*
David M. Markovitz, M.D., *Associate Professor of Internal Medicine*
Miriam Meisler, Ph.D., *Professor of Human Genetics*
Jack M. Parent, M.D., *Assistant Professor of Neurology*
James A. Shayman, M.D., *Professor of Internal Medicine*
Theodore J. Standiford, M.D., *Associate Professor of Internal Medicine*
Robert M. Strieter, M.D., *Professor of Internal Medicine*
Galen B. Toews, M.D., *Professor of Internal Medicine*
Stephen J. Weiss, M.D., *Professor of Internal Medicine*
John A. Williams, M.D., Ph.D., *Professor of Internal Medicine and Chair of Physiology*

Pediatric Cardiology

Pediatric Cardiology Fellowship

DIVISIONAL FACULTY

Albert P. Rocchini, M.D., *Division Director*

- Interventional cardiac catheterization and hemodynamics
- Hypertension

Macdonald Dick, M.D., *Director of Fellowship Program*

- Arrhythmias/Electrophysiology

Stephanie Burns-Wechsler, M.D.

- Congenital heart disease in genetic syndrome
- Clinical cardiology

John Charpie, M.D., Ph.D

- Cardiac catheterization
- Cardiovascular Intensive Care
- Vascular smooth muscle physiology

Dennis Crowley, M.D.

- Cardiovascular Intensive Care
- Cardiac transplantation
- Kawasaki disease

Gregory Ensing, M.D.

- Transesophageal echocardiography
- Cardiac genetic syndromes

Peter Fischbach, M.D.

- Electrophysiology
- Pacemaker therapy and management
- Cardiac pharmacology

Robert Gajarski, M.D.

- Cardiovascular Intensive Care
- Cardiac transplantation

Caren Goldberg, M.D.

- Preventive Cardiology
- Echocardiography
- Outcomes research

Carlen Gomez, M.D.

- Echocardiography
- Fetal echocardiography

Joseph Graziano, M.D.

- Cardiac catheterization
- Cardiovascular Intensive Care

Thomas Kulik, M.D.

- Cardiovascular Intensive Care

Thomas Lloyd, M.D.

- Interventional cardiac catheterization
- Cardiac Function and hemodynamics

Achiahu Ludomirsky, M.D.

- Pediatric Doppler transesophageal
- Echocardiography
- Fetal echocardiography

Amnon Rosenthal, M.D.

- Natural history
- Diagnosis and management of congenital heart malformations
- Hematologic complications of cardiovascular disease

Mark Russell, M.D.

- Molecular genetics of congenital heart disease
- Genetic controls of cardiac development

Margaret Samyn, M.D.

- Clinical trials of cardiac medications
- Prevention clinic

Gerald Serwer, M.D.

- Pacemaker therapy and management
- Computer application in medicine
- Fetal ultrasound

CLINICAL COMPONENT

The Pediatric Cardiology Fellowship at the University of Michigan is flexible and can be tailored to the individual needs and interests of each fellow, commensurate with the requirements of the accrediting residency review committees and the needs of the division. The first 18-24 months are usually devoted to developing skills required for clinical care (80%) and to developing skills in teaching and clinical investigation (20%). The third year is divided between 60-80% in research and 20-40% in clinical education and duties. Inpatient service includes 3-4 months on the medical floor service in the first year and 3-4 months in the intensive care unit the second year. The fellow participates in outpatient clinic for 1/2 day a week throughout the three-year fellowship. Clinical rotations include outpatient and inpatient management of heart disease in children, cardiac catheterization including interventional procedures, electrophysiology studies and ablation, and transthoracic, transesophageal, and fetal echocardiography. Unique opportunities exist for development of expertise in interventional catheterization, clinical electrophysiology, and echocardiography, especially fetal cardiology. A fourth year fellowship is available for selected fellows in these technical areas.

Multiple interdisciplinary interactions are available and highly active. The division has a strong and close working relationship with Pediatric Cardiothoracic Surgery under the programmatic umbrella of the University of Michigan Congenital Heart Center. The members of the division, including the fellows, further interact with Medical Cardiology, attending and participating in their teaching conferences including Cardiology Grand Rounds, and Cardiology ECG Conference held weekly. The fellows and faculty interact with general pediatric faculty as well as attend the conferences of the Pediatric Department.

RESEARCH COMPONENT

Opportunities to participate in research abound. Virtually all members of the pediatric cardiology staff participate in clinical studies including outcomes research, design and development of innovative/interventional practices and devices, development of imaging techniques, and analysis of the health care system.

Unique research opportunities are available for selected qualified fellows in the course entitled "Clinical Research Design and Biostatistics" offered by the School of Public Health every 18 months. A Master of Science Degree is awarded following successful completion of this program. A number of pediatric cardiology fellows have successfully completed the program. In addition, opportunities for basic science research, in a number of divisional, as well as university, laboratories exist. An introduction to molecular biology course is offered by the Medical School each summer and selected and basic research directed fellows are encouraged to enroll. Several of the faculty members have ongoing research activities in cardiac morphogenesis, genetic regulation of cardiac development, and the identification of cardiac disease related genes. In addition, several faculty members explore vascular biology and operate active laboratories in this field. One investigator has a nationally funded program in the mechanisms of hypertension, particularly involving insulin resistance and obesity.

In addition, interactions between other disciplines and units and members of the Division have an established track record at Michigan; these include: collaboration with Pediatric Cardiovascular Surgery, the Departments of Pharmacology, Pathology, and Physiology, the Divisions of Medical Cardiology, Human Genetics, and Hypertension within the Department of Internal Medicine, the Upjohn Center for Clinical Pharmacology,

the School of Pharmacy, the School of Public Health, the Howard Hughes Institute, the College of Engineering and Computer Science, the Cardiovascular Research Center, and the Program for Organogenesis. In addition, interactions within the Department of Pediatrics and Pediatric Surgery are ongoing and available.

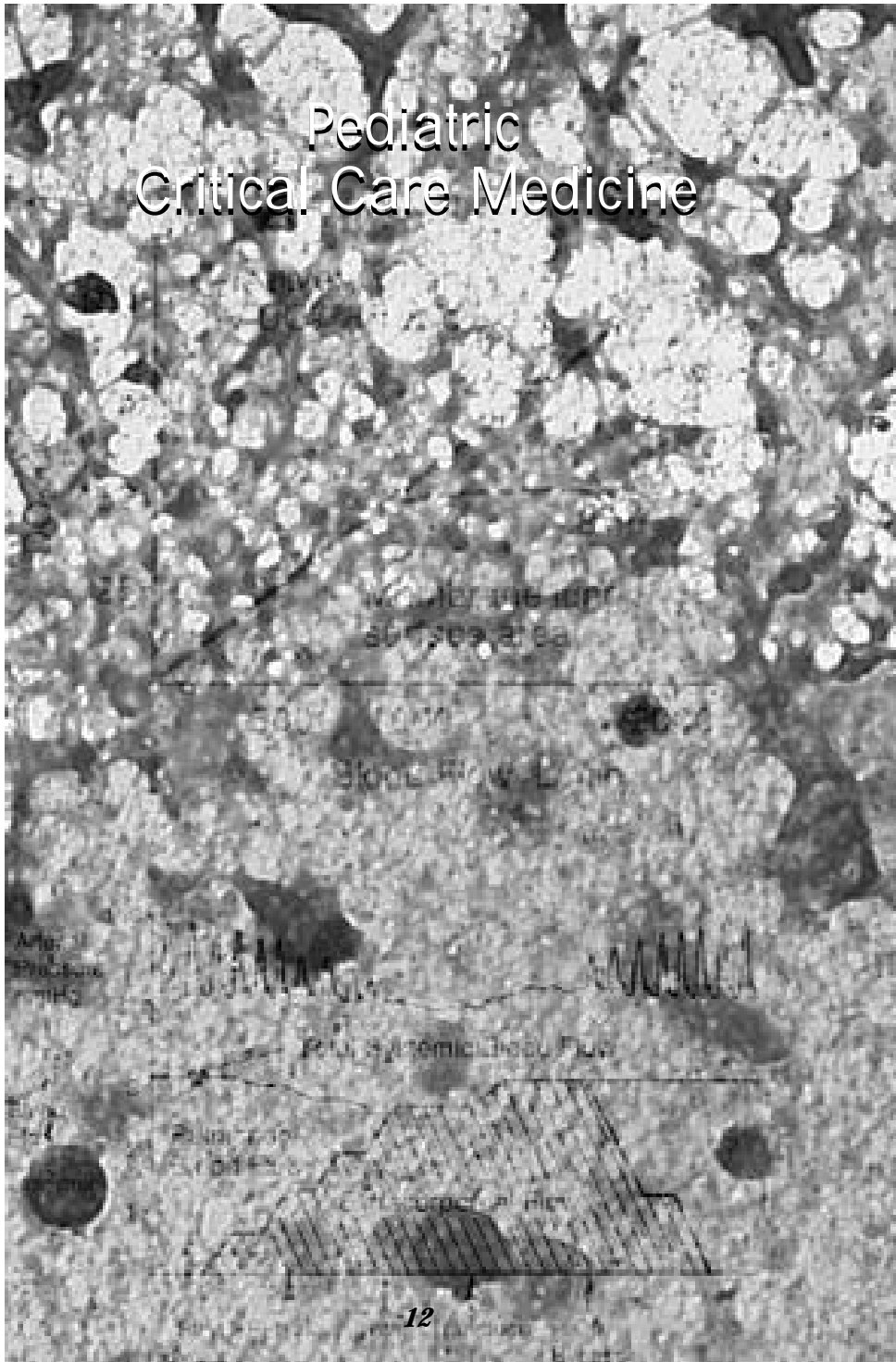
For Information and Application

Macdonald Dick, II, M.D., Director,
Pediatric Cardiology Fellowship Program
University of Michigan Health Systems
Pediatric Cardiology
1500 East Medical Center Drive
F1310 MCHC Box 0204
Ann Arbor, Michigan 48109-0204

(734) 936-8993 - Office

(734) 936-9470 - Fax

e-mail: mdick@umich.edu



Pediatric Critical Care Medicine Fellowship

DIVISIONAL FACULTY

Joseph R. Custer, M.D., *Division Director*

- End of life, palliative care, hospice care, pulmonary physiology

Susan L. Bratton, M.D., M.P.H.

- Quality of care assessment, health disparities in poor children

Gail M. Annich, M.D., M.P.H.

- Platelet and anticoagulant physiology in artificial circuits

Frank W. Moler, M.D., M.S.

- Epidemiology of respiratory syncytial virus infection

CLINICAL COMPONENT

The Pediatric Critical Care Medicine Training program at the University of Michigan is committed to training leaders in academic critical care who also demonstrate paradigmatic and compassionate clinical skills.

Trainees spend 12 months on the clinical PICU service with electives in surgery, cardiothoracic post-operative care, anesthesia, nephrology and trauma burn. In house call averages every fourth to fifth night.

The quality of our graduates is underscored by data from annual in-service training exams, the Critical Care Board Scores, the fellowship match, and the competitiveness of graduates for positions following training here at Michigan.

Past trainees are division directors, unit directors or co-directors, or fellowship directors at Duke, San Antonio, Seattle, Tulane, The University of Arizona and The University of Cincinnati.

RESEARCH COMPONENT

Trainees generally follow two templates in preparation for an academic career.

Trainees interested in careers in academic basic science are eligible to compete for support under the training grant in Cell and Molecular Biology. These individuals have time protected for research.

The majority of our trainees are interested in hypothesis driven clinical trials and outcomes research. In the first year, research projects, hypothesis, study design and statistical methodology are developed and the appropriate mentor is identified. Trainees are mentored by one of the division's three faculty with Master Degrees in public health or clinical research design.

Multidisciplinary research is performed with other divisions within the Departments of Pediatrics and Surgery, the Extracorporeal life support program, and the School of Public Health.

Trainees are expected to present the results of their work at National Symposia during the second or third year of training.

Trainees must demonstrate the ability to independently author and submit a grant proposal in the second half of the training program.

Trainees are expected to meet the research requirements established by the sub-board of Pediatric Critical Care Medicine. The majority of trainees exceed these requirements and are prepared to be principal investigators and mentors during their careers.

For Information and Application

Joseph R. Custer, M.D., *Director,*
Pediatric Critical Care Medicine
University of Michigan Health System
F-6884/Mott Box 0243
Ann Arbor, MI 48109-0243

Phone: (734) 764-5302

FAX: 734-647-5624

e-mail: jcuster@umich.edu



Pediatric Endocrinology Fellowship

DIVISIONAL FACULTY

Carol M. Foster, M.D., *Division Director*

- Neural mechanisms that control the onset of puberty
- Role of gonadal peptides in regulating FSH secretion in developing girls

Nancy J. Hopwood, M.D.

- Endocrine effects on growth
- Diagnosis of growth disorders

Josephine A. Kasa-Vubu, M.D.

- Effect of exercise and body composition on gonadotropin secretion and on the timing and tempo of puberty

Delia M. Vazquez, M.D., *Fellowship Program Director*

- Effect of early life stress and vulnerability to disease states
- Role of stress in regulating growth hormone secretion

Vasantha Padmanabhan, Ph.D.

- Regulation of secretion of gonadal peptides in the ovaries during development

CLINICAL COMPONENT

Pediatric endocrinology training is carried out in an outpatient setting. Three half-day experiences of general diabetes care, one half day of intensive insulin management, and 3 half-days of general endocrinology experience are available each week. Fellows also perform consultations and manage children admitted to the Mott Children's Hospital. There are about 25 new consultations each

month. Fellows have the opportunity to attend clinics with Adult endocrinology mentors to participate in adult thyroid and adrenal management. Participation in a clinical research project conducted through the Clinical Research Center of the University of Michigan is encouraged.

RESEARCH COMPONENT

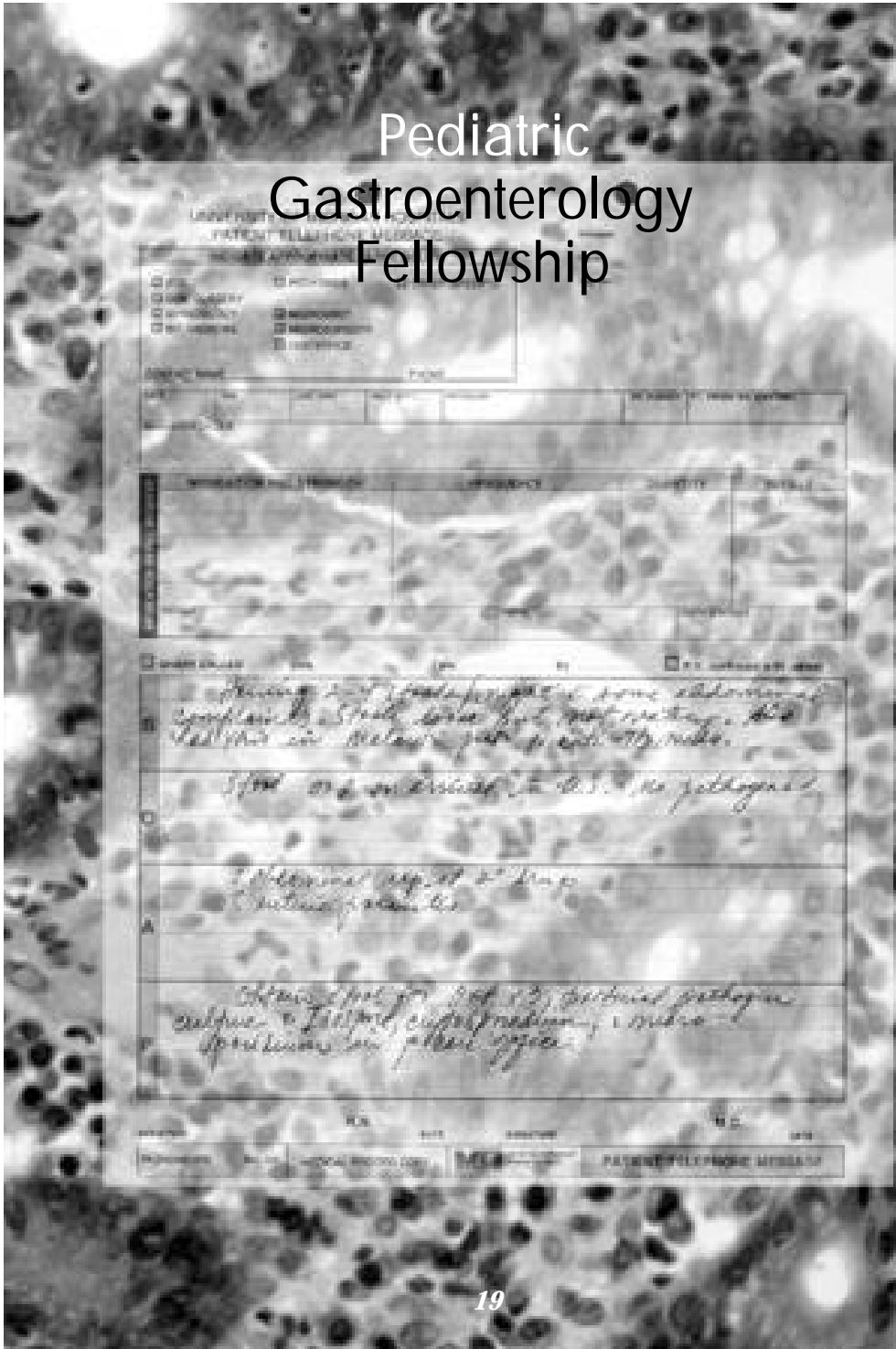
Fellowship trainees may participate in the research projects of all faculty members within the division. Fellows may extend experiences by short projects to learn specialized techniques in any laboratory within the University. Interdisciplinary research is encouraged. Research partnerships have been developed in the Reproductive Sciences, for growth research with Adult Endocrinology and Kinesiology, and with the Center for Organogenesis, the Neuroscience Program, Biological Program, Center for Human Growth and Development, the Michigan Diabetes Research and Training Center, and the School of Public Health.

For Information and Application

Delia M. Vazquez, M.D.
Pediatric Endocrinology
University of Michigan
D1205 MPB, Box 0718
Ann Arbor, MI 48109-0718

Phone: (734) 764-5175

Email: dmvazq@umich.edu



Pediatric Gastroenterology Fellowship

DIVISIONAL FACULTY

Chris J. Dickinson, M.D., *Division Director, Director of Fellowship Program*

- Molecular mechanisms responsible for the post-translational processing of gastrointestinal peptide hormones
- Characterization of enzymes responsible for the endo-proteolysis of progastrin
- Signal transduction mechanisms that mediate the trophic effects of G-Gly, a gastrin post-translational processing intermediate

Khalil N. Bitar, Ph.D.

- Role of neuropeptides in the regulation of smooth muscle activity in the gut
- Role of heat shock-like 27kd protein (Hsp27) in PKC mediated contraction

Pamela Brown, M.D., Ph.D.

- Growth factors and intestinal adaptation
- Growth and development in children with short bowel syndrome
- Growth in chronic disease
- Growth factors and liver regeneration

Ronald Holmes, M.D.

- Liver transplantation
- Metabolic diseases

R. Bhanu Pillai, M.D.

- Abdominal pain in children
- Novel therapies in the treatment of inflammatory bowel disease

Cheryl Gariepy, M.D.

- Development of the enteric nervous system
- Animal models of Hirschsprung's disease

CLINICAL COMPONENT

Fellows will be fully trained in all areas of clinical pediatric gastroenterology and hepatology. The University of Michigan, as the only center performing liver transplants within the state, attracts a diverse population of hepatology patients. There is also a large inflammatory bowel disease population available for clinical research. The division has close clinical ties with adult Gastroenterology. This unique interaction has several benefits for fellows including opportunities for clinical rotations on the adult GI service, rotations in a GI physiology laboratory for experience with manometry, carbohydrate tolerance tests, pancreatic function tests, and pH probe testing. Pediatric GI fellows can also obtain further training in various GI endoscopic procedures. They also spend 12 months on an inpatient service with the remainder of their time devoted to research. Clinical responsibilities during the research training will be limited to a half day per week.

RESEARCH COMPONENT

Pediatric GI fellows at the University of Michigan have many potential options to pursue their research interests. In addition to working with the three NIH funded laboratories of the pediatric GI faculty, fellows can also choose to work with members of the adult GI division or in the Department of Physiology. These opportunities outside the division include treatment of viral hepatitis, elucidation of the molecular mechanisms regulating appetite, the regulation of pancreatic function, gastrointestinal motility,

regulation of gastric acid secretion, as well as state of the art studies in outcomes research. There is also a NIH funded Gastrointestinal Peptide Research Center that promotes interdisciplinary collaborations between the departments of pediatrics and adult gastroenterology as well as surgery, biochemistry, and physiology.

For Information and Application

Chris J. Dickinson, M.D., *Director,*
Pediatric GI Fellowship Training Program
University of Michigan Medical Center, Research Office
1150 West Medical Center Drive, MSRB1, Room A520
Ann Arbor, MI 48109-0656

Phone: 734-763-2005

FAX: 734-647-9703

e-mail: chrisjd@umich.edu



Medical Genetics Fellowship

DIVISIONAL FACULTY

Jerome L. Gorski, M.D., *Division Director*

- Rho/Rac GTPases and cytoskeleton; Aarskog syndrome; incontinentia pigmenti

Jeffrey W. Innis, M.D., Ph.D., *Director of Fellowship Program*

- HOX genes and limb malformation syndromes in mice and humans

Donna Martin, M.D., Ph.D.

- Homeobox genes in pituitary and mammalian brain development

David Kurnit, M.D., Ph.D.

- Molecular diagnostics of quantitative PCR analysis

Mason Barr, M.D.

- Teratogenesis of ACE inhibitors, fetal pathology

CLINICAL COMPONENT

The Medical Genetics Residency Program is a RRC-accredited program providing broad clinical genetics training leading to American Board of Medical Genetics certification in Clinical Genetics. Concurrent training leading to certification in Clinical Cytogenetics, Clinical Biochemical Genetics, and Clinical Molecular Genetics is also offered. The second goal is to provide research opportunities in order to develop an academic research career. The clinical training is 18 months of inpatient/outpatient rotations in Pediatric Genetics, Biochemical Genetics, Prenatal Genetics and Teratology,

Adult Genetics, Cancer Genetics and Pediatric/Adult Neurogenetics. Clinical rotations are coupled with didactic courses, Pediatrics Outreach Genetics clinics and rotations in the cytogenetics, biochemical genetics, and molecular diagnostics laboratories.

RESEARCH COMPONENT

During the two-year clinical training program, six months are devoted to research. Due to the distributed clinical rotations, time is also available during each rotation to meet with research faculty, begin research projects, or write grant applications. The resident is encouraged to write postdoctoral fellowship applications during this time to support their genetics research after the clinical training is completed

For Information and Application

Jeffrey W. Innis, M.D., Ph.D.

Director, Medical Genetics Residency Program
University of Michigan
Taubman Center, 1924, Box 0318
Ann Arbor, MI 48109-0318

Phone: 734-764-0579

FAX: 734-936-6897

URL: outerped.med.umich.edu/

e-mail: innis@umich.edu



Pediatric Hematology/Oncology

Pediatric Hematology/Oncology Fellowship

DIVISIONAL FACULTY

Laurence A. Boxer, M.D., *Division Director*

- Regulation of granulocyte phagocytosis
- Disorders of granulocyte function and number

Valerie P. Castle, M.D.

- The biology of neuroblastoma

Nabanita Datta, Ph.D.

- Regulation of megakaryocyte endomitosis

Samir Hanash, M.D., Ph.D.

- Mutational Effect of radiation and chemotherapy
- Neuroblastoma cell biology
- Proteomics

Ken Cooke, M.D.

- Mechanisms of graft vs host disease

James Ferrara, M.D.

- Mechanisms of graft vs host disease

Matthew Hansen, M.D.

- Mechanism of immune synapse formation

Rajen Mody, M.D.

- Biology of neuroblastoma

James Williams, M.D.

- Novel treatments for ITP

Raymond J. Hutchinson, M.D.

- Children's Oncology Group
- Neuroblastoma
- Bone Marrow Transplantation

John E. Levine, M.D.

- Bone marrow transplantation
- Adoptive cellular immunity for leukemia treatment

Michael Long, Ph.D.

- Mechanisms/factors regulating the various stages of human and murine megakaryocyte differentiation
- Mechanisms of signal transduction in hematopoietic cells
- Identification and role of bone stem cells
- Actions of cellular oncogenes in normal hematopoietic cells

Steven Pipe, M.D.

- Regulation of coagulation Factor VIII synthesis and activity

Daniel S. Wechsler, M.D., Ph.D.

- Regulation of gene expression by transcription factors
- Pathogenesis of glioblastoma tumors and neuroblastoma
- Biology of IIq23 translocation

Gregory Yanik, M.D.

- Novel stem cell approaches to treating neuroblastoma

CLINICAL COMPONENT

During the first year of training, fellows are exposed to a variety of hematology and oncology patients which should enable them to gain expertise in the management of children and young adults with wide ranging problems in hematology, oncology and immunology. During the six months spent on the Hematology/Oncology inpatient rotation, the fellow is responsible for supervision of three pediatric residents assigned to the Pediatric Hematology/Oncology service. While on the inpatient service, the fellow is also responsible for providing consulta-

tions regarding patients admitted to other sections of the pediatric department. Three months are spent on the Pediatric Bone Marrow Transplant service, during which the fellow works together with Pediatric BMT attendings in caring for BMT in- and outpatients. Two weeks are spent on the pathology service, where the fellow is exposed to immunologic evaluation of malignant cells using the fluorescent activated cell sorter, and histopathology of pediatric leukemias and solid tumors. A two-week rotation in the Blood Bank allows the fellow to become familiar with techniques and complications of blood product transfusions. An additional month is divided between in-depth explorations of radiation oncology and coagulation. Throughout the inpatient experience, trainees directly interact with other pediatric and adult specialty services, including pediatric surgery, pathology, radiology, and radiation oncology. The fellow will be assigned to one weekly outpatient clinic during which time he/she is responsible for seeing continuity patients, and for supervising medical students and residents who are present in that clinic. Beginning midway through the second fellowship year, the fellow's continuity clinic will be held every other week; during alternate weeks, the fellow will attend specialty clinics, including those dealing with brain tumor, coagulopathy or sickle cell disease patients.

Teaching of fellows is given high priority by members of the section of Pediatric Hematology/Oncology. A weekly course on review of normal and abnormal bone marrow smears directed at the first year fellows begins in the summer, and extends through early fall. In addition to ward attending rounds, several regular teaching conferences provide instruction in a variety of clinical and research topics related to Pediatric Hematology/Oncology and Pediatric BMT issues: a didactic Pediatric Hematology/Oncology conference and an interactive Pediatric Hematology/Oncology Case Conference are held weekly; a multidisciplinary Pediatric Hematology/Oncology Tumor

Board takes place every other week, and a Pediatric Hematology/Oncology Journal Club occurs monthly.

RESEARCH COMPONENT

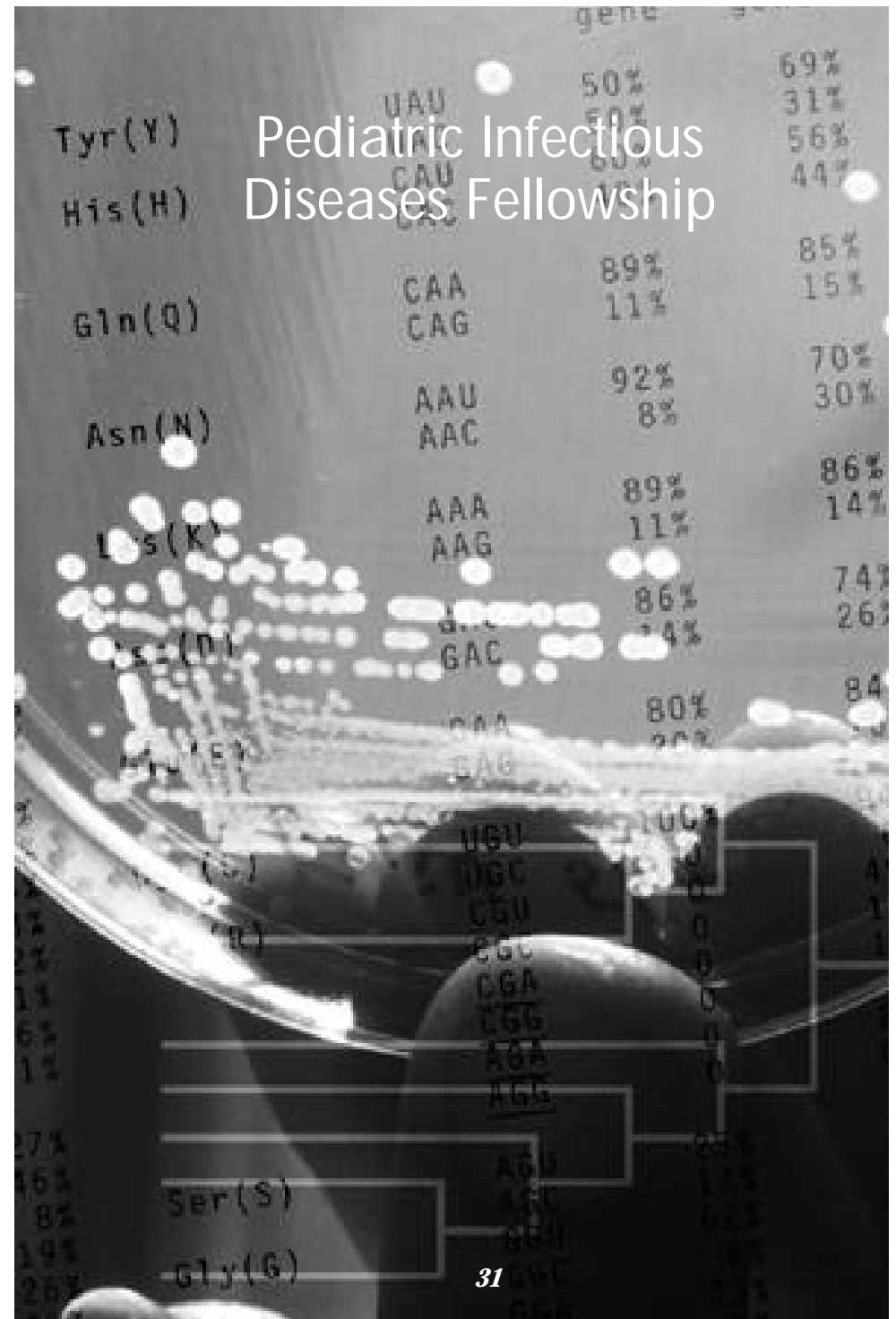
During the research years, the trainee has an opportunity to work in the laboratory of one of the members of the Section of Pediatric Hematology/Oncology, or engage in research in another lab anywhere in the Medical Center or University. Expectations for postgraduate training during this time are high; in addition to developing competency in carrying out research related to a specific scientific topic, it is expected that fellows will give two or three seminars related to both research and clinical interests. By the third year of training, with the guidance and under the supervision of a research mentor, the fellow is expected to submit a grant for extramural funding to support his or her research. Under some circumstances, the tenure of the fellowship may be extended by a year to enable further development as a research scientist. In addition to learning how to prepare grants and deliver both clinical and research talks, it is expected that the fellow will present an abstract at a national meeting, as well as write a first author paper.

For Information and Application

Laurence A. Boxer, M.D., Professor and Director,
Pediatric Hematology/Oncology
University of Michigan Health System
L2110 Women's Hospital, Box 0238
1500 E. Medical Center Drive
Ann Arbor, MI 48109-0238

Phone: (734) 764-7127

e-mail: laboxer@umich.edu



Pediatric Infectious Diseases Fellowship

DIVISIONAL FACULTY

Janet R. Gilsdorf, M.D., *Division Director*

- Molecular analysis of the assembly and regulation of expression *H. influenzae* pilin
- Molecular mechanisms of *H. influenzae* antigenic diversity
- Molecular epidemiology of *H. influenzae* colonization

R. Alexander Blackwood, M.D., Ph.D.

- Relationship between phospholipid metabolism following PMN stimulation and degranulation, particularly on the potential relationship of the subcellular pool of phosphatidylcholine sensitive to phospholipase D and the annexins

Graham P. Krasan, M.D.

- Host-microbe interactions during *H. influenzae* colonization and infection

John J. LiPuma, M.D.

- Molecular epidemiology of *Burkholderia cepacia*
- Virulence factors in *Burkholderia cepacia*

Kirk W. McCrea, Ph.D.

- Molecular mechanisms of adherence of *H. influenzae* to human cells

CLINICAL COMPONENT

Under the supervision of the Pediatric Infectious Diseases faculty members, the fellows care for children with a wide variety of both common and uncommon infections. Many patients served by our hospital are immunosuppressed and develop serious, challenging infec-

tious diseases. Mott Hospital also cares for pediatric general surgery and subspecialty surgery patients (thoracic and cardiovascular surgery, urology, orthopedics, neurosurgery, plastic surgery, ophthalmology, and otolaryngology) with complex surgical problems that often present challenging infectious diseases questions. Our division is closely integrated with the hospital bacteriology, mycology, parasitology and virology laboratories and the fellows serve rotations in these areas. Fellows participate in weekly clinical conferences within the Pediatric Infectious Diseases Division and in conjunction with Internal Medicine Infectious Diseases, as well as general pediatric conferences such as Grand Rounds, case conference, x-ray conference, and morning report. Continuity care of patients is encouraged as fellows have the opportunity to follow their patients in the Pediatric Infectious Diseases Clinic. The Pediatric Infectious Disease Consultation service usually consists of a supervising faculty member, a fellow, one or two pediatric residents, and one or two fourth-year medical students.

RESEARCH COMPONENT

Under the direction of a faculty member, a research program is designed for each fellow to meet his/her unique needs. This program includes extensive time in the laboratory learning investigative techniques and courses in molecular biology, statistical methods, and study design. Fellows write a research grant proposal during their first year, and actively participate in research conferences and journal clubs sponsored by the Department of Microbiology and Immunology, Division of Pediatric Infectious Diseases, Division of Internal Medicine Infectious Diseases and the Center for Molecular and Clinical Epidemiology in Infectious Diseases. The University prides itself on its commitment to research

endeavors and offers many resources in the Departments of Microbiology and Immunology, Internal Medicine, Pathology, Biology, Laboratory Animal Medicine, and the School of Public Health, that will enrich the fellow's research training.

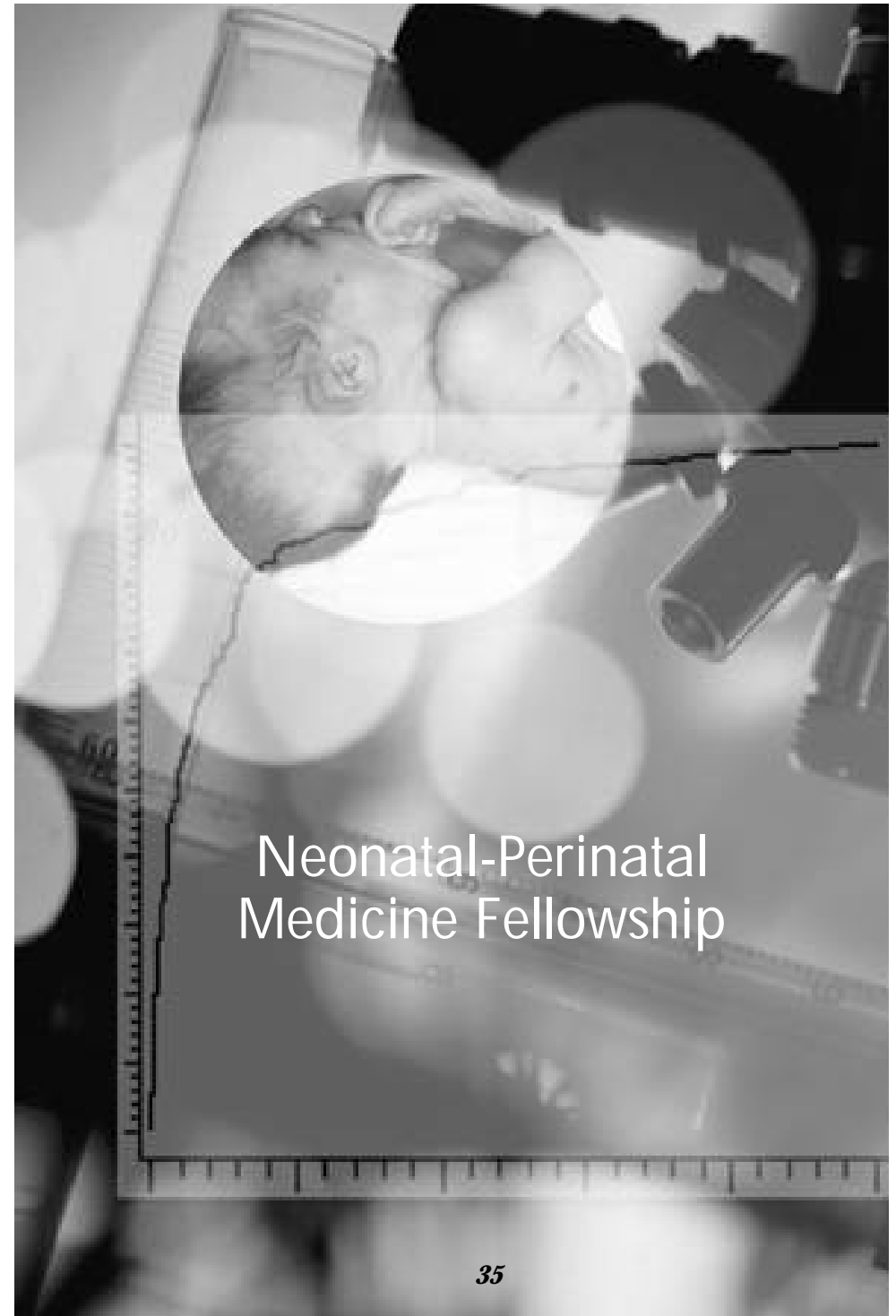
For Information and Application

Janet R. Gilsdorf, M.D., *Professor and Director,*
Pediatric Infectious Diseases
L2225 Women's, Box 0244
University of Michigan Health Systems
1500 E. Medical Center Drive
Ann Arbor, MI 48109-0244

Phone: (734) 763-2440

FAX: (734) 936-7635

e-mail: gilsdorf@umich.edu



Neonatal-Perinatal Medicine Fellowship

Neonatal-Perinatal Medicine Fellowship

DIVISIONAL FACULTY

Steven M. Donn, M.D., *Director*

- Management of respiratory failure in neonates
- Risk management techniques in perinatal and neonatal practice
- Neonatal and pediatric pulmonary graphic analysis

Mary E. A. Bozynski, M.D., M.S., *Director, Education and House Officer Program*

- Developmental follow-up of the premature infant
- Effect of bronchopulmonary dysplasia on growth at school age

Robert E. Schumacher, M.D., *Medical Director, Normal Newborn Nursery – Director, Neonatal-Perinatal Medicine Fellowship Program*

- Efficacy of extracorporeal membrane oxygenation (ECMO) life support in premature and low birth weight infants, synthetic surfactant treatment
- Cognitive aspects of medical information needs

John D. E. Barks, M.D., *Co-Director, Neonatal Fellowship Program*

- Role of hypoxia-ischemia in focal disruption of glutamate receptors in developing brain
- Neurotoxicity of HIV peptides in perinatal rodent brain
- Interleukin-1 and perinatal brain injury

Mohammed A. Attar, M.D.

- Lung development, lung failure and mechanical ventilation.

Charles R. Neal, Jr., M.D., Ph.D.

- Normal ontogeny of glucocorticoid, opioid receptors in the developing rat and human brain
- Role of treatment with exogenous opiates and steroids in the development of these receptor systems

CLINICAL COMPONENT

The Holden Neonatal Intensive Care Unit is a part of the Maternal Child Health Center and Mott Hospital and is an integral component of the University of Michigan Medical Center. There are approximately 1,100 admissions annually to the 37-bed neonatal unit. Additionally, there is a Mother/Baby Unit in which nearly 4,000 babies are delivered each year. About one-half of the Holden admissions are inborn and one-half are transported to the Unit from a referral region extending fifty miles from Ann Arbor. The Nursery also serves as the metabolic-endocrine center for the entire state and receives wider referrals for infants with special problems such as congenital heart disease, complex surgical problems or unusual anomalies, need for extracorporeal membrane oxygenation (ECMO), high frequency ventilation, nitric oxide therapy, and liquid ventilation. More than 100 infants per year are transferred from other NICUs for such “cutting edge” therapy.

During the three years of training, fellows spend approximately one-third of their time in clinical service and two-thirds of their time in research, teaching and related electives such as perinatology, pediatric cardiology, pediatric surgery, and teratology.

Clinical activities include attending rounds in the intensive care nursery, patient care and teaching conferences, neonatal transport, direct supervision of house officers and medical students, and participation in the Developmental Assessment Clinic. Significant involvement in management of ECMO, high-frequency ventila-

tion, nitric oxide therapy and liquid ventilation are integral parts of the clinical experience.

Fellows may participate in any of the ongoing education programs of the Department of Pediatrics and are encouraged to do so. A neonatology journal club and research seminar are held weekly to foster a critical and scientific attitude and to review ongoing research. Fellows are also encouraged and supported to participate in regional and national scientific meetings.

RESEARCH COMPONENT

A number of different areas of neonatal research are under investigation. These include neonatal follow-up and affective and cognitive development, diagnosis, treatment and prevention of intracranial hemorrhage and asphyxia neonatorum, high-frequency and patient-triggered ventilation, perinatal immunology and infection, developmental neurochemistry, ECMO and pharmacology and biochemistry of the lung, nitric oxide therapy, neurodevelopment. Strong collaborative ties exist with the Division of Pediatric Neurology, Division of Pediatric Pulmonology, the Department of Radiology, and the Department of Obstetrics. Fellows are expected to have significant research involvement during their training.

For Information and Application

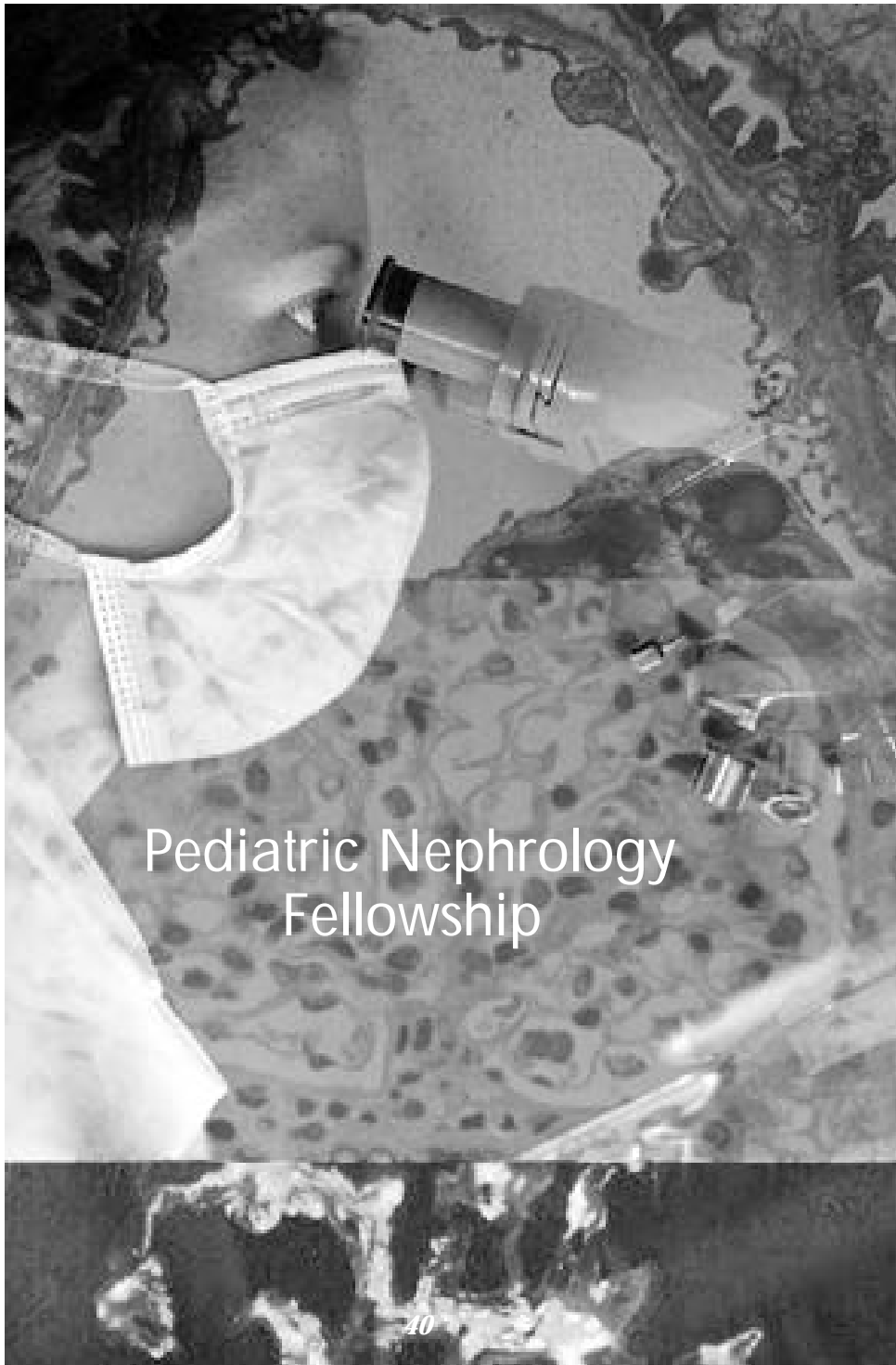
Robert E. Schumacher, M.D.

University of Michigan Medical Center
Department of Pediatrics
Division of Neonatal-perinatal Medicine
F5790 Mott Children's Hospital/0254
1500 E. Medical Center Drive
Ann Arbor, MI 48109-0254

Phone: 734-763-4109

FAX: 734-763-7728

e-mail: Ped-NPM-General@med.umich.edu



Pediatric Nephrology Fellowship

Pediatric Nephrology Fellowship

DIVISIONAL FACULTY

William E. Smoyer, M.D., *Division Director, Director of Fellowship Program*

- Glomerular epithelial cell cytoskeletal changes in nephrotic syndrome
- Role of heat shock protein 27 in the regulation of podocyte structure during nephrotic syndrome
- Pediatric continuous renal replacement therapy
- Effectiveness of newer immunosuppressive therapies for nephrotic syndrome

Susan E. Thomas, M.D., *Clinical Assistant Professor of Pediatrics*

- Pediatric renal transplantation and immunosuppression
- General pediatric nephrology
- Acute / chronic renal failure and renal replacement therapy
- Nephropathic cystinosis

David B. Kershaw, M.D., *Assistant Professor of Pediatrics*

- Cloning and characterization of glomerular epithelial cell proteins
- Protein-protein interactions of the intracellular domain of podocalyxin and the analysis of podocalyxin knockout mice.
- Effectiveness of newer immunosuppressive therapies for nephrotic syndrome.

Melissa J. Gregory, M.D., *Assistant Professor of Pediatrics*

- Nutrition in renal failure
- Pediatric dialysis
- General pediatric nephrology
- Acute renal replacement therapy
- Pediatric renal transplantation

Jean E. Robillard, M.D., *Chair of Department of Pediatrics*

- Functional role of renal sympathetic innervation during fetal and postnatal development.
- Influence of renal nerves on renal function during development.
- Role of AT1 and AT2 receptors during renal development.
- Molecular, cellular and functional development of the immature kidney.
- Mechanisms regulating the development of different transporters and channels.

Patrick D. Brophy, M.D., *Lecturer*

- Renal development
- Continuous renal replacement therapy
- Lupus Nephritis
- Critical Care Nephrology

Aileen B. Sedman, M.D., *Professor of Pediatrics*

- Metabolic bone disease in renal insufficiency
- Specified nutrition in renal insufficiency and failure
- Polycystic kidney disease in children
- General pediatric nephrology

CLINICAL COMPONENT

This program is based at the C. S. Mott Children's Hospital within the University of Michigan Health System (UMHS). The first year includes 6-7 months of inpatient service and 4-5 months of outpatient service. Inpatient duties include direct involvement in the management of children with all forms of renal disease, acute and chronic dialysis (PD, HD, and CRRT), hypertension, and solid organ transplantation. Educational seminars, such as Renal Grand Rounds, Renal Journal Club, the Renal Fellows' Board Preparation Conference, and the Renal Basic Science Seminar occur weekly. Invited speakers for these seminars include investigators from the

University, as well as national and international speakers.

The inpatient volume includes approximately 10-25 children being followed by the Pediatric Nephrology Service on a daily basis. Approximately 50-70 native and transplant renal biopsies are performed each year, and acute or chronic renal replacement therapy is initiated in 40-60 new patients each year. Adjacent to the hospital in the Alfred Taubman Health Care Center, approximately 70-90 outpatients are seen weekly. The outpatient clinics, which are held four days a week, include general pediatric nephrology, dialysis, transplant, hypertension, and combined clinics with Pediatric Rheumatology and Pediatric Urology.

PEDIATRIC RESEARCH TRAINING

Fellows will be provided challenging opportunities for either clinical or basic science research projects, and will be taught how to prepare abstracts and manuscripts for submission, as well as how to prepare posters and oral presentations for national meetings. During the fellowship training program, submission of at least one first-authored basic science or clinical research manuscript and at least one grant proposal will be required. A research project and mentor will be identified during the first year of training. The project may be under the direction of a pediatric nephrologist, adult nephrologist, or (with arrangement) another faculty member at the University of Michigan.

For Information and Application

William Smoyer, M.D.

Pediatric Nephrology
F6865, Box 0297
1505 Simpson Road East
Ann Arbor, MI 48109

Phone: (734) 936-4210 or 763-9524

e-mail: wsmoyer@umich.edu



Pediatric Neurology Fellowship

Pediatric Neurology Fellowship

DIVISIONAL FACULTY

Faye Silverstein, M.D., *Division Director*

- Neurobiology of perinatal brain injury
- Neuropharmacology

Patricia Robertson, M.D.

- Neuro-oncology

Steven Leber, M.D., Ph.D.

- Developmental disorders
- Applications of Internet resources for physicians and families

Timothy Hoban, M.D.

- Pediatric sleep disorders

Martha Carlson, M.D., Ph.D.

- Neurometabolic diseases

Elizabeth Garofalo, M.D.

- Adjunct faculty member
- Pediatric epilepsy
- Pharmacology

CLINICAL COMPONENT

The Pediatric Neurology fellowship is designed to meet the requirements for board eligibility in Neurology with special competence in pediatric neurology. This entails one year of Adult Neurology (in-patient, consultation, and out-patient experiences integrated); one year of clinical pediatric neurology (in-patient and out-patient experiences integrated); and one year which has tradition-

ally been an elective year, but is being modified to include board-required rotations in Child Psychiatry, Neuropathology, Pediatric Rehabilitation, and Pediatric Neurosurgery. There are opportunities for electives in electrophysiology/epilepsy/sleep, neuromuscular disorders, neuro-ophthalmology, neuroradiology, neuro-oncology, and relevant laboratory research.

RESEARCH COMPONENT

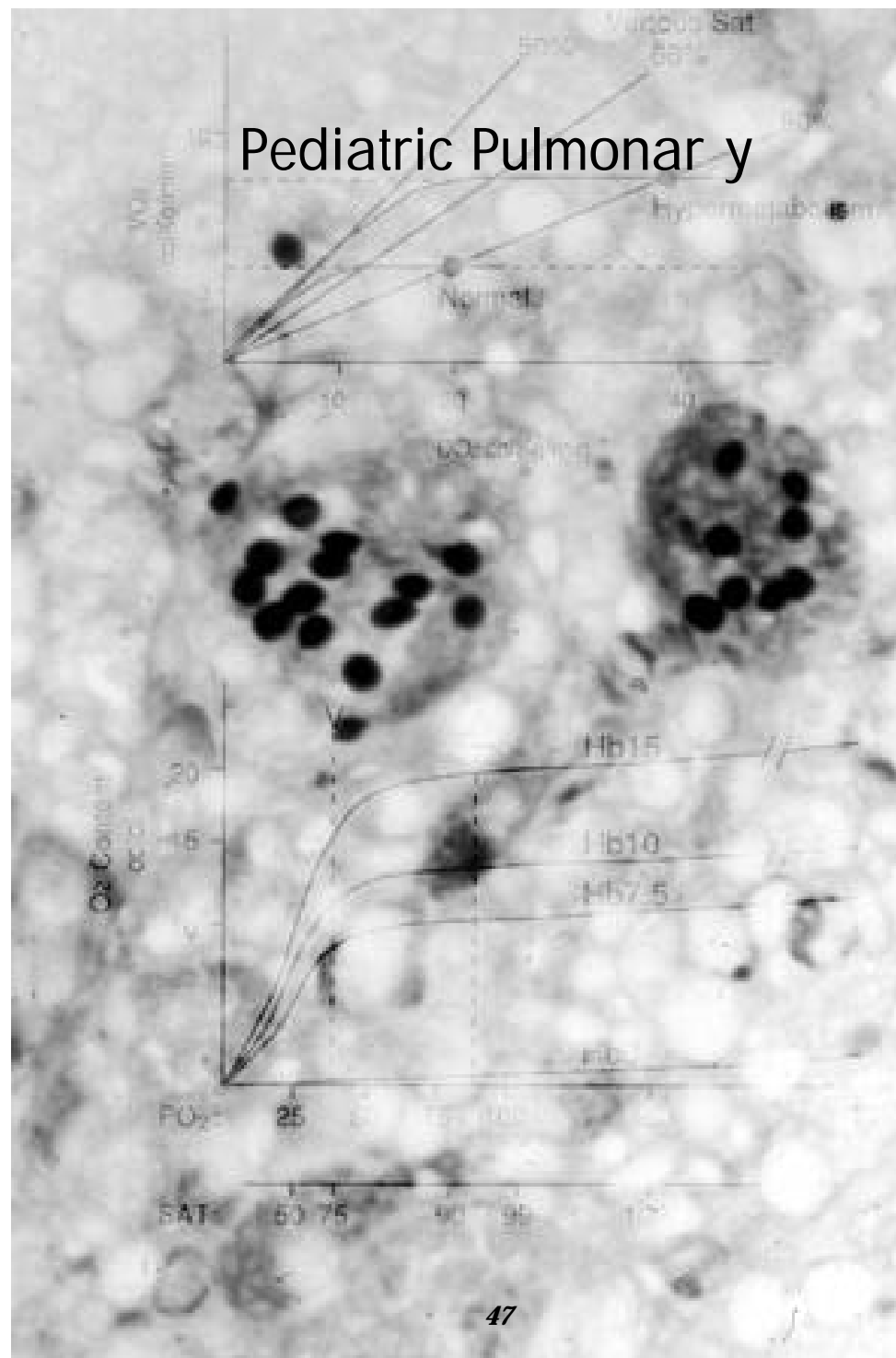
Unlike other pediatric sub-specialty fellowships, the demands of required clinical training limit the opportunities for research during much of the first 2.5 years of the fellowship. In the third year of the fellowship, individuals would have the opportunity to begin research training. For individuals interested in developing research expertise (either in clinical or basic science related research), it is anticipated that additional training will be required after the three year fellowship.

For Information and Application

Faye Silverstein, M.D., Director, Pediatric Neurology
 University of Michigan
 8301 MSRB3, Box 0646
 Ann Arbor, MI 48109-0646

Phone: (734) 764-2116

e-mail: fsilvers@umich.edu



Pediatric Pulmonary Fellowship

DIVISIONAL FACULTY

Samya Z. Nasr, M.D., *Division Director, Clinical Services;
Director, Cystic Fibrosis Center*

- Cystic Fibrosis: phenotypic genotypic correlation, new therapeutics
- Respiratory syncytial virus, pathogenesis and new therapeutics

Randall W. Brown, M.D., M.P.H.

- Epidemiology of bronchial asthma
- Educational programs for schools, community physicians and families

Wan C. Tsai, M.D.

- Cellular and molecular mechanism in innate pulmonary host defense against bacterial pulmonary infections

Martin E. Hurwitz, M.D.

- Bronchial asthma in athletes

Georgiana M. Sanders, M.D.

- Bronchial asthma: evaluation compliance issues

Toby C. Lewis, M.D.

- Epidemiology of bronchial asthma
- Educational programs for community physicians and families

CLINICAL COMPONENT

Pediatric Pulmonary Fellows are required to do 16 months of inpatient rotation; 12 months are usually spent covering the Pediatric Pulmonary inpatient and consult ser-

vices. The remaining 4 months are usually spent on electives. Elective services include: Pediatric Intensive Care Unit, Pulmonary Function Test Laboratory, Adult Pulmonary Service, ENT, Pediatric Infectious Disease Service and others. The outpatient experience includes one half-day clinic each week, staffed by a faculty member. Fellows are expected to see their own patients and follow them up. Fellows are trained to perform flexible bronchoscopy and to read pulmonary function sleep study tests, and allergy skin tests. The Pediatric Pulmonology Service cares for patients with cystic fibrosis, bronchial asthma, PBD, apnea, pneumonia, immunodeficiency, immotile cilia syndrome, bronchiectasis, and other lung diseases.

RESEARCH COMPONENT

20 months of the three-year fellowship training period are spent in a basic science research laboratory. During the first year of fellowship, each fellow is introduced and exposed to different aspects of basic science research in the University of Michigan that include inflammation, cytokines, antioxidants and pathogenesis of pulmonary diseases. Strong interdisciplinary interactions exist with the adult pulmonology service, the pathology department, the pediatric critical care service and the pediatric radiology department.

For Information and Application:

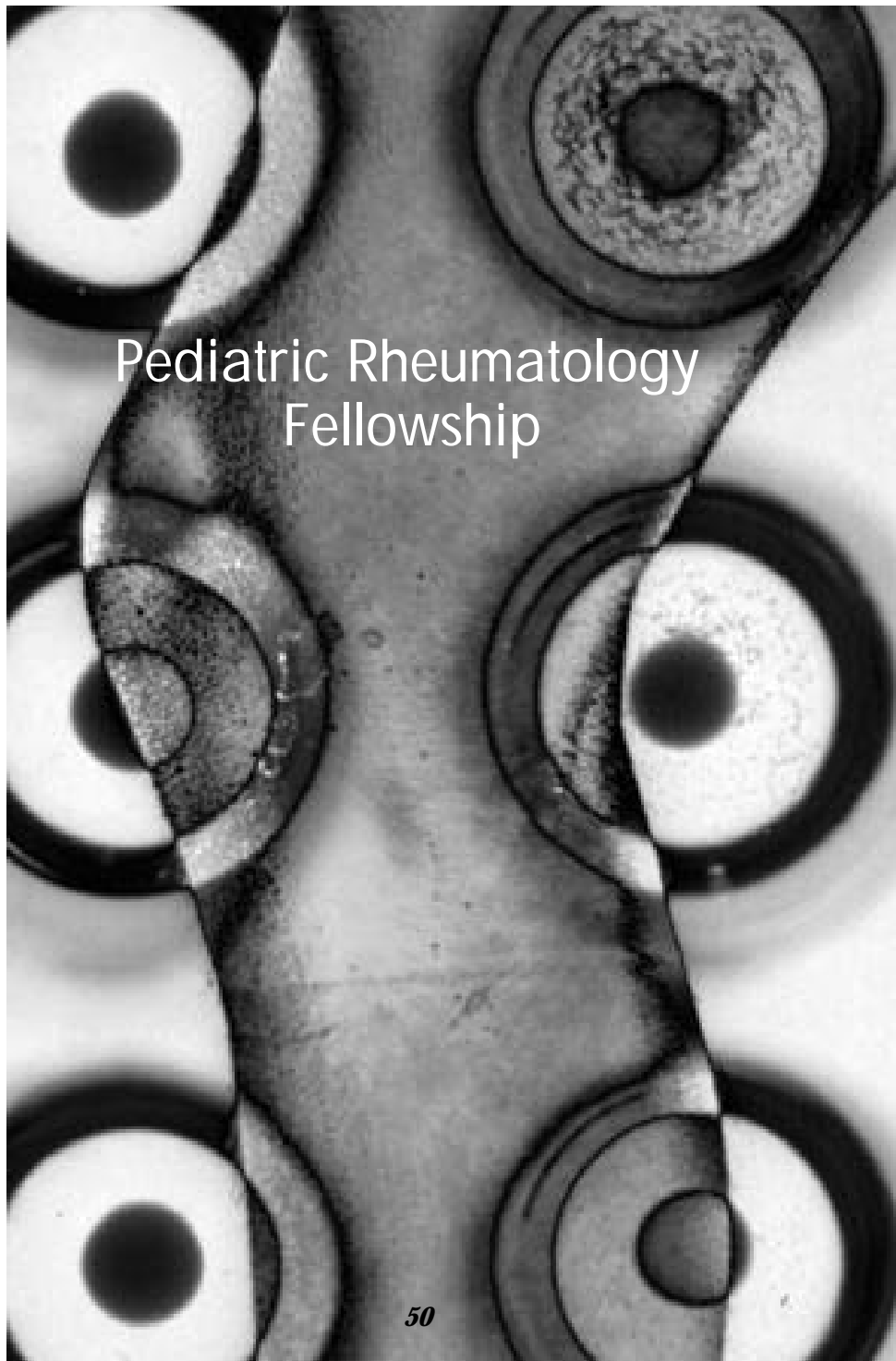
Samya Z. Nasr, M.D., *Director, Fellowship Training Program*

1500 E. Medical Center Dr.
D1109 MPB/0718
Ann Arbor, MI 48109-0718

Phone: (734) 764-4123

Fax: (734) 936-7635

Email: snasr@umich.edu



Pediatric Rheumatology Fellowship

Pediatric Rheumatology Fellowship

DIVISIONAL FACULTY

Barbara S. Adams, M.D., *Division Director*

- Molecular mechanisms in the pathogenesis of juvenile arthritis

Hilary M. Haftel, M.D.

- Medical education, long term outcome in lupus erythematosus

CLINICAL COMPONENT

The Pediatric Rheumatology Clinic of the University of Michigan Health System is the focal point of the clinical component of the Pediatric Rheumatology Fellowship. This outpatient clinic receives approximately 2200 patient visits annually, of which more than one-fifth are new patients referred for evaluation and management. Using a team approach, a licensed physical therapist, nurse specialist, and medical social worker join the physicians in developing a diagnostic and therapeutic plan that will ensure rigorous disease control, preserve musculoskeletal function and maturation, and promote health psychosocial development for each child or young adult with rheumatic disease. Collaborative care for patients with complex needs is also a high priority for our service, exemplified by the combined Pediatric Rheumatology/Pediatric Nephrology Clinic for children and young adults with renal manifestations of rheumatic disease and with primary renal disease and musculoskeletal complaints.

Although the outpatient Pediatric Rheumatology Clinic furnishes the largest part of the clinical training for Pediatric Rheumatology fellows, admissions to the Pediatric Rheumatology Inpatient Service (60-75 per year) and inpatient consultations from pediatric medical and

surgical services (90-100 per year) are also a critical element of the clinical training. Fellows evaluate inpatients at the time of admission to the Pediatric Rheumatology Service, and work with the attending physician to direct care by the pediatric housestaff and to facilitate communication among inpatient providers.

The clinical component of the Pediatric Rheumatology Fellowship also includes a structured program of complementary clinical opportunities in related disciplines: Pediatric Orthopedic Surgery, pediatric Ophthalmology, pediatric Radiology (including MRI, ultrasound, angiography, and nuclear imaging), Pediatric Physical medicine and Rehabilitation, and arthroscopy. In addition, Pediatric Rheumatology fellows attend relevant conferences in the Division of Rheumatology of the Department of Internal Medicine, including regularly scheduled clinical conferences, selected Rheumatology Grand Rounds and special symposia, and monthly pathology conferences and Rheumatology Journal Club.

RESEARCH COMPONENT

The Pediatric Rheumatology Training Program ensures a meaningful supervised research experience for fellows by means of its partnership with the Rheumatology Training Program of the Division of Rheumatology in the Department of Internal Medicine for research training. Research mentors in the Rheumatology Training Program include selected faculty in the Departments of Internal Medicine, Pediatrics, Biological Chemistry, Physiology, Chemistry, Epidemiology, and Geriatrics. Fellows choose a research mentor early in the first year after mentors present a summary of research activities in their laboratories, and trainees have an opportunity to explore the research opportunities in greater detail. Pediatric Rheumatology

trainees will have one month of minimal clinical duties early in their first year, so that they can launch the application process for extramural funding under the supervision of their research mentor. Weekly didactic conferences in the (adult) Rheumatology Training Program (also called the Rackham Arthritis Research Unit seminar) introduce concepts of research design, laboratory techniques, and data analysis in the context of structured teaching in basic science. Topics in immunology, inflammation, cell biology, biochemistry, molecular genetics, and epidemiology/health services research are taught as organized blocks throughout the year by faculty with expertise in these areas.

Subspecialty residents who wish to obtain training in clinical research most often choose faculty mentors with specific expertise in epidemiology and clinical investigation. In addition, the On Job/On Campus (OJOC) Master of Science Program in Clinical Research Design and Statistical Analysis offered in the School of Public Health provides a means for trainees to develop expertise in research design, statistical analysis, and ethical issues in clinical research, scheduled as 18 monthly four-day sessions.

For Information and Application

Barbara S. Adams, M.D., *Director of Pediatric Rheumatology*

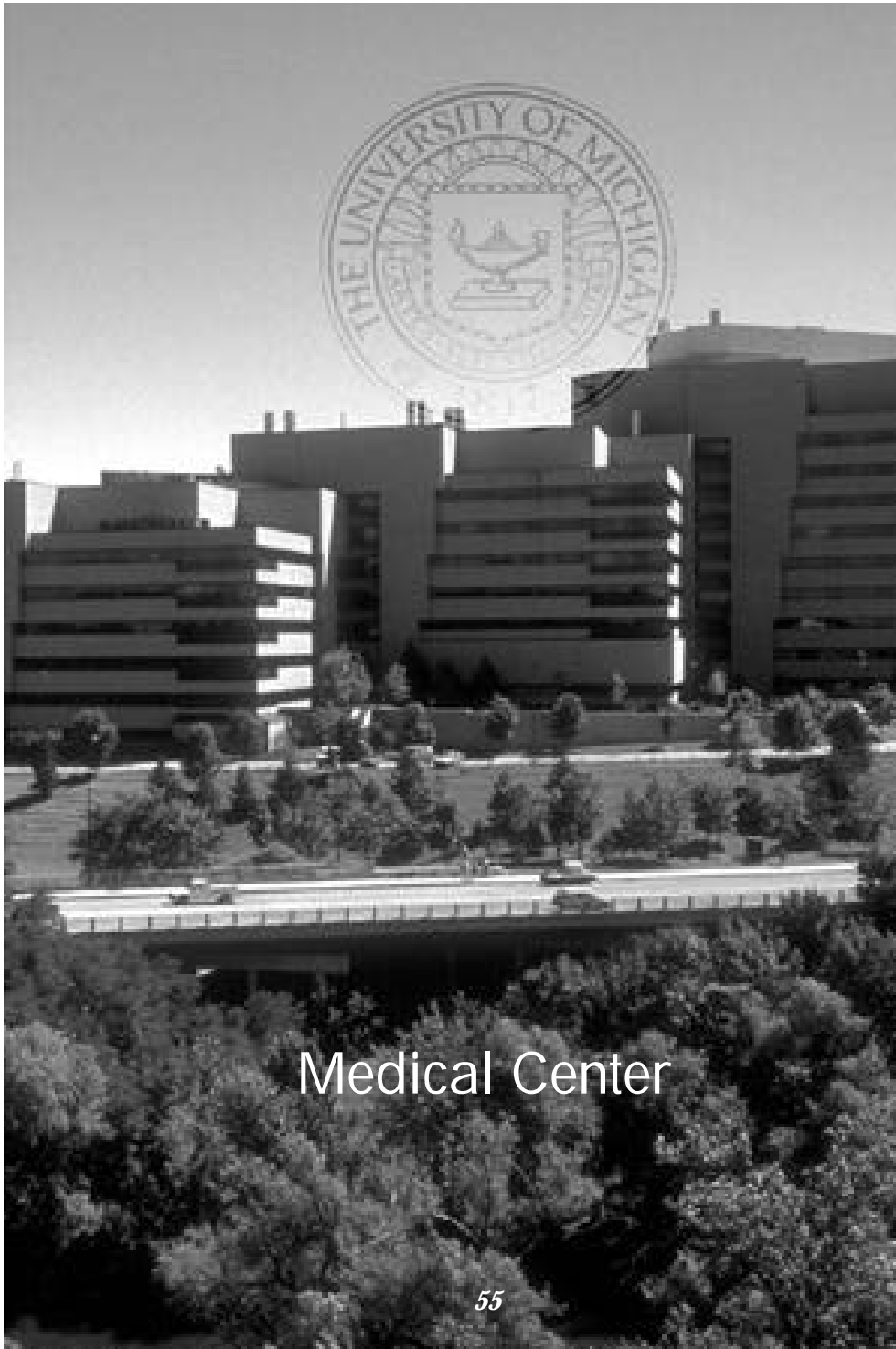
1924 Taubman Center, Box 0318

1500 E. Medical Center Dr.

Ann Arbor, MI 48109-0318

Phone: (734) 764-6266 or 764-2224

e-mail: barbad@umich.edu



Medical Center

The University of Michigan Medical Center

The University of Michigan Hospital, established in 1869, was the nation's first teaching hospital to be owned and operated by a university. The original hospital had a capacity of only 10 beds, having been converted from a faculty residence. From this modest beginning, the Medical Center has developed into one of the largest and most respected modern health education institutions in the country.

The present Medical Center, located within walking distance of the University's main campus, includes:

- Five hospital buildings (including C.S. Mott Children's Hospital) with a combined capacity of 888 patient beds.
- The Cancer Center/Geriatrics Center opened in May 1997, and includes both Pediatric and Adult Hematology and Oncology outpatient programs, as well as four floors of research labs devoted to cancer research.
- The A. Alfred Taubman Health Care Center, a three-story ambulatory care facility shared by all departments. This facility houses specialty and subspecialty care outpatient clinics and accommodates 425,000 patient visits annually.
- A complex of buildings devoted entirely to educational and research activities of the Medical Campus faculty, staff, and trainees. These buildings house the following:
 - Howard Hughes Medical Institute
 - The University Laboratory Animal Medicine facilities
 - The A. Alfred Taubman Medical Library
 - The Medical School Core Service Laboratories

- Research laboratories of basic sciences and clinical sciences faculty
- The Med Inn, a 90-room hotel, providing unique, cost-effective accommodations for patients and visitors. It is operated as an integral part of the University of Michigan Medical Center
- Ronald McDonald house

The School of Public Health, School of Nursing, School of Dentistry, Speech and Hearing Institute, College of Pharmacy, Kellogg Eye Institute, Mental Health Research Institute, and Center for Human Growth and Development are other University units located in close proximity to the Medical Campus, thereby facilitating interaction between the respective professional staff as well as enriching the teaching programs of all Medical Center units.

C. S. Mott Children's Hospital

The C.S. Mott Children's Hospital was completed in 1969 and has recently been completely remodeled. This modern children's hospital has a 170-bed capacity, its own operating suite, dental service, radiology service, nuclear medicine facilities and many other laboratory and diagnostic units devoted exclusively to the service of children.

The hospital receives a large variety of patients with basic pediatric problems from the immediate geographic area, while other more complex patients are referred for specialized diagnostic or therapeutic services from all over the state as well as from neighboring states. The Pediatric Intensive Care Unit, which includes both intensive and moderate care units, currently has a total capacity of 26 beds. The Pediatric Critical Care Transport System, which includes both air and ground transport, results in high-level occupancy throughout the hospital.

The Pediatric Outpatient Department, other than the Pediatric Acute Care Clinic, is on the first level of the Taubman Health Center. A wide spectrum of subspecialty ambulatory health services is located in this area. The Pediatric Emergency Services is located on the B-1 level of the University Hospital, immediately adjacent to the Adult Emergency Department. Together, the pediatric clinics have approximately 41,000 patient visits per year. The Pediatric Emergency Services have 13,000 patient visits per year.

Ann Arbor

Ann Arbor is home to the University of Michigan, a national leader in undergraduate, graduate and professional education. Community life in Ann Arbor revolves around the educational and cultural programs of the University. The music department is nationally known and sponsors a series of concerts throughout the year. Ann Arbor is a regular stop on the tours of international artists, musicians, theater companies and lecturers. The City of Ann Arbor sponsors art fairs, ethnic festivals, art programs, athletic events and educational opportunities in many, diverse areas. For sports enthusiasts, state parks and lakes surround the town, providing multiple recreational opportunities throughout the year. The University athletic teams are world famous, with several national championship titles (football, basketball, hockey) over the past few years. For those with families, the Ann Arbor school system is one of the finest in the country. A number of national surveys conducted over the past several years have consistently named Ann Arbor as one of the nation's most desirable places to live. Few cities of its size offer the range of attractions and diversions available, while maintaining the convenience, comfort, and feeling of community more befitting a small town.



The University of Michigan, as an equal opportunity/affirmative action employer, complies with applicable federal and state laws regarding nondiscrimination and affirmative action, including Title IX of the Education Amendments of 1972 and Section 504 of the Rehabilitation Act of 1973. The University of Michigan is committed to a policy of nondiscrimination and equal opportunity for all persons regardless of race, sex, color, religion, creed, national origin or ancestry, age, marital status, sexual orientation, disability, or Vietnam-era veteran status in employment, educational programs and activities and admission. Inquiries or complaints may be addressed to the University's Director of Affirmative Action and Title IX/Section 504 Coordinator, 4005 Wolverine Tower, Ann Arbor, Michigan 48109-1281, (313) 763-0235, TDD 747-1388.

University Regents

David A. Brandon
Laurence B. Deitch
Daniel D. Horning
Olivia P. Maynard
Rebecca McGowan
Andrea Fischer Newman
S. Martin Taylor
Katherine E. White
Lee C. Bollinger, President (*ex officio*)

Photograph of child on cover by: *Emmy Liston*

Design and production by: *Surgery Graphics*

Printed by: *White Pine, Inc.*