

section four

DIVISIONS,
DEPARTMENTS,
INSTITUTES,
AND CENTERS

11. DIVISION OF MEDICINE

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*A good physician knows his patient through and through,
and his knowledge is bought dearly. Time, sympathy,
and understanding must be lavishly dispensed, but
the reward is to be found in that personal bond, which
forms the greatest satisfaction of medical practice.*

—A.C. Ernstene

BEGINNINGS

THE DIVISION OF MEDICINE HAS PLAYED AN IMPORTANT ROLE IN THE development of medical practice at The Cleveland Clinic since its opening in 1921. Dr. John Phillips, the only internist among the four founders, was the first chief of the Division of Medicine, then called the Medical Department. He was a true family physician who saw medicine begin to move away from house calls and toward an office-based practice during the eight years between 1921 and his untimely death in 1929 at age 50. Nevertheless, he continued to treat patients with diverse disorders and make house calls, often spending his entire weekend visiting patients in their homes.

Despite his own inclination and experience, Phillips recognized the value of specialization. In 1921, he assigned Henry J. John, M.D., the field of diabetes and supervision of the clinical laboratories. In 1923, he appointed Earl W. Netherton, M.D., head of the Department of Dermatology, and in 1929, E. Perry McCullagh, M.D., head of the Department of Endocrinology. The rest of the staff, like Phillips, practiced general medicine.



*Russell L. Haden, M.D.,
Chief of Medicine, 1930-1949*

In September 1930, one and a half years after Phillips's death (see Chapter 3), Russell L. Haden, M.D., was appointed chief of the Division of Medicine. Formerly a professor of experimental medicine at the University of Kansas School of Medicine, he approached medicine in a significantly different way. Whereas Phillips had been interested primarily in the clinical aspects of disease, Haden was a modern, laboratory-oriented medical scientist. During his eight years at the Clinic, Phillips published 26 papers, 23 of which were concerned with unusual cases or the diagnosis or treatment of diseases. In contrast, Haden's first

five years at the Clinic saw publication of 26 papers, 23 of which were descriptions of laboratory innovations or attempts to define the causes or interrelationships of various diseases. Although his interests spanned the entire field of internal medicine, he was a hematologist, and he made many important contributions to the field of blood diseases, most notably the discovery of spherohemolytic anemia. However, his enthusiasm for physical therapy combined with the reluctance of most physicians to tackle the problems of arthritic patients resulted in a large referral practice in rheumatic diseases. Dynamic, brilliant, and possessing impeccable manners, Haden treated everyone with equal respect. Renowned as a superb clinician, he impressed patients and physicians alike by the speed at which he arrived at correct conclusions.

Residents coming to Haden's service did so with apprehension because "the chief" demanded high performance. This challenge usually brought out the best in the young physicians. Haden never seemed to forget small mistakes and frequently reminded the offender much later. However, he rarely mentioned major errors again because he knew how miserable the trainee felt and that the

lesson had been learned. Although he never complimented residents for a job well done, they knew when Haden was pleased by the twinkle in his eye and slight smile.

Haden's first appointment to the Clinic staff was A. Carlton Ernstene, M.D., as head of the Department of Cardiorespiratory Disease in 1932. Ernstene had been trained in internal medicine and cardiology on the Harvard services of Boston City Hospital and served on the Harvard faculty. His interest in laboratory and clinical research made him an excellent choice to direct the new department. In 1939, H.S. Van Ordstrand, M.D., who had been appointed head of the Section of Pulmonary Disease, joined Ernstene.

Gastroenterology, allergy, and physical medicine were added between 1932 and 1937. Then economic restrictions imposed by the Great Depression required the staff to devote most of their energy to providing the highest volume of patient care at the lowest cost. The Clinic experienced almost no further growth until World War II.

A gradually improving economy brought visions of expansion that were dimmed by the war. Young physician candidates for the staff were drafted into military service, along with several members of the Division of Medicine and many residents. The entire Cardiorespiratory Department was depleted when Ernstene and Van Ordstrand departed for military service. Fortunately, Fay A. LeFevre, M.D., a former fellow, was able to return to the Clinic to replace them.

Immediately after the war, the Clinic experienced a rapid increase in staff as well as further specialization. As a result of military training, many young physicians recognized the value of group practice and applied to the Clinic for training. Haden preferred to accept those who had served their country and actually took more than his residency program needed.

When Haden retired in 1949, the chairmanship fell on Ernstene. Aside from his love of work and clinical abilities, he had little in common with Haden. Meticulous order was his hallmark. He started his hospital rounds at 8 A.M. and finished in one hour. He would rapidly complete any brief, unscheduled activities before he returned to his office, by which time he expected his first patient of the day to have been examined by his resident. He would question the patient closely, recheck much of the physical examination, and make careful and concise notes in a tight, angular, small script. Residents were occasionally heard to comment that Ernstene's hand-



*James Young, M.D.,
Chairman, Division of Medicine, 2003-*

writing was reminiscent of 60-cycle interference commonly seen on the electrocardiograms of the time. Although he had a good background in internal medicine, cardiology was his field and he had all the attributes of an outstanding clinical cardiologist. Ernstene was a model of uncluttered, perfectly logical judgment, although he was not a good teacher in the traditional sense. His lectures were excellent because of their superb organization and precise delivery.

Seven new departments were established during Ernstene's tenure as division chairman, and the Department of Cardiorespiratory Disease was divided into

Clinical Cardiology and Pulmonary Disease. The new departments were Internal Medicine (1949), Pediatrics (1951), Peripheral Vascular Disease (1952), Rheumatic Disease (1952), Hematology (1953), Hypertension (1959), and Pediatric Cardiology (1960). However, Ernstene discovered that as a physician with a large practice who also served as an officer of several national medical societies, administrative duties were burdensome. He formed a committee to advise and assist him, and this was the beginning of democratic governance in the Division of Medicine.

At the time of Ernstene's retirement as chairman in 1965, the Division of Medicine had 28 staff physicians. Expansion continued under the successive chairmanships of Van Ordstrand, Ray A. Van Ommen, M.D., Richard G. Farmer, M.D., and Muzaffar Ahmad, M.D. They were, respectively, specialists in pulmonary disease, infectious disease, gastroenterology, and pulmonary disease, but each sought a balanced development in the division, and each brought a unique character and style to the job. By 2003, there were 304 staff members in the division, excluding the pediatricians who had become part of a separate Division of Pediatrics in 1994. As this

book was nearing completion in October 2003, cardiologist Dr. James B. Young replaced Ahmad as Division Chairman.

NEPHROLOGY AND HYPERTENSION

The senior Crile was interested in blood pressure his whole life, and early in his career he made notable contributions to the understanding of blood pressure maintenance under certain conditions. Through a considerable amount of experimental and clinical work, he became convinced that hypertension was mediated through the sympathetic nervous system, and that denervation of the celiac ganglion would be beneficial to the hypertensive patient. Although the therapeutic results of his surgical endeavors did not meet his expectations, he remained interested in hypertension and tried, with mixed success, to interest others on staff.

For many years, hypertensive patients at the Clinic were treated by general internists and cardiologists. After 1945, those with severe problems were studied in the hospital and then followed in the clinic by Robert D. Taylor, M.D., from the Division of Research. It was natural that with the large number of patients referred for the treatment of hypertension, drugs for its treatment were often tested at the Clinic. Soon, the need for specialized services to supplement those provided by Taylor became evident. In 1959, the Clinic formed a new Department of Hypertension and appointed David C. Humphrey, M.D., to head it.

In 1967, Ray W. Gifford, Jr., M.D., succeeded Humphrey. Gifford forged a strong alliance between the clinical and research programs in hypertension. Innovative and accomplished investigators, such as Irvine Page, Merlin Bumpus, Robert Tarazi, and Harriet Dustan, and their successors, Fetnat Fouad and Emmanuel Bravo, pioneered research programs in the humoral, hemodynamic, and neurologic aspects of hypertension. These activities were linked to clinical programs that focused on treatment options and their benefits as well as the education of physicians and their patients, leading to a national standard of excellence for departments of hypertension.

The Division of Research also addressed the development and application of dialysis. Willem J. Kolff, M.D., head of the Department of Artificial Organs, had developed an artificial kidney

in Holland in 1940 and demonstrated its value in the treatment of reversible kidney disease. At the Clinic, it was discovered that regular dialysis could prolong life and relative comfort even when kidney function was seriously impaired.

Kolff was one of a trio of physicians who profoundly influenced the development of cardiology at the Clinic. The other two were cardiologist F. Mason Sones, Jr., M.D., and Donald B. Effler, M.D., a cardiovascular surgeon. Their contributions were monumental and received international acclaim. There were times, however, when these men did not get along. Their effect upon one another became so stressful to them and others around them that the Board of Governors decided that something had to be done and formed a committee to address the issue in 1956. It was headed by William L. Proudfit, M.D., a cardiologist on speaking terms with each of the dissident colleagues. The four men met daily at 8 A.M. and often would talk to each other only through the chairman. Much of the dissension surrounded the death of several high risk-patients who were operated on and had been expected to live. At one point, Effler decided to stop operating. However, Dr. John W. Kirklin, then at the Mayo Clinic, said he felt there was nothing wrong with the approach or selection of patients and that the operations should be resumed. His judgment proved correct, and with improved results, bad tempers eased. Nevertheless, Kolff left the Clinic in 1967 to continue his work with artificial organs at the University of Utah.

This activity was officially merged with hypertension in 1967 to form the Department of Hypertension and Nephrology. Members of the department led the development of standard hemodialysis techniques and newer approaches to prolong life in end-stage renal disease, including slow continuous ultrafiltration, continuous ambulatory peritoneal dialysis, and special interventions for critically ill patients in intensive care units.

Donald G. Vidt, M.D., an investigator and practitioner of pharmacologic approaches to hypertension, became chairman of the combined department in 1985. He consolidated programs in hypertension and expanded those in nephrology to include all aspects of dialysis. Gifford remained on Vidt's staff until his retirement in 1994, at which time the department established the Ray W. Gifford, Jr., Chair in Hypertension and Nephrology, and honored him as Distinguished Alumnus.

The succession of department chairmen with roots in The Cleveland Clinic changed in 1992 with the appointment of Vincent W. Dennis, M.D., from Duke University. By this time, the department was heavily engaged in research and patient care in kidney diseases, and so it was renamed Nephrology and Hypertension. In 2003, the department was composed of nine members with research and practice specialties in renovascular hypertension, immunologic aspects of transplantation, endocrine causes of hypertension, treatment for acute renal failure, and metabolic disturbances in kidney disease and stone disease. They were also closely involved in the selection and treatment of patients in the kidney and kidney-pancreas transplant program. Although the first cadaver kidney transplant was done elsewhere, the Clinic was one of the first institutions to apply this technique, in 1963. The Clinic's program was the first long-term successful series. Dennis stepped down from the chairmanship in 2003, and a search for his successor was under way at the time of this writing.

CARDIOVASCULAR MEDICINE

The Department of Cardiology has its roots in the Department of Cardiorespiratory Disease, which was established in 1932. In the late 1950s, when image-amplifying radiographic equipment first became available, Sones became interested in photographing the coronary arteries. Some incidental photographs showing portions of the coronary arteries already had been made in Sweden, but Sones attempted to photograph the vessels by injecting contrast material near their openings. One day he accidentally injected a large amount of dye directly into a coronary artery. When no dire consequences were noted, he deliberately injected small doses directly into the coronary arteries. The result was a clear x-ray picture of the coronary arteries. Thus, selective coronary arteriography began, and Sones was soon able to use his technique to verify the location of blockages in the arteries as well as the effectiveness of a coronary bypass operation.

In 1960, an offshoot of the department was formed to reflect the diagnostic laboratory studies developed under Sones. Named the Department of Pediatric Cardiology, it was renamed the Department of Cardiovascular Disease and Cardiac Laboratory in 1967, and

Sones was appointed chairman. Two years earlier, Ernstene had retired as chairman of Clinical Cardiology and had been replaced by William L. Proudfit, M.D. Although the two cardiology departments overlapped in many areas, their relationship remained harmonious.

Upon Proudfit's retirement in 1974, the two departments were merged into one Department of Cardiology, and William C. Sheldon, M.D., was named chairman. After 16 years of excellent leadership, in 1991, Sheldon was replaced by Eric J. Topol, M.D., a pioneer researcher in the field of ischemic heart disease and leader in interventional cardiology.

Over the next decade, the department grew from 33 to more than 72 physicians. Beyond its primary mission of delivering outstanding patient care, the department has gained a reputation for international leadership in education and research through its exceptional contributions to the specialty. These include the orchestration and successful completion of a 41,000-patient heart attack trial in 15 countries (with the acronym GUSTO), the development of new antiplatelet drugs used in millions of patients each year (IIb/IIIa blockers and clopidogrel), and becoming the leading center in the world for ablation of atrial fibrillation and carotid stenting, as well as one of the foremost centers for heart failure and transplantation.

In 2001, the department of Vascular Medicine merged with the department of Cardiology to form a new department of Cardiovascular Medicine, bringing the total membership of the department to 73 as of this writing in 2003.

PULMONARY AND CRITICAL CARE MEDICINE

The Department of Pulmonary Disease separated from the Department of Cardiorespiratory Disease in 1958. Howard S. Van Ordstrand, M.D., who subsequently became chairman of the Division of Medicine, was appointed its first head. Van Ordstrand also served a one-year term as president of the American College of Chest Physicians. He was known for his original description of acute berylliosis, a potentially lethal inflammatory disorder of the lungs that occurred in workers exposed to high concentrations of beryllium. Van Ordstrand worked on this problem with Sharad D. Deodhar, M.D., Ph.D., of the Department of Immunopathology.

Deodhar demonstrated the immunological nature of berylliosis, an outstanding example of the interdivisional collaboration that typifies the Clinic's approach to clinical investigation.

In 1973, Joseph F. Tomashefski, M.D., succeeded Van Ordstrand as department chairman. Under Tomashefski, the department successfully navigated the changes that were rapidly transforming the specialty of pulmonary medicine. During this time, fiberoptic bronchoscopy and the activities of the Pulmonary Function Laboratory were formally organized. The department also was given responsibility for the medical intensive care unit.

Following "Dr. Tom's" retirement in 1983, Muzaffar Ahmad, M.D., was appointed chairman. During his eight years of leadership, effective recruiting practices doubled the number of staff members to 10 and established a productive blend of individuals who contributed to the department's growing national reputation for clinical expertise and research. In 1985, the department became the first in the Division of Medicine to appoint a full-time laboratory scientist, Mary Jane Thomassen, Ph.D., to its primary staff, thus providing an important model for collaborative research. The addition of a Section of Respiratory Therapy laid the groundwork for subsequent growth in clinical activity and academic accomplishment.

After Ahmad's appointment as chairman of the Division of Medicine in 1991, Herbert P. Wiedemann, M.D., was designated chairman of the department, and its name was changed to Pulmonary and Critical Care Medicine. Under Wiedemann's direction, clinical and research activity continued to increase. In conjunction with the Department of Thoracic and Cardiovascular Surgery, the department developed one of the leading programs of lung transplantation in the country which is, at this time, the only one in Ohio (see Chapter 15). Seventeen physicians were on the staff in 2003, including two adult allergists.

In 1991, the Department of Pulmonary and Critical Care Medicine absorbed the Department of Allergy, which became the Section of Adult Allergy and Immunology. It had been created in 1934 with I. M. Hinnant, M.D., as head. Subsequent heads were J. Warrick Thomas, M.D. (1939-44); C. R. K. Johnston, M.D. (1944-66); Richard R. Evans, M.D. (1966-76), co-discoverer of the enzymatic defect responsible for hereditary angioneurotic edema; Joseph F. Kelley, M.D. (1976-86); and Sami Bahna, M.D. (1987-90). Today, the section concentrates on rhini-

tis and sinusitis, asthma, and latex allergy.

The National Institutes of Health supports five separate research projects in the department: a clinical center for research in adult respiratory distress syndrome (ARDS); a data-coordinating center for the registry of patients with severe deficiency of alpha-1 antitrypsin; a study of alveolar macrophage function in lung disorders; the development of inducible vectors for gene therapy; and the assessment of pulmonary function in pediatric AIDS patients. Other research projects, such as the investigation of innovative therapies for sepsis, ARDS, and asthma, and new bronchoscopy techniques for detecting or palliating lung cancer, are supported by private donations. As a link to the past, the department recently rekindled its research into beryllium-induced lung disease.

ENDOCRINOLOGY

Although the treatment of hypertension and coronary artery disease greatly influenced the Clinic's growth and development, significant advances were made in many other specialties. The first medical specialty at the Clinic was endocrinology, which was established in 1921 as a "diabetic service" under Henry J. John, M.D. A formal Department of Endocrinology was formed in 1928 with E. Perry McCullagh, M.D., as chairman. McCullagh had started his training in surgery, but he gradually shifted his interest to endocrinology, which was a new specialty at that time. Like John, he started with diabetes, but soon expanded to encompass the entire field of endocrinology. He was a walking encyclopedia, a colorful and friendly person with an inexhaustible supply of poems, jokes, and stories.

Sometimes McCullagh gave orders that were clear only to him. Once his resident misinterpreted an order and requested that a radiological examination of the colon be done on a woman with no gastrointestinal symptoms. The patient was undergoing the study when McCullagh was making rounds, and he became visibly annoyed. However, the x-ray film showed a large cancer of the colon, so McCullagh accepted the report in good grace and complimented the resident.

In the early days, McCullagh was engaged in laboratory and clinical research on a wide variety of endocrinologic topics. His

work with testosterone and intermedin received wide recognition. His belief in rigid control of blood glucose levels for diabetics was later discounted, but is now being revived. With McCullagh's support, John and his wife founded Camp Ho Mita Koda, the world's first summer camp for diabetic children.

Diabetes has remained a driving interest of the department, which, following McCullagh, was headed successively by Penn G. Skillern, M.D., O. Peter Schumacher, M.D., Byron J. Hoogwerf, M.D., Charles Faiman, M.D., and, most recently, Sethu Reddy, M.D. Over the years, the department's interests have included lipid disorders, bone and mineral metabolism, and general endocrinology. The areas of reproductive medicine and pituitary disorders, which fascinated McCullagh, have recently again become centers of attention. The Clinic's research and education in endocrinology and metabolism have earned widespread respect. As of 2003, the department had five staff members.

DERMATOLOGY

The second specialist appointed to the Clinic staff was Earl Netherton, M.D., who served as chairman of the Department of Dermatology from 1923 to 1958. Although dermatology was generally disliked and even omitted from most training programs at that time, it was a treasured rotation among the Clinic's internal medicine residents. Netherton was a kindly teacher, respectful of students' opinions and intent on sharpening their observational skills. His charts vividly describe patients' skin lesions along with their diagnoses and treatments and include prescriptions and directions for use. A true "hands-on" physician, Netherton could tell whether or not an ointment had been prepared properly by merely rubbing it between his fingers. He was a pioneer in dermatopathology and safe radiation therapy for skin diseases and was an expert in the tedious investigation of patients with contact dermatitis.

John R. Haserick, M.D., succeeded Netherton as chairman of dermatology in 1958. He is best known for his contributions to the diagnosis and treatment of disseminated lupus erythematosus, a disease sometimes affecting only the skin but which often attacks other organs and leads to death if untreated. Haserick discovered

the L. E. cell phenomenon, which for years was the mainstay diagnostic test for this disease. He never really got credit for this, however, because his publication was a few months behind that of Hargreaves at Mayo Clinic, who had simultaneously observed the same phenomenon. Haserick was the first to describe the fact that the phenomenon was due to a circulating "factor," which later turned out to be one of the antinuclear antibodies.

Henry H. Roenigk, M.D., who led the department into several new areas of endeavor, followed Haserick. Among these were hair transplantation and dermabrasion surgery, photochemotherapy for psoriasis, and topical and systemic chemotherapy for cutaneous lymphomas. He also began the department's long and highly recognized efforts in pharmaceutical research.

The current chairman is Philip L. Bailin, M.D., M.B.A., who assumed that role in 1977. Under Bailin's guidance, the department has grown from four to eleven staff physicians at the main campus, making it one of the nation's largest academic dermatology programs. Bailin also expanded the residency program to include a basic research track. In addition, he developed post-residency fellowships in dermatologic surgery, dermatopathology, and environmental dermatology.

With the establishment of The Cleveland Clinic's Family Health Centers, the department added a Section of Community Dermatology, now with eleven dermatologists in several of these regional offices. Cleveland Clinic Florida also added dermatology services with multi-physician sites at both Weston and Naples. In 2000, the department appointed Edward Maytin, M.D., Ph.D., to head the newly created Section of Molecular Dermatology, with dedicated basic laboratory facilities in the Lerner Research Institute. This NIH-funded effort examines the role of transcription factors and other molecular pathways in skin growth and development in both normal and disease states. The department has achieved expertise in cutaneous oncology (Mohs' surgery and malignant melanoma), cutaneous laser therapy, pediatric dermatology, oral medicine and cutaneous immunology, contact dermatitis, psoriasis and related disorders, and cosmetic dermatology.

Dermatology has also been active in organized medicine. One of the best known members of the department, Wilma Bergfeld, M.D., holds the distinction of having been the first woman president of

the Academy of Medicine of Cleveland. She was also elected president of the American Academy of Dermatology. Bailin has served as president of the American Society for Dermatologic Surgery, the American College of Mohs' Micrographic Surgery and Cutaneous Oncology, and the Association of Academic Dermatologic Surgeons. James Taylor, M.D., has been president of the American Contact Dermatitis Society. Several members have served as president of the state and local dermatologic societies, and on the boards of many national organizations.

The department has 13 members. In 2003, Bailin stepped down from the department chair, and at the time of this writing, a search was under way for his successor.

GASTROENTEROLOGY

E. N. Collins, M.D., came to the Clinic in 1931 as a radiologist with a special interest in disorders of the digestive tract. By 1934, his reputation as a "stomach specialist" was firmly established, and he was asked to set up a Department of Gastroenterology. Thus, he became a practicing internist. His background in radiology, extensive knowledge, and aptitude for teaching made him popular with residents. R. J. F. Renshaw, M.D., an early member of the department, helped lay the groundwork for the emerging field of endoscopy in the late 1930s and early 1940s.

Upon Collins' death in 1959, Charles H. Brown, M.D., was named head of the department. During his tenure, he added two important physicians to the staff: Benjamin H. Sullivan, Jr., M.D., and Richard G. Farmer, M.D. Sullivan, picking up the baton from Renshaw, was a pioneer in the development and popularization of fiberoptic endoscopy, which greatly affected the practice of that subspecialty worldwide. Farmer, who was destined to succeed Brown as chairman of the department, shared his interest in inflammatory bowel disease. By working with his colleagues in pediatrics, surgery, and pathology, Farmer led the Clinic to international prominence in the management of this affliction.

When Farmer became chairman of the Division of Medicine, Bertram Fleshler, M.D., was named his successor in the Department of Gastroenterology. Fleshler continued to strengthen the department,

particularly in the areas of motility and diseases of the esophagus.

The next chairman was Michael Sivak, M.D., who established an outstanding training program in innovative endoscopic technology and procedures, including endoscopic ultrasound and sclerosis of bleeding varices.

Joel Richter, M.D., has chaired the Department of Gastroenterology since 1994. Richter divided the 20-member group into six academic centers of excellence: colon cancer, endoscopy, hepatology, gastrointestinal motility (with a swallowing center), inflammatory bowel disease, and nutrition. Their goal is to expand clinical and research activities while working with colleagues in Colorectal Surgery, General Surgery, Liver Transplant Surgery, Thoracic Surgery, Radiology, and Pathology to make the Clinic's Digestive Disease Center one of the best in the country.

The Department of Gastroenterology, with 23 members as of 2003, now provides care in the new facilities of the Digestive Disease Center in the Crile Building. On one floor, all the clinical activities and research of both the Departments of Gastroenterology and Hepatology and Colorectal Surgery are housed together. This is the only combined center of its kind in the United States, and it significantly enhances the ability to give excellent clinical care in an environment of teaching and patient-related research.

NEUROLOGY

The need for a Department of Neuropsychiatry brought Professor Louis J. Karnosh from City Hospital (now called MetroHealth Medical Center) to the Clinic in 1946. His stature lent immediate prestige to the new department. According to his colleagues, what Karnosh did not know about neuropsychiatry was either unimportant or false.

Karnosh was a master neuropsychologist who inspired the confidence of patients, residents, and colleagues. His clinical approach was characterized by insightful questioning and therapeutic recommendations. His clinical notes were so complete and exquisitely phrased and executed that he never dictated reports to physicians; his secretaries merely copied his notes. Underneath his sharp features and stern countenance lay a good sense of humor, which was

intensified by his deadpan delivery. Karnosh found time to write books and illustrate them with superb woodcuts of his own making. He also built a model railroad system and cultivated an encyclopedic knowledge of railroading.

When Karnosh retired in 1957, Guy H. “Red” Williams, M.D., succeeded him. He was a gentle, good-natured man and an accomplished physician who was popular with his staff. He gradually expanded the department and developed an outstanding Section of Electroencephalography. Due to increasing specialization in both areas, Williams advised that Neuropsychiatry be divided into two departments. This was accomplished in 1960. Williams became chairman of the new Department of Neurology, and A. Dixon Weatherhead, M.D., was appointed chairman of the Department of Psychiatry (see next section).

In 1976, John P. Conomy, M.D., became chairman of the Department of Neurology, succeeding the brief and tumultuous but productive chairmanship of Arnold H. Greenhouse, M.D. Greenhouse had recruited several young, highly talented neurologists, including Conomy, who eventually came to occupy leadership positions within the department. As chairman, Conomy expanded the department by adding experts in all major neurological subspecialties. Today, the effort continues under Hans O. Lüders, M.D., who joined the Clinic in 1978 as head of the Section of Electroencephalography and was appointed department chairman in 1991.

Since Lüders’ appointment, Asa Wilbourn, M.D., established an electromyographic laboratory of national repute, and Hiroshi Mitsumoto, M.D., developed a Section of Neuromuscular Disease and a laboratory for amyotrophic lateral sclerosis (ALS) research. Conomy was instrumental in establishing the Mellen Center for Multiple Sclerosis, which has become a model of integrated clinical and research efforts (see Chapter 15).

Under Lüders’ direction, the Section of Epilepsy and Sleep Disorders became an international leader, with a four-bed adult monitoring unit and specialized four-bed pediatric unit. The section was taken over by Harold “Holly” Morris, M.D., in 1991.

The department, with 43 members as of 2003, established subspecialty programs of national visibility and clinical research efforts in the fields of pediatric neurology, neuro-oncology, and movement disorders. The creation of the Department of Neuroscience within

the Lerner Research Institute under the direction of Bruce Trapp, Ph.D., provided the necessary infrastructure to help the Neurology Department make essential contributions in the quest to conquer neurologic diseases.

PSYCHIATRY AND PSYCHOLOGY

The Department of Psychiatry developed more gradually during Weatherhead's tenure as chairman, which began in 1960. The department's emergence at that time paralleled the introduction in this country of a new and expanding pharmacopoeia of antipsychotic, antidepressant, and non-barbiturate sedative-hypnotic (benzodiazepine) drugs. Weatherhead was among the first U.S. psychiatrists to use the then-novel mood stabilizer, lithium, developed in Scandinavia. Under his leadership, the department grew into an interdisciplinary group of psychiatrists, psychologists, and social workers, providing services to adults as well as children. David A. Rodgers, Ph.D., the department's first clinical psychologist, was hired in 1966, followed shortly by Michael McKee, Ph.D., and Gary DeNelsky, Ph.D.

Clare Robinson, M.S., had been hired as a child psychologist by the Department of Pediatrics in 1953. However, lack of a Ph.D. degree prevented her from being promoted to full membership on the professional staff. When the "Associate Staff" category was created in 1968, she was immediately promoted to that position.

When Richard M. Steinhilber, M.D., was named chairman in 1977, a five-year growth spurt brought the number of staff members to a total of 13 psychiatrists and three psychologists. Steinhilber was dynamic and energetic in a way that belies the stereotype of the quiet, thoughtful, contemplative psychiatrist. Farmer used to say, "Within his chest beats the heart of an orthopedic surgeon." He added special Sections of Child and Adolescent Psychiatry, Consultation-Liaison Psychiatry, Alcohol and Drug Recovery, Chronic Pain Management, and Psychology. Ricky Huerta, M.D., A. Dale Gullledge, M.D., Gregory B. Collins, M.D., and Edward C. Covington, M.D., were recruited to lead the new sections of Child and Adolescent Psychiatry, Consultation-Liaison Psychiatry, Chemical Dependency, and Chronic Pain Management, respectively.

Neal Krupp, M.D., who succeeded Steinhilber in 1982, recognized the broader membership by changing the name to the Department of Psychiatry and Psychology. Krupp added the Section of Neuropsychology in 1985 and expanded the psychiatry residency and post-doctoral training in psychology.

George E. Tesar, M.D., assumed the chairmanship in 1993. During his first 10 years of leadership, he guided his staff through the turbulent waters of managed care. Important programmatic developments included the Anxiety and Mood Disorders Subspecialty Unit, the Child and Adolescent Fellowship, and extension of mental health services to the regional medical practices. As of 2003, the department had 19 members.

RHEUMATIC AND IMMUNOLOGIC DISEASE

Despite Russell Haden's interests in arthritis in the 1930s and 1940s, the Department of Rheumatology was not established until 1953. Arthur L. Scherbel, M.D., was named the first chairman and held the post for 27 years.

In Scherbel's time, most practitioners were discouraged by the problems of joint disease. Yet his optimistic attitude helped to create a great demand for this service. During his tenure, the department conducted important studies in cytotoxic drugs, especially mechlorethamine and methotrexate, for rheumatoid arthritis, systemic lupus erythematosus, vasculitis, and allied disorders. Scherbel also had a strong interest in scleroderma and was one of the first to recognize the importance of vascular lability and ischemia in this disease.

In 1981, John D. Clough, M.D., succeeded Scherbel as department chairman. Within a few years, he increased the department to 11 physicians in order to handle the growing patient load as well as increased interest in the specialty by young physicians. He also changed the name to the Department of Rheumatic and Immunologic Disease to recognize the staff's involvement in the care of patients with immunologic abnormalities and in immunologic research. Beginning in 1974, the department also operated the Special Immunology Laboratory in the Department of Immunopathology, where modern testing for autoantibodies and immune

complexes was developed and research projects on immunocyte interaction were conducted. This laboratory was another model of interdivisional collaboration, but it fell victim to the reorganization of the Division of Laboratory Medicine that occurred subsequent to Deodhar's retirement.

Leonard H. Calabrese, D.O., the first osteopath appointed to the staff, became the head of Clinical Immunology. Calabrese has achieved national prominence for his work with rheumatological manifestations of AIDS, central nervous system vasculitis, and inclusion-body myopathy. William S. Wilke, M.D., has played a prominent role in the popularization of methotrexate for the treatment of severe rheumatoid arthritis and some forms of systemic lupus erythematosus. Daniel J. Mazanec, M.D., led the department's efforts in metabolic bone disease, and Anna P. Koo, M.D., ran the therapeutic apheresis program.

In 1992, Gary S. Hoffman, M.D., became the third chairman of the department, filling the vacancy created when Clough was named Director of Health Affairs for The Cleveland Clinic. During his years at the National Institutes of Health, Hoffman had founded the International Network for the Study of Systemic Vasculitides, of which he is chairman. The organization is now based at the Clinic and serves to coordinate large, multicenter studies for a variety of rare disorders. Hoffman is an internationally known expert in Wegener granulomatosis, giant-cell arteritis, and Takayasu arteritis.

The department has established a commitment to basic science in the area of immunogenetics. Starting in the year 2000, efforts have focused on identifying variations in candidate immunoregulatory genes in patients with vasculitis. Thomas Hamilton, Ph.D., chairman of the Department of Immunology, has facilitated linkage of his department with the Department of Rheumatic and Immunologic Diseases, providing expertise and space for Dr. Yihua Zhou and visiting scientists working in this area. In 2000, Hoffman and Calabrese were honored with the creation of the Harold C. Schott Chair in Rheumatic and Immunologic Diseases and the Richard Fasenmyer Chair in Clinical Immunology, respectively.

Chad Deal, M.D. joined the department in 1998 and developed a multidisciplinary Center for Osteoporosis and Metabolic Bone Disease, active at both the main campus and the Family Health Centers.

The department has formed a Section of Pediatric Rheumatology, headed by Philip Hashkes, M.D., and continues to support a variety of research activities aimed at enhancing the understanding and quality of care in rheumatoid arthritis, fibromyalgia, chronic fatigue syndrome, systemic lupus erythematosus, and vasculitis. As of 2003, the department had nine members.

HEMATOLOGY AND MEDICAL ONCOLOGY

Although Haden was primarily a hematologist, the Department of Hematology was not established until 1953. John D. Battle, M.D., was its first chairman. Over time, the medical treatment of cancer was recognized as a separate specialty, and the name was changed to the Department of Hematology and Medical Oncology.

James S. Hewlett, M.D., succeeded Battle in 1971. One of Hewlett's most important contributions to the field was his use of exchange transfusion for the effective treatment of thrombotic thrombocytopenic purpura, which previously had almost always been fatal. This treatment became the standard therapy until it was replaced by the much simpler technique of plasmapheresis, which was also pioneered at the Clinic.

When Hewlett retired, Robert B. Livingston, M.D., led the department until 1982. Livingston established the Predictive Assay Laboratory, where tumor cells from patients are grown and their reactions to various chemotherapeutic agents are determined.

James K. Weick, M.D., assumed the chairmanship in 1983 and held the post until he left to become chairman of the Department of Hematology and Medical Oncology as well as chairman of the Division of Medicine at Cleveland Clinic Florida in 1991 (see Chapter 21).

Maurie Markman, M.D., recruited from Memorial Sloan-Kettering Cancer Center in 1992, chaired the department until he left the institution in 2004. Under Markman and subsequent to his departure, the staff was active in testing the effectiveness of experimental drugs and drug combinations in the treatment of malignant disease. This commitment required a great deal of time, accurate record-keeping, careful analysis, and persistent optimism, despite frequently discouraging responses. The staff treated benign hemato-

logical conditions as well.

Beginning in the mid-1980s, the Department of Hematology and Medical Oncology demonstrated significant growth in patient numbers as well as the size and scope of clinical research programs. Bone marrow transplantation, chemotherapy, and immunotherapy were among the treatments widely used by the staff. The bone marrow transplant program, which performed 50 percent of all transplants in Ohio, became nationally recognized. The department's palliative care and hospice program was designated a pilot program of the World Health Organization, and the Horvitz Center, which opened in 1994, provided a unique focus on symptom management of patients hospitalized with cancer.

The Hematology/Oncology's 25 staff members have played a major role in the Clinic's multidisciplinary cancer efforts, including its highly regarded program in experimental therapeutics, headed by Ronald Bukowski, M.D., which examined innovative treatments for malignant disease. The search for effective treatments continues, often drawing upon the cooperation of other medical and surgical departments at the Clinic.

In the fall of 2000, the Department of Hematology and Medical Oncology moved into the new Taussig Cancer Center (see also Chapter 15). This wonderful new facility permitted significant growth in patient numbers, dramatically enhanced the department's ability to conduct innovative clinical research in hematologic and solid malignancies, and enabled recruitment of outstanding laboratory and clinical scientists.

GENERAL INTERNAL MEDICINE

Notwithstanding the rapid growth of specialty medicine at the Clinic, the institution recognized the value of general internal medicine by formally establishing the Department of Internal Medicine in 1949. John Tucker, M.D., the first chairman, had been a member of the Division of Medicine since 1921. He was succeeded in 1960 by Leonard L. Lovshin, M.D., who founded the Section of Headache Medicine. The growth of this subspecialty continued under the stewardship of Robert Kunkel, M.D., an internationally recognized headache specialist. Glen Solomon, M.D., joined him in 1986 and

became section head in 1994. All three physicians have held national leadership roles in the study of headache, bringing the Clinic wide recognition in experimental therapeutics and medical outcomes in this field. The section was transferred to the Department of Neurology in 1998.

Ray A. Van Ommen, M.D., became the third chairman of the Department of Internal Medicine in 1970, and he also served as chairman of the Division of Medicine as well as founder of the Department of Infectious Disease. William H. Shafer, M.D., served ably as department chairman from 1972 until 1989. In 1971, the Clinic responded to corporations seeking periodic health evaluation for their executives by establishing a Section of Health Services under the direction of Alfred M. Taylor, M.D. Richard N. Matzen, M.D., succeeded him, and the section eventually became a department (Department of Preventive Medicine).

Beginning in 1986, Dennis Jahnigen, M.D., who was recruited from the University of Colorado, formed and headed a Section of Geriatric Medicine. Under his direction, the program became one of the top ten geriatric medicine programs in the United States. When Jahnigen left the Clinic in 1994, Robert M. Palmer, M.D., was appointed as section head.

In 1989, Stephen Ockner, M.D., restructured the Department of Internal Medicine. The Department of Preventive Medicine became a section in the Department of General Internal Medicine with Richard S. Lang, M.D., as section head. At the same time, the Department of Primary Health Care, which had been established in 1974 for the care of employees and their families and headed by Gilbert Lowenthal, M.D., also joined General Internal Medicine. Geoffrey Lefferts, M.D., was appointed head of the new Section of Primary Care. To reflect the wider scope of activities encompassed by the internists, the department was renamed General Internal Medicine.

After this consolidation, the Clinic recruited David L. Bronson, M.D., from the University of Vermont to serve as department chairman. Tremendous growth in the number of new staff members, patient visits, and residents occurred between 1992 and 1995. By the end of 1994, the department was logging more than 97,000 patient visits annually, making it the busiest in the Clinic. The residency program had grown to include 110 internal medicine residents, most of whom were receiving a large portion of their training

in the Department of General Internal Medicine.

In the early 1990s, Clinic leaders recognized that the organization could provide more convenient service to patients in the surrounding communities through satellite facilities. The first satellite opened in Independence, Ohio, in 1993, with a group of orthopedic surgeons and one internist, Cynthia Deyling, M.D. Additional satellites were established, a new Division of Regional Medical Practice was created, and Dr. Bronson was appointed Division Chairman. Joseph M. Cash, M.D., originally a member of the Department of Rheumatic and Immunologic Disease, succeeded Bronson as department chairman in 1996. Following Cash's untimely death in 1998, Richard S. Lang, M.D., became acting chairman of the department and was appointed chairman in 2000.

From 1997 through 2003, the department formed new sections and explored fresh directions. The Section of Women's Health was established in 1997, headed by Holly L. Thacker, M.D. Clinical activity for this enterprise grew steadily, leading ultimately to establishment of the multidisciplinary Flo and Stanley Gault Avon Women's Health Center on the first floor of the Crile Building in 2002.

To address the facilitation of preoperative medical evaluation of surgical patients, the department created the Internal Medicine Preoperative Assessment Consultation and Treatment (IMPACT) Center in 1997 under the direction of David Litaker, M.D. This center handled almost 11,000 consultations in 2002, among the largest such operations in the United States.

To care better for hospitalized medical patients, the department established the Section of Hospital Medicine, which began as the hospitalist program in 1997 and formally became a section in 1999. Franklin A. Michota, Jr., M.D., who had directed the program from its outset, served as section head. Hospital admissions to the department increased dramatically in the following years, reflecting growth in main campus Emergency Department activity, maturing of the Regional Medical Practice Family Health Centers, and a trend toward shifting of admissions from subspecialty services to the Department of General Internal Medicine. The availability of internal medicine residents for coverage of inpatients on the internal medicine services considerably reinforced this trend. Admissions to the department increased from 1,226 in 1992 to 4,466 in 2002.

By 2003, the Department of General Internal Medicine had 45

professional staff members and, in addition to carrying out the varied clinical duties and activities outlined, also covered the Subacute Care Unit; performed a major role in education of students, residents, and fellows; participated significantly in the implementation of the electronic medical record; established fellowship training in geriatric medicine, women's health, medical informatics, and hospital medicine; and provided leadership in the establishment and planning of The Cleveland Clinic Lerner College of Medicine of Case Western Reserve University with Alan L. Hull, M.D., Ph.D., serving as Associate Dean of Curricular Affairs and J. Harry (Bud) Isaacson, M.D., as Director of Clinical Education. The department is among the largest and most diverse clinical entities in the institution.

INFECTIOUS DISEASE

The Department of Infectious Disease originated as a section of the Department of Internal Medicine under Van Ommen. In 1972, a separate department emerged, and Martin C. McHenry, M.D., was named chairman.

The department flourished under McHenry's guidance, and was soon recognized for excellence in both clinical medicine and education. McHenry epitomized the consummate scholar, combining excellence at the bedside with compassionate care, superlative teaching, and active clinical research. For these reasons, he was the first recipient of the Bruce Hubbard Stewart Award for humanism in the practice of medicine.

During McHenry's chairmanship, the department grew to five physicians and conducted clinical trials and outcomes research in many areas, including new antimicrobials, heart and bloodstream infections, and osteomyelitis.

McHenry stepped down in 1991, and David L. Longworth, M.D., was appointed chairman in 1992. Three new staff physicians were recruited, and the department intensified its commitment to research. Programs in transplantation, infectious disease, outcomes research related to hospital epidemiology, and laboratory-based investigation regarding antiviral susceptibility testing were initiated. Numerous clinical trials of newer antimicrobial agents were begun, along with studies to determine the optimal therapy for dif-

ficult infectious diseases.

The department's close relationship with the Section of Microbiology in the Department of Clinical Pathology has proven to be fruitful. Many collaborative studies have resulted from this, as well as a combined fellowship program leading to certification in both disciplines. Clinical activity has grown steadily, with routine evaluations performed on difficult infectious disease problems in the areas of nosocomial and postoperative infections, endocarditis, bone and joint infections, HIV disease, fever of unknown origin, tropical disease, and community-acquired infections. Under Longworth's leadership, research productivity increased, and the department has achieved national stature commensurate with its recognized excellence in clinical medicine and education.

Longworth left the Clinic in June 2002. As of this writing in 2004, a search for his successor was still under way.

EMERGENCY MEDICINE

In May 1994, The Cleveland Clinic strengthened its emergency medicine program with the opening of an 18,000-square-foot facility on the southwest corner of E. 93rd St. and Carnegie Avenue, the E Building. The new facility, which was a far cry from a standard emergency room, included a 19-bed emergency treatment area and a 12-bed minor illness area. It was adjacent to a 20-bed Clinical Decision Unit—an advanced concept in emergency medicine shared with Kaiser Permanente. In this unit, patients who do not require immediate hospitalization can be observed and treated for up to 24 hours after their initial evaluation. This unit has become a national model for the evaluation of chest pain and the treatment of heart failure.

Kaiser Permanente of Ohio, a branch of the giant health maintenance organization, which formed a partnership with the Clinic in 1992, shared space in the Clinical Decision Unit and had a separate emergency department within the same building. Patients of both organizations benefited from on-site radiology facilities, operating rooms directly overhead, efficient access to the clinical laboratories, and a rooftop helipad.

Responsibility for providing care in this new facility belonged to

the Department of Emergency Medicine, which the Board of Governors created in 1993 in anticipation of the new enterprise. Norman S. Abramson, M.D., became its first chairman. In the first year, he assembled a board-certified emergency medicine staff and, working with Sharon Coulter (Director of Nursing), expanded the nursing staff to accommodate the patient volume. The department instituted education and training programs for Ohio State University medical students and Cleveland Clinic internal medicine residents and laid plans for an emergency medicine residency program. The Department of Emergency Medicine became the home base for establishing centers for the evaluation and treatment of patients with chest pain, stroke, and asthma, as well as pediatric emergencies.

Charles L. Emerman, M.D., assumed the chairmanship in 1996. He expanded the staff to 17 members by 2003 to meet the increasing patient volume and educational needs. The department affiliated with the MetroHealth Medical Center Emergency Medicine residency program in 1996 and currently trains 33 emergency medicine residents.

CONCLUSION

Although practice methods have become more scientific since 1921, the Clinic's approach to patient care has remained unchanged: one physician is responsible for each patient's care and orders any consultations with other physicians that may be required. With drastic changes in health care under way, the Clinic agrees that the role of the primary physician is more important than ever to ensure appropriate care and the timely, judicious use of resources.

12. DIVISION OF PEDIATRICS

BY JOHN LAMPE

Children are poor men's riches.

—English Proverb

PEDIATRICS BEGINS

CHILDREN WITH RARE AND COMPLICATED DISEASES HAVE BEEN CARED FOR AT The Cleveland Clinic since its inception. When co-founder John Phillips, M.D., moved his practice to the Clinic from Western Reserve University, he brought with him the tradition of caring for children, a skill for which he was widely known in those days. At that time, the care was disease-oriented rather than child-centered. That changed in 1951 when Robert D. Mercer, M.D., arrived from Western Reserve University, as Phillips had done some three decades before, to start a Department of Pediatrics.

Mercer was already well known in the community before he arrived at The Cleveland Clinic. He and his wife, Ann, had helped to found the Cleveland chapter of United Cerebral Palsy, now located on the Clinic's main campus. He was a gifted teacher, and he had a massive slide collection, the envy of his colleagues, which he continued to expand throughout his career. His willingness to share this asset with anyone who had need of it was legendary. Long after he retired, Mercer was honored for his contributions to medicine and to The Cleveland Clinic during the dedication ceremony for the Alumni Library in the educational wing of the newly opened Lerner Research Institute in 2000. United Cerebral Palsy also dedicated a room in his honor in their new building at that time. He died in 2002.

The Clinic's first pediatric outpatient department was located in two rooms "loaned" by the Department of Urology. They were just around the corner from Sones's original cardiac catheterization laboratory. A pediatric cardiologist, Sones was using his new cardiac visualization technique to help Clinic surgeons perform heart operations on children, with excellent results. At that time there, was no pediatric cardiologist or pediatric cardiac surgeon at Western Reserve University, and patients from that institution were sent to the Mayo Clinic. With the formal establishment of the pediatrics department, the Clinic reserved 30 of its 357 hospital beds for a pediatric ward.

The first pediatrician Mercer recruited was Viola Startzman, M.D., a superb clinician admired and respected throughout the community. Startzman had been trained as a laboratory technician before going to medical school, and her understanding of blood chemistry proved invaluable.

Nineteen fifty-three was a landmark year in which the Department of Pediatrics started a residency program, paying the residents the princely salary of \$150 per month, and gave its first post-graduate education course. It was also the year Clare Robinson, M.S., became the department's third staff member. Considered to be one of the best pediatric and adolescent psychologists in the profession, she nevertheless lacked the doctoral degree necessary for full staff status. When the "Associate Staff" category was created in 1968, she was appointed to that position, as noted in the previous chapter.

In 1954, the department initiated a program with St. John School of Nursing for training student nurses in pediatrics. This was the first student nurse program at The Cleveland Clinic. A few years later, the department developed a curriculum for training third-year medical students, and this became the Clinic's first medical school program.

RELATIONSHIP WITH OBSTETRICS

During those years, the Clinic had an excellent Department of Obstetrics under the supervision of Howard P. Taylor, M.D. It was among the first in the country (a) to make use of amniocentesis, (b) to invite fathers into the delivery room, and (c) to permit newborns to stay in their mothers' hospital rooms. Clinic obstetricians even

carried out intrauterine transfusions. Their newborn nursery was open to all pediatricians in the community. Yet despite all these successes, the Clinic closed the Department of Obstetrics in 1966 to make room for expansion of cardiac surgery, which was on the brink of explosive progress. This was, nevertheless, a severe blow to the pediatricians, whose patient base in large part was composed of babies born at the Clinic. In any case, pediatrics survived and ultimately separated from the Division of Medicine, becoming a division in its own right. After a 29-year absence, obstetrics reopened at the Clinic in 1995 (see Chapter 13).

PEDIATRIC SPECIALIZATION

Mercer recognized the value of specialization and began the process around the same time it was going on throughout the Division of Medicine, in which pediatrics was then still a department. In 1956, Mercer invited Mary Harmon, M.D., to join the staff. A specialist in metabolic abnormalities in babies, she established a unit that was designated by the State of Ohio as a center for the treatment of phenylketonuria.

The department next added gastroenterology with the appointment of William M. Michener, M.D., in 1961. He left to accept an academic position in New Mexico in 1968 but returned five years later to become Director of Education for The Cleveland Clinic (see Chapter 19). He then resumed his pediatric practice on a part-time basis. His colleagues greatly valued his ability to distinguish chronic ulcerative colitis from Crohn's disease. It was not until the early 1980s that the department recruited a second gastroenterologist, Robert Wyllie, M.D. Thereafter, the section rapidly grew into one of the largest groups of pediatric gastroenterologists in the country, gaining additional national recognition in the treatment of inflammatory bowel disease as well as hepatitis, gastrointestinal bleeding, and the procedures of endoscopy and liver transplantation. Wyllie set the national standards for pediatric endoscopy and was the senior editor of a major textbook in pediatric gastroenterology. Drs. Rita Steffen and Marsha Kay received staff positions in 1996 and 1997, respectively, after completing their pediatric gastroenterology fellowships at the Clinic. Barbara Kaplan, M.D., joined the department

in 1998 from Mt. Sinai Hospital in Cleveland, and Vera Hupertz, M.D., arrived the next year from Rainbow Babies and Children's Hospital, a pediatric hospital-within-a-hospital at University Hospitals of Cleveland.

Mercer had helped conduct the first successful chemotherapy during his pathology residency at Boston Children's Hospital. The study in which he participated included a large number of patients, and its success gave birth to the subspecialty of pediatric oncology. At the Clinic, Mercer continued to care for cancer patients himself until his other pediatric patients and administrative duties necessitated looking for help. In 1962, he recruited Derrick Lonsdale, M.D., a pediatrician with a special interest in childhood cancer, to assume the care of the Clinic's young patients with leukemia and other childhood cancers. Paul Dymont, M.D., arrived and assumed leadership of the pediatric hematology/oncology section in 1971, and was later joined by Donald Norris, M.D. (1981), Michael Levien, M.D. (1989), and Karen Bringelsen, M.D. (1991).

In 1960, Mercer started one of the first laboratories in the state for the culture of cells and study of chromosomes and their role in genetics. He very early recognized the need for these studies to aid in diagnosis of certain congenital disorders. Once the procedures were well established, he turned the laboratory over to the Department of Laboratory Medicine.

In 1971, residency programs began to graduate a new wave of physicians and surgeons with training in pediatric specialties, and the Clinic recruited two: Dymont, as mentioned above, and Ronald L. Price, M.D., a pediatric ophthalmologist. Price joined the Department of Ophthalmology and received a joint appointment in Pediatrics. Dymont became a well-known pediatric specialist and was appointed department chairman upon Mercer's retirement in 1980. These and other additions allowed the Clinic to begin offering the specialty care in pediatrics that has distinguished it in adult medicine.

In 1973, the appointment of A. David Rothner, M.D., enabled the Clinic to establish a section devoted to pediatric neurology. Over the years, the section has grown and has developed particular expertise in the treatment of headaches, neurofibromatosis, learning disabilities, brain tumors, and metabolic and neuromuscular disorders. Gerald Erenberg, M.D., joined Rothner in 1976, later becoming nationally known for his treatment of patients with Tourette's syndrome.

Bruce Cohen, M.D., in 1991, brought to pediatric neurology new expertise in neuro-oncology, and Neil Friedman, M.D. (1998), provided additional abilities in the care of neuromuscular diseases. By the mid-1980s, so many children with epilepsy were being evaluated at the Clinic that a special childhood epilepsy service was established, headed by Elaine Wyllie, M.D., soon joined by Prakash Kotagal, M.D. The pediatric neurologists offered a 24-hour, fully computerized epilepsy and sleep studies unit, and with their neurosurgical colleagues (including William Bingaman, M.D., 1997) they developed an international reputation in epilepsy surgery for children.

In 1977, Carl C. Gill, M.D., joined the staff to organize a pediatric cardiac surgery program. A year later, Douglas S. Moodie, M.D., a pediatric cardiologist who had worked with Gill at the Mayo Clinic, rejoined him as the first head of the section of pediatric cardiology. Pediatric cardiologists with expertise in pediatric electrophysiology (Richard Sterba, M.D.), echocardiography (Daniel Murphy, M.D.), cardiac catheterization (Lourdes Prieto, M.D.), and cardiac transplantation (Maryanne Kichuk-Chrisant, M.D.), were subsequently added. The section developed a unique program that provided continuity of care for patients with congenital heart defects from birth through old age. Today, the Clinic's pediatric cardiologists and cardiac surgeons care for the largest number of adult congenital heart disease patients in the country. Capitalizing on this expertise, they developed fellowships in adult congenital heart disease (1993) and pediatric interventional cardiology (1994)—both unusual training programs in this country. Larry Latson, M.D., was recruited in 1993 to become chairman of a rapidly expanding and diversifying department of pediatric cardiology.

In 1986, Dymont left the Clinic to become chairman of pediatrics at the Eastern Maine Medical Center in Portland and was succeeded as department chairman by Moodie. Moodie oversaw a period of unprecedented growth in pediatrics, including successful recruitment of pediatric staff members representing the full complement of pediatric specialty services as well as a children's hospital at The Cleveland Clinic.

After Gill left Cleveland in 1987 to become chief of staff and then chief executive officer of Cleveland Clinic Florida, Eliot Rosenkranz, M.D., was named the new head of the Section of Congenital Heart Surgery. Renowned Australian pediatric cardio-

thoracic surgeon Roger B. Mee, M.B., Ch.B., succeeded him, bringing with him an international reputation for excellence and innovation. A second congenital heart surgeon was added in 1993. Together, they doubled the number of pediatric open-heart cases and at the same time achieved one of the lowest mortality and morbidity rates in the world.

Robert Kay, M.D., started the section of pediatric urology in 1980, and quickly became known as an outstanding urologist. However, he became so busy with his responsibilities as Director of Medical Operations (and later Chief of Staff) for the Clinic that a second surgeon, Jonathan H. Ross, M.D., had to be added to the staff in 1992.

The first full-time practitioner of pediatric general surgery at the Clinic was Hugh V. Firor, M.D., who arrived in 1981 and operated primarily on children with abdominal and bowel disease. He left the Clinic in 1991 and was replaced by Fred Alexander, M.D. By 2002, Alexander was performing more than 800 operations annually and investigating the feasibility of doing small-bowel transplantation in children. John DiFiore, M.D., was recruited to join the pediatric surgery department in 1998 after completing his training at Boston Children's Hospital. Anthony Stallion, M.D., joined them in 2002, following his residency at the University of Cincinnati.

By the 1980s, the Clinic was becoming well known worldwide for pediatric specialty care but was not known in the community for general pediatrics. A section of general pediatrics had existed since the appointment of Dr. Ruth Imrie in 1978, but it was part of the Department of Primary Care and existed to provide care for the children of staff and employees. In 1982, Moodie recruited Michael L. Macknin, M.D., a highly regarded academic pediatrician. Two well-known community pediatricians, Daniel Shapiro, M.D., and Richard Garcia, M.D., were added to the growing general pediatric department in the mid 1980s. In 1991, Moodie brought the section into the Department of Pediatrics to give it a higher profile in the community.

Robert J. Cunningham, M.D., became head of pediatric nephrology in 1981 and assumed directorship of the pediatric residency program in 1985. He built the largest pediatric nephrology service in northeastern Ohio, was named vice-chairman of Pediatrics, and became associate director of The Children's Hospital at The Cleveland Clinic. Accordingly, the need arose for a second nephrologist. When Ben Brouhard, M.D., joined the staff in 1988, he brought

expertise in pediatric hypertension and renal transplantation. Deepa Chand, M.D., joined them in 2002.

Because of Brouhard's strong research background, he subsequently became director of pediatric research and developed an excellent program for both staff and residents. Johanna Goldfarb, M.D., a well-known pediatric infectious disease specialist, subsequently assumed the directorship of pediatric research. While only a quarter of the pediatric programs in the country require their residents to do research, The Cleveland Clinic requires pediatric residents to present the results of a research project each year. Brouhard also encouraged staff members to publish, speak, and spread their expertise as visiting professors.

Although neurosurgery chairman Donald F. Dohn, M.D., regularly performed surgery on children, the first designated pediatric neurosurgeon was Joseph F. Hahn, M.D., who eventually succeeded Dohn as department chairman. In 1987, Hahn's patient-care capacity was reduced when he was appointed chief of the Division of Surgery while maintaining his departmental leadership. The growing need for a full-time pediatric neurosurgeon led Moodie to recruit the Clinic's first pediatric-trained neurosurgeon, Mark S. Luciano, M.D., in 1993.

A similar situation existed in endocrinology. Department chairman O. Peter Schumacher, M.D. Ph.D., had developed a solid reputation in pediatric diabetes, but he had been trained in adult endocrinology. The Clinic's first pediatric endocrinologist, Geoffrey Redmond, M.D., arrived in 1982. When he left for private practice in 1991, he was replaced by Douglas G. Rogers, M.D., a specialist in pediatric diabetes. Rogers also became the first quality assurance officer for Pediatrics, a post he held until 1995 when it was assumed by gastroenterologist Marsha Kay, M.D. Ajuah Davis, M.D., joined Rogers in 2000 in the busy endocrinology section.

Michael J. McHugh, M.D., was recruited to head pediatric intensive care in 1979 and became director of the new Pediatric Intensive Care Unit (PICU) in 1992. Competition with University Hospitals was intense at that time, and the issue of pediatrics, particularly pediatric intensive care, was a hot-button issue with them. University Hospitals used the certificate-of-need process to try to block the establishment of this unit. In the end, they failed to make their case, and the state granted the certificate of need.

McHugh also took over directorship of the residency program from Cunningham in 1992. Under his leadership, the number of residents has more than doubled to 33. In addition, up to 60 medical students now rotate through pediatrics every year, and fellowships have been developed in the pediatric subspecialties of neurology, gastroenterology, allergy and immunology, critical care, interventional cardiology, psychology, and adult congenital heart disease. Gary Williams, M.D., who had joined the Department of General Pediatrics in 1991, became the director of the pediatric residency program in 1996. During his tenure, the pediatric residency program continued to flourish, increasing the number of residents to 13 in each of the three years of pediatric residency training. Ronald Holtzman, M.D., was appointed chairman of the Department of Neonatology in 2000 and oversaw the opening of the Clinic's first level III Neonatal Intensive Care Unit (NICU) a year later.

Gita P. Gidwani, M.D., came to the Clinic in 1976 from Kaiser Permanente to establish the pediatric and adolescent gynecology practice. She was the institution's only gynecologist with special training in the problems of adolescence until the arrival of Dr. Marjan Attaran in 1996. Both physicians worked closely with Ellen Rome, M.D., a specialist in adolescent pediatrics who joined the staff in 1994, Ruth Imrie, M.D., who had developed an interest and expertise in the problems of teenagers over the years, and Karen Vargo, M.D., who had brought her adolescent medicine specialty experience to the Clinic from the Children's Hospital of Pittsburgh in 1999.

Under Moodie's direction, the Department of Pediatric and Adolescent Medicine took a quantum leap from a small but respected group of pediatric specialists to a large and comprehensive pediatric program. He expanded existing sections, and he added the first pediatric specialists in many fields to care for the growing number of children. These included allergy (Alton L. Melton, M.D., 1988, and Velma Paschall, M.D., 1988), infectious disease (Barbara Baetz-Greenwald, M.D., 1988, Johanna Goldfarb, M.D., 1992, and Camille Sabella, M.D., 1995), dermatology (Teri A. Kahn, M.D., in 1992), plastic surgery (Frank A. Papay, M.D., 1992), orthopedics (Alan Gurd, M.D., 1976, and Jack Andrish, M.D., 1977, joined by Thomas Kuivila, M.D., in 1995), ophthalmology (Elias Traboulsi, M.D., 1997) pulmonary disease (Paul C. Stillwell, M.D., 1992, who was succeeded by Karen McDowell, M.D., in 1998), rheumatology

(Bernhard Singsen, M.D., 1993, replaced by Philip Hashkes, M.D., 2003), otolaryngology (Diana Traquina, M.D., 1993, followed by Peter Koltai, M.D., in 1998), and neonatology (Jeffrey Schwersenski, M.D., 1994). John B. Lampe, M.D., a general pediatrician recruited in 1991, had a special interest in pediatric dermatology and provided new expertise in this area. Kahn was the first trained pediatric dermatologist at the Clinic, and she had established the largest practice of its kind in northern Ohio.

The PICU, which had opened in 1992 under the leadership of Michael McHugh, M.D., soon needed dramatic expansion to accommodate the burgeoning pediatric surgical practices. McHugh was joined at this time by Stephen Davis, M.D., and Demetrious Bourdakos, M.D., in 1996; Kathryn Weise, M.D., in 1997; and A. Marc Harrison, M.D., and Elumalai Appachi, M.D., in 1999. Their 24-hour in-house attending physician level of care yielded one of the lowest mortality rates in the nation. The Clinic opened a pediatric cardiac surgery operating room adjacent to the intensive care unit and moved all pediatric cardiology and cardiac surgery services into The Children's Hospital at The Cleveland Clinic toward the end of 1994.

THE CHILDREN'S HOSPITAL AT THE CLEVELAND CLINIC

In 1987, the Clinic opened its Children's Hospital and became an associate member of the National Association of Children's Hospitals and Related Institutions. This hospital-within-a-hospital occupied the third and fourth floors of the old hospital. In one unit, children under age 10 are cared for in single rooms. Each room provides space for the patient's own toys as well as a convertible chair bed to accommodate a parent.

A rooftop play deck provides a safe outdoor play area for patients right off the hospital wing. The Jennifer Ferchill Play Deck is a highly valued component of The Cleveland Clinic Children's Hospital. Located right off the pediatric hospital wing, its wide doors, flat surface, and oxygen hook-ups ensure that even wheelchair-bound and intravenous-tethered children can enjoy fresh air. A glass house between the outdoor portion and the hospital provides an outdoor-type setting where children can play during the

winter. The play deck was donated by John Ferchill, a corporate developer, in gratitude for the care his young daughter had received at the Clinic during her battle with a brain tumor. Ferchill persuaded Cleveland's construction community to donate almost \$700,000 worth of labor to construct the deck.

A separate unit, designed for adolescent patients, is staffed with nurses specially trained in treating teenagers. To make hospitalization as pleasant an experience as possible, the unit included a recreation room with appropriate furniture, stereo equipment, and games. A four-bed special-care unit, originally placed on this unit to treat patients needing more intensive nursing care, has evolved into an epilepsy-monitoring unit.

Vanessa Jensen, Psy.D., reinvigorated the Department of Pediatric Psychology when she joined the Clinic in 1992. Her expertise in autistic spectrum disorders was widely sought, and the increasing demand for psychology services soon mandated the addition of pediatric psychologists Beth Anne Martin, Ph.D., and Amy Lee, Ph.D. Michael Manos, Ph.D., joined the department in 1999, bringing his expertise in attention-deficit hyperactivity disorder, as did Gerard Banez, Ph.D., whose particular interest was childhood functional disorders.

Pediatric radiology expertise was essential to The Children's Hospital at The Cleveland Clinic. Marilyn Goske, M.D., became head of this section in 1993 and quickly recruited outstanding colleagues to provide the full range of imaging and interventional services, including David Frankel, M.D., in 1997; Janet Reid, M.D., and Stuart Morrison, M.D., in 1999; and Sunny Chung, M.D., in 2001.

In 1998, as The Cleveland Clinic was establishing the Cleveland Clinic Health System, Health Hill Hospital added its 52 beds to The Children's Hospital at The Cleveland Clinic, in the process changing its name to the Cleveland Clinic Children's Hospital for Rehabilitation.

THE DIVISION OF PEDIATRICS

In 1994, the Department of Pediatrics, with a staff of 79 physicians, achieved division status in recognition of its increased importance in the institution and to help coordinate and administer all pediatric activity at The Cleveland Clinic.

In 2002, Moodie left The Cleveland Clinic to take on the challenge of developing a strong pediatrics program at the Ochsner Clinic in New Orleans. After a national search, his successor was identified as Michael Levine, M.D., who was recruited from Johns Hopkins University. Levine arrived in March 2003.

The future of pediatrics at The Cleveland Clinic promises to be exciting. The staff anticipates rapid growth in the general pediatrics programs as well as the specialty programs, The Children's Hospital facilities, satellite pediatric programs, and obstetrics. A common focus on providing the best possible care of sick children unifies these activities. Active research programs in many areas, including the study and treatment of genetic and immunologic diseases, will constantly reaffirm and support this goal.



*Michael Levine, M.D.,
Chairman, Division of Pediatrics, 2002-*

13. DIVISION OF SURGERY

BY JOSEPH HAHN

*A surgeon must have a hand as light as
floating perfume, an eye as quick as a
darting sunbeam, a heart as compassionate
as all humanity, and a soul as pure as
the water of Lebanon.
—John Chalmers DaCosta*

WHEN THE CLINIC OPENED IN 1921, UROLOGY AND OTOLARYNGOLOGY (THEN called ear-nose-throat) were the only surgical specialties represented. General surgeons did all other operations. Urology had not, however, formally separated from general surgery, and Lower performed almost as many thyroidectomies, cholecystectomies, and general surgical procedures as urologic procedures.

The first otolaryngologist, and later, orthopedic, neurological, and ophthalmic surgeons, strictly limited their practices to their specialties. Eventually, specialists in plastic surgery, gynecology, thoracic surgery, vascular surgery, and colorectal surgery were added to the staff. General surgery gradually became one of the smaller services, limited in scope to the treatment of diseases of the upper abdomen, thyroid, and breast, and to hernia repair.

Nevertheless, many of the physicians who helped shape The Cleveland Clinic Foundation in its early days were general surgeons. For this reason, the development of the Division of Surgery has been closely intertwined with the history of the Department of General Surgery and the practice of surgery as a whole in the 20th century.

GENERAL SURGERY

Thyroidectomies provided the bulk of the financial support for the original Clinic and Hospital. In 1921, following the discovery that iodine made thyroidectomy possible for patients with Graves' disease, surgeons suddenly were confronted with a backlog of previously inoperable patients. Nontoxic goiters that were endemic in the Great Lakes region increased this backlog. Improvements in surgical techniques introduced by Crile and the Mayo brothers made thyroidectomy safe, and, in 1927, Clinic surgeons were performing an average of ten a day. Their mortality rate for this procedure was the lowest ever reported.

The greatest danger at that time was thyroid crisis, a dramatic chain of events that was likely to occur when a patient with Graves' disease and severe hyperthyroidism was subjected to general anesthesia, surgery, infection, or even a bad fright. The patient's pulse rate would soar, the heart often fibrillated, and the body temperature rose to 105° or 106°F. The patient literally was consumed in the fire of his own metabolism. Ice bags and oxygen tents sometimes helped; transfusions did not. The crisis tended to run its course, peaking on the second night after surgery, and then, if the patient survived, subsiding.

Crile believed that fear could trigger such a crisis. To avoid it, he developed a system called "stealing the thyroid." The patient would not be told when the operation was to take place. Every morning, breakfast was withheld and the nurse anesthetist would go to the patient's bedside and administer just enough nitrous oxide to make the patient a bit giddy and confused. On the morning of surgery, the routine was the same except that the analgesia was a little deeper, so the patient took no notice when the team moved in. The neck was prepared with ether, iodine, and alcohol, and then draped. A floor nurse or the patient's private nurse stood on a chair behind the head of the bed and illuminated the operative field with a shaded light held on the end of a pole.

With a single stroke, Crile would make a gracefully curved incision and then dissect the skin flap. He never stopped to clamp bleeders; that was the function of the first assistant. The second assistant, hanging uncomfortably over the head of the bed, would retract the skin and cut the thread after the knots were tied. These 10-minute

operations were bloody and unanatomic, but in the days before intravenous anesthesia, speed was necessary. A transfusion team was always available to give blood when there was excessive loss. The same team stood ready to do tracheotomies when necessary, since the incidence of injury to the recurrent laryngeal nerves was high. Postoperative hemorrhage was fairly common, too, because the main vessels were not tied.

Better surgical training and technique and improved anesthesia gradually enabled increasing numbers of these operations to be done in community hospitals. The introduction of iodized salt, better food transportation, antithyroid drugs, and radioactive iodine eventually obviated the need to operate on patients for Graves' disease. After 1927, the frequency of thyroidectomy at The Cleveland Clinic declined steadily.

Despite the large number of thyroidectomies performed in 1927, not one patient was diagnosed as having hyperparathyroidism. In 1969 Clinic surgeons performed 32 operations on the parathyroid. By the 1990s, as the result of better diagnostic techniques and the reputation of Caldwell B. Esselstyn, Jr., M.D., over 100 operations for hyperparathyroidism were performed annually.

At the same time, the number of operations for cancer of the colon and rectum grew. Thomas E. Jones, M.D., an accomplished abdominal surgeon, returned from a trip to London having learned a one-stage combined abdominoperineal resection procedure, which he proceeded to perfect into a fine art. He could perform three or four of these complex operations in a morning when it took most surgeons three or four hours to do one.

Jones was operating in the days before sulfonamides or antibiotics, and mortality from colon resection with anastomosis was



*Thomas E. Jones, M.D.,
Chief of Surgery, 1943-1949*



*Robert S. Dinsmore, M.D.,
Chief of Surgery, 1949-1957*

high everywhere. The fatal problem was peritonitis, which Jones avoided by not opening the bowel or anastomosing it. Cancers located well above the rectum were treated by abdominoperineal resection with end colostomy. After a resection of the left colon or transverse colon, he usually exteriorized the tumor over a Rankin clamp and performed an obstructive resection. There were no anastomoses except after resections of the right colon, which had few complications. The result was an astonishingly low mortality rate for surgery of the colon and rectum, but the price was a high incidence of colostomy.

Jones was a true general surgeon whose versatility encompassed not only abdominal surgery, but also gynecology, varicose veins, radical dissections of the neck, and some thoracic surgery. A pioneer in implanting radium and gold radon seeds into cancers, Jones mastered the techniques of surgical irradiation and was considered a leading authority on the treatment of cancer. He performed a successful local resection of a lung cancer several years before the first reported successful pneumonectomy for this disease, and he pioneered the use of electrocoagulation with implantation of radon seeds in selected low-lying rectal cancers. Although his results were excellent, he never reported them.

In 1949, Jones was 57 years old and at the peak of his career when he collapsed in the surgeons' locker room from a ruptured left ventricle. Efforts to resuscitate him failed. At the time of his death, he was the principal surgeon in the Department of General Surgery and chairman of the Division of Surgery. After Jones's sudden death, he was replaced by Robert S. Dinsmore, M.D., one of the two remaining general surgeons in the department. He held the titles of principal surgeon and chairman of the Division of Surgery until his own

death in 1957. During that eight-year period, the hospital expanded. Dinsmore, wisely looking ahead, planned a 23-room operating pavilion. Many members of the staff felt that this was far too big, since antibiotics, antithyroid drugs, and radioactive iodine were rapidly drying up the source of thyroid operations. But by the time the building was finished, the operating rooms were fully used. Ten years later, after closure of the obstetrics department, six more rooms had to be opened to accommodate the growing number of cardiac cases.

Upon Dinsmore's death, Stanley O. Hoerr, M.D., was appointed chairman of the Division of Surgery, and George Crile Jr., M.D., became chairman of the Department of General Surgery. They had been colleagues in the Department of General Surgery under Dinsmore. Thus arose a unique situation in which Hoerr was Crile's chairman in the division and Crile was Hoerr's chairman in the department. The arrangement worked, undoubtedly because the men respected each other and had no cause for conflict.

James S. Krieger, M.D., succeeded Hoerr as chairman of the Division of Surgery in 1971 and served until his retirement. Bruce H. Stewart, M.D., a urologist, held the position from 1980 until his untimely death from cancer in 1983. Ralph A. Straffon, M.D., Stewart's colleague and chairman of the Department of Urology, was then appointed chairman of the Division of Surgery. When Straffon was tapped to become Chief of Staff in 1986, Joseph F. Hahn, M.D., former chairman of the Department of Neurological Surgery, took over the position. In 2003 Hahn stepped down to assume leadership of Cleveland Clinic Foundation Innovations, and Kenneth Ouriel, M.D., ascended to the division chair.



*George "Barney" Crile, Jr., M.D.,
son of Founder Crile, General Surgeon,
Co-Editor of the first edition of
To Act As A Unit*



*Joseph F. Hahn, M.D., Chairman,
Division of Surgery, 1987-2003*



*Kenneth Ouriel, M.D., Chairman,
Division of Surgery, 2003-*

For more than six decades, Clinic surgeons have tried to find ways to avoid the morbidities associated with radical operations for cancer. In 1955, when the worldwide trend was towards more radical and, therefore, extensive and deforming operations, Crile, Jr., began to treat selected patients with small breast cancers by wide local excision or partial mastectomy, usually combined with axillary dissection. He abandoned radical mastectomy, setting a national trend. In 1980, Caldwell B. Esselstyn, Jr., M.D., began to combine local excision of small breast cancers with specialized radiation. The Breast Center, opened in 1995, builds on this philosophy as it provides a multidisciplinary approach to treating breast cancer.

In 1968, Crile, Jr., who had always planned to retire at age 60, resigned as head of the Department of General Surgery and became a senior consultant. Hoerr served as head for one year before following in Crile's footsteps. Robert E. Hermann, M.D., a member of the staff with a special interest in teaching, was chosen to head the department. An exuberant man and an excellent surgeon, Hermann made friends for the Clinic all over the world. The department, with six other surgeons, continued to see and treat breast disease, upper

abdominal problems, and hernias. In addition, Hermann also started a successful liver transplantation program that complemented the department's previous experience with liver surgery, major bile duct surgery, and portal hypertension (see chapter 15).

With the cooperation of their colleagues in the Department of Gastroenterology, the general surgeons developed a Section of Surgical Endoscopy.

Hermann resigned as chairman in 1989, but remained on the active staff for five more years. After a lengthy search, Scottish-trained liver surgeon J. Michael Henderson, M.B., Ch.B., was chosen in 1992 to head the department as well as the Transplant Center. The department grew to a staff of fifteen by 2002. While most staff members maintained their general surgery roots, there was a growing emphasis on specialization, particularly in breast diseases, hepato-biliary-pancreatic surgery, minimally invasive surgery, endocrine surgery, and surgical endoscopy. The practice also extended to the Clinic's Ambulatory Surgery Centers and Family Health Centers for routine general surgery and some resident teaching.

The Breast Center opened in 1995 on the ground floor of the Crile Building under the leadership of Dr. Joseph Crowe. This center emphasized a multidisciplinary approach to the evaluation and management of patients, integrating radiology, medical breast specialty, oncology, radiation therapy, and plastic surgery with the general surgery.

The department expanded hepato-biliary-pancreatic surgery. As this specialty matured, the Clinic's higher volume and multidisciplinary approach resulted in superior outcomes. Living-related partial adult liver transplantation became an option for some patients in 1999.

Laparoscopic and endoscopic expertise expanded significantly through the 1990s under Dr. Jeffrey Ponsky's leadership, placing the Clinic at the cutting edge, as it were, of innovation in these fields. Development of education programs for residents and fellows was a highlight of these new approaches in surgery.

Surgery of the thyroid and parathyroid glands (endocrine surgery) was an early mainstay of the surgical practice at The Cleveland Clinic. Both of the Criles did extensive work in this area, which was carried on by Esselstyn until his retirement in 2000. The baton was then passed to Dr. Allan Siperstein, who had been trained in San Francisco, and who capably assumed the responsibility of maintaining the tradition of excellence established by his predecessors.

COLORECTAL SURGERY

After Jones's death, Rupert B. Turnbull, Jr., M.D., performed most of the colon operations. Before long he became so expert in diagnosis and management that the Clinic established a Department of Colonic and Rectal Surgery in 1968 and named him chairman. Later that same year, the Board of Governors simplified the name to "Colon and Rectal Surgery." Turnbull introduced many innovations and operations that circumvented the need for permanent colostomy and reduced morbidity.

Turnbull carried an extremely large hospital service, sometimes with as many as 50 or 60 patients at various stages of preparation for or recovery from surgery. Considering the complex nature of what he was doing and the potential frequency of unexpected (mostly bad) sequelae, the pressures on him were enormous. Nonetheless, he always exuded calmness and confidence, even in the operating room, where the norm for many of his contemporaries was considerably different. With his tall stature and flowing white hair, he seemed to float serenely above the fray.

Turnbull was succeeded by Victor W. Fazio, M.B., M.S., F.R.A.C.S., under whose direction the department has developed an international reputation. They were the first to use stapled ileal pouch anastomoses, and with 150 cases per year they have the greatest experience in the world with this procedure. The pouch database exceeded 2,400 cases by the year 2001.

The department maintained its preeminence in surgery for inflammatory bowel disease and performed more operations for Crohn's disease, especially the bowel-conserving strictureplasty, than any other institution. The staff developed the world's most extensive experience with the advancement rectal flap operation for Crohn's anal and anovaginal fistulas, as well as with the stapled valve-pouch and T-pouch operation for continent ileostomy. They were the first to use the advancement pelvic pouch anal anastomosis for fistula-stricture complications and the advancement rectal sleeve operation for Crohn's anal and anovaginal fistulas. The group also devised the combination strictureplasty technique for Crohn's stricture and restorative colo-anal anastomosis for rectal Crohn's disease. In addition, they perfected many new laparoscopic bowel surgery techniques that greatly shorten hospital stay and recovery time.

Much of the department's success stems from basic research on colorectal cancer and inflammatory bowel disease. A major program for research and clinical application of laparoscopic bowel surgery began in 1992 with a \$1.7 million grant awarded to Dr. Scott Strong. Endowments also funded personnel for the familial polyposis and Crohn's disease registries, ulcerative colitis research, and laboratory technicians. By 2001, research nurses and managers had oversight of twelve disease and treatment-specific databases, supervised by Feza Remzi, M.D.

Election of many of these surgeons to positions in prestigious national and international subspecialty organizations demonstrated the esteem in which their peers held them. Fazio himself served as president of the American Board of Colon and Rectal Surgery in 1992 and was president of the American Society of Colon and Rectal Surgery in 1995. Dr. Ian Lavery also served as President of the American Board of Colon and Rectal Surgery beginning in 2002. Dr. James Church, founder of the Collaborative Group of the Americas and head of the David Jagelman Registries, was honored by his colleagues through his appointment as president of the Leeds Castle Group and also the International Hereditary Non Polyposis Colorectal Cancer Group (HNPCC)—the first person to be thus doubly honored—thereby bringing together the two leading societies in this field.

The David Jagelman Registries, which contain information on patients with familial polyposis and colorectal cancer, were posthumously named for David Jagelman, M.D., a staff member who was instrumental in setting them up. When Cleveland Clinic Florida began in 1988, Jagelman was one of the original "Pioneers" there, and he started the colorectal surgery service in Ft. Lauderdale. Tragically, he died of cancer at a young age a few years later, and the registries, among the largest of their kind worldwide, were named in his memory.

Jeffrey Milsom, M.D., started the department's program in laparoscopic bowel surgery in 1990, and Anthony Senagore, M.D., brought the department to leadership in the field with the assistance of Conor Delaney, M.D. Dr. Tracy Hull did seminal work in anorectal functional disorders, especially fecal incontinence, and developed the artificial anal sphincter program. In the fall of 2000, James Wu, M.D., became the first department member to provide service at the Clinic's satellite outpatient facilities and regional hospitals.

OTOLARYNGOLOGY

In 1921, ear, nose, and throat (ENT) surgeons were preoccupied with tonsils and adenoids. The concept of chronic infection as a cause of many illnesses was gaining popularity, and the tonsils bore the brunt of the surgeon's assault. In those days before sulfanilamide and antibiotics, the treatment of mastoid infections was a great challenge. The correction of deviated nasal septa, an easier procedure, was also in vogue.

Justin M. Waugh, M.D., was the Clinic's first ENT surgeon. After his retirement, William V. Mullin, M.D., took over and did much to develop the technique of operating on the mastoid. After Mullin's untimely death from an overwhelming bacterial infection, Paul M. Moore, M.D., headed the department. He was succeeded by Harold E. Harris, M.D., a young surgeon with superb technical skill and clinical judgment.

By the 1940s, cancer of the larynx was becoming increasingly common. Pediatricians and internists were beginning to take a second look at tonsillectomy and to wonder whether the tonsils might be serving some useful function. Most importantly, an operation for otosclerosis, a disease that fused together the tiny bones of the inner ear, causing progressive deafness, was developed. When the surgeon who developed the procedure organized a course to teach other otolaryngologists how to do it, Harris was among the first to apply.

As a result of learning this new technique, he was swamped with patients. By 1955, the need for operations in which he had been trained (i.e., tonsillectomy, adenoidectomy, mastoidectomy, and correction of a deviated septum) had all but disappeared. In their place were new operations for cancers of the larynx, tongue, and mouth. Competition for the care of patients with these cancers caused conflict with the newly formed Department of Plastic Surgery. Bronchoscopic operations, historically performed by the otolaryngologists who had developed the technique, were rapidly shifting into the domain of the thoracic surgeons, who could then operate on whatever pulmonary disease was visualized. Thus, a struggle developed, and resolution of this conflict seemed insoluble without casualties.

Fortunately, the Clinic's Surgical Committee, composed of the contestants' peers, acted discreetly and with tact. They took no

action on bronchoscopy, believing that there would be enough to provide training for residents in both departments. They charged a subcommittee to review the results of neck dissections in the presence of the surgeons who had done them. It soon became clear that the plastic surgeons, who had been trained to do radical surgery, performed the operations in about one-third the time and with fewer complications. Soon, the plastic surgeons and otolaryngologists were cooperating, the latter doing the laryngeal part of the operations and the former doing the neck dissections assisted by ENT residents.

After Harris' death in 1975, Harvey M. Tucker, M.D., was named chairman of the Department of Otolaryngology and Communicative Disorders. By 1985, the department had six members who were specializing in head and neck cancers, nerve reconstruction, cosmetic surgery of the face, and hearing problems. Newer diagnostic tests for dizziness and hearing loss were implemented. The addition of otolaryngologists with special expertise in head and neck cancer ensured a steady flow of patients formerly referred to plastic surgeons.

Under the chairmanship of Marshall Strome, M.D., who assumed the post in 1993, the department's residency program was lengthened one year to accommodate a full year of research. Graduates can now receive a Master of Science degree for their work during that year. Each year since the initiation of the research program, residents have won one or more of the Academy of Otolaryngology's prestigious research awards. Further, the department added a Section of Pediatric Otolaryngology and the Center for the Professional Voice, as well as Sections of Rhinologic Disorders, Medical Otolaryngology, and Regional Medical Practice.

Under Dr. Donald Lanza's direction, the Section of Rhinology, with three staff physicians, became the largest nationally and the only one with two fellowship-trained rhinologists.

New programs attracting local and national recognition included laser palatal surgery for snoring, phonosurgery for the larynx, cochlear implantation, endoscopic sinus surgery alone and in conjunction with laser surgery, and innovative techniques for managing skull base tumors.

Strome performed the first total human larynx transplant in 1998, and the patient was still doing well in 2004. Also associated with that operative procedure were human thyroid and parathyroid transplantation. Ongoing research in the otolaryngology transplantation labora-

tory holds the promise for frequent transplantation of all three organs.

Research flourished in all sections. Clinical studies improved the understanding of autoimmune inner ear disease. Rhinology explored the importance of the eosinophil in the genesis of chronic sinusitis and polyposis. Further, with its new basic science laboratory, otology investigated cellular involvement in noise-induced hearing loss. The Section of Vestibular Disorders piloted programs with National Aeronautics and Space Administration on the adaptation of the inner ear to the environment of space. The head and neck service investigated adoptive immunotherapy for head and neck cancer. The laryngotracheal reconstruction service developed new techniques of tracheotomy, improving the reconstruction of damaged tracheas and offering new options for patients with severe obstructive sleep apnea. In audiology, outcome studies evaluated the effects of hearing aids and hearing aid use, and, in speech and language pathology, the impact of acid reflux on the voice and the potential for induction of malignancy were under investigation.

In 2000, the Departments of Otolaryngology at Cleveland Clinic Florida in both Weston and Naples came under the directorship of the department in Cleveland. Using the very successful Cleveland regional facilities as the model, three new physicians were recruited, bringing the total staff in Florida to four. The new section flourished under the on-site section head, David Greene, M.D. Shared satellite rounds, joint courses, and frequent on-site visits by Strome strengthened both the section and the department. At present, the otolaryngology group is very successful, and it serves as a possible model for other programs.

An emerging research program is transforming this clinical department into a formidable academic center. Clinical studies have improved the understanding of autoimmune inner ear disease. The new Immunology Genetics Laboratory is carrying out clinical trials for treatment of advanced squamous cell carcinoma of the head and neck.

NEUROLOGICAL SURGERY

From the moment the Department of Neurological Surgery was founded by Charles E. Locke, Jr., M.D., in 1924, it was considered outstanding. The second chairman, W. James Gardner, M.D.,

enjoyed a long and brilliant career characterized by the combination of innovation with superlative skill. His contributions to the art and philosophy of neurologic surgery earned him a special place in his field. His achievements were not limited to neurosurgery and included development of the pneumatic suit to maintain blood pressure or control bleeding, the pneumatic splint for fractures, and the alternating air-pressure mattress for preventing bedsores. His associate for 30 years was Alexander T. Bunts, M.D., son of one of the four founders, who specialized in the surgery of protruded intervertebral disks and spinal cord tumors.



*Alexander T. Bunts, M.D., son of
Founder Bunts, Neurosurgeon,
Co-Editor of the first edition of
To Act As A Unit*

Gardner was succeeded by Wallace B. Hamby, M.D., who had trained under him and then developed a national reputation in the diagnosis and treatment of brain aneurysms.

After Hamby came Donald F. Dohn, M.D., who maintained the department's reputation for leadership with his proficiency in stereotactic surgery for symptoms of Parkinson's disease, surgery to control excessive sweating, and pituitary destruction with implanted radioactive yttrium (Y^{90}). Dohn left the Clinic in 1981 to enter private practice in Mississippi, but he was coaxed out of retirement in 1988 to start the Department of Neurosurgery at Cleveland Clinic Florida.

Joseph F. Hahn, M.D., who was subsequently appointed chairman of the Division of Surgery in 1987, filled the vacancy Dohn left in Cleveland in 1981. John Little, M.D., held the post of department chairman from 1987 until he left in 1990, whereupon Hahn resumed the department chair in addition to his duties as chairman of the Division of Surgery. During Hahn's tenure, the department grew to include not only clinical neurosurgeons, but also a neu-

reintensivist and a director of neurological research. Hahn developed basic research programs in neuro-oncology, epilepsy surgery, vascular disease, and congenital defects. Taken together with programs in the Department of Neurology, the complete epilepsy program is now ranked among the best in the country. Over the past 17 years, the department established a computer-assisted neurosurgery program, partially funded by a \$10 million grant from the Department of Defense, part of a government effort to convert defense technology for civilian applications. The Clinic's program uses targeting software to pinpoint and eradicate lesions in the brain. To better exploit this and other new technologies for treating brain tumors, the department established a Neuro-Oncology Center. Two of the technologies housed in this center are the gamma knife and the Cyberknife[®].

The Department of Neurological Surgery also developed the use of subdural and epidural electrodes in epilepsy surgery and the stereotactic wand for brain and spinal surgery. Both procedures are now used throughout the country.

In 1998, Dr. Marc Mayberg was appointed as chairman, succeeding Hahn. Mayberg substantially expanded the department, increasing the staff from eight to seventeen. Subspecialty and multi-specialty programs were developed in cerebrovascular and endovascular neurosurgery, functional neurosurgery, spine, epilepsy, pediatrics, and brain tumor. He developed a community neurosurgery practice on the west side of Cleveland, serving Lakewood, Fairview, and Lutheran Hospitals. He established the Brain Tumor Institute, under the chairmanship of Dr. Gene Barnett, as an independent department in the Cancer Center.

Mayberg also grew the department's basic research programs. Due to the efforts of both basic scientists and clinician-scientists, the department obtained over \$4 million annually in extramural funding to support research projects in cerebrovascular disease, neurodegenerative disorders, spine, hydrocephalus, and neuro-oncology research.

New techniques and medical devices developed and refined in the department since the mid-1990s include frameless stereotactic navigation, deep brain stimulation for movement and behavioral disorders, specialized techniques for endovascular therapy of cerebrovascular disorders, spinal fixation devices, and experimental

protocols for treatment of primary brain tumors. Deep brain stimulation is an exciting new intervention in the emerging field of functional neurosurgery. At The Cleveland Clinic, Dr. Ali Rezai, a young staff member, leads this effort and is developing one of the most advanced programs in deep brain stimulation in this country.

ORTHOPEDIC SURGERY

Orthopedic surgery was introduced as a specialty at the Clinic in 1922 by James A. Dickson, M.D., a surgeon of great originality and international repute. Before it became common practice to insert metal hip joints, Dickson had perfected an elegant operation called geometric osteotomy, in which an unhealed fracture of the hip was rotated to promote healing. During his tenure, which lasted until 1954 when he was succeeded by James I. Kendrick, M.D., he witnessed the decline and fall of osteomyelitis as a major orthopedic problem and the development of artificial joints and operations to correct arthritis.

In 1951, George Phalen, M.D., identified carpal tunnel syndrome, a painful disorder that afflicts workers who use repetitive hand and wrist movement. Phalen also developed a test for diagnosing the syndrome, thus enabling its treatment and contributing greatly to the science of occupational health.

Charles M. Evarts, M.D., replaced Kendrick as department chairman in 1970. He was one of the first proponents of internal fixation, the process of holding vertebrae in place by a metal prosthesis. His pioneering work in scoliosis surgery has developed into what is today a broad-based and highly respected spine surgery program. The Clinic pioneered techniques of endoscopic spine surgery as well as the treatment of neoplasms of the spine. During this time, the Clinic took a notable role in the beginning of total joint replacement. In 1970, Evarts performed the first total hip replacement using a metal-on-plastic design. The Clinic received one of the first FDA licenses to use the new methyl methacrylate bone cement.

Another example of the innovativeness of Clinic orthopedists was Dr. Lester Borden's development of instrumentation allowing total hips and total knees to be successfully and precisely implanted by private practitioners. Dr. Borden, a prodigious teacher of joint

replacement techniques, also pioneered the development of porous in-growth total hip replacement. This method uses a metal prosthesis with an irregular surface that allows the bone to grow into it and secure it more firmly.

Sports medicine was introduced to the department by H. Royer Collins, M.D., who succeeded Evarts as chairman. Over the years, sports medicine increased in importance and visibility, reaching its peak under the direction of John A. Bergfeld, M.D., who joined the staff in 1973. Bergfeld not only developed techniques of surgery for the treatment of sports injuries, but also developed an organization of medical coverage that helped prevent sports injuries. His ideas on the integration of orthopedic surgeons, sports medical specialists, and on-site athletic trainers have been a model for the rest of the country. Emphasizing conditioning to prevent injury, the Clinic was one of the first centers to make the sports physiologists an integral member of the sports medicine team. Highly respected by athletes and trainers, Bergfeld has fostered many key relationships between the Clinic and major sports teams, including the Cleveland Browns and the U.S. Olympic Ski Team.

Alan H. Wilde, M.D., a surgeon noted for joint replacements, took over the department in 1976 and served with distinction for 15 years.

Since the mid-1980s, the department has added a Foot and Ankle Center, an Upper Extremity Center, and a traumatology program. Musculoskeletal researchers, first housed in the department's biomechanics and biomaterials programs started by Evarts, later merged into the Department of Biomedical Engineering in the Research Institute, collaborate with the orthopedic surgery staff in studies of musculoskeletal biology, gait analysis, neuromuscular control, biomechanics, biomaterials, and image processing. Technology transfer is one of the department's priorities.

A number of new techniques and technologies have been developed in part or wholly at the Clinic. One example is the non-cemented joint prosthesis, which allows bone to grow into pores in the metal surfaces for better fixation. The sports medicine surgeons have led the way in developing techniques for reconstructing knee ligaments. This allows a common but complex operation to be done mostly through an arthroscope, which translates into a shorter hospital stay and quicker recovery.

In 1991, Dr. Kenneth Marks, an orthopedic oncologist and

department member since 1975, succeeded Wilde as department chairman. Under Marks's leadership, the department rose in national rankings and was the first specialty department to expand into the Clinic's Family Health Centers. Ultimately, the family health center offices effectively tripled the department's size.

Prior to 1975, the standard dictum in orthopedics was to amputate sarcomatous limbs. But Marks had been a resident of George "Barney" Crile, M.D., and was impressed with his results with tissue-sparing breast surgery. Inspired, he introduced the same principles to orthopedic oncology. Today, only five percent of cancerous limbs require amputation.

The department's Section of Musculoskeletal Oncology has developed methods for reconstructing the skeleton and soft tissues after massive limb-sparing cancer surgery. These include a new method for the functional attachment of bone or soft tissue to the metal endoprosthetic devices used to reconstruct hips and knees after tumor resection. Fresh and frozen allografts are used often in reconstruction after tumor resection, trauma, and surgery for arthritis, and a new device allows for congenital defects to be gradually reconstructed with vascularized bone segments. A new system for harvesting human osteoblastic progenitor cells by aspiration has played a critical role in the healing of fractures, the incorporation of bone grafts, and maintenance of the skeleton throughout life.

The cerebral palsy clinic helps maximize the function of children with neuromuscular disorders. A Rheumatology/Orthopaedics Clinic improves the care of patients with rheumatoid arthritis, and a Foot and Ankle Clinic aids patients with a broad spectrum of conditions, including those related to diabetes. A geriatric orthopedic program helps patients stay mobile and independent as long as possible. Care for nonsurgical orthopedic conditions of all kinds is provided by the addition of three family practitioners with special training in musculoskeletal disease.

Orthopedic surgery at the Clinic entered a new era of dynamic research and expanded academics with the appointment of chairman Joseph P. Iannotti, M.D., Ph.D., in 2000. The department, which is regularly cited among the nation's top ten by *U.S. News & World Report*, continues to have a single goal: to improve the care of patients with musculoskeletal disorders. At the beginning of the new century, the Department of Orthopaedic¹ Surgery had a grow-

ing clinical staff of fifty full-time physicians and surgeons, representing nine general and subspecialty areas of orthopedics. They managed more than 200,000 outpatient clinic visits and performed more than 9,000 surgical procedures annually at the main campus and at nine family health centers.

Iannotti established a Center for Orthopaedic Research, the cornerstone of a restructured and expanded investigative arm. With two major components—musculoskeletal research and clinical outcomes—the center promotes collaboration between clinicians and basic scientists in areas of common interest. Of special interest were bridge programs designed to bring bench research to the bedside. Teams of investigators included surgeons, molecular biologists, bioengineers, and biostatisticians. Recognizing the growing importance of basic research, the orthopedic residency was lengthened from five to six years. All incoming orthopedic residents spend one year performing basic science research. In addition, the curriculum for all residents, fellows, and graduate students now includes an extensive basic science study, emphasizing the principles of the musculoskeletal system and orthopedic surgery.

UROLOGY AND THE GLICKMAN INSTITUTE

During The Cleveland Clinic's existence, scientific developments have transformed urology from a service concentrating on medical treatments and minor surgery to a major surgical specialty. At first, urologists were primarily occupied with treating gonorrhea and performing suprapubic prostatectomies. Then came transurethral resection of the prostate and of bladder tumors. William J. Engel, M.D., Lower's son-in-law, was a master of the transurethral resectoscope. Charles C. Higgins, M.D., who succeeded Lower as head of the Department of Urology in 1948, became renowned for his "acid ash diet," an effective way of preventing, and sometimes dissolving, kidney stones. He also pioneered an operation to transplant the ureter into the lower bowel of children with exstrophy of the bladder. He operated on more of these patients than anyone else in the world, and also had one of the world's largest series of cystectomies for bladder cancer.

In 1934, a Cleveland pathologist (Harry Goldblatt, M.D., of

Western Reserve University) discovered that partial blockage of a renal artery was one cause of hypertension. Acting on this information, Clinic urologist Eugene F. Poutasse, M.D., developed renal arteriography. He discovered that removing the obstruction, grafting a new vessel, or removing the part of the kidney that the diseased artery supplied could correct renal hypertension in many such patients.

After Higgins and Engel retired, Ralph A. Straffon, M.D., became chairman of the department. Straffon was destined for surgical stardom. An All-Star football player during his days at the University of Michigan, he had both the intellectual firepower and the physical stamina to excel in whatever task he set for himself. His achievements were recognized nationally in 1993 by his election to the presidency of the American College of Surgeons, the most prestigious post to which a surgeon can professionally aspire, and one once held by the senior Crile. Collaborating with Willem J. Kolff, M.D., Ph.D., inventor of the artificial kidney and head of the newly formed Department of Artificial Organs, Straffon initiated a kidney transplant program. Within a few years, the Clinic reported more successful transplantations of kidneys taken from cadaver donors than had ever been done elsewhere. Today, the Clinic's renal transplant program remains one of the largest and most successful in the world (see chapter 15); it is supported by a large dialysis program and regional tissue-typing laboratory.

By 1983, the Department of Urology had begun the process of subspecialization. That year, Straffon relinquished his chairmanship to assume the chair of the Division of Surgery, and James E. Montie, M.D., took over. A highly regarded urologic oncologist dedicated to his patients, Montie served only 18 months before deciding that the demands of the position took too much time away from patient care. He returned to his position as a staff urologist, and Andrew C. Novick, M.D., was appointed as department chairman.

Novick had become a national figure in urology through pioneering contributions in kidney disease and reconstructive renal surgery. He developed the technique of extracorporeal or "bench" kidney surgery for repairing complex kidney disorders outside the body and then transplanting the repaired kidney back into the patient. His work on atherosclerotic renal artery disease was the first to demonstrate that this condition was a major cause of kidney failure in older patients and could be successfully treated with sur-

gical renal arterial reconstruction. He pioneered the technique of partial nephrectomy or nephron-sparing surgery for patients with kidney cancer, and he accumulated the largest experience in the world with this approach. Interestingly, much of Novick's work represented an extension of the concept of "conservative kidney surgery" first espoused by Lower.

Under Novick's leadership, the department evolved into one of the largest and most subspecialized programs of its kind in the country, with tertiary care expertise in every urologic subspecialty: female urology, urodynamics, endourology, stone disease, impotence, prostatic surgery, urologic oncology, renal vascular disease, renal transplantation, adrenal disease, male infertility, reconstructive surgery, pediatric urology, and laparoscopic and minimally invasive surgery. Seven basic research laboratories, staffed by full-time urologic scientists, were developed to perform translational investigations in these areas. The urology residency training program was expanded to include an additional year of laboratory research. Several urology staff members gained recognition for their work and were elected to leadership positions in national and international organizations. Novick served as President of the American Board of Urology in 2000 and Chairman of the National Urology Residency Review Committee in 2001-2002.

In August 2000, the institution recognized the excellence of the department's activities by announcing to the trustees that it would henceforth be known as the Cleveland Clinic Urological Institute. In December of that year it was again renamed, this time as the Glickman Urological Institute.

OBSTETRICS AND GYNECOLOGY

James S. Krieger, M.D., introduced gynecology as a specialty at The Cleveland Clinic in 1950. He arrived about the time that the Papanicolaou (Pap) smear became popular. Krieger was interested in the conservative treatment of in situ carcinoma of the cervix by conization. While gynecologists across the country were debating whether the condition should be treated by radical or conservative hysterectomy with or without radiation, Krieger collected data showing that simple conization could be as effective as the more

complex procedures if the physician followed the patients with annual Pap tests. At first bitterly criticized, the concept gradually gained broad support.

After Krieger's retirement in 1974, Lester A. Ballard Jr., M.D., assumed the chairmanship. He increased the staff to seven physicians, who covered the areas of general gynecology, gynecologic oncology, child and adolescent gynecology, and microsurgery. He also started a program in assisted reproductive technologies. This program includes both cryopreservation of embryos for later reimplantation as well as routine in-vitro fertilization. In addition, the newest micromanipulation technique of sperm injection into the cytoplasm of the egg has enabled many previously barren couples to achieve pregnancy.

As a natural extension of this program, the Clinic reestablished the obstetrical service under the leadership of Dr. Elliot H. Philipson in 1995 after a 29-year hiatus. The new obstetrics unit was located on the sixth floor of the original hospital building, just around the corner from the old obstetrics ward. The old delivery suite, which had served as an operating pavilion for cardiovascular surgery, then orthopedics, and finally ambulatory surgery, had come full circle with its reconversion to the original use.

Lack of options to treat a large number of patients with defects in the pelvic floor resulted in the establishment of a Center for Pelvic Support. This center unites the efforts of Clinic gynecologists, colorectal surgeons, urologists, and physical therapists to give better care for these difficult problems.

Although the Department of Gynecology always had a strong clinical focus, it began to develop major commitments to research and education in the 1990s with the arrival of a new chairman, Jerome L. Belinson, M.D. The department formed an organized research effort with numerous funded projects in reproductive endocrinology, gynecologic oncology, and general gynecology.

During Belinson's chairmanship, the department expanded rapidly to include all subspecialty clinical services of obstetrics and gynecology. These included maternal-fetal medicine, general obstetrics, midwifery services, reproductive genetics, pediatric and adolescent gynecology, reproductive endocrinology and infertility, general gynecology, gynecologic oncology, and pelvic reconstructive surgery. Minimally invasive surgery procedures expanded rapidly

to encompass all the different gynecologic surgical areas. The research effort was expanded to include a basic science laboratory in collaboration with the Urological Institute. This Center for Advanced Research in Human Reproduction, Infertility, and Sexual Function is the laboratory infrastructure for the Obstetrics and Gynecology research program.

After ten years as chairman, Belinson stepped down to focus his practice and research in gynecologic oncology, having a specific interest in cancer prevention in developing countries. Dr. Tommaso Falcone became chairman in 2001 after serving as head of the Section of Reproductive Endocrinology. Falcone and his team at The Cleveland Clinic were the first to conduct a patient trial using robotic laparoscopic surgery. The report is now part of the permanent research collection at the Smithsonian Institution. The department is continuing its objective in outstanding clinical care. The name of the department was changed to "Obstetrics and Gynecology" in 2001 to reflect the growing importance of obstetrical services within the department. A new Women's Health Center opened in 2001 with strong participation from this department. A new Maternal-Fetal Unit also opened in 2002 in collaboration with the Neonatal Intensive Care Unit.

PLASTIC SURGERY

With formal training programs established just before World War II, plastic surgery is one of the youngest surgical specialties. Soldiers wounded in World War I, who had recovered with serious deformities, challenged surgeons in the 1920s and 1930s to develop expertise in repair and reconstruction. These surgeons had a variety of surgical backgrounds, and so the emerging specialty was a hybrid.

Robin Anderson, M.D., was a general surgeon trained in St. Louis by some of the great American pioneers of plastic surgery. Anderson's technical prowess was not limited to the operating room. Like many noted physicians, he had a profound interest in music. He expressed this by building fine harpsichords in his spare time, many of which are still in existence. When Hoerr felt the need to develop plastic surgery at the Clinic, he extended an invitation to Anderson, whom he had known for several years. Anderson joined

the Department of General Surgery in 1951. By 1960, a second plastic surgeon had been added, and the department was separated from general surgery with Anderson as chairman.

When Anderson retired in 1979, Melvyn I. Dinner, M.D., succeeded him. A move into more spacious facilities was followed by rapid growth. Dinner recognized the importance of developing subspecialties within plastic surgery and encouraged the development of expertise in craniofacial, pediatric, hand, and microvascular techniques.

When Dinner left the Clinic in 1983 to enter private practice, Shattuck W. Hartwell, Jr., M.D., a long-time member of the department and director of the Office of Professional Staff Affairs, was asked to serve as acting chairman while a search committee looked for a new permanent chairman. Earl Z. Browne, M.D., was appointed in 1985. James E. Zins, M.D., who had been on the staff for the previous nine years, succeeded him. Zins is the department's current chairman. In the ensuing ten years, Zins doubled the size of the plastic surgery staff, adding specialists in aesthetic surgery, and hand surgery, as well as in pediatric, craniofacial, breast, and plastic surgery research.

DENTISTRY

In 1982, a Section of Dentistry and Maxillofacial Prosthetics was established within the Department of Plastic Surgery to provide support for the treatment and rehabilitation of patients with head and neck cancer as well as deformities of the jaw, face, and skull. Salvatore J. Esposito, D.M.D., was recruited to head the section, which included prosthodontists, an oral and maxillofacial surgeon, and a general dentist. Dentistry had existed as a department, led by Dr. Charles Resch, from 1934 until his retirement in 1966. Between 1966 and 1982, consultants provided dental care at the Clinic.

By 1991, the section had regained departmental status, with Esposito as chairman. Under his direction, the department has grown from four to eleven staff members. To support their multidisciplinary approach to patient care, Sections of Maxillofacial Prosthetics, Oral and Maxillofacial Surgery, Oral Medicine, Cosmetic and Implant Dentistry, Dental Oncology, Orthodontics, and Sports Dentistry were established. It became one of the larger

hospital programs in the United States.

The department's residency and fellowship positions are highly sought after. It was the first in Ohio to offer a dental oncology fellowship, which, funded by the American Cancer Society, is one of only five in the country. The department's general practice residency, initially funded by the NIH, is now considered one of the finest in the United States. Among the new techniques residents learn are dental implantation, craniofacial implantation, and the carbon dioxide laser for removing intra-oral soft tissue lesions and gingival hyperplasia.

Research activities in the Department have addressed dental implants, periodontal factors in heart disease, effects of mouth guards for athletes, speech prostheses for the patient with neuromuscular compromise, and quality of life for the head and neck cancer patient.

VASCULAR SURGERY

The Department of Vascular Surgery began in 1957, and it was one of the earliest of its kind in the country. In 1952, Crile, Jr., had visited St. Mary's Hospital in London, where he saw the world's first homograft (allograft) artery bank. Impressed with the success of replacing a blocked artery with a patent one from a cadaver, he decided this procedure should be brought to the Clinic. Upon his return, he persuaded Dinsmore to select a surgeon to learn this technique. Since the vessels in the lower extremity would be the main ones grafted, they chose Alfred W. Humphries, M.D., a junior member of the Department of Orthopaedic Surgery. They felt he had the skill, stamina, knowledge of the anatomy, and (perhaps most importantly) would be able to amputate the leg if the graft failed. Fortunately, Humphries proved to be an innovative technician with a keen intellect, and he made bold progress in a new field that was virtually uncharted in the 1950s.

Crile, Jr., was not alone in his interest in establishing this service at The Cleveland Clinic. Victor G. deWolfe, M.D., former chairman of the Department of Vascular Medicine, writes:

"Early in 1952, I made a visit to Dr. Robert S. Dinsmore, the Chief of the Department of Surgery, and explained to him that, just as heart and kidney surgery were rapidly advancing, so was

the new specialty of vascular surgery, and we should get into the act. Shortly after this, Dr. Barney Crile returned from England with news about Dr. Charles Rob's artery bank and his early work in replacing vessels with freeze-dried arteries. He urged Dr. Dinsmore to take action

"Due to Barney's enthusiasm, Dr. Dinsmore wasted no more time in solving this dilemma. He came to a very logical solution. On the staff at that time was a young orthopedic surgeon, Alfred Humphries Initially he would do vascular work in the extremities. Ausey Robnett was a young general surgeon, newly appointed to the staff, who had an interest in abdominal surgery and proved himself to be skillful in that area, and he would work in the belly. These two young surgeons would operate together and each would teach the other about his area of expertise

"Humphries did his first operation in 1952, when he successfully treated a popliteal aneurysm and replaced it with a section of the patient's saphenous vein. By 1957, 280 patients had been operated on with a 90% success rate in the larger arteries and 80% in the arteries below the groin

"The department, created from spare parts, has continued the well-established tradition of careful selection, meticulous technology, and outstanding results."

Within a year, Humphries was working full time at vascular surgery, and his knowledge about all types of arterial reconstructions and their complications had become widely recognized. He was the first surgeon in the area with an artery bank. He then promoted the use of plastic grafts, and through the years had great success treating all types of aneurysms. With the assistance of anesthesiologist John Homi, M.D., he devised a technique to increase blood flow to the brain by having patients inhale carbon dioxide, thus enabling operations on their carotid arteries, which previously had often led to brain damage from anoxia.

In 1961, he added a second member to his staff, Edwin G. Beven, M.D., whose surgical skill as a resident was legendary. Beven succeeded Humphries as chairman in 1973. His first staff appointee, Norman R. Hertzner, M.D., was another Clinic graduate who would eventually succeed him as chairman in 1989. Hertzner is a former

President of the Society for Vascular Surgery and also former Associate Editor for the *Journal of Vascular Surgery*.

In 1998, Dr. Kenneth Ouriel was recruited from the University of Rochester to succeed Hertzner as chairman of the department. Ouriel had a long interest in the minimally invasive treatment of vascular disease. His work has examined the use of thrombolytic therapy to treat intra-arterial clots, as well as the minimally invasive treatment of aortic aneurysms with endovascular grafts. Ouriel was the lead author on a landmark multicenter trial comparing thrombolytic therapy to surgery for treatment of acute lower extremity occlusion.

The vascular surgical staff now numbers fourteen surgeons. The department is the largest of its kind and maintains the largest vascular surgical fellowship in the United States. The staff performs the greatest number of aortic endograft procedures of any center in the world and performs almost 4,000 total vascular surgical procedures annually with morbidity and mortality rates that rival those of any other center in the country. The department is active in basic and clinical research, maintaining laboratories within the Lerner Research Institute as well as a clinical research staff that includes nurses, technologists, and a biostatistician. The department has recently added a second operative angiography suite to further its focus of minimally invasive treatment for vascular disease processes.

THORACIC AND CARDIOVASCULAR SURGERY

The growth of cardiac surgery has been one of the most dramatic developments in the history of the Clinic. In 1948, Donald B. Effler, M.D., was appointed head of the Department of Thoracic Surgery. At that time, lung cancers were still rare, and thoracic surgeons were mainly occupied with draining empyemas and lung abscesses and performing thoracoplasties for tuberculosis. With the findings that penicillin was effective in controlling pneumonia and streptomycin reduced the need for thoracoplasties, surgery for these diseases all but vanished. However, the rising incidence of lung cancer, first treated by total pneumonectomy in 1932, soon filled the gap. Then came the pioneering work of surgeons in Boston and California on congenital heart disease and mitral stenosis, and the specialty of cardiac surgery was born. The California surgeon was John Jones, M.D.,

brother of the Clinic's Chief of Surgery Thomas Jones.

The Clinic's thoracic surgeons were poised to participate in heart surgery. They found that some cardiac defects could be corrected or improved by relatively simple operations, but others required a machine to maintain circulation during surgery. Such machines existed, but they were large and cumbersome. Clinic staff member Willem J. Kolff, M.D., Ph.D., constructed a membrane oxygenator that permitted open heart surgery to be performed on children, who do not have a large volume of blood. Once heart-lung machines were improved, the number of relatively safe operations increased, but other problems remained. Kolff had done animal experiments in which he temporarily stopped the heart's action by injecting a solution of potassium into the coronary arteries. This technique was adapted for clinical use, and open heart surgery became a reality. Congenital and rheumatic valve defects were soon successfully corrected, and prosthetic valves were inserted into the heart.

As soon as Clinic cardiologist F. Mason Sones, Jr., M.D., used his new angiography technique to demonstrate that an internal mammary artery implanted in the heart muscle could form connections with coronary arteries, there was great demand for this operation. Occasionally, a narrowed portion of a coronary artery was excised and a vein inserted, or the narrowed area was slit lengthwise and a tapered gusset inserted to widen the narrowed portion. Both procedures resulted in increased blood flow through the coronary arteries.

In May 1967, Clinic staff surgeon René G. Favaloro, M.D., born and educated in Argentina, began using sections of saphenous veins to bypass coronary artery obstructions. Although isolated attempts at coronary bypass surgery had been attempted previously, Favaloro saw this strategy as a planned, consistent approach to the treatment of large numbers of patients with coronary artery disease, and his colleagues in cardiology and cardiothoracic surgery agreed. The effectiveness of bypass surgery in relieving angina was soon obvious, and coronary bypass grafting rapidly became one of the most common operations performed in the United States. Bypass surgery, an anatomic treatment for coronary artery disease, set the stage for many types of invasive treatments of cardiovascular disease and remains a major contribution to progress in the treatment of cardiovascular disease. The operative mortality associated with these bypass operations was low, and, since 1971, the Clinic's overall



Drs. René G. Favaloro and F. Mason Sones, Jr. (photographed in 1982)

operative mortality rate for non-emergency coronary artery bypass surgery without valvular disease or other serious complications has been less than one percent.

Favaloro returned to his homeland in 1971, where he remained an internationally acclaimed surgical leader until his death in July 2000. Effler retired to a more relaxed practice in 1975 and was succeeded by Floyd D. Loop, M.D. Loop's contributions included development of arterial grafting, improvement of the techniques involved in reoperation, extensive follow-up studies on bypass patients, and approaches to control the cost of hospitalization for cardiac surgery. His confirmation of the superiority of the internal thoracic artery as a bypass graft to the left anterior descending coronary artery was a major advance, and the department has continued to lead the field of cardiovascular surgery in the use of arterial grafting to treat coronary artery obstructions. Clinic surgeons have continued to play important roles in the progress of the field of coronary bypass surgery, including the development of techniques for coronary reoperations and surgery performed without cardiopul-

monary bypass. Drs. Joseph Sabik, Gösta Pettersson, and Bruce Lytle have become recognized authorities in these areas.

In addition to bypass surgery, Clinic surgeons have led the world in valve repair and replacement. Delos M. Cosgrove III, M.D., developed techniques to repair the mitral valve in the mid-1980s. He subsequently introduced a mitral valve retractor and annuloplasty ring that afford a more effective repair. With the assistance of intraoperative Doppler echocardiography, the mortality rate of operations for mitral valve repair has been extremely low, and the long-term success has been excellent. The large number of patients with valvular heart disease treated at The Cleveland Clinic has yielded a large experience with a variety of valve procedures, and Clinic surgeons have become expert in the use of homografts (human valve transplants), minimally invasive valve surgery, and aortic valve repair.

Cleveland Clinic surgeons have also become known for the repair



Leaders in the treatment of coronary artery disease. Standing: Willem J. Kolff, M.D., Ph.D., Artificial Organs (far left); Donald B. Effler, M.D., Thoracic and Cardiovascular Surgery (5th from left); Laurence K. Groves, MD., Thoracic and Cardiovascular Surgery (6th from left); Donald E. Hale, M.D., Anesthesiology (4th from right); F. Mason Sones, Jr., M.D., Cardiology (far right) (photographed in 1956)

of thoracic great-vessel aneurysms and aortic dissections. In collaboration with the cardiac perfusionists, Bruce W. Lytle, M.D., introduced and refined a technique that extends the safe interval of total circulatory arrest necessary to perform these complex surgeries without neurological complications. To aid in the continued expansion of techniques for aortic surgery, the department in 2001 recruited Dr. Lars Svensson, a major contributor in the development of this field.

The coalescence of multiple surgical techniques and approaches for the treatment of valvular, coronary, and aortic disease has allowed the Clinic surgeons to treat patients with complicated situations involving combined cardiac diseases, including reoperations. No single breakthrough is responsible for the success in this field, but it results from a combination of improved techniques in anesthesia, perfusion, blood conservation and transfusion, myocardial protection, cerebral protection, and, most of all, the large experience of the surgeons and anesthesiologists involved.

Although surgery for congenital heart disease was performed early in the department's history, the treatment of acquired heart disease demanded the most attention. Progress in the study and correction of cardiac defects accelerated following the appointment of Carl C. Gill, M.D., a congenital heart surgeon, to the staff in 1978. Gill later became Chief Executive Officer of Cleveland Clinic Florida and Chairman of the Department of Cardiothoracic Surgery there. Under the direction of the current head of The Cleveland Clinic's congenital heart program, internationally renowned and legendary Australian surgeon Roger B. Mee, M.B., Ch.B., this program has become one of the largest and most successful in the country.

In the late 1960s, Clinic cardiac surgeons performed two successful heart transplants. But it was not until 1984 that consistent transplantation activity was launched. Initially directed by Robert W. Stewart, M.D., by the mid-1990s the transplantation team was performing more than sixty heart transplants a year, making it one of the top four programs in the country (see chapter 15).

In 1997, The Cleveland Clinic established the Kaufmann Heart Failure Center, with surgeon Patrick M. McCarthy, M.D., and cardiologist James Young, M.D., as co-directors. The heart failure concept brings together multiple medical and surgical treatments for heart failure, including transplantation, in one area. Additional options offered include left ventricular remodeling, mitral valve repair, revasculariza-

tion for patients with ischemic cardiomyopathies, and the use of mechanical-assist devices. Also participating in this heart failure team are surgeons Nicholas Smedira, Michael Banbury, and José Navia.

In December 1991, the Clinic joined a multicenter group using the HeartMate implantable left ventricular assist device (LVAD) as a bridge to transplantation. Patients who were candidates for a heart transplant, but who were not expected to survive the wait for a donor, received the LVAD. Despite the fact that all were in cardiogenic shock and many were moribund, 75% recovered and subsequently underwent transplantation. The Clinic's program quickly became the most active in the United States and obtained some of the best clinical results.

In 1993, The Cleveland Clinic was one of three centers selected by the National Institutes of Health to continue research towards an electrically powered total artificial heart. This device will be used on patients who are not candidates for an LVAD, and will initially be used as a bridge to transplantation. Both the HeartMate® and total artificial heart are designed to serve as an alternative to heart transplantation as well as therapy for patients with end-stage heart disease.

In 1986, the Board of Governors established a formal Section of Thoracic Surgery under the leadership of Thomas W. Rice, M.D. This section has recorded significant achievements, including the first lung transplant in Ohio and, since then, approximately 176 single and 101 double transplants. The lung transplant program is currently under the direction of Malcolm DeCamp, M.D. In addition, pioneering work in video-assisted, thoracoscopic lobectomies and the use of ultrasound to further the clinical staging of esophageal cancers has improved results, and with the input of Drs. Rice, DeCamp, and Sudish Murthy, the volume of the Section of Thoracic Surgery has grown to almost 1,300 cases per year.

The department's extensive surgical activity has provided a fertile resource for its computerized cardiovascular information data bank (Cardiovascular Information Registry [CVIR]). Established in 1971, it is the oldest and one of the country's largest. The data, entered on every patient, have helped the surgeons to track the results of the procedures they perform. In 1986, the CVIR was instrumental in confirming the long-term benefits of the internal thoracic artery bypass graft, thus influencing the choice of grafts for future patients.

In 1989, Loop became chairman of the Board of Governors and Chief Executive Officer. Paul C. Taylor, M.D., then served as acting chairman of the Department of Thoracic and Cardiovascular Surgery until Delos M. Cosgrove III, M.D., was selected as chairman the following year. Under Cosgrove's direction, The Cleveland Clinic has become the largest open-heart surgery center in the United States, also performing the largest number of valve operations. In addition to caring for several thousand patients a year and conducting extensive research, members of the Department of Thoracic and Cardiovascular Surgery have tackled the challenges of a more efficient and cost-effective surgical practice. Despite the facts that 48 percent of the patients are over age 65, that 30 percent undergo reoperations, and that the majority of cases are complex, the department has reduced overall length of stay by admitting stable patients to the hospital on the day of surgery and discharging many earlier than is traditional. A total quality management program ensures consistency in the quality of care. For this reason, The Cleveland Clinic is proud to have been the first hospital in the country to voluntarily release outcomes data and mortality statistics to the public. The first of the Cleveland Clinic's award-winning *How to Choose a Doctor and Hospital* series dealt with coronary artery surgery. In these brochures, various Clinic services are evaluated according to six quality indicators (credentials, experience, range of services, research and education, patient satisfaction, and outcomes) showing Clinic data vs. national benchmarks.

CONCLUSION

An overview of the Division of Surgery shows that Clinic surgeons have been both innovative themselves and quick to exploit the best ideas of others. Moreover, some have shown how medical or office treatment could replace an operation previously considered necessary. This ability to think of surgery as only one way of treating the patient is encouraged by the fact that there is no incentive for Clinic surgeons to perform a large number of operations; their salaries depend more on their peers' estimation of the quality of their work than on the dollars received as a result of it. It has been helpful, too, to have the cooperation of skilled colleagues who spend their time in

research as well as readily available, high-quality support from medical services. The tradition of innovation started so many years ago by Bunts, Lower, Crile, and Phillips has flourished in an environment well suited to the study of clinical problems and to the discovery of their solutions in the operating room, clinic, and laboratory.

¹ The department affects the British spelling, with an "a" in its official name, but American usage eschews the "a"; hence the inconsistency of spelling of orthop(a)edics in this section and elsewhere.

14. DIVISION OF ANESTHESIOLOGY AND CRITICAL CARE MEDICINE

BY FAWZY G. ESTAFANOUS AND JOHN TETZLAFF

*We are more sensible of
one little touch of a surgeon's
lancet than of twenty wounds
with a sword in the heat of fight.
—Montaigne, 1588*

THE BEGINNINGS OF ANESTHESIA HAD A DISTINGUISHED PLACE AT THE Cleveland Clinic. Around 1910, one of the four founders, Dr. George Crile, coined the term “anoci-association,” later shortened to “anociation,” which denoted the removal of pain and defined the role of anesthesia in safety and survival of patients undergoing surgery. Crile created the expression anoci-association to explain why the prevention of the perception of pain was an essential element to the practice of surgery, placing the importance on the preoperative preparation of the patient.

From 1921 to 1946, the administration of anesthesia at The Cleveland Clinic was handled by three or four nurses, who dropped ether onto gauze laid over the patient’s airway or used chloroform to “put them under.” This was done at the direction and under the supervision of the staff surgeon. Physicians did not begin to specialize in anesthesiology until just before World War II.

THE HALE YEARS, 1946-1967

Following the war, the Clinic established a Department of Anesthesiology in the Division of Surgery. Donald E. Hale, M.D., was appointed chairman in January 1946. Fully trained in surgery at the Mayo Clinic, Hale obtained board certification in both surgery and anesthesiology and later published an important textbook on anesthesia (Hale, Donald E., ed. *Anesthesia, by Forty American Authors*, Philadelphia: Davis, 1954). In this work, Hale wrote: "The anesthesiologist must have a thorough knowledge of the various surgical needs which he must meet. He must be a diagnostician and therapist; his diagnosis must often be instantaneous and must be followed by immediate and accurate therapy. To give anesthesia is not difficult; but to give safe anesthesia is." Among his numerous innovations while at The Cleveland Clinic were the first ventilator used in the state of Ohio and the first EKG machine that could be used in the operating room to support the developing area of open-heart surgery.

THE WASMUTH YEARS, 1967-1969

To complement his efforts to establish physician anesthesia at the Foundation, Hale initiated a residency program in anesthesiology in 1946. One of his early trainees (1949) was Carl E. Wasmuth, M.D., who replaced him as chairman in 1967, but served only two years before being elected chairman of the Board of Governors. Wasmuth also served as president of the American Society of Anesthesiologists (1968-9).

THE POTTER-VILJOEN YEARS, 1970-1977

J. Kenneth Potter, M.D, filled Wasmuth's vacancy in the Department of Anesthesiology. Under Potter's chairmanship, anesthesiology achieved divisional status at The Cleveland Clinic. John F. Viljoen, M.D., a specialist in the care of patients undergoing surgery for heart disease, succeeded Potter. Viljoen was one of the founders of the Association of Cardiac Anesthesiologists, an elite group of 50 physicians. When Viljoen stepped down in 1976, Potter was called out of retirement to lead the division until a replacement could be found.



*J. Kenneth Potter, M.D., Chairman,
Division of Anesthesiology,
1970-1973*



*Fawzy G. Estafanous, M.D., Chairman,
Division of Anesthesiology and
Critical Care Medicine, 1987-*

THE BOUTROS YEARS, 1977-1986

The Board of Governors appointed a search committee that recommended Azmy R. Boutros, M.D., a professor of anesthesiology at the University of Iowa, who accepted the position and assumed the chair in May 1977. Boutros subsequently reorganized the division and added staff to accommodate increasing clinical and educational responsibilities. He had a special interest in critical care and functioned as its director. In addition, he reestablished the anesthesiology residency program.

THE ESTAFANOUS YEARS, 1986-

Fawzy G. Estafanous, M.D., who came to The Cleveland Clinic in 1970 and became chairman of the Department of Cardiothoracic Anesthesiology in 1977, was appointed chairman of the Division of Anesthesiology upon Dr. Boutros' retirement in 1986. To reflect the

scope of its services, Estafanous changed the name of the division to the Division of Anesthesiology and Critical Care Medicine. In 2003, the division oversaw 70 operating rooms and more than 70 critical care beds. The division contains four departments (General Anesthesiology, Cardiothoracic Anesthesiology, Pain Management, and Regional Practice) and three centers (clinical engineering and information systems, anesthesiology research, and anesthesiology education) reporting to the division chairman. The division has become one of the largest anesthesiology groups in the world.

CARDIOTHORACIC ANESTHESIOLOGY

In response to the Clinic's growing recognition as a heart center, the Section of Cardiothoracic Anesthesiology, founded by Viljoen, became a department in 1976, the first subspecialty department of its kind in the country, with Estafanous as its first chairman. As a cardiac anesthesiologist with an active interest in clinical and basic research, Estafanous played an important role in the evolution of cardiac anesthesia as a specialty. Not only did he build his department into one of the most respected in the world, but also he made significant contributions in the areas of post-myocardial-revascularization hypertension, hemodynamic and clinical effects of opioids and muscle relaxants, blood conservation, and limitations of hemodilution. In 1979, the department started one of the first fellowships in cardiothoracic anesthesiology, and this fellowship has become the largest of its kind in the United States. In 1986, the department offices moved to the new hospital wing, adjacent to eleven modern cardiac operating rooms and three cardiovascular intensive care units.

Upon Estafanous's appointment to the chair of the Division of Anesthesiology, Norman J. Starr, M.D., a staff member since 1979, became chairman of the Department of Cardiothoracic Anesthesiology. Under Starr, the department has grown to include 20 full-time, board-certified cardiac anesthesiologists, nine certified registered nurse anesthetists, 43 respiratory therapists, and a five-member clinical engineering department.

In addition, the Clinic's recognition as a major center for heart and lung transplantation has enabled the cardiac anesthesiologists to gain extensive experience in the use of advanced ventricular support

devices, the forerunners of an artificial heart. At the Clinic, surgeons regularly implant cardiac assist devices and perform lung reduction surgery, arrhythmia surgery, and valvuloplasty. The section for congenital heart anesthesia, headed by Dr. Emad Mossad, participates in more than 500 open heart procedures on infants and children each year. It also provides anesthesia for an equal or greater number of patients undergoing diagnostic and therapeutic procedures in the pediatric catheterization laboratories. In 2002, the approximate number of patients anesthetized by the members of the Department of Cardiothoracic Anesthesiology exceeded 6,190. By 2003, under the direction of Jean Pierre Yared, M.D., the 55-bed cardiovascular intensive care unit accommodated 14,000 patient-days per year, providing the department's twelve-year-old registry with a rich resource for outcomes research.

GENERAL ANESTHESIOLOGY

Although committed to subspecialization in anesthesia, one of Estafanous' first acts as chairman of the Division of Anesthesiology was to reestablish a Department of General Anesthesiology. Arthur Barnes, M.D., was selected chairman. Barnes formalized the department structure, establishing clinical subspecialty sections, appointing section heads, and creating new protocols to distribute resources. He also arranged for additional space to accommodate pre-surgical evaluation and the School of Nurse Anesthesia. In 1993, Barnes stepped down as chairman of general anesthesiology to dedicate all his time and efforts as director of the residency program.

Armin Schubert, M.D., a neuroanesthesiologist with a strong background in clinical research, succeeded Barnes as department chairman in 1993. Schubert expanded the acute postoperative pain service to make epidural analgesia routinely available. By 2003, the Department of General Anesthesiology was a dynamic group of more than 50 physicians with a remarkable breadth and depth of talent, and 36 nurse anesthetists supported it.

The department met the rapidly growing need for sophisticated post-surgical intensive care through its Section of Critical Care, with four staff members certified in critical care medicine as well as anesthesiology and full responsibility for the 18-bed surgical intensive

care unit (SICU). Shahpour Esfandiari, M.D., current director of the unit, was one of the original members, serving continuously for 28 years. In 1989, the department developed an ambulatory anesthesia service headed by R. John Anderson, M.D. This unit cared for 45 percent of all non-cardiac surgical patients at The Cleveland Clinic.

In 1995, Walter Maurer, M.D., became director of pre-anesthesia testing. He transformed this system into the pre-anesthesia consultation and evaluation (PACE) clinic. He established uniform algorithms for disease assessment and guidelines for laboratory testing. Maurer also served the institution as director of the Office of Quality Management. Universal use of HealthQuest, the computer-based health-screening tool developed by the division's clinical engineering group, was initiated by Dr. Sara Spagnuolo and accepted by the Division of Surgery.

The chair of the Department of General Internal Medicine (the late Joseph Cash, M.D.) agreed to participate in pre-surgical testing in 1995 and created the internal medicine pre-anesthesia consultation and therapy (IMPACT) clinic, which now evaluates approximately 9,000 patients per year.

The Departments of Orthopaedic Surgery and Plastic and Reconstructive Surgery have added procedure rooms in the Crile Building to accommodate more patients. In 1995, the Division of Anesthesiology acquired new space on the third floor of the Emergency Medicine and Access Center Building. In 1999, the Cole Eye Institute added a section of ophthalmic anesthesia under the leadership of Mark Feldman, M.D.

In the 1990s, pediatric surgery grew rapidly. The Clinic built two pediatric operating rooms in 1994 for congenital heart surgery and five for general pediatric surgery in 1997. Dr. Julie Niezgoda, the section head for pediatric anesthesiology, and Mossad, the section head for congenital heart anesthesiology, established the pediatric anesthesiology fellowship in conjunction with Akron Children's Hospital.

In 1960, the south wing of the sixth floor of what is now known as the M building housed the obstetrics unit. Interestingly, as noted in chapter 9, the space committee selected the same location (with some additional space on the same floor) as the site for the new obstetrics unit, which opened in April 1995. The late Dr. Gerald A. Burger started the obstetric anesthesia service. Steady growth in volume of service had led to a number of expansion projects, including the establish-

ment of a level-3 neonatal nursery in 2002. In 1999, Jonathan Waters, M.D., became the head of the section of anesthesia for obstetrics.

PAIN MANAGEMENT

In the 1970s, The Cleveland Clinic established a formal program for the management of postoperative pain. In 1988, the program was expanded to include chronic pain. Michael D. Stanton-Hicks, M.B., B.S., was appointed director of the Pain Management Center. The center's activities rapidly outgrew the capacity of its original space in the original hospital building and moved to the second floor of the former Woodruff Hospital. In 1998, the center moved again into a 25,000-square-foot space at the William O. Walker Center. Because of its increasing importance and rapid growth, the center became the Department of Pain Management in 2001, with Nagy Mekhail, M.D., Ph.D., as its first chairman. The department worked closely with the Reflex Sympathetic Dystrophy Syndrome Association, and The Cleveland Clinic's Spine Center, Cancer Center, Department of Physical Medicine and Rehabilitation, and Department of Gynecology. The most current pain management techniques were available, including spinal cord stimulation, the implantation of infusion systems, and the introduction of highly specific diagnostic tests using enhanced fluoroscopic imaging. Pain management expanded beyond the Clinic's main campus, providing diagnostic and therapeutic services at Lutheran Hospital, Lakewood Hospital, Marymount Hospital, Lorain Community Hospital, and others.

Postoperative pain management was a key service. The staff oversaw the placement of epidural catheters prior to anesthesia, allowing patients to continue analgesia postoperatively as long as necessary. The fellowship in pain management, established in 1993, has grown to be the largest pain management fellowship in the United States.

CLINICAL ENGINEERING AND INFORMATION TECHNOLOGY CENTER

In 1977, the Department of Cardiothoracic Anesthesiology formed the nation's first clinical engineering group. Headed by John Petre,

Ph.D., the group was charged with providing instrumentation management for cardiac anesthesia as well as the cardiac surgical intensive care units. This role rapidly expanded to the selection of equipment, round-the-clock maintenance, invention of new medical equipment, and planning for construction of new clinical spaces in the division. In the late 1990s, the clinical engineering group assumed the responsibility for the division's information systems. Estafanous encouraged the clinical engineering group to develop a computerized anesthesia record, the automated record-keeping system (ARKS). They formed a partnership with General Electric to commercialize the product.

EDUCATION CENTER

Hale started the first residency program, which continued under Wasmuth's leadership, and it combined with the residency program at Huron Road Hospital with the cooperation of William Dornette, M.D. When Boutros arrived in 1977, the division applied for an independent residency program that received approval the following year. The first class of two residents included Zeyd Ebrahim, M.D., who subsequently joined the staff and became vice-chairman of the Department of General Anesthesiology.

Estafanous delegated the responsibility for the residency program to Barnes. Under his direction, the program achieved a high level of excellence, having repeatedly received five-year unconditional approvals by the national Residency Review Committee in 1990, 1995, and 2000. Graduates of the program are highly sought after and continue to attain prominent positions. In addition to residency training, the Division of Anesthesiology initiated fellowships in cardiac anesthesiology (1979), anesthesiology critical care medicine (1989), anesthesiology pain management (1993), pediatric anesthesiology (1999), and obstetric anesthesiology (2002).

The opening of the E Building in 1995 provided sufficient space to establish the Center for Anesthesiology Education, including library space, a multimedia classroom seating 150, and dedicated on-call rooms. The division acquired a full-scale anesthesiology human patient simulator, created fully electronic residency information systems as well as an education website, and developed several soft-

ware programs for resident selection, tracking of cases, and evaluation. In 2000, the center applied for an increase in the residency and received permission to train 30 more residents for a total capacity of 90 residents. Upon Barnes's retirement in 2001, Estafanous appointed Dr. John Tetzlaff as director of the residency program.

In 1969, Wasmuth and Marietta (Del) Portzer started The Cleveland Clinic School of Nurse Anesthesia. Portzer was the first director of the school, which graduated its 216th student in July 1995. It was a hospital-based, 24-month certificate program until 1989, when it affiliated with the Frances Payne Bolton School of Nursing to offer an M.S. degree. Paul Blakeley, C.R.N.A., M.S.N., is the current director of the school. More than half of the graduates join the division.

RESEARCH CENTER

In 1994, the division established its first endowed chair, the Carl Wasmuth Endowed Chair in Anesthesiology and Critical Care Medicine for basic science research. In 1996, the Michael J. Cudahy Chair for Clinical Engineering was endowed for research in biomedical engineering. The division's research projects have attracted significant funding from the pharmaceutical and medical technology industries as well as the National Institutes of Health and American Heart Association.

In 1995, the division established the Carl Wasmuth Center for Anesthesiology Research and recruited Paul Murray, Ph.D., to coordinate and administer all research activity. The center occupies 3,500 square feet and includes six laboratories and six offices. Its goal is to maintain active investigation within the basic sciences of anesthesiology and to coordinate clinical research within the division.

Murray's own research focused on the mechanisms of pulmonary vascular regulation and the effects of anesthetic agents on pulmonary vasoregulation. A program for basic science research in pain management resulted in the recruitment of Manju Bhat, Ph.D., Salim Hayek, M.D., and Leonardo Kapural, M.D., Ph.D.

15. CENTERS, INSTITUTES, AND EMERGING DIVISIONS

BY DANIEL J. MAZANEC, RICHARD A. RUDICK, J. MICHAEL
HENDERSON, MAURIE MARKMAN, AND HILEL LEWIS

*Men of genius do not excel in any
profession because they labour in it, but
they labour in it because they excel.*

—William Hazlitt, 1823

THE COMBINATION OF EXPONENTIAL GROWTH OF THE INSTITUTION THROUGH addition of increasingly talented individuals, the emergence of new technology, and refinement of the team approach to complex clinical problems has begun to strain the traditional departmental and divisional structure of The Cleveland Clinic. To accommodate the special needs generated by these factors, the Board of Governors has designated several centers and institutes (some with their own endowments secured through philanthropy) and has created some new divisions as well. A few of these, such as the Lerner Research Institute, are long-established entities within the Clinic's structure, renamed to recognize specific benefactors. Others, like the Post Acute Medicine Division, are totally new structural entities, formed to better coordinate previously fragmented, or even unavailable, services. Some are so new that their histories are very short, and others are as yet in a somewhat fluid state and still works in progress. A few others are described in enough detail in other sections of this book that they do not require further description here.

While the Board of Governors has applied the designations

“Institute” or “Center” (or occasionally both) to some of these entities, there exist as yet no formal definitions of these terms. Some institutes are divisions, others are departments, and still others are neither. Most are multidisciplinary in some way: either multiple departments (sometimes crossing divisional lines), or strong, wholly contained research components may be incorporated into them.

This chapter describes a group of these entities that do not fit into the more traditional structural formats. Perhaps in future editions of this book, some or all of them may appear elsewhere, or, indeed, the entire basic structure of The Cleveland Clinic could be different. Time will tell what the best structure is, but it is certain that the Clinic will continue to experiment and fine-tune its structure as long as potential improvement in function appears possible.

THE CLEVELAND CLINIC SPINE INSTITUTE

The Center for the Spine was established in November 1984 as a cooperative effort of the Departments of Orthopaedic Surgery and Neurosurgery under the joint leadership of Frank Boumphrey, M.D., and Russell Hardy, M.D. Specialists from the Departments of Neurology and Rheumatic and Immunologic Disease who shared an interest in studying and treating patients with spinal conditions readily joined them in this effort. This “center without walls” relied on a central triage system to refer patients to the appropriate physician. The entire group met regularly to discuss and develop new approaches to the diagnosis and management of patients with back pain.

In 1990, a task force appointed by the Board of Governors recommended that the Center for the Spine be reorganized as a medical department “with walls.” They concluded that placing a medical director, physicians, and physical therapists at a single location, devoting their practices to disorders of the spine, would further the Center’s development as a model program for the treatment of spinal disorders through conservative patient management and rehabilitation. Its core concept was initial evaluation by a medical specialist rather than a surgeon.

In July 1991, rheumatologist Daniel J. Mazanec, M.D., became director of the Center for the Spine. Shortly thereafter, he developed

a close collaboration with the recently reconstituted Department of Physical Medicine and Rehabilitation (housed at that time in the Division of Medicine, later in the Division of Post Acute Medicine). In 1994, this collaboration resulted in the WERC (Work Evaluation and Rehabilitation Clinic), an innovative, multidisciplinary program for injured and disabled back patients aimed at restoring function and returning patients to work. The WERC has become one of the most successful programs of its kind in the country, with more than 90% of the patients who complete the program returning to work.

The Center for the Spine attracted a growing number of workers' compensation patients seeking alternative approaches or second opinions on work-related injuries. Center physicians collaborated extensively with the Department of Physical Medicine and Rehabilitation and the Pain Management Center to meet these patients' needs.

The interdisciplinary nature of the Center for the Spine enabled it to serve as a focal point for clinical activities, research, and education. The participating members of the Departments of Orthopaedic Surgery, Neurosurgery, Radiology, Pain Management, Psychiatry, and Rehabilitation Medicine focused on the development of clinically superior, cost-effective diagnostic and management methods for spinal disorders, emphasizing the appropriate use of technology.

In August 2002, a section of occupational health and employee health was created in the Spine Center headed by Dr. Richard Lewis. This clinical area served the health needs of both Cleveland Clinic employees and injured workers requiring ongoing follow-up care and rehabilitation.

In March 2003, the Center for the Spine joined the Spine Surgery sections in Neurosurgery and Orthopedic Surgery in a newly created Cleveland Clinic Spine Institute (CCSI), headed by neurosurgeon Edward C. Benzel, M.D. This new entity combined



*Edward C. Benzel, M.D., Director,
Cleveland Clinic Spine Institute, 2002-*

the medical and surgical spine programs at The Cleveland Clinic into one organizational structure for the purpose of streamlining patient care, promoting treatment pathways, and ultimately facilitating the most efficient model of spine healthcare delivery. Its goal was to facilitate clinical and academic collaboration among medical and surgical staff as well as strengthen research and educational activities in existing departments. It enabled further development of The Cleveland Clinic as a leader in the field of spine disorders.

MELLEN CENTER FOR MULTIPLE SCLEROSIS

A comprehensive center for the treatment of multiple sclerosis was the brainchild of Neurology chairman John Conomy, M.D., who had a special interest in the disease. The generosity of the Mellen Foundation and Mr. John Drinko made the dream a reality.

The Mellen Center for Multiple Sclerosis opened on February 11, 1985, occupying two rooms in the Department of Neurology. In addition to Conomy, the staff included three neurologists, each of whom dedicated one day a week to multiple sclerosis patients. Within three months, the Center also had a full-time nurse, occupational therapist, physical therapist, psychologist, and social worker, making it one of the most comprehensive clinical teams ever assembled to handle the various neurological and psychosocial aspects of the disease. Conditions were so crowded that staff members often saw patients together. Each team member evaluated every patient, resulting in comprehensive treatment recommendations. This mode of operation continued for about two years, until the increasing demand for services made it impractical. By mid-1986, the Mellen Center had moved into its own facility in the former Woodruff Hospital. A search committee recruited Richard A. Rudick, M.D., as the full-time director of the Mellen Center, and the program began a rapid growth phase.

Space and resources allowed the development of novel clinical programs, including special aerobic exercise, functional electrical stimulation, and adapted cooking. Staff members formed psychology groups for stress management and development of coping strategies, as well as specialized programs for children and adults. They also developed educational programs to teach patients and their families about multiple sclerosis, often in conjunction with the

local Multiple Sclerosis Society. The Center began to train students in nursing, occupational therapy, and social work to help non-Mellen patients cope with the disease. Outpatient services expanded to include neuropsychological assessments and counseling about the functional effect of multiple sclerosis-related cognitive impairment. A project to design and fabricate custom seating was implemented along with programs designed to help patients maximize their independence. In 1990, the Center started a day treatment program to provide social and therapeutic activities for patients with severe physical or cognitive impairment, and to afford a respite for their caregivers.

In 1999, the Mellen Center opened a Multiple Sclerosis Learning Center in the lobby of the U building to augment the educational focus of the Mellen Center. Several generous donors made this unique facility possible, and it became a collaborative effort among the local chapter of the National Multiple Sclerosis Society, the Multiple Sclerosis Women's Committee, and the Mellen Center itself. A full-time health educator staffed the Learning Center, providing resources in various formats, including a website and both drop-in educational sessions and scheduled programs.

In 1998, the Mellen Center began to explore the possibility of communicating with established patients about their care and concerns via the Internet. The result was establishment of the Mellen Center Care On-Line. Mellen Center Care On-Line allowed patients to communicate securely with their health-care providers without having to wait by the telephone. It made use of preformatted, fill-in-the-blank questions to assist patients in providing the information necessary to address their needs. The system routed questions to



*Richard A. Rudick, M.D., Director,
Mellen Center for Multiple Sclerosis,
1987-*

the appropriate member of the care team and tracked response time.

The Mellen Center helped found the Consortium of Multiple Sclerosis Centers. Conomy was named its first executive director, and subsequently two other Mellen staff members, Jill S. Fischer, Ph.D. (1992 to 1993), and Marie Namey, R.N., M.S.N. (2000 to 2001), served as presidents of the organization.

In 2002, the Mellen Center expanded its imaging capability by adding an MRI facility adjacent to the existing outpatient clinic.

Research programs began in 1988 at the Mellen Center and soon included studies of medications, memory impairment, cognitive function, physical function, and emotional status. The Center received grants to develop new devices to assist in managing symptoms and adapting computer equipment. Center scientists played a key role in developing interferon therapy, the first treatment proven to slow multiple sclerosis disease progression. The Center recruited Dr. Jeffrey Cohen to direct and develop experimental therapeutics.

In the realm of basic research, Dr. Richard Ransohoff, one of the founding neurologists at the Mellen Center and a world authority on brain inflammation, established a multidisciplinary group of investigators. Ransohoff and Rudick recruited a well-known myelin researcher, Bruce Trapp, Ph.D., to chair the newly formed Neuroscience Department in 1994. By 1998, the combined efforts of researchers in the Departments of Neuroscience, Immunology, Radiology, and Biomedical Engineering teamed with Mellen Center researchers to win a \$5-million program project grant from the National Institutes of Health to study the pathogenesis of multiple sclerosis.

In summary, the Mellen Center has developed a reputation as a leading multiple sclerosis center. The team approach has enabled the Center to fulfill its mission to provide compassionate, innovative care to patients and families affected by multiple sclerosis, to conduct important clinical and basic research, and to educate other clinicians, scientists, and the public about the disease.

TRANSPLANT CENTER

The concept of organ transplantation had long interested Clinic surgeons looking for ways to extend natural organ function without the

use of artificial materials. The first successfully transplanted organs were the kidneys. Ralph A. Straffon, M.D., started the Clinic's renal transplant program while he was chairman of the Department of Urology, and this program was the precursor of the Transplant Center. Since the 1980s, major technical improvements, advances in immunosuppression, and better patient selection criteria enabled establishment of successful transplant programs for bone, bone marrow, cornea, heart, larynx, liver, lung, and pancreas.

The Cleveland Clinic views transplantation as an essential component of a broad strategy to offer all patients with advanced diseases the most appropriate therapy. To coordinate all activities in this rapidly developing specialty, the Clinic opened a Transplant Center in 1985, under the direction of Andrew C. Novick, M.D. Since 1992, it has been directed by J. Michael Henderson, M.B., Ch.B., a liver transplant surgeon who also chaired the Department of General Surgery.



*J. Michael Henderson, M.B., Ch.B.,
Director, Transplant Center, 1992-*

Kidney Transplantation

The kidney transplant program, initiated in January 1963, was an outgrowth of Dr. Willem Kolff's pioneering efforts to develop and refine hemodialysis. At that time, renal transplantation was considered experimental and had relatively low patient and graft survival rates. From 1963 to 1967, The Cleveland Clinic, under Straffon's direction, performed about 10 percent of all cadaver kidney transplants. Advances in tissue matching techniques, the use of living donors, and a reduction in the surgical morbidity gave the program an edge, which resulted in more successful transplants than any other institution.

Andrew C. Novick, M.D., became director of renal transplantation in July 1977. The following year, he initiated the first approved postgraduate fellowship-training program in transplantation. As the first program to receive approval by the Education Committee of the American Society of Transplant Surgeons, it has trained 28 urologists in renal transplantation. Many went on to direct their own programs. In 1985, he was appointed chairman of the newly established Cleveland Clinic Organ Transplant Center, a position he held until Henderson assumed the role in 1992.

During the 1980s, the Clinic made important contributions to the field of renal transplantation, including use of pediatric cadaver kidneys for transplantation, development of microvascular surgical techniques to enable the transplantation of kidneys with abnormal vascular supply, and use of antilymphocyte globulin for immunosuppression.

By 2003, Clinic surgeons were performing approximately 200 kidney transplants a year at The Cleveland Clinic's main campus in Cleveland and its affiliated transplant programs in Youngstown, Akron, and Charleston, West Virginia. These programs, staffed by full-time Clinic kidney transplant surgeons, were developed to serve patients better and to improve acquisition of cadaver kidneys. The Cleveland Clinic's patient- and graft-survival rates following kidney transplantation were above the national average: the one-year patient survival rate was 95 percent, and the one-year graft survival rate was 93 percent following live-donor transplant. The graft survival rate was 86 percent following cadaver transplantation.

Kidney/Pancreas Transplantation

In the mid-1980s, physicians realized that a combined kidney and pancreas transplant could be used to improve management of diabetic renal disease in some patients. The Clinic performed its first kidney/pancreas transplant in 1985, and had done 14 by 1989, when the procedure was put on temporary hold due to the high rate of complications. After reassessing the immunologic and surgical aspects of the procedure, the kidney/pancreas program was resumed in 1993 under the direction of James Mayes, M.D. In 2000, Venkatesh Krishnamurthi, M.D., assumed the directorship and also

initiated a pancreas-only transplant program. Today, improved patient selection and better understanding of immunosuppressive agents make these procedures a viable option for selected patients with diabetes mellitus.

Bone Marrow Transplantation

The Cleveland Clinic's first bone marrow transplant took place in 1977, but the program did not begin to grow in earnest until the arrival of Roger Herzig, M.D., in 1982. Brian Bolwell, M.D., became director of the program after Herzig left the Clinic in 1988. During the 1990s, under Bolwell's dynamic leadership, bone marrow transplantation experienced remarkable growth. The Clinic was a founding member of the National Marrow Donor Program, which coordinates the search for unrelated donors for patients in need of allogeneic marrow transplants but lacking sibling donors. The Clinic became one of America's most active bone marrow transplantation centers performing transplants from unrelated donors.

In the 1990s, the use of stimulated peripheral blood progenitor cells, or stem cells, revolutionized autologous bone marrow transplantation. Researchers at the Clinic pioneered the application of novel growth factors to stimulate hematopoietic stem cells, thus bringing international recognition to the organization as a research leader in this field. The most common indication for autologous transplantation is non-Hodgkin's lymphoma.

Allogeneic bone marrow has the potential to yield an anti-tumor effect known as the graft-versus-tumor effect. This concept has led to non-myeloablative allogeneic hematopoietic cell transplantation, in which donor cells are utilized to confer an anti-tumor effect. Clinical application of the graft-versus-tumor effect became a major focus of the program.

Heart Transplantation and the Kaufman Center for Heart Failure

Cardiac transplantation is the most effective treatment for patients with truly end-stage heart failure. The cardiac transplant

program, as we know it today, began in 1984 and has sustained tremendous growth since that time. Indeed, in 1999, Clinic surgeons performed 113 cardiac transplants, the most at any single center in the United States in one year. More important than volume, however, are the outcomes. The survival rate exceeded the national average and was higher than expected, given the Clinic's liberal donor and recipient criteria.

Patrick M. McCarthy, M.D., joined the Department of Cardiovascular Surgery in 1990. He became a pioneer in the field of heart-failure surgery. He developed the Left Ventricular Assist Device (LVAD) program at the Clinic, the largest such program in the United States. Utilized primarily as bridge-to-transplant, the LVAD improved survival and quality of life for the most critically ill patients awaiting a donor heart. The Clinic participated in the early clinical trials for both the Novacor[®] and HeartMate[®], now FDA-approved. In 2001, The Cleveland Clinic became the second center in the United States to begin a clinical trial with the Jarvik 2000[®] assist device.

The cardiac transplant program underwent significant personnel changes after its inception in 1984. James B. Young, M.D., joined the Department of Cardiology to head the Section of Heart Failure and Transplant Medicine. McCarthy became Director of the program in 1998. Three additional surgeons, Nicholas G. Smedira, M.D., Michael K. Banbury, M.D., and José L. Navia, M.D., eight cardiologists, and thirteen nurse coordinators worked with him.

For all its success, cardiac transplantation remained but a small part of the multitude of medical and surgical options available to treat heart failure. Recognizing the enormity of the heart failure epidemic, George M. and Linda H. Kaufman established the Kaufman Center for Heart Failure in 1998. The Center provided for collaboration across departments, bringing together cardiologists, cardiothoracic surgeons, research scientists, and allied health professionals to advance the treatment of congestive heart failure.

Lung and Heart/Lung Transplantation

Cleveland Clinic surgeons performed Ohio's first single lung transplant in February 1990 and the state's first double lung transplant 16 months later.

In February 2000, the Clinic's Lung Transplant Program entered its second decade, riding an impressive wave of growth. With the recruitment of thoracic surgeon Malcolm DeCamp, M.D., in 1998, the program doubled its annual volume. By 2003, performing more than 40 transplants each year, the Clinic continued to have the most active lung transplantation program in Ohio and ranked in volume among the top five in the country. To sustain such volume, the surgical cadre grew to include four experienced transplanters. DeCamp joined Nicholas Smedira, who was also active in the cardiac transplant program and served as Director of the Heart/Lung Transplant Program. B. Gösta Pettersson, M.D., who initiated and directed Denmark's flagship heart and lung transplant center, was recruited to the Clinic in 1999. His pioneering work with bronchial artery revascularization at the time of lung transplantation enriched the spirit of innovation within the Clinic's program. General thoracic surgeon Sudish C. Murthy, M.D., Ph.D., also joined the team in 1999.

By 2003, the program had evaluated more than 1,100 patients with advanced lung disease. Almost 300 individuals received replacement lungs. Patients with a variety of end-stage respiratory diseases are potential lung transplant recipients and can expect survival rates approaching 80 percent after one year and 50 percent after five years. An ongoing shortage of donors has stimulated the evolution of a comprehensive advanced lung disease program. Directed by Atul C. Mehta, M.D., this collaboration identified alternatives to transplantation for patients with chronic respiratory failure. Drs. Jeffrey Chapman and Omar Minai assisted Mehta in the evaluation of selected patients with emphysema for lung volume reduction surgery, selected patients with pulmonary hypertension for pulmonary thromboendarterectomy, continuous prostacyclin or endothelin-antagonist therapy, and interstitial lung disease patients for antifibrotic or immune modulative drug therapy.

The success of The Cleveland Clinic's lung transplant program as well as the advanced lung disease center was the result of a multidisciplinary effort by experts from the Departments of Pulmonary and Critical Care Medicine, Thoracic and Cardiovascular Surgery, Cardiothoracic Anesthesiology, Infectious Disease, Pathology, Endocrinology, Nursing, and Social Services as well as the allogeneic laboratories. Surgical mortality for lung transplantation steadily decreased from nearly 30% in the early 1990s to less than 5% by

2000. In 2001, all 40 patients transplanted left the hospital alive. Such results are a testament to the success of an integrated transplant center concept.

On February 14, 1992, McCarthy performed the first heart-lung transplant in Ohio. Candidates for this rare type of transplant have either complex congenital heart disease with severe pulmonary hypertension, or combined end-stage heart and lung disease. Due to the lack of donors, only 30-50 of these operations have been performed in the entire country every year.

Liver Transplantation

Robert E. Hermann, M.D., and Edwin G. Beven, M.D., performed the first liver transplant at The Cleveland Clinic in the late 1960s. It was an auxiliary transplant, and the patient's own liver remained in place. The patient, a child, died 24 hours after the operation. This was one of only 100 liver transplants that had been attempted worldwide by 1975.

Cleveland Clinic physicians performed the Clinic's first orthotopic (in the normal position) liver transplant in November 1984. The operation followed several months of planning and training of the liver transplant team. Hermann, along with David Vogt, M.D., and William Carey, M.D., visited the University of Pittsburgh to observe Thomas Starzl's liver transplantation program before the Clinic's program began. Additionally, the surgeons carried out several transplant procedures in the laboratory setting to become familiar with both the donor and recipient procedures. From 1985 to 1992, Vogt and Thomas Broughan were the Clinic's liver transplant surgeons. In 1992, Broughan left The Cleveland Clinic, and Dr. J. Michael Henderson, an experienced liver transplant surgeon from Emory University, came aboard as chairman of the Department of General Surgery and Head of the Transplant Center. In 1993, the liver transplant surgical staff was further augmented by the arrival of James T. Mayes III, M.D.

Between November 1984 and December 2001, the Clinic's team did 586 liver transplants on 542 patients, including four patients who had combined liver/kidney transplants, one patient who had a liver/pancreas transplant, and thirteen adult patients who received a

right lobe from a living donor. In 2002, the overall one-, five-, and ten-year survival rates were 84.7%, 72.6%, and 55.2%, respectively. The limiting factor in liver transplantation was always insufficient availability of cadaver organs. To address this, in October 1999, after several months of preparation and planning, the Clinic's liver transplant team began using liver tissue from adult living donors. By 2003, 14 living-donor liver transplants had been performed at The Cleveland Clinic without serious complications for the donors. The survival results for the recipients were also very good.

Corneal Transplantation

The corneal transplant program, co-directed by David M. Meisler, M.D., and Roger H.S. Langston, M.D., in the Cole Eye Institute, was initiated in 1970. By 2003, surgeons in the Cole Eye Institute performed more than 100 corneal transplants annually.

Meisler has sat on the national advisory committee of the Eye Bank Association of America and has been a long-standing member of the medical advisory committee for the Cleveland Eye Bank. He has authored many articles and chapters on corneal transplantation. He has participated in national collaborative studies and is currently the principal investigator for The Cleveland Clinic in the National Eye Institute-sponsored Cornea Donor Study. Current research efforts, in part supported by the Eye Bank Association of America, include investigating the effect that nitric oxide has on corneas in corneal storage media.

Laryngeal Transplantation

Marshall Strome, M.D., joined The Cleveland Clinic in 1993, having been recruited from the Brigham and Women's Hospital in Boston to head the Department of Otolaryngology and Communicative Disorders. Strome's primary research focus from the mid-1980s had been on laryngeal transplantation. The Clinic's laryngeal transplantation laboratory opened soon after his arrival. Five more years of research data supported consideration of a human procedure, which was controversial because the organ was

considered “non-vital.” After an exhaustive review by the Institutional Review Board, Strome received a green light to proceed. The screening process for the “perfect” recipient took one year. Donor screening was similarly rigorous.

Strome performed the transplantation on January 4, 1998, and, as of 2003, it remained viable. This represented the first-ever total laryngeal transplantation. The thyroid gland and parathyroid glands were transplanted as well, also firsts. Interestingly, 80% of the patient’s thyroid function today is from the donor organ. Calcium metabolism is normal. The patient uttered his first words in many years, “Hello Mom”—very hoarsely—three days after the procedure. Today his voice is normal with pitch control, inflection, and normal volume. His occupation is motivational speaking!

Bone Transplantation

The Department of Orthopaedic Surgery has restored limbs using large-segment bone allografts, allograft prosthetic composite reconstructions, and osteoarticular allografts since the 1980s. In 1983, the department established a full-service Musculoskeletal Tissue Bank, under the direction of Michael Joyce, M.D., since 1993. Services included donor screening, serological testing, procurement, processing, and hospital-based patient surgical implantation, coordinated through a national Musculoskeletal Tissue Organization, working with The Cleveland Clinic to ensure quality and safety by meeting federal guidelines and standards of the American Association of Tissue Banks. The Musculoskeletal Tissue Bank stored tissues such as demineralized bone, freeze-dried small segments of bone, and frozen large bone segments, including whole bones, hemipelvises, and fresh osteochondral grafts. These allografts were commonly used in prosthetic hip revisions, reconstruction of long bones affected by previous tumor resection, and restoration of cruciate knee ligaments.

Allogen Laboratories

The Cleveland Clinic’s kidney transplant program was in its infancy when the Department of Immunopathology opened a tissue-

typing laboratory to support it. William E. Braun, M.D., arrived in 1968 to head the laboratory, with a joint appointment in the Department of Hypertension and Nephrology. Under Braun the laboratory achieved international prominence in HLA typing for solid organ and bone marrow transplants as well as disease associations and paternity testing. In recognition of these achievements, the American Society of Histocompatibility and Immunogenetics elected Braun as its first president in 1974.

Under the direction of Daniel J. Cook, Ph.D., the allogeneic laboratory used advanced technology, such as flow cytometry, to perform more than 60,000 tests annually. These techniques were used to identify the presence of antibodies recognizing a potential organ donor's histocompatibility antigens, possibly indicating a heightened risk of organ rejection. In addition, they enabled monitoring of the effectiveness of post-transplant treatment in preventing rejection. The laboratory's use of high-resolution HLA typing to identify HLA gene products at the molecular level was critical in obtaining a contract to type the DNA of potential bone marrow donors through the National Marrow Donor Program.

TAUSSIG CANCER CENTER

Throughout its history, Cleveland Clinic physicians have contributed significantly to advances in the care of cancer patients. George Crile, Jr., M.D., was one of the earliest and most influential advocates of limited surgery for breast cancer, having begun to doubt the need for radical mastectomy in the early 1950s. Rupert P. Turnbull, Jr., M.D., discovered that isolating diseased tissue during surgery for colon cancer would prevent the further spread of cancer cells. By the 1980s, his "no-touch" technique was widely accepted as reducing the risk of death from metastatic disease following colorectal surgery.

Since the term "cancer" refers to a group of more than 100 diseases characterized by the abnormal growth and spread of cells, many departments incorporated the treatment of patients with cancer into their programs at The Cleveland Clinic. Pathologist William A. Hawk, M.D., first attempted to organize a centralized cancer program in the 1970s. Hawk's vision focused on aspects of malignant



Taussig Cancer Center, 1999

disease that were not yet well represented within the institution, such as basic research, epidemiological studies, cancer rehabilitation, and continuing care. He conceived the program in collaboration with Case Western Reserve University, which had an established program in basic cancer research and could contribute to the community-wide efforts necessary for epidemiological studies and rehabilitation. Unfortunately, this resulted in an initial activity that had little relationship to the cancer treatment services under way in the clinical departments.

In the early 1980s, the Board of Governors perceived the need for a Cancer Center that could coordinate all cancer treatment and research at The Cleveland Clinic. The Departments of Hematology and Medical Oncology and Radiation Therapy had already established distinct programs. Surgical oncology fell under no specific departmental umbrella. The Board of Governors recruited general surgeon John H. Raaf, M.D., in 1985 to be the center's first full-time director.

As the cancer program expanded, surgical departments began to create formal oncology sections. This increased the number of cancer patients. To serve them best, the Department of Hematology and Medical Oncology, then chaired by James K. Weick, M.D., began to recruit staff members with special organ expertise. The first was David J. Adelstein, M.D., an expert in digestive tract malignancies, who joined the group in 1989. After Weick transferred to Cleveland Clinic Florida, Maurie Markman, M.D., a medical oncologist with a

major interest in gynecologic malignancies, was recruited as chairman of the Department of Hematology and Medical Oncology and director of the Cancer Center in 1992.

In the mid-1980s, the opening of the A Building, later rechristened as the Crile Building, had a significant impact on the Cancer Center. Several departments vacated space in the original and main Clinic buildings when they moved to their new quarters. Fortunately, this space was adjacent to Radiation Therapy. Weick immediately recognized the value of such space, where related clinical specialties could practice in proximity, and he decided to relocate Hematology and Medical Oncology to the third floor of the original Clinic building. A portion of this floor was reserved for interdepartmental use, where related services, such as neurological assessments and post-operative follow-up of cancer patients, could take place.

Even in the absence of physical proximity, some oncologists had organized interdepartmental clinics before 1985 by making departmental space available for cancer patients scheduled to be seen by physicians from other departments. One example is urologic oncology, where a team that included a urologic oncologist from the Department of Urology and a medical oncologist from the Department of Hematology and Medical Oncology saw patients weekly. The area was renovated and dedicated as the Cleveland Clinic Cancer Center in June 1987. The subsequent catalytic impact of the physical identity for the Cancer Center resulted eventually in the creation of several additional discrete centers, including the Breast Center on the ground floor of the Crile Building, and the Center for Prostatic Diseases in the Department of Urology.

By 1994, the Cleveland Clinic Cancer Center had the largest cancer treatment program in Ohio and surrounding states. In only 10 years, the number of patients treated at the Clinic for cancer had grown from one in six to one in four inpatients, and from one in twelve to one in nine outpatients. This volume permitted subspecialists to develop substantial expertise in dealing with some relatively rare forms of cancer.

Besides coordinating existing cancer programs, the Cancer Center collaborated with other departments to develop new programs. One successful example was the establishment of screening and detection programs for patients without symptoms within departments that previously focused on the diagnosis and treatment

of symptomatic patients. By 1994, the Clinic was offering site-specific screenings for cancers of the breast, cervix, colon and rectum, mouth, prostate, and skin.

Treatment advances since 1971 have increased the number of patients surviving five or more years by one-third. Many of these patients at The Cleveland Clinic participated in a peer-support group, which was founded in 1988 by Cancer Center nurse counselor Barbara Gustafson. They also celebrated National Cancer Survivors Day yearly with major festivities on campus.

Unfortunately, the lack of basic understanding about how to control cancer means that progression of the disease is still a reality for many patients. For this reason, the Cancer Center is committed to helping patients with a poor prognosis control their symptoms. The Palliative Care program began in 1987 when T. Declan Walsh, M.D., was recruited jointly by the Cancer Center and Department of Hematology and Medical Oncology. Initially established as a consulting service for hospitalized patients, the program grew to include a dedicated outpatient clinic, home care services, and certified hospice. In 1994, a generous gift from the H. R. H. Family Foundation made it possible to add a 23-bed inpatient unit, which has been recognized by the World Health Organization.

Comprehensive cancer care required a team approach that combined the contributions of physicians with those of allied health professionals, especially nurses and social workers. In 1985, the Division of Nursing established a Cancer Nursing Section with six clinical nurse specialists assigned to interdepartmental cancer teams. By 2003, cancer nursing care throughout The Cleveland Clinic had been carefully coordinated. Social workers, who were available only to hospitalized cancer patients and their families before 1985, were provided in the Cancer Center clinics for outpatient counseling, follow-up in the community, and leadership of peer support groups.

Since the analysis and interpretation of results were recognized to be critical in controlling cancer, the Department of Biostatistics and Epidemiology, then in the Research Institute, established a new Section of Biostatistics in the Cancer Center in 1985 to help with this process and track cancer patients enrolled in clinical trials. Beginning in 1986, the section directed the work of the Cleveland Clinic Tumor Registry, which collected baseline and follow-up

information on all cancer patients seen at the Clinic. In 1994, it was expanded to include a registry for studies involving families with a strong history of cancer. In 2003, the Section of Cancer Biostatistics, under the leadership of Paul Elson, D.Sc., supported collaboration of clinical researchers with biostatisticians, systems analysts, and data management study coordinators.

In 1993, the Cancer Center assisted in recruiting Roger Macklis, M.D., to chair the Department of Radiation Therapy. A funded investigator in radiation biology and radiation physics as they related to targeted delivery of cancer therapy, Macklis was interested in many of the Cancer Center's programs. For this reason, the new department was transferred from the Division of Radiology to the Cancer Center and renamed the Department of Radiation Oncology. Within the first two years, the new department received a gift that allowed it to begin planning a Center of Oncologic Robotics and Computer-Assisted Medicine, where a prototype linear accelerator mounted on a robotic arm (Cyberknife[®]) was housed. This design was intended to reduce the need for rigid immobilization of patients undergoing lengthy and recurring treatments for brain cancer.

New basic research insights have been applied to the care of cancer patients at the Clinic for over a quarter of a century and have been an integral part of the Cancer Center's success. Cancer research reached a new level of institutional prominence when Bernadine Healy, M.D., was named chair of the Division of Research (soon thereafter renamed the Research Institute) in 1985. She immediately established a Department of Cancer Biology in the division and recruited Bryan R. G. Williams, Ph.D., to head it. Its importance was further underscored when George R. Stark, Ph.D., a researcher with interests in gene amplification and interferon, succeeded Healy as chairman. He received the Research Institute's first National Cancer Institute basic sciences program project award for an interdepartmental investigation into signal transduction (for more about the Research Institute, see Chapter 20). By 2003, dozens of Clinic researchers were working closely with Cancer Center clinicians to find better ways of preventing and treating all forms of this group of diseases.

In September 2000, the new 162,000 square-foot Taussig Cancer Center opened, with modern facilities for both treatment and research. The design included accommodations for patient comfort, including individual rooms for patients receiving chemotherapy.

The highlight of the building was an entire floor devoted to multidisciplinary outpatient clinics where the various specialists caring for cancer patients could work as a team to optimize management. The building, designed by Cesar Pelli, also included ten laboratories where researchers focused on translating basic discoveries from the bench to the clinic could work in close proximity with oncologists and their patients.

In the new century, the Clinic continued to build upon its leadership role in the care of cancer patients through a wide array of experts and specialized services. The Cleveland Clinic's Taussig Cancer Center provided a single, integrated approach to the control of cancer for patients throughout the Foundation.

COLE EYE INSTITUTE AND DIVISION OF OPHTHALMOLOGY

Ophthalmology was introduced at The Cleveland Clinic in 1924 under A. D. Ruedemann, M.D., a capable surgeon with a dynamic personality. He acquired an enormous following and saw an extraordinarily large number of patients on a daily basis. An independent thinker who often locked horns with the chief of surgery, Ruedemann left the Clinic in 1947 and was succeeded by Roscoe J. Kennedy, M.D., a respected physician who served with distinction.

When Kennedy retired in 1969, Froncie A. Gutman, M.D., a vitreoretinal specialist, was appointed department chairman. The only other staff member at that time was a general ophthalmologist named James Nousek, M.D., whom Kennedy had hired in 1957.

Under Gutman's leadership, the Department of Ophthalmology began to expand and modernize, adding subspecialty-trained physicians, implementing new technology, strengthening the educational programs, and expanding clinical research activity. By 1988, the department included specialists in corneal and external disease, neuro-ophthalmology, uveitis, pediatric ophthalmology, glaucoma, ophthalmic plastic and reconstructive surgery, and general ophthalmology, in addition to a vitreoretinal staff of four. They developed busy and challenging clinical practices that provided the resources and environment for resident and fellowship training as well as clinical investigation. Many of the staff members were recognized as



Cole Eye Institute, 1999

leaders through their appointment or election to office in professional ophthalmic organizations. Gutman himself was elected chairman of the American Board of Ophthalmology and served as president of the American Academy of Ophthalmology.

Ophthalmic technicians, laboratory services, and optometry were introduced to support the clinical programs. In 1970, the Department of Ophthalmology opened the first ophthalmic laboratory in Cleveland with a full-time staff of photographers who performed fluorescein angiography studies. New laboratories for ophthalmic electrophysiology and ultrasonography soon made additional diagnostic services available. The department established an ophthalmic technician training program to supply a pool of trained individuals who could assist in patient evaluations and ancillary testing. The addition of optometrists and an optical dispensary rounded out the department's primary care service.

In 1993, Hilel Lewis, M.D., a highly regarded vitreoretinal specialist and researcher from California, succeeded Gutman as chairman. With his appointment, the Ophthalmology Department left the Division of Surgery and formally became a new division and an institute in October 1994. Lewis envisioned the creation of a world-class center for vision science that would be preeminent in patient care,



*Hilel Lewis, M.D., Chairman,
Cole Eye Institute (Division of
Ophthalmology), 1992- (© Janine
Bentivegna, used with permission)*

research, and education. His goals were to create the leading eye research and patient care institute in the world, and to train the future leaders in ophthalmology.

Lewis immediately began recruiting both experienced and established as well as young and ambitious ophthalmologists and highly credentialed basic researchers to staff 10 clinical departments and the newly formed basic and clinical research programs. He encouraged all of them to participate in clinical trials, to conduct original research, and to involve themselves in basic research.

To solidify a national and international academic reputation, Lewis planned a series of

disease-specific summits, continuing medical education courses, and other education activities. He placed new emphasis on the residency-training program and added fellowships in vitreoretinal diseases and surgery, pediatric ophthalmology, uveitis, neuro-ophthalmology, refractive surgery, and glaucoma. By 1998, the program was recruiting from the top 10% of the applicant pool.

It was clear that top-notch facilities would be needed to accommodate the ophthalmology initiative. The Clinic made the decision to build a freestanding, comprehensive facility that would house all Eye Institute activities. Lewis envisioned an innovative facility that would foster provision of the best outcomes and service for patients, close and effective interactions between clinicians and scientists, and meeting the Institute's goals. After two years of program planning, the Clinic hired Cesar Pelli and Associates to design the building according to the plan.

Beginning in 1994, Lewis led fundraising efforts for the \$60-million Eye Institute. After a successful campaign, construction began in May 1997, and the building opened in 1999. A naming gift that year

from the Cole National Corporation gave the campaign a major boost.

By 2003, the clinical and research faculty numbered 70. The Cole Eye Institute provided care to more than 130,000 patients in 2001, more than any other eye institute in the country. Its physicians were providing care to heads of state, royalty, and industry leaders, as well as everyday people. Scientists were working in all Cole Eye Institute laboratories, and an additional 3,000 square feet of lab space in the 1974 Research Building (FF) had to be renovated for research in corneal wound healing and gene therapy. Multi-million dollar grants from the National Institutes of Health, foundations, and industry provided support for this work.

Lewis understood that, to be effective, the Cole Eye Institute would need to integrate into the community. He established ophthalmology practices at the Clinic's Family Health Centers to provide regionally convenient access to eye care. An Eye Care Network, established in 1995, enables the Eye Institute to provide services under managed care contracts.

By 2003, initial staffing was complete. Cole Eye Institute physicians provide clinical services in the departments of Comprehensive Ophthalmology, Vitreoretinal Services, Corneal and External Disease, Refractive Surgery, Neuro-Ophthalmology, Uveitis, Pediatric Ophthalmology and Adult Strabismus, Oculoplasty and Orbital Surgery, Glaucoma, and Ocular Oncology, supported by departments of Optometry, Low Vision and Rehabilitation, and Ophthalmic Anesthesia. The Institute has clearly made excellent progress toward its ambitious goal of world leadership in eye care and related research.

DIVISION OF POST-ACUTE CARE

In September 2002, the Board of Governors brought together several clinical operations under the rubric of post-acute care, directed by Declan Walsh, M.D. These included rehabilitation medicine (physical medicine and rehabilitation), palliative care, home care services (including hospice care and infusion therapy), subacute care, discharge planning, and long-term acute care (Grace Hospital). A main driver for the creation of this division was the recognition that, although consumers of post-acute care services accounted for

about 25% of hospital discharges, they incurred 40% of hospital days with the attendant high costs. Another reason for combining these services was the similarity of Medicare reimbursement issues that affected them all, as the federal government continued to develop prospective payment systems to cover all services. Appropriate operation under these payment systems requires special administrative expertise, which Walsh had accumulated in setting up palliative care and hospice care under the Cancer Center, as discussed in the Taussig Cancer Center section of this chapter.

Rehabilitation Medicine merits special mention, having existed for many years as a department in the Division of Medicine. Recognizing the necessity of rehabilitation for continuity of care, the Clinic established a free-standing Institute of Rehabilitation Medicine in 1990. Vinod Sahgal, M.D., a respected neurologist and rehabilitation specialist, was recruited from Northwestern University Medical School to head the new program. The institute later became a department in the Division of Medicine and finally in the Division of Post-Acute Care in 2002. It is physically located at Euclid Hospital, a member of the Cleveland Clinic Health System. It now has 150 employees and collaborates with nearly every department in the Clinic. A measure of the department's excellence is the recent philanthropic funding and establishment of the Robert, Eleanore and Kathy Risman Chair and Professorship in Medicine, currently held by Sahgal.

DIVISION OF CLINICAL RESEARCH

As previously noted (Chapter 10), the Board of Governors created the position of Chief Academic Officer in March 2001 and appointed Eric Topol, M.D., to this job. At the same time the Board established the Office of Clinical Research and made Rudick the head of it. In December 2002, the Board of Governors made this office a division and placed two departments (Biostatistics and Bioethics) into it.

In addition to the two departments, the new division contained three centers: (a) Integrative Medicine, headed by Joan Fox, Ph.D.; (b) the General Clinical Research Center (GCRC); and (c) Clinical Trials. The GCRC, as of this writing (2003) had \$17 million of outside funding.

The Division of Clinical Research, the Division of Education

(see Chapter 19), the Lerner Research Institute (see Chapter 20), and the Lerner College of Medicine (see Chapters 10 and 19) report to the Chief Academic Officer. Together, these constitute the “academic enterprise” of The Cleveland Clinic.

DIVISION OF REGIONAL MEDICAL PRACTICE

We have described this new division, created in 1995 and headed by Dr. David Bronson, in Chapter 10.

CONCLUSION

Each of the above entities brought together professionals from a variety of disciplines, often in a common setting but in some cases more dispersed, to address all aspects of an identified clinical problem. Group practice lends itself well to the creation and smooth operation of team approaches to medicine, and The Cleveland Clinic has been particularly successful in implementing this matrixed approach to health care delivery, research, and education.

16. DIVISION OF PATHOLOGY AND LABORATORY MEDICINE

BY WILLIAM R. HART, M.D.

*The fruit of healing grows on the tree of understanding.
Without diagnosis, there is no rational treatment.
—Carl Gerhardt, Wurzburg, 1873*

DURING ITS LONG AND ILLUSTRIOUS HISTORY, THE CLEVELAND CLINIC'S Division of Pathology and Laboratory Medicine has undergone remarkable growth and development. Since 1992, the division has been consolidated into two departments: Anatomic Pathology and Clinical Pathology. The apparent simplicity of this structure belies the complexity of the division's specialty and subspecialty laboratories, which have routinely produced staggering amounts of laboratory data for diagnosis and treatment.

The Department of Anatomic Pathology provides diagnostic services based primarily on the gross and microscopic features of tissue and cellular samples obtained by biopsy, smear, surgery, or autopsy. The Department of Clinical Pathology is composed of six sections: Clinical Biochemistry, Clinical Microbiology, Hematopathology, Molecular and Immunopathology, Thrombosis and Hemostasis, and Transfusion Medicine. Also housed in the Division Office are Laboratory Information Systems, responsible for all computerization activities in the division, the Division Business Office, the Pathology Residency program, and The Cleveland Clinic Reference Laboratory.

Under the leadership of William R. Hart, M.D., who became



*William R. Hart, M.D., Chairman,
Division of Pathology, 1992-*

chairman in 1992, the division supports a highly specialized professional staff of about three dozen pathologists and clinical laboratory scientists, and a technical and clerical staff of about 540 employees. They perform nearly all laboratory testing for The Cleveland Clinic hospitals and clinics, as well as for the off-campus Family Health Centers and ambulatory surgery centers. By 2003, more than 5.5 million tests were reported annually, including more than 76,000 surgical pathology and 81,000 cytopathology cases. These volumes surely could not have been foreseen in 1921. At one time, the clinical laboratories were

scattered in different buildings around the Clinic's campus, but in 1980, essentially all diagnostic anatomic and clinical pathology laboratories and offices were brought together in the 185,000 square-foot Laboratory Medicine Building.

Each of the five physicians who have occupied the position of division chairman has also held leadership roles in national and international organizations devoted to pathology and laboratory medicine. The first chair, Dr. J. Beach Hazard (1958-70), was President of the U.S. and Canadian Academy of Pathology (USCAP). Dr. Lawrence J. McCormack (1970-81) was President of the College of American Pathologists (CAP). Dr. George C. Hoffman (1981-86) was President of the American Society of Clinical Pathologists (ASCP). Dr. Thomas L. Gavan (1986-91) was President of the National Committee for Clinical Laboratory Standards (NCCLS) and a member of the Board of Directors of the CAP. Dr. William R. Hart (1992-present [2004]) was President of the International Society of Gynecological Pathologists, a member of the Board of Directors of ASCP, and a member of the Governing Councils of both the USCAP and the Association of Directors of Anatomic and Surgical Pathology (ADASP).

ANATOMIC PATHOLOGY

In the early days, Allen Graham, M.D., who joined the organization in 1928 as head of tissue pathology, provided the sole pathological support for Cleveland Clinic surgeons. Everyone respected him for his abilities as a diagnostician, teacher, and expert in diseases of the thyroid. Trained first as a surgeon, he was a valued consultant in the operating room. An acute observer, he was able to identify several abnormal conditions whose corresponding diseases were not described until many years later. He preferred to work alone, even doing his own photomicrography and developing his own prints and films. However, this often delayed pathology reports by months. Faced with a growing workload and unable to delegate, Graham became overwhelmed by his burden and left The Cleveland Clinic in 1943.

During the next few years, pathology services were supplied by Harry Goldblatt, M.D., an outstanding pathologist at the Western Reserve University School of Medicine. Routine activities within the department were carried out by Betty Haskell, one of the original technologists. Although Clinic surgeons felt the quality of pathology reports was excellent, they missed having the support of a pathologist in the operating room. Fortunately, several staff surgeons had become acquainted with a pathologist named John Beach Hazard, M.D., either through shared service during World War II or through Boston City Hospital. In 1946, Hazard joined the staff as head of the Department of Tissue Pathology. As part of the Division of Surgery, the department was located in a small area adjacent to the operating room where surgeons could freely seek consulta-



*John Beach Hazard, M.D., Chairman,
Division of Laboratory Medicine and
Chief of Pathology, 1946-1970*

tions. In the beginning, Hazard was the only physician in a department of technicians.

Hazard set about organizing his department with the enthusiasm and good will that characterized his leadership of 24 years. He made pathology come alive. Growth of the Clinic's hospital and surgical facilities eventually created a demand for additional pathologists. In 1951, Lawrence J. McCormack, M.D., joined Hazard. It was a good match, since Hazard specialized in diseases of the thyroid, and McCormack's interests encompassed diseases of the lung, kidney, bone, and brain, as well as the developing field of cytology. William A. Hawk, M.D., became the third member of the team in 1955, specializing in gastrointestinal and thyroid diseases. Surgical pathology activities continued to expand at a rapid pace. To ensure an orderly development in this rapidly growing specialty, the Division of Surgery relinquished the Department of Tissue Pathology. The Board of Governors created a new Division of Pathology in 1958 with Hazard as chairman. For the first time, the Division contained both anatomic pathology and the clinical laboratories.

McCormack took over as head of Tissue Pathology (later the Department of Anatomic Pathology) in 1968. Upon Hazard's retirement in 1970, he became chairman of the division, which he renamed the Division of Laboratory Medicine. In contrast to the mild-mannered Hazard, McCormack was an imposing figure with a booming voice. Residents shuddered at the prospect of incurring his wrath. In truth, he was a gentle soul at heart, and those who worked closely with him held him in affectionate esteem. Hawk became the anatomic pathology department chair. In the early part of that decade, Howard S. Levin, M.D., and Bruce A. Sebek, M.D., joined the staff. Their interests in the fields of genitourinary, endocrine, breast, and head and neck pathology expanded the department's growing expertise. These stalwart pathologists carried the bulk of the caseload themselves for years. The division added sections of dermatopathology and neuropathology to meet the needs of the growing departments of neurology, neurological surgery, and dermatology.

In 1981, William R. Hart, M.D., became the department chairman. McCormack had recruited him to the Clinic from the University of Michigan, where he was professor of pathology specializing in surgical pathology and gynecologic pathology, after stints at the Armed Forces Institute of Pathology and the University

of Southern California-Los Angeles County Medical Center. Under his direction, growth of the department accelerated. New staff members (Norman B. Ratliff, M.D., Ralph T. Tuthill, M.D., Steven N. Becker, M.D., Thomas W. Bauer, M.D., Ph.D., Robert E. Petras, M.D., Melinda L. Estes, M.D., Charles V. Biscotti, M.D., Mark H. Stoler, M.D., and John R. Goldblum, M.D.) with subspecialty expertise were recruited from around the country to develop cytology, cardiovascular pathology, dermatopathology, gastrointestinal pathology, gynecologic pathology, hematopathology, hepatic pathology, nephropathology, neuropathology, orthopedic pathology, and soft-tissue pathology. James T. McMahon, Ph.D., expanded the use of diagnostic electron microscopy. Under the leadership of Raymond R. Tubbs, D.O., the department rapidly incorporated new technologies into the diagnostic armament, including immunohistochemistry, flow cytometry (pioneered a few years earlier in the Department of Immunopathology), DNA cell-cycle analysis, and morphometry. The addition of tissue-based molecular techniques and liquid-based thin-layer cytology helped keep the department at the forefront of technological advancement in anatomic pathology.

During the 1980s, the anatomic pathology department emerged as one of the strongest such departments in the country, specializing in diagnostic pathology and clinical research. Scientific publications from the staff coupled with high-visibility lectures at major educational conferences and leadership positions held in national and international pathology organizations established the department as a leader in academic pathology. The department also became one of the first fully computerized anatomic pathology facilities of its kind in the country.

In 1993, after Hart was appointed chairman of the renamed Division of Pathology and Laboratory Medicine, Robert E. Petras, M.D., was promoted to chairman of Anatomic Pathology. He had joined the staff after completing his residency training at the Clinic and had developed expertise in gastrointestinal pathology. Petras continued to build on the department's strengths, as the volume of surgical and cytology specimens exploded. He expanded the training of histotechnologists as physician extenders to enhance efficiency. Petras recruited additional staff pathologists (Jonathan L. Myles, M.D., Richard A. Prayson, M.D., Diana Fischler, M.D., Carol F. Farver, M.D., Terry L. Gramlich, M.D., Andrea E. Dawson, M.D.,

and Jennifer A. Brainard, M.D.) to bolster the subspecialty expertise of the staff. Petras also introduced “telepathology” to provide real-time consultation to off-site pathologists.

In early 2001, Petras resigned as chairman and Hart replaced him as acting chairman until John R. Goldblum, M.D., was appointed chairman in 2002. Goldblum, a prolific contributor to the surgical pathology literature, had established himself as an authority on soft-tissue tumors and gastrointestinal pathology

CLINICAL PATHOLOGY

The original clinical laboratories were designed by David Marine, M.D., who never occupied them. They opened in 1921 under the medical supervision of Henry J. John, M.D., a diabetologist with an interest in chemical analysis. After John left the Clinic in 1933, Russell L. Haden, M.D., head of the Division of Medicine, supervised the clinical laboratories for 10 years. He also organized and led a laboratory for the study of hematologic diseases in the Research Building while carrying a heavy clinical load as well. The various other clinical laboratories were also under Haden’s direction, but technicians actually ran them.

Although Clinical Pathology was said to have been “inaugurated” in 1930,¹ it was not until 1944 that the Division of Medicine created a new Department of Clinical Pathology, and appointed Lemuel W. Diggs, M.D., to head it without formally designating him as chairman. The organization incorporated his ideas into the design of the modern laboratories in a new clinic building. After Diggs left in 1947, John W. King, M.D., Ph.D., became head of the department in 1950. King was a one-man faculty at first, but soon the department began to grow, with the additions of Drs. Adrian Hainline (1952), Willard Faulkner (1956), and Devina Tweed (1957). In order to ensure a steady supply of well-trained technologists, King also founded the School of Medical Technology (later to be designated the John Weaver King School of Medical Technology), which graduated hundreds of students.

In 1958, the Board of Governors transferred the Department of Clinical Pathology from the Division of Medicine and combined it with the Department of Tissue Pathology to form the new Division

of Pathology with Hazard as chairman and King as vice chairman. Each of the clinical laboratory specialties was established as a separate department in 1970. This arrangement continued until Hart restructured the division in 1992. The Department of Clinical Pathology was then resurrected by combining the departments of biochemistry, blood banking, immunopathology, laboratory hematology, and microbiology into a single department where they became sections. John A. Washington, M.D., became the department chairman, a position he held until 1997, when health problems caused him to relinquish it. Raymond R. Tubbs, D.O., was then promoted to chair the department.

Section of Transfusion Medicine

The Clinic's Blood Bank, originally established by Diggs, came under King's direction in 1950. The Blood Bank prospered under his leadership, meeting the enormous need for blood required by the Clinic's expanding surgery program. Between 1975 and 1981, the Blood Bank resided administratively within the Department of Laboratory Hematology and Blood Banking. Following King's retirement, the Department of Blood Banking separated from Hematology in 1981, and Gerald A. Hoeltge, M.D., became its chairman. The demand for blood products escalated as the overall volume of cardiac surgical procedures rose and organ transplants became commonplace. The Clinic's Blood Bank has become the largest user of blood products supplied by the American Red Cross in the United States. With the divisional reorganization in 1992, Hoeltge became the head of the Section of Transfusion Medicine, which additionally included the growing intraoperative autotransfusion service and the cytogenetics laboratory.

Section of Clinical Biochemistry

King, who had originally established the Section of Biochemistry, later added an endocrine laboratory and named Adrian Hainline, M.D., as head. Charles E. Willis, M.D., a practicing general surgeon who had developed an interest in clinical chemistry

and had a talent for working with automated machinery, replaced him in 1961. After Willis' retirement, Robert S. Galen, M.D., joined the Clinic in 1982 to head Biochemistry. Galen recruited several experienced staff Ph.D.s and developed a number of specialized functional sections: Quality Control, Lipids, Nutrition and Metabolic Diseases, Automated/Acute Care Chemistry, Applied Clinical Pharmacology, and Enzymology. He introduced automated instrumentation capable of handling high volumes of routine as well as specialized chemical analyses, and these became the laboratory standard. Galen left in 1988, and Frederick Van Lente, Ph.D., a clinical biochemist the former had appointed to head the automated and acute care laboratories, replaced him. Van Lente later became vice chairman of the Department of Clinical Pathology under Tubbs in 1997. He further advanced laboratory automation, culminating in the installation of a robotic modular automation laboratory system in late 2000. Point-of-care testing, a burgeoning activity throughout the Clinic, also came under Van Lente's supervision.

Section of Hematopathology

George C. Hoffman, M.D., became head of the hematology section in 1959 after a two-year fellowship in clinical pathology at the Clinic. For many years, the hematology laboratory (called Special Hematology) was Hoffman's domain alone. Five colleagues eventually joined him, each specializing in different hematologic diseases. The andrology laboratory initially found its home there. Hoffman was named division chairman in 1981 and recruited Ralph G. Green, M.D., from the Scripps Clinic, who succeeded him as head of laboratory hematology in 1983. Green's research focused on Vitamin B₁₂ metabolism. Andrew J. Fishleder, M.D., who later became the chairman of the Division of Education, introduced molecular techniques for the diagnosis of hematologic and lymphoid diseases.

Green served until 1993, when he returned to California and was replaced by Michael L. Miller, D.O., a former fellow in laboratory hematology and member of the staff. He incorporated the reporting of lymphomas and related conditions, previously done in Anatomic Pathology, into the section and renamed it the Section of

Hematopathology. Eric Hsi, M.D., recently recruited from the Loyola University faculty and medical director of the flow cytometry laboratory, was promoted to section head in 1999 when Miller left. Research into various lymphoid diseases expanded under his leadership. Dr. Karl S. Thiel arrived from Ohio State University and also took over as director of the Stem Cell Laboratory for bone marrow transplantation. After more than a decade of research and development of sophisticated coagulation assays, the division created a new Section of Hemostasis and Thrombosis in 2001. Kandice Kottke-Marchant became its first section head.

Section of Clinical Microbiology

King, who also had a doctorate in microbiology, established the bacteriology and serology laboratory when he became head of clinical pathology. He led this informal section, along with the blood bank, until 1961 when Donald A. Senhauser, M.D., took over the microbiology laboratory. Senhauser introduced new immunologic techniques. When Senhauser left the Clinic three years later, Thomas L. Gavan, M.D., joined the staff as a clinical pathologist in microbiology and later became chairman of the Department of Microbiology in 1970. Gavan loved calculators and computers, which were just then coming into use around the laboratory, and he soon established himself as the laboratory's resident consultant for any issues that arose with these new-fangled devices. He took pride in his ability to calculate chi-square from a two-by-two contingency table on a hand-held calculator faster than anybody else. The department incorporated the bacteriology and serology laboratory. As the scope of microbiology expanded, Gavan recruited additional staff to head anaerobic microbiology, parasitology, mycobacteriology, mycology, and clinical virology. Under his direction, the staff actively pursued interests in computerization, automation, and antibiotic susceptibility testing, and the laboratory established a national reputation.

Following Gavan's appointment as division chairman in 1986, John A. Washington, M.D., was recruited from the Mayo Clinic to head Microbiology. Washington, an acknowledged authority in microbiology before joining the Clinic, expanded the laboratory's

activities and continued his highly-regarded microbiology fellowship program. The virology laboratory, directed initially by Max R. Proffitt, Ph.D., and later by Belinda Yen-Lieberman, Ph.D., became a leader in the development and use of molecular techniques for the identification of viruses, most notably the human immunodeficiency virus (HIV). Geraldine S. Hall, Ph.D., focused her activities in mycobacteriology and mycology, while Isobel Rutherford, M.D., took responsibility for parasitology and serology. Washington continued as microbiology section head after being appointed chairman of Clinical Pathology in 1992, until his retirement in 1998. Gary W. Procop, M.D., trained in microbiology at the Mayo Clinic, replaced him as section head. Procop's broad-based training in anatomic pathology as well as clinical pathology led to increased collaborative clinical and research activities with his colleagues in molecular pathology, cytology, and surgical pathology. He became a strong advocate for the transformation of the specialty into molecular microbiology.

Section of Molecular and Immunopathology

In 1964, McCormack established a Department of Immunopathology with Sharad D. Deodhar, M.D., Ph.D., as head. Deodhar, originally from India, had received his training at Western Reserve University and was a protégé of Harry Goldblatt. Deodhar, himself a fine tennis player, was the son of one of India's most famous cricket players. The senior Deodhar had been immortalized on an Indian postage stamp, which his son was fond of displaying when the opportunity arose. He led the laboratory from its inception until his retirement in 1993. Under his guidance, the Clinic became a national leader in the field of immunopathology. With the assistance of John D. Clough, M.D., William E. Braun, M.D., Manjula K. Gupta, Ph.D., Barbara Barna, Ph.D., and Rafael Valenzuela, M.D., the laboratory developed expertise in the functional aspects of the immune system, cellular immunity, endocrine immunology, autoimmunity, and cancer immunology. Deodhar instituted the histocompatibility laboratory under Braun's direction for the organ transplantation program. He also started the flow cytometry program under the leadership of Valenzuela. Raymond R. Tubbs, D.O., a member of the anatomic pathology staff and a former fellow in immunopathology,

succeeded Deodhar. Tubbs recognized the looming importance of molecular techniques in the laboratory and accepted Hart's challenge to spearhead the development of molecular pathology for the entire division. The section was renamed the Section of Molecular and Immunopathology, and Ilka Warshawsky, M.D., Ph.D., was recruited to expand the menu of molecular assays. In 1998, Tubbs succeeded Washington as chairman of the Department of Clinical Pathology and continued his role as section head.

THE CLEVELAND CLINIC REFERENCE LABORATORY

When The Cleveland Clinic built the Laboratory Medicine Building in 1980, McCormack began a regional laboratory to provide high-quality, cost-effective laboratory services to the community. In 1989, Gavan formed the Reference Laboratory by partnering the Regional Laboratory with an expanding reference laboratory developed at the University of Utah. The intent of the joint venture was to provide esoteric clinical laboratory testing to hospitals and institutions



Laboratory Medicine Building, 1980

within a six-state area. Gavan appointed Washington as medical director. The growth of the partnership business, however, was slow and did not meet expectations.

In 1994, Hart developed a new business plan calling for dissolution of the partnership and the creation of an independent Cleveland Clinic Reference Laboratory. The Board of Governors enthusiastically adopted the plan. Hart became the Medical Director. He quickly developed an infrastructure, including sales and marketing, couriers, account representatives, a client services center, and a business office with computerized billing capabilities. The Cleveland Clinic Reference Laboratory (CCRL) eventually became the major provider of esoteric clinical laboratory testing for the hospitals of northeast Ohio and also has clients outside the region, as well as in nearby states. In addition, the CCRL provided surgical pathology and cytology services to physician offices and second-opinion consultations in anatomic pathology to hundreds of clinicians and pathologists throughout the country. Couriers drive about 300,000 miles annually to pick up and deliver specimens for testing.

LABORATORY INFORMATION SYSTEMS

Over the years, the laboratory became a major generator of data for the medical record. As the Clinic expanded, the volume of laboratory data eventually threatened to overcome routine systems for ordering laboratory tests and distributing results to the treating physicians. Under McCormack's leadership as division chairman, the arduous task of planning for the systematic computerization of the clinical pathology laboratories began. The microbiology laboratory was the first to be computerized, followed by anatomic pathology, the blood bank, the histocompatibility laboratory, and the acute care laboratory.

In 1984, McCormack recruited David Chou, M.D., a clinical pathologist and informatics specialist, to implement an innovative, one-of-a-kind general laboratory computer system developed by Kone, a Finnish company. Chou was named Director of Laboratory Information Systems (LIS) upon McCormack's retirement the following year. Chou successfully managed and maintained the system despite its being orphaned by the company that had developed it. He also implemented a computer system for the Reference Laboratory. In

1995, Chou replaced the general laboratory system with a more comprehensive and sophisticated computer system that incorporated the previously independent microbiology and blood bank systems and interfaced with the newly installed hospital information system, thereby allowing direct order-entry of clinical laboratory tests.

The anatomic pathology system, which remained as a stand-alone system, was also interfaced with the hospital information system. Since then, all clinical pathology and anatomic pathology reports have been electronically available to the entire medical staff, regardless of their location in the hospital, clinic, or off-site family health centers. Walter H. Henricks, M.D., replaced Chou as LIS director in 1997. He expanded the LIS, implemented electronic interfaces with numerous Reference Laboratory client hospitals, and upgraded both the clinical pathology and the anatomic pathology computer systems to client-server, graphical-user-interface platforms.

CONCLUSION

The Division of Pathology and Laboratory Medicine developed from small disparate laboratories in the medical and surgical divisions into an integral component of the Clinic and one of the largest clinical laboratories in the country. Analytic methods have evolved from simple chemical reactions to complex molecular studies. Diagnoses previously based solely on light microscopy have been enhanced by sophisticated adjunctive techniques. The division has responded to the challenges of a rapidly changing medical environment by increasing subspecialization of its staff, adopting modern automation systems, maximizing computerization, and continually implementing innovative strategies to stay at the forefront of diagnostic medicine. Clinical research and development by the staff have kept the division in the vanguard of pathology and laboratory medicine. The division has always been dedicated to providing accurate diagnoses and timely test results for physicians and their patients within and beyond The Cleveland Clinic.

¹ Rowland, Amy. The Cleveland Clinic Foundation. 1938, p 58.

17. DIVISION OF RADIOLOGY

BY GEORGE H. BELHOBEK

Beware lest you lose the substance by grasping at the shadow.

—Aesop, Sixth Century B.C.(?)

WHEN THE CLEVELAND CLINIC FIRST OPENED, RADIOLOGY WAS A RELATIVELY young medical specialty. At least one of the founders of The Cleveland Clinic had reason to believe that good diagnostic radiology was essential to the practice of medicine. In 1902, when Crile was still operating at St. Alexis Hospital (known in its later years as St. Michael Hospital), one of the trustees of the hospital woke up at midnight, choking, and felt certain that he had swallowed his lower denture. For an hour and a half he clawed at his throat, mistaking the hyoid bone for the missing teeth. He succeeded in so traumatizing the throat that he could no longer swallow, even his saliva. A roentgenogram was made (this was only seven years after Roentgen's discovery of the x-ray), and the film showed some calcifications in the aortic arch which were interpreted as being the missing teeth. The patient was by this time in serious condition as a result of his own and his physicians' attempt to locate and remove the teeth. Finally Crile was called and was prevailed upon to operate.

Shortly after the operation the teeth were found in an obscure corner of the patient's room. The next day the patient died, and the story hit the headlines throughout the country: "Death Due to Operation. Patient Who Didn't Swallow His Teeth Is Dead." Crile in his autobiography summarized the diagnostic problem as follows:

"The positive statement of an intelligent man, a benefactor of the hospital, one whom we had known for a long period, that

he had not only swallowed his teeth but that he had touched them a number of times with his fingers and at one time had almost succeeded in removing them; the firm belief of his doctor, a physician of wide experience, that the teeth were still in the throat; the statements of the family that the teeth were not in the room, and their reiterant belief that the teeth had been swallowed; the rapid increase and gravity of the symptoms of the patient during the first day, seemingly out of proportion to the exploratory traumatism; and lastly the positive x-ray diagnosis, overruled our negative findings at the exploration. In consultation the various doctors who had been interested agreed that an operation was indicated."

The founders selected Bernard H. Nichols, M.D., to be the first head of the Department of Radiology, which was positioned in the Division of Medicine. This choice was a singularly fortunate one, for Nichols was one of the country's pioneers in diagnostic radiology. He practiced medicine first in Youngstown, Ohio. He then moved to White Hospital (now Robinson Memorial Hospital) in Ravenna, Ohio. There he met Bunts, Crile, and Lower, who were also on the staff and often operated there. Nichols became interested in radiology when a Ravenna manufacturing company began making x-ray machines of the primitive hand-cranked variety and one of these machines was put at his disposal.

Nichols entered the Army Medical Corps during World War I and, after completing a course in bone pathology, served as a radiologist. With this background, he joined the staff as a specialist in radiology in 1921. Over the next 15 years, he wrote 50 papers on diagnostic radiology, 23 of which concerned the diagnosis of diseases of the genitourinary tract. Energy, honesty, and an amused affection for people combined to make him a popular member of the staff. He had a goatee that gave him such a distinguished air that he was commonly referred to as the "Duke of Ravenna," the town in which he lived.

In 1922, the Department of Radiology was strengthened by the appointment of U. V. Portmann, M.D., as director of radiation therapy and by the purchase of the Cleveland area's first 250,000-volt radiation therapy machine. Tall, massively built, handsome, and somewhat intimidating, Portmann generated confidence. He soon became a national figure in radiotherapy, writing as extensively as Nichols

did, chiefly on the measurement of radiation dosage and its use in treating cancers of the thyroid and breast. He also wrote a widely read textbook on radiotherapy.

A third pioneer in radiology, Otto Glasser, Ph.D., was a biophysicist and a member of the Research Division. He was described by a colleague as "a giant radiation physicist." Glasser first formulated the concept of a condenser dosimeter for measuring the amount of radiation delivered by a diagnostic or therapeutic radiation device. This instrument was used for calibrating x-ray equipment, a safety measure for the patient and medical personnel. Previously, radiothera-



*Otto Glasser, Ph.D., Head,
Department of Biophysics, 1923-1964*

pists estimated the dosage on the basis of reaction of the skin, the amount of radiation required to redden the skin being considered to be an "erythema dose." Glasser's concept was implemented by the Clinic's brilliant engineer, Mr. Valentine Seitz, who constructed a practical unit that Portmann used clinically. Thus, the talents of a radiotherapist, a biophysicist, and an engineer were combined to produce one of the fundamental advances in radiology. A prototype of the dosimeter is in the collection of scientific discoveries in the Smithsonian Institution.

Glasser was responsible for control of the radon (radium) seeds used in the treatment of certain types of cancers. He was also a prolific writer of scientific papers and editor of a massive three-volume work entitled *Medical Physics*. In addition, he wrote a definitive biography of Wilhelm Conrad Roentgen, the man who discovered the x-ray in 1895. Later in his career, Glasser's interest turned to radioactive isotopes, and again he made important contributions. He was urbane but not pretentious, and he was kindly and considerate to all, relating to those of modest station in life as easily and sincerely as to those of exalted status. His human qualities matched his scientific achievements.



*C. Robert Hughes, M.D., Chairman,
Division of Radiology, 1960-1969*

C. Robert Hughes, M.D., became head of the Department of Radiology in 1946. Hughes had trained in surgery before his interests changed to radiology, and this clinical background, combined with his technical knowledge, gave him insights valued by both internists and surgeons, who consulted him frequently about problem patients.

Hughes was a born planner and inventor whose talents were not confined to medicine. At the time of his appointment, the Clinic was on the threshold of an explosion in growth, and Hughes, working with Charles L. Hartsock, M.D., of the Department of Internal Medicine,

designed a new and innovative x-ray department. Hughes wanted original ideas to supplement proven concepts, so the two planners came up with a unique department design that served efficiently for many years with little modification—a great accomplishment in an ever-changing field. The Department of Radiology was originally confined to the Clinic Building. Only “portable” equipment was used in the hospital, at the bedside, or during operations. An additional radiology facility was opened in the hospital in 1947. Surgical operations were becoming more complex, and often it was desirable to obtain intraoperative radiological examinations, and so x-ray facilities were included in many of the operating rooms when a new surgical pavilion was built in 1955.

In 1960, the Board of Governors established a Division of Radiology, removing Radiology from the Division of Medicine. Hughes was appointed to head this new division. In 1966, the Board further subdivided the Division of Radiology into a Department of Hospital Radiology, including radiology performed in the operating pavilion, a Department of Clinic Radiology, and a Department of Therapeutic Radiology and Isotopes.

At this time, the Board of Governors appointed Thomas F. Meaney, M.D., a former radiology fellow under Hughes, to chair the Division of Radiology and manage the hospital department, with Hughes taking responsibility for the clinic department, and Antonio R. Antunez, M.D., chairing therapeutic radiology and nuclear medicine. Hughes continued as clinic department chairman until 1970 when he was replaced by Anthony F. Lalli, M.D. George H. Belhobek, M.D., assumed the responsibility of chairman of the Department of Clinic Radiology in 1983. Meaney turned the hospital department chair over to Ralph J. Alfidi, M.D., in 1970 and continued on as division chairman until 1987. Gregory P. Borkowski, M.D., was appointed chairman of the Department of Hospital Radiology in 1985. With the retirement of Belhobek as clinic chairman in 2002, the hospital and clinic departments were combined into a single Department of Diagnostic Radiology. Borkowski assumed responsibility for this unit.

Meaney, an innovative young man with great vision, became division chairman coincident with tremendous advances in x-ray technology and practice. He had already achieved recognition for his work with the newly developed procedure of angiography, a technique with which he had become familiar during a sabbatical leave in Sweden in 1963. Over the next several years, Meaney was instrumental in developing angiographic and interventional procedures for use not only at The Cleveland Clinic but across the nation. His collaborative work with Harriet Dustan, M.D., in the Department of Hypertension and Nephrology and Lawrence McCormack, M.D., in the Department of Tissue Pathology in the mid-1960s yielded multiple publications outlining the role of renal vascular disease in hypertension.

Over the next 35 years, radiologists expanded their arsenal of interventional procedures to include biliary drainage, abscess drainage, tumor embolization and clot lysis, venous access procedures, and percutaneous lung, kidney, and bone biopsies. Thus, radiologists emerged with an active role in patient treatment as well as diagnosis.

DIAGNOSTIC RADIOLOGY

In 1972, Meaney visited England to evaluate a new device that was capable of directly imaging pathology of the brain in a cross-section-

al display. The technique, computerized axial tomography (CAT), was just being introduced to the world at that time. Seeing its great promise, Meaney purchased the fourth such device in the world for the Clinic. This original machine, which was limited to scanning the brain, quickly had a profound effect on the practice of neurology and neurosurgery. Ten months later, a computed axial tomography (CAT) scanner (now referred to as a CT scanner) designed for body imaging was installed at the Clinic, greatly increasing the scope of this technology. Numerous generations of CT scanners have been developed since that time, with the latest technology providing images of very thin tissue thickness obtained with sub-second imaging times. Current machines also provide sophisticated multi-planar reconstruction capabilities.

Digital subtraction angiography was the next innovative technology to hold a primary research focus in the Division of Radiology during Meaney's tenure. This computerized technology allowed individual arteries to be visualized with a generalized injection of intravenous water-soluble contrast material, thereby decreasing the need for the more invasive catheter arteriography in some cases.

Meaney brought a third technological breakthrough to The Cleveland Clinic in the early 1980s. Nuclear magnetic resonance imaging, later called magnetic resonance imaging (MRI), was first used to examine internal organs in 1973. Although the development of this technique was slow, by the early 1980s, recognition was growing that this non-invasive means of visualizing internal organs without exposure to the ionizing radiation characteristic of x-ray-based techniques would have great promise in examining the tissues of the body, especially the brain and spinal and musculoskeletal structures. Meaney once again recognized the potential value of an emerging technology and purchased a unit for the Clinic in 1983. The Cleveland Clinic's Department of Diagnostic Radiology led the way in developing this major imaging technology.

A corollary of the dramatic growth of radiology activities in the 1970s and 1980s was the need to enlarge the physical facilities of the diagnostic radiology departments. In 1974, the Hospital Radiology Department moved from the eighth floor of the original hospital to a vastly expanded facility in the basement of the new hospital building. Further expansion of radiology facilities came with the development of an outpatient radiology facility in the Crile Building, which opened



Meyer Center for Magnetic Resonance Imaging, 1983

in 1985. A philanthropic gift from Mr. E. Tom Meyer (president of The Cleveland Clinic Foundation from 1969 to 1972) enabled the construction of the Meyer Center for Magnetic Resonance Imaging in 1983, a building constructed without the use of iron-containing materials (such as steel nails), designed to house the Clinic's magnetic resonance scanners. The department installed plain radiographic, CT scanning, and ultrasound capabilities in the expanded emergency department facility that opened in 1994.

Following Meaney's retirement in 1987, the Board of Governors convened a search committee to identify a new division chairman. After an intensive review of nationally known candidates, the Board selected Michael T. Modic, M.D., a former resident in diagnostic radiology at the Clinic, to fill this important position. Modic, a neuro-radiologist, was well known for his MRI research, especially for its application to diseases of the spine. He had a reputation for clear, decisive thinking. He enthusiastically accepted the challenges of maintaining The Cleveland Clinic's leading position in diagnostic imaging and of supporting a research-friendly environment while providing excellent clinical care and educational opportunities. With a growing staff of subspecialty-oriented diagnostic radiologists, Modic forged ahead into the 1990s.

New challenges soon arose, however. While the traditional goals



*Michael T. Modic, M.D., Chairman,
Division of Radiology, 1989-*

of excellent patient care, productive research, and effective education were still considered high priorities, stricter control of operational costs also became increasingly important. The addition of eight off-campus family health center radiology facilities, along with management and professional staffing responsibilities for five Cleveland Clinic Health System community hospital radiology departments, further increased demands on the Division of Radiology. In 2002, the division added a Department of Regional Radiology to coordinate and direct the activities of these off-campus facilities. Gregory Baran, M.D., assumed leadership for this

new department. Modic also agreed to oversee the operations of the two Cleveland Clinic Florida hospital radiology departments.

Modic recognized that traditional radiology practice had to be reevaluated and that new practice methods, including electronic transfer of digital-based images, voice recognition transcription, and filmless radiography (digital or computed radiography), needed to be considered. He initiated soft-copy interpretation of CT, MR, and ultrasound images on workstations and developed plans for progressive installation of digital or computed radiography units in various departments. The conversion to digital-based imaging processes would not only improve the operational efficiency of each department, but also eliminate significant film purchase costs.

Electronic image transfer capabilities would also lead to new radiology ventures, such as contractual arrangements to interpret examinations performed at independent imaging centers across the country. The growth and success of these operations necessitated the development of an additional department in the radiology division (eRadiology). Dr. Michael Recht assumed leadership of this business unit. The demands of modern practice would also require more plain

hard work. The division was ready to accept these challenges and move ahead.

RADIATION ONCOLOGY

After Portmann's retirement, several radiologists led the radiation therapy activities within the Department of Radiology until Antunez was appointed chairman of the Department of Therapeutic Radiology and Nuclear Medicine in 1963. Like Meaney, Antunez was a builder. As in the case of diagnostic radiology, radiation physicists and engineers were developing new equipment, and Antunez acquired the latest equipment, sometimes raising funds to pay for new devices by personally attracting large gifts from philanthropists and grateful patients.

Antunez' department acquired a modern cobalt therapy unit and high-voltage linear accelerators. He obtained computers for treatment planning and a simulating device to permit calculation of the maximal dose delivery to the desired location. He also arranged for the Lewis Research Laboratories of the National Aeronautics and Space Administration to make their Cleveland cyclotron available for neutron beam treatment of Clinic patients. In 1991, a major expansion of radiation therapy space became necessary to keep up with increasing practice demands.

Two chairmen (Frank Thomas, M.D., and Melvin Tefft, M.D.) each led the department for brief periods after Antunez' departure.

In 1993, shortly after the arrival of the present department chairman, Roger Macklis, M.D., radiation therapy was moved administratively from the Division of Radiology into the Cleveland Clinic Cancer Center. Radiation oncologists and medical oncologists had long been combining their talents to provide effective treatment protocols for the Clinic's cancer patients. The positioning of these two groups within the Cancer Center further strengthened this working relationship. With the recruitment of Macklis from the Harvard Joint Center for Radiation Therapy, the renamed Department of Radiation Oncology began another expansion phase. By 1995, it had become the largest and most technically sophisticated clinical radiation therapy department in Ohio, treating over 2,500 patients a year at the main campus

and satellite sites. New personnel, new equipment, and a new clinical and research pavilion constructed at the corner of Euclid Avenue and East 90th Street added to the department's momentum.

NUCLEAR MEDICINE (MOLECULAR AND FUNCTIONAL IMAGING)

The use of radioactive iodine in treating thyroid disease had interested Glasser, who headed the Department of Bio-Physics in the early days, prior to the formal establishment of the Division of Radiology. With his knowledge of physics and the technical skills of Mr. Barney Tautkins, a hand-constructed rectilinear scanner for imaging the thyroid gland following the uptake of radioactive iodine was developed. The device worked well, and thus isotope imaging studies at The Cleveland Clinic began. A physician was needed to interpret these scans, and since the Radiation Therapy Department was near the scanner, this responsibility naturally fell to the department's staff.

Eventually the gamma camera replaced the slower rectilinear scanning devices, and a multitude of radioisotopes useful for organ imaging were developed. The scope of nuclear medicine was rapidly increasing so that in 1978 a separate Department of Nuclear Medicine was created within the Division of Radiology. Sebastian A. Cook, M.D., became its first chairman.

Raymundo Go, M.D., succeeded Cook as chairman in 1983, a position he held until 2000. During his tenure, Dr. Go added the sophisticated computerized technology necessary for the practice of modern nuclear medicine. Under the direction of W. James MacIntyre, Ph.D., an internationally respected authority on nuclear instrumentation, the department embarked on investigations of cardiac radionuclide imaging and positron emission tomography (PET) imaging techniques.

Following Go's retirement, Dr. Jean Luc Urbain was recruited to chair the department. He brought to The Cleveland Clinic, among other things, a fine reputation for innovative research. He soon instituted additional nuclear medicine capabilities, such as second-generation single-photon emission computed tomography (SPECT) scanning and gene-expression imaging techniques. The department changed its name to Molecular and Functional Imaging to reflect the

new dimensions of the specialty. Subsequent to Urbain's resignation in June 2003, the search for a new chairman began.

CONCLUSION

Nichols, Portmann, and Glasser would be amazed that from their small beginnings the Division of Radiology has grown to include 74 staff physicians, six physicists, two computer scientists, 19 informatics personnel, and 359 employees who support their work. They have achieved many significant accomplishments over the years, and many accolades have been bestowed on individual staff members. Under Modic's leadership, the Division of Radiology is shaping itself to meet the challenges of the future. We expect that the next 80 years will be as productive and promising as the previous 80 have been.

18. DIVISION OF NURSING

BY SANDRA S. SHUMWAY

*I enjoy convalescence. It is the part
that makes the illness worth while.*

—George Bernard Shaw, 1921

THROUGHOUT THE HISTORY OF THE CLEVELAND CLINIC, THE IMPORTANCE OF nursing in providing “better care of the sick” has always been recognized. It is universally acknowledged that the dedication, professionalism, and compassion of Cleveland Clinic nurses have played a key role in making it one of the world’s leading health care institutions. Nursing, like all health care professions, has changed drastically over the years as a result of advances in medical technique and technology as well as changes in the way health care is financed. Florence Nightingale could never have foreseen many of the duties and programs undertaken today by Cleveland Clinic nursing personnel.

IN THE BEGINNING

The Cleveland Clinic opened in 1921 with four clinic nurses on staff. Secretaries at the Clinic took care of many of the clerical functions usually handled by a doctor’s office nurse in private practice. The 184-bed hospital, which opened in 1924, had a nursing staff of 75, which included seven head nurses, 42 general-duty nurses, and four operating room nurses. Graduate (i.e., registered) nurses, assisted by orderlies and ward maids, provided all direct patient care. For

many years, private-duty nurses, who contracted directly with patients, supplemented the hospital nursing staff. At first, nurses were mostly white women. This began to change slowly in the 1950s, gaining momentum thereafter, as racial and ethnic minorities (especially African Americans) and men appeared in larger numbers in registered nurse, nursing unit assistant, and patient care assistant positions.

The position of the ward maid eventually evolved into that of the nursing unit assistant (NUA). The Clinic added floor hostesses, the precursors of unit secretaries, in 1947. The hospital hired the first practical nurses in 1954, and five years later there were as many practical nurses as general duty registered nurses on the hospital staff. The ambulatory nursing staff also added practical nurses in the 1950s. The hospital added patient care assistants (a new title) in 1977. These were nursing assistants who received additional training to assist the nurse with patient care at the bedside.

With a nurse-superintendent supervising all departments in the hospital, nursing was represented at the highest level of hospital administration. However, when long-time superintendent Abbie Porter, R.N., retired in 1949 and was replaced by hospital administrator James Harding (not a nurse), the heads of the nursing and operating room departments became the Clinic's highest-ranking nurses. In 1970, the Clinic decentralized the Department of Nursing into seven areas headed by directors, leaving the hospital without a unified nursing department.

THE DANIELSEN ERA, 1981-1986

This situation lasted until 1981, when the Board of Governors reunified nursing activities under the leadership of Sharon L. Danielsen, M.S.N., R.N. The new Department of Nursing encompassed operating-room nursing as well as nursing education and nurse recruitment. Within the next few years, Danielsen organized the department according to a clinically oriented scheme.

By 1985, the department consisted of three clinical divisions—surgical nursing, medical nursing, and operating room and treatment areas—and a support division called nursing resources. The number of nursing personnel had risen to 150 in

the outpatient departments and 1,725 in the hospital. They attended to more than 400 patients daily in the operating rooms and treatment areas alone. Increasing numbers of nurses were breaking with traditional roles and practicing as clinical nurse specialists or departmental assistants in outpatient medical departments. Certified registered nurse anesthetists (CRNAs) worked outside the Department of Nursing. From the first, they had administered all anesthetics at the Foundation until a physician-headed Department of Anesthesiology came into being in 1946. Nurse anesthesia was never phased out as it was in many hospitals after World War II, and the Clinic established a school for nurse anesthetists in 1969.

Danielsen met regularly with the four division heads, the director of program planning, and the fiscal coordinator as the nursing administrative group to make decisions about nursing policy and practice. Surgical nursing was headed by Linda J. Lewicki, M.S.N., R.N.; Medical Nursing by Francine Wojton, M.S.N., R.N.; operating room and treatment areas by Isabelle Boland, M.S.N., R.N.; nursing resources by Shirley Moore, M.S., R.N.; and program planning by Sandra S. Shumway, M.S.N., R.N.

The next year was a busy one for nursing as the hospital's new wing opened in January 1986. Several older inpatient units in the original hospital building underwent a phased transfer to the new building. The first unit in the new building to open was G80. The new wing, part of the Century Project (see chapter 8), added needed beds to the hospital especially in the cardiac area. The census at this time ranged from 750 to 800.

Danielsen left the Foundation in July 1986. Isabelle Boland, head of the operating room and treatment areas, served as acting head of nursing during a nationwide search for a new director.

THE COULTER ERA, 1987-1997

Sharon J. Coulter, M.S.N., M.B.A., R.N., was chosen for the position and assumed her duties in May 1987. The Board of Governors immediately approved her request for divisional status for nursing. The new Division of Nursing encompassed all inpatient facilities, surgical services, and the emergency depart-

ment. It did not, however, include clinic nursing or departmental assistants.

Coulter reorganized the administrative structure of nursing to reduce its management hierarchy to three levels: head nurse, clinical director, and division chairperson. She retained nursing operations managers (similar to nursing supervisors) and assistant head nurses to handle administrative and managerial responsibilities on the off-shifts. She also streamlined the department of nursing resources and the operating room nursing structure. She focused quality management efforts at the unit level. Her team annually identified and tracked quality indicators to keep practice standards high. She also initiated patient satisfaction efforts.

By 1988, Coulter chaired the nursing management group (successor to the nursing administrative group and predecessor of the nursing executive council), which included the clinical directors for medical nursing, neurosurgery/orthopedics/otolaryngology nursing, critical care nursing, surgical nursing, operating room nursing, cardiac nursing, and the support department directors for physical and environmental resources, nursing research, and nursing education, the fiscal coordinator, and the assistant to the chairman. Clinical directors for oncology and critical care nursing were added in 1989 and 1991.

By 1988, the nursing management group had the following membership: Coulter as chair; clinical directors Mary Ann Brown, M.S.N., R.N. (medical nursing), Cathy M. Ceccio, M.S.N., R.N. (neuro/ortho/ENT nursing), Angela Janik, M.S.N., R.N. (critical care), Linda Lewicki, M.S.N., R.N. (surgical nursing), Marian K. Shaughnessy, M.S.N., R.N. (operating room nursing), and Gayle Whitman, M.S.N., R.N. (cardiac nursing); support department directors Kathleen Lawson, B.S., R.N. (physical and environmental resources), Deborah M. Nadzam, Ph.D., R.N. (nursing research), and Elizabeth Vasquez, M.S.N., R.N. (nursing education); and two staff, Amy Caslow Maynard (fiscal coordinator) and Sandra S. Shumway, now assistant to the chairman. Meri Beckham (Armour), M.S.N., R.N., was named clinical director of oncology in 1989. Marlene Donnelly, M.B.A., R.N., was named director, center for nursing, in 1990. Madeline Souplos, R.N.C., served as acting director of critical care nursing for most of 1991 until a permanent director,

Deborah Peeler (Charnley), M.N., R.N., was hired.

Coulter subsequently modified the basic table of organization. By 1993, the Division of Nursing had six departments: medical/surgical nursing, cardiothoracic nursing, critical care nursing, surgical services, the center for nursing (which included nurse recruitment and retention, nursing education, quality management, staffing and scheduling, nursing operations managers, and information systems), and nursing research. At that time, medical/surgical nursing was headed by Armour, cardiothoracic nursing by Whitman, critical care nursing by Charnley, surgical services by Betty Bush, M.B.A., R.N., the center for nursing by Donnelly, and nursing research by Christine Wynd, Ph.D., R.N. To top it off, in 1993 the Division of Nursing broadened its scope, adding the pharmacy and the patient support services operations department. At the same time, the division changed its name from the Division of Nursing to the Division of Patient Care Operations.

In May 1994, the Clinic opened a new Emergency Department (see chapter 9). It included a clinical decision unit designed for observation of selected patients to determine the need for hospitalization. Also in 1994, a new palliative care service opened in the hospital, and plans were afoot to open an obstetrical service. This occurred in May 1995, after a 28-year hiatus. Staffing efforts were successful during this period because of a large local and regional supply of nurses. In 1994 the vacancy rate was just 4.2% at The Cleveland Clinic, while nationally it was 5%.

By 1996, the Division of Nursing had three vice-chairs for nursing (two for clinical units and one for surgical services), 25 unit directors, 69 unit clinical coordinators (formerly head nurses), and ten managers in surgical services.

In 1997, Coulter left the Clinic. Sandra Shumway was appointed interim chair from September 1997 through March 1998. At this same time, the Division of Nursing's reporting structure moved from the Division of Operations, directed by Frank Lordeman, to the Office of Medical Operations, directed by Dr. Robert Kay, soon to become Chief of Staff. The structure of the division reverted to the old Division of Nursing, and the pharmacy, itself becoming upgraded, administratively separated from nursing. Kay immediately initiated a search for a new division chair.



*Shawn M. Ulreich, M.S.N., R.N.,
Chairwoman, Division of Nursing,
1998-2003*

THE ULREICH ERA, 1998-2003

Shawn M. Ulreich, M.S.N., R.N., became Chief Nursing Officer and chair of the Division of Nursing effective April 1, 1998. Ulreich had fourteen years of nursing practice and management experience at The Cleveland Clinic. She announced a new and flatter organizational structure later that year. It consisted of four clinical directors and two non-clinical directors: one for systems/resources/operations and one for education and research. The clinical directors then were Debbie Albert for surgery and post-acute care, Dawn Bailey, M.A.O.M., R.N., for medicine and children's services, Peggy Kuhar, M.S.N., R.N., for cardiac and emergency services, and Lois Bock, B.S.N., R.N., for surgical services. Non-clinical directors were Lorraine Mion, Ph.D., R.N., for education/research and Donnelly for systems/resources/operations. Also included were nurse managers and assistant nurse managers for each unit. One operations analyst, to assist with financial and other support functions, was added for each department. Further changes in leadership personnel continued until the final additions in November 2001.

In 1998, Cheryl Adams, R.N., B.A., C.P.H.Q., was appointed director of case management. In 1999, her reporting relationship changed from Kay to Ulreich, and Adams joined the nurse executive council. In December 1999 Mion left the Clinic, and Lewicki served as interim director of education/research. In May 2000, Michelle Dumpe, Ph.D., M.S.N., R.N., joined the staff as director of nursing education, research, and advanced practice. In August 2000, Albert assumed a chief nursing role at the Cleveland Clinic Health System's Euclid Hospital and was replaced in January 2001 by Andi

Wasdovich, R.N., B.S.N., B.A., who brought much experience from leadership positions in ambulatory clinics at The Cleveland Clinic and University Hospitals of Cleveland. On September 11, 2000, Bock moved to the Division of Human Resources to assume responsibility for nurse recruitment and retention, and Bush was appointed to head the surgical services. On November 5, 2001, a fifth clinical director, Sharon Kimball, R.N., M.S., M.B.A., was appointed to lead nursing practice in the newly formed Cleveland Clinic Children's Hospital and birthing services.

Along with the new organizational structure, Ulreich formed the nurse executive council (NEC), which included all directors, the finance manager, the assistant to the chairman, and a nurse manager representative. The NEC met twice monthly to set nursing policy and to manage nursing operations. By 2002 a task force of its members had completed revision of contemporary policies and procedures for administration of the division. The NEC's standards committee, composed of clinical nurse specialists, also developed contemporary nursing practice policies and procedures. The division focused on enhancing its quality monitoring of patient care outcome indicators including patient satisfaction, patient education, continuing education for the staff, and nursing research to improve practice.

New services added in subsequent years included a heart failure unit in January 2000 and a neonatal intensive care unit in July 2001. Opening a new cardiothoracic fast-track unit and a cardiac step-down unit also enabled the division more efficiently to meet the needs of special patient populations.

The expansion of care-delivery sites, along with increased patient volume and acuity, contributed to the need for additional personnel in nursing and other professions. At The Cleveland Clinic, pressure for more patient beds continued, as patient volumes often strained capacity. Signs of a nursing shortage became apparent in 1999, with a vacancy rate of 17% at The Cleveland Clinic (national range: 4-12%). We discuss the nursing shortage and the Clinic's response to it in greater detail later in this chapter under "The Nursing Shortage."

In 2000, Ulreich formed the Cleveland Clinic Health System Nurse Executive Council (CCHS-NEC) with its membership consisting of all system hospitals' chief nursing officers. The purpose of the group was to manage system-wide planning for nursing practice.

Clinic Nursing

Throughout the years, Clinic Nursing remained separate from hospital nursing. The clinic nurses traditionally reported directly to the medical departments for which they worked and had no nursing management *per se*. After World War II a Director of Nursing was appointed, but it was not until the long tenure of Corinne Hofstetter, R.N., that the department firmly established its own identity and stability. After Hofstetter's retirement in 1986, E. Mary Johnson, B.S.N., R.N., assumed the directorship.

In 1990, a significant gap between clinic and hospital nursing closed when Johnson, who had long supported the idea of closer ties among Cleveland Clinic nurses, accepted an invitation to join the nursing management group as a voting member. This improved communication for policy-making between the Division of Nursing and Clinic Nursing. Ambulatory (clinic) nursing, however, remained administratively separate from the Division of Nursing. With decentralization in 1991, the nurses reported directly to the medical department chairmen. In August 1999, Johnson retired as director of ambulatory nursing. Jan Fuchs, M.S.N., R.N., served as the interim leader and was appointed director in 2000.

By 2003, a medical director, administrator, and ambulatory-nursing manager managed the ambulatory clinics. Patient care delivery and its quality were their responsibility. Ambulatory nursing managers had a matrix reporting relationship, which included the medical departments and ambulatory clinic nursing. Ambulatory clinic nursing was integrated with the Division of Nursing through the director's membership on the NEC.

Health care financing and technology had a substantial effect on ambulatory nursing, as many procedures moved to the outpatient setting. Diagnostic and interventional procedures carried out under sedation became common, including cardiac catheterization, cardioversion, pacemaker change, ablation, bronchoscopy, pump insertion for pain management, and many gastrointestinal procedures.

Also by 2003, outpatient nursing incorporated ambulatory nursing practice at 67 outpatient desks, at 14 family health centers located throughout northern Ohio, and at 25 regional surgical practices in off-campus facilities. There were 108 advanced practice nurses (APNs) working in outpatient clinics on the main campus.

Another 30 APNs staffed six of the 14 family health centers, located in Independence, Wooster, Lorain, Strongsville, Westlake, and Beachwood.

Changes in Delivery of Nursing Care

As in all other areas of medicine, The Cleveland Clinic's nursing staff had to evolve in response to the scientific and technological advances. In the 1920s, no antibiotics were available to treat post-operative patients or those with infections. Today, nurses administer antibiotics daily by mouth as well as parenterally. Better infection control removed one obstacle to the performance of increasingly complex surgical procedures. Operating room nurses, who had themselves manufactured some of the supplies and equipment used in the operating room well past the mid-century, now became responsible for the purchase, care, and readiness of an extensive array of surgical instruments and supplies. But high costs of care in the hospital raised the pressure for cost containment and fostered a new emphasis on outpatient care.

In the hospital, the delivery of nursing care was originally organized according to function: nurses received specific assignments, such as pouring and passing medications for all patients on their units. During the 1960s and 1970s, nursing leadership implemented team nursing, with registered nurses heading small teams that included licensed practical nurses and nursing unit assistants, who were responsible for the complete care of a group of patients. In the late 1970s, the Nursing Department began to encourage "primary nursing," whereby a nurse was assigned to each patient. The idea was that primary nursing would enable each patient to identify his or her nurse, give nurses increased responsibility for patient care, and provide better continuity of care. Later, many of the less technical nursing functions became the domain of specially trained non-registered nurses, while nurses continued to perform more demanding patient-care services and administrative functions.

In the 1980s, each unit had a head nurse and, in most cases, two assistant head nurses. In 1992, the title of head nurse was changed to nurse manager, clarifying the responsibility for managing 50 or more employees as well as the unit's patients and budget. The fol-

lowing year, the title of ambulatory nursing coordinator was also changed to nurse manager, to reflect the same level of responsibility within the clinic.

The patient care technician (PCT) position was developed in the early 1990s. First proposed by the cardiothoracic nursing department in the late 1980s, the intensive care units had adopted it by 1992. The intensive care units used PCTs to perform some technical tasks along with the traditional duties of the nursing unit assistant, freeing registered nurses to concentrate on patient assessment, care planning, and patient education.

By the late 1980s, the effect of managed care on nursing had become obvious. Nurses understood the importance of documentation in tracking the patient's progress and response to nursing interventions. But lack of nurse documentation developed financial implications as, in some cases, third-party payers would refuse reimbursement if portions of the record had not been completed properly. For better compliance, the division replaced old forms with new ones and adopted new charting methods. By 1992 the PIE charting system, which focused on a "nursing progress record," was in use. This provided a format for recording the nursing assessment, planning, intervention, and evaluation (PIE) for the individual patient. An associated "problem list" recorded the results of the assessment in terms of nursing diagnoses, and followed the problems to record their resolution—or lack thereof—during the patient's hospital stay.

In 1988, the Division of Nursing began to focus on a case management system for care delivery. Nurse case managers would be assigned to track patients throughout the course of their care, ensuring that they were recovering according to schedule. In 1994 the information systems staff implemented "order entry phase I" throughout the hospital and clinical areas. Work on coordinated care tracks (CCTs), or care maps, began in the same year. In 1995 the information systems department implemented "order entry phase II" and "results reporting," requiring extensive design and educational training efforts.

Facing the impact of managed care, the Division of Nursing was under pressure to control costs while managing a significant increase in numbers of patients. Capacity management became an issue, and increasing the efficiency of patient discharge and admission was a goal.

Nursing Education and Research

In the 1920s, the largest Cleveland hospitals had their own “nurses’ training” schools. At the best schools, nurses received education in both the classroom and clinical settings. At the better hospitals, graduates might serve as head nurses. But in hospitals with training schools, the staff nurses were often students. Early on, Cleveland Clinic leadership decided not to follow this pattern, but to staff both the clinic and hospital with graduate nurses. The founders felt that an experienced nursing staff would provide the best patient care.

Formal educational opportunities for nurses at the Clinic existed from the beginning, but these were limited to a few postgraduate positions on staff. However, a severe nursing shortage caused by World War II led to the hiring of a few undergraduate nurses. In 1954, the hospital entered into its first formal affiliation with a nursing school, which allowed students to receive clinical experience at The Cleveland Clinic’s hospital. In subsequent years, a number of local diploma, associate degree, bachelor’s degree, and graduate programs as well as licensed practical nursing schools arranged to send their students to the Clinic for clinical observation and practice.

At first, overseeing these affiliation programs fell to the assistant director of nursing, who was also responsible for orientation and continuing education as well as for nurse recruitment, staffing, and scheduling. In the late 1960s, this position was divided into three parts: recruitment, continuing education, and patient care. The Departments of Nurse Education and Nurse Recruitment grew from the first two, and the Division of Nursing absorbed them in the mid-1980s. In response to the severe nursing shortage that began in the late 1990s, the division created a Nurse Recruitment and Retention Department, which was moved to the Division of Human Resources in September 2000, with a dual reporting relationship to nursing.

By the 1988-89 academic year, the Division of Nursing had affiliated with seven college- and university-based nursing programs, including Case Western Reserve University’s Frances Payne Bolton School of Nursing, and the schools of nursing at Cleveland State University, Cuyahoga Community College, Kent State University, Lakeland Community College, the University of Akron, and Ursuline College. Thirty-three Cleveland Clinic nursing staff

members were pursuing A.D.N., B.S.N., or M.S.N. degrees with the help of tuition grants administered through the division. By 2002, that number had increased to sixty-two.

The division strengthened its ties with the Frances Payne Bolton School of Nursing at Case Western Reserve University when the latter reinstated its B.S.N. program in 1990. The Clinic, along with University Hospitals of Cleveland and Cleveland Metropolitan General Hospital (now called MetroHealth Medical Center), agreed to collaborate in the program by providing tuition support and clinical experience to the students, who would commit to serve at the sponsoring hospitals after graduation. Because of high costs, all hospitals eventually discontinued financial support for this program. The last graduates completed their studies in the late 1990s.

In addition to educating students, the Division of Nursing provided ongoing education for its own nursing staff in a number of ways. Nurse educators oriented all new nurses, and unit-based preceptors worked with the new staff to facilitate their entry into practice. Clinical instructors provided education for staff when practice changes were required, for example, with the introduction of new equipment and procedures. Finally, 34 advanced practice nurses worked with hospital nursing staff to enhance patient care practices in the Clinic's many specialty areas.

The Division of Nursing also offered education to nurses outside the Clinic. Nurses from around the world visited the Clinic regularly to observe nursing practice and organization. Cleveland Clinic nurses traveled widely, offering their expertise in clinical specialties, procedures, and management to clinics, hospitals, and professional groups at home and abroad. An international nurse scholar program offered clinical fellowships to nurses from other countries.

A formal program for nursing research was established under the jurisdiction of nursing resources in the mid-1980s. First, a process for approving nursing research proposals was established, then a nursing research committee was formed. The committee reviewed research proposals with an eye towards projects that would enhance the quality of nursing and institute new approaches to patient care. The program was housed in the Nursing Education and Research Department. Initially, the director of nursing was a member of The Cleveland Clinic's Institutional Review Board. More recently, the senior nurse researcher has filled that role.

The Nursing Shortage

The national nursing shortage of the late 1990s extended well into the early 2000s. Projections for the future indicated an aging nursing work force, a decline in available graduates from schools of nursing, and continued shrinkage of the registered-nurse pool, as well as a decrease in the availability of other professionals. In 2001, in response to the nursing shortage, the Clinic made major financial investments in nursing and in the operations that support nursing. For example, one million dollars was allocated to support a tuition assistance program for nursing students. Students accepted in this program obtained loans of \$5,000 or \$10,000 per academic year. The Clinic's commitment was to forgive \$5,000 of a student loan for each year the graduate worked in the Clinic's hospital. In 2002 this program had 55 enrolled students.

Nursing leadership concluded that various types of flexible scheduling would increase nurse satisfaction and improve recruitment and retention. In response to the challenge, they implemented a "Weekender Option Program" in 1990. It attempted to solve one part of the problem by allowing part-time registered nurses and licensed practical nurses to work two 12-hour shifts during the weekend, as well as additional hours during the week. The option was so popular that by 1991, full-time nurses in most areas were working only one out of every three to six weekends. When the division instituted a shift-incentive program that year to encourage more nurses to work straight evenings or nights, 130 nurses signed up to participate. This helped stabilize staffing and reduced the need for rotating shifts.

Economic constraints resulted in discontinuation of the weekender program, but it was re-introduced in a modified form in 2001, along with other incentives. These incentives included premium pay for nurses, unit secretaries, and other staff working extra shifts, an hourly rate premium for division registered nurses, and a retention bonus for registered nurses with two years of continuous service. These incentives demonstrated the Clinic's commitment to attracting and retaining their experienced and talented staff.

The nursing shortage became a national and international crisis in 2001, and the Clinic invested approximately \$5 million in additional incentives to retain nurses. These included a retention bonus,

an hourly differential for nurses working in the Clinic's main campus hospital, premium pay, the reinstated weekender program mentioned above, and three 12-hour shifts. Recruitment investments included financing for job fairs, sign-on bonuses, international recruitment, a program to attract retired nurses, a program to attract nurses working in other roles at the Clinic, and a summer work program for nursing students.

The Clinic initiated an educational program designed to serve as a long-term approach to the shortage in 2002. This was an accelerated B.S.N. curriculum resulting from a collaboration between The Cleveland Clinic and the Cleveland State University nursing department. It afforded persons with bachelor's degrees in other fields the opportunity to complete their study of nursing in an accelerated format. Students in this program received their clinical practice experience in the Cleveland Clinic Health System.

The April 2002 registered nurse position vacancy rate was 15.2%, up from 14.7% in January 2002. Significant recruitment and retention efforts continued. Retention efforts included leadership training through a Nursing Leadership Academy to enhance the skills of front-line managers, since research had demonstrated their significant impact on staff nurse decisions to remain in current positions. These and other efforts helped to ensure that the Clinic recruited and retained the nurses needed to deliver the quality care for which The Cleveland Clinic has always been known.

In June 2003, the Clinic received designation as a Magnet hospital from the American Nurses Credentialing Center (ANCC). This prestigious designation (one of 82 nationally and only three in Ohio) recognized the strength of the administrative priority on quality of care, delegation of management authority to clinicians, involvement of nursing staff in continuing education, and creation of a satisfactory working environment. Peggy Kuhar led the project that resulted in this designation.

LOOKING AHEAD

In 2003, Ulreich announced her resignation as the Clinic's Chief Nursing Officer. In September of that year, as this book was going to

press, the Clinic announced that Claire Young, R.N., M.B.A., would be her successor. At that time, the Division of Nursing had a staff of close to 3,000, caring for approximately 57,000 patients admitted to the hospital, 35,000 patients requiring surgery, and 435,000 patients receiving ambulatory care. Nurses were working in all 50 inpatient units, in 59 operating rooms, perioperative areas, the emergency department, infection control, and in ambulatory clinics. Annually, nurses received and triaged 260,000 calls through the Nurse-On-Call program.

Although many of their duties were changing, Cleveland Clinic nurses remained focused on their nursing mission: to help patients perform activities contributing to health or its recovery (or to a peaceful death), and to help patients become independent as quickly as possible. Clearly nurses have been an essential part of the care delivery team at The Cleveland Clinic from the beginning. Their roles will continue to change and expand as clinical innovations follow successful research endeavors here and elsewhere. Nursing and medicine will continue their collaborative efforts to enhance the practice environment for patient care and to attract and retain nursing staff in spite of the serious shortage. The future for nursing at The Cleveland Clinic has never been brighter.



*Claire Young, R.N., M.B.A.,
Chairwoman, Division of Nursing,
2003-*

19. DIVISION OF EDUCATION

BY ANDREW J. FISHLEDER

The roots of education are bitter, but the fruit is sweet.

—Aristotle, Fourth Century B.C.

THE EARLY YEARS, 1921-1944

AT THE OPENING OF THE CLEVELAND CLINIC IN 1921, DR. FRANK BUNTS said, “We hope that as we have after many years been allowed to gather together able associates and assistants to make this work possible, so in time to come, those men, taking the place of their predecessors, will carry on the work to higher and better ends, aiding their fellow practitioners, caring for the sick, educating and seeking always to attain the highest and noblest aspirations of their profession.”

It is not surprising that the founders placed so much emphasis on teaching, since all served on the clinical faculties of one or more Cleveland medical schools. From the time it opened, the Clinic had graduate fellows-in-training, now called residents. The first medical resident was Charles L. Hartsock, M.D., who trained from June 1921 to June 1923, then joined the staff and served with distinction until his death in 1961. The first surgical resident was William O. Johnson, M.D., who spent June 1921 to June 1922 at the Clinic, then returned in 1924 after the hospital opened and served with another surgical resident, Nathaniel S. Shofner, M.D. The Clinic also established fellowships in research soon after the institution opened, and a number of traveling fellowships were awarded for residents to visit other clinics and medical centers in this country and abroad.

In the Clinic's early years, the absence of American specialty boards made training programs more flexible than they are today. Residents could finish a year or two at one hospital and then apply to another to train with someone else. In those days the terms "residents" and "fellows" were used interchangeably. Because the training programs at the Clinic were called "fellowships" then, the term "fellow" was normally used where we would now use the term "resident." The system had no formal rules, rotations, or examinations. Today, the rigid requirements of the various specialty boards make transferring from one institution to another difficult. In the 1920s, most interns and residents in teaching hospitals were underpaid or not paid at all. The Clinic paid relatively high salaries for that era and supplied competent technicians to perform time-consuming laboratory studies. Consequently, there was no shortage of applications for the limited number of fellowships offered. Both residents and staff benefited from an apprentice-like arrangement.

Dr. William Proudfit, retired former chairman of the Department of Cardiology, recalls, "The entire formal educational experience when I was in training was a weekly lecture for fellows—all the fellows, regardless of specialty. This was held in the evening, and the same program was repeated annually (an advantage, for we learned what lectures to miss!). How that contrasts with the present programs! An internist or a surgeon was expected to be competent in all subspecialties (except, perhaps, allergy for internists and neurosurgery and orthopedics for surgeons)."

Although formal postgraduate courses had not been established, more than 12,000 physicians spent various periods of time at the Clinic between 1924 and 1937. To support teaching, lecturing, and the presentation of papers, a medical library, medical illustrators, and medical photographers were available.

In 1935, the Clinic formalized education by establishing the Frank E. Bunts Educational Institute with Cleveland Clinic staff as faculty. The stated purpose of the new institute was "to maintain and conduct an institution for learning, for promoting education, and giving instruction in the art, science, and practice of medicine, surgery, anatomy, hygiene, and allied or kindred sciences and subjects."

During the Clinic's early years, a fellowship committee, which

was organized in 1924, administered the fellowship program. Robert S. Dinsmore, M.D., of the Department of General Surgery served as chairman until 1936. Founder Frank Bunts's son, Alexander T. Bunts, M.D., a neurosurgeon, who held the post with distinction for 10 years, succeeded him. After Bunts came William J. Engel, M.D., of the Department of Urology. Engel's service ended with the establishment of the Cleveland Clinic Educational Foundation in 1962.

By 1944, expanding educational activities pointed out the need for a full-time director of medical education. Howard Dittrick, M.D., a well-known Cleveland physician, was chosen for the role. For the next three years he was in charge of the editorial department, library, postgraduate courses, preparation of exhibits, and art and photography departments. He also became editor of the *Cleveland Clinic Quarterly*, which had been publishing scientific papers by the Clinic staff since 1932.

In 1982 the *Cleveland Clinic Quarterly* published its fiftieth anniversary issue. The following remarks are summarized from an article by James S. Taylor, M.D., editor-in-chief, on the history of the *Quarterly*.

"In the first year of publication, the *Quarterly* published six original articles and the balance consisted of reprints. Because of the Great Depression, the *Quarterly* did not appear in 1933 or 1934. On November 28, 1934, the Medical Board met and decided that the *Quarterly* would no longer publish papers that had appeared in other journals.

"Some outstanding contributions to the world literature have been published in the *Quarterly*. The *Quarterly* is distrib-



*Howard Dittrick, M.D., Director,
Frank E. Bunts Educational Institute
(now Division of Education), 1944-1947*

uted without charge to physicians and medical libraries throughout the world. In 1982, circulation exceeded 16,000. It is sent to approximately 2,600 alumni of The Cleveland Clinic Educational Foundation and to 1,000 medical libraries and medical schools. The remainder are sent to other physicians requesting the journal.

"The *Cleveland Clinic Quarterly*, a refereed, indexed journal, is an integral part of the educational activities of the Cleveland Clinic and is underwritten solely by The Cleveland Clinic Educational Foundation. The journal is indexed in *Index Medicus*, *Chemical Abstracts*, *Biological Abstracts*, *Current Contents*, and *Nutritional Abstracts*. It is also microfilmed by University Microfilms International."

Upon Dittrick's retirement, Edwin P. Jordan, M.D., an editor at the American Medical Association, was appointed to replace him. He held the position from 1947 to 1950, when he was replaced by Stanley O. Hoerr, M.D. Then Fay A. LeFevre, M.D., served as acting director of education from 1952 until 1955, when Col. Charles L. Leedham, M.D., was recruited from the Armed Forces to assume the directorship.

THE LEEDHAM YEARS, 1955-1962

When Leedham took over, with the development of American specialty boards and increased regulation by the American Medical Association's Council on Medical Education, formal training programs had to be established for candidates to meet the requirements of the various specialties. Leedham established a Faculty Board within the Bunts Educational Institute in 1956 to oversee the quality of the educational programs and develop policies governing them. The nine-member group comprised the division chairmen, director of research, chairman of the Board of Governors, director of education, and two members-at-large. They made appointments and promotions within the Clinic teaching staff, determined educational policies and curricula for graduate education, established criteria for their selection, and established standards for granting certificates for academic work performed.

THE ZEITER YEARS, 1962-1973

In 1962, the name of the Bunts Education Institute was changed to The Cleveland Clinic Educational Foundation to help physicians here and abroad more closely recognize its relationship with The Cleveland Clinic. Walter J. Zeiter, M.D., a physiatrist and former Executive Secretary to the Board of Governors, was appointed director and held the position until 1973. There was another reason for changing the name: Crile did not wish to be memorialized in any way that would set him apart from the other founders. Some felt that this policy should extend to Bunts as well. Also, with Dr. Alexander Bunts' retirement, Dr. George Crile, Jr., was the only remaining descendant of the founders on the staff. Dr. William Engel, who was soon to retire, was Lower's son-in-law.

As the years passed, the growth of The Cleveland Clinic led to an expansion of educational activities. However, the Clinic lacked adequate physical facilities to support them. The solution came in the form of a generous gift from the estate of Martha Holden Jennings, which provided funds for the construction of a seven-story Education Building and an endowment to maintain it. The building, which opened in 1964, contained an auditorium, seven seminar rooms, a medical library, editorial and administrative offices, and on-call accommodations for house staff.

THE MICHENER YEARS, 1973-1991

In 1973, the Board of Governors appointed William M. Michener, M.D., director of education following Zeiter's retirement. A former Clinic staff member, Michener returned after spending five years as a professor of pediatrics and assistant dean of graduate education at the University of New Mexico.

Under Michener's leadership, education programs flourished. By 1981, the division clearly needed reorganization, and he formed a task force to accomplish this. Two years later, the task force made many excellent recommendations, which the Board of Governors adopted. These included replacing the Faculty Board and its committees with a peer review group. Called the Education Governing Group, it was charged with reviewing, monitoring, and evaluating

all existing and proposed education activities and training programs; establishing educational policies and program priorities; and proposing programs and budgets to the Division of Education.

At the same time, the division formed councils for allied health and nursing education, management and training, and physician education. Michener also appointed a vice chairman to oversee the Physician Education Council. Later, a Continuing Medical Education Council was added.

The Board of Governors also agreed that The Cleveland Clinic Educational Foundation should formally function as a division of the institution. Patient education became a department within the new Division of Education. Most importantly, the Board of Governors affirmed that teaching should become an integral part of the annual professional review process for staff members involved in education, and that consideration should be given to the quality and quantity of their educational performance. With great foresight, the task force recommended that Cleveland Clinic training programs in collaboration with one or more medical schools be considered in the future.

Graduate Medical Education (GME) programs also thrived during Michener's tenure. With advances in medical technology stretching the curriculum of core residencies to capacity, the Clinic expanded subspecialty fellowships in a broad range of medical and surgical areas. Residency training programs grew in size, reflecting the growth of the institution and its professional staff. In order to ensure the maintenance of high-quality education programs, the Clinic responded to recommendations from the Accreditation Council on Graduate Medical Education (ACGME) by establishing an internal review of training programs and documenting the evaluation of resident performance and staff teaching. By 1994, 650 residents were registered at the Clinic, with approximately 250 graduating each July.

Clinic graduates have gone on to practice in a broad range of medical environments throughout the United States and the world. Under the jurisdiction of the Division of Education, the Office of Alumni Affairs maintained contact with more than 7,600 alumni throughout the United States and 72 other countries in an effort to help the institution remain responsive to their evolving needs.¹

In addition to the strong focus on residency training, the educa-

tion of medical students began to play a more prominent role starting in 1974. The first year, 125 students enrolled in the senior medical student electives at the Clinic. In 1975, the number jumped to 280. By 1994, 400 third- and fourth-year students from American medical schools were rotating through the Clinic. They provided a broadened academic stimulus to the residents and staff and served as an important source of candidates for residency positions. An average of 26 percent of the Clinic's first-year positions in the National Residency Match were annually filled by these students, who knew firsthand the value of training at The Cleveland Clinic.



*Andrew J. Fishleder, M.D.,
Chairman, Division of Education,
1991-*

In 1986, the Clinic expanded its medical student commitment through a formal affiliation with the Pennsylvania State University Medical School in Hershey. The agreement provided for third-year medical students to spend required clerkships in neurology, internal medicine, and pediatrics at the Clinic. Both students and faculty rated the experience highly, and it helped enhance the academic focus of residency training in these areas.

THE FISHLEDER YEARS, 1991-

In 1991, the Board of Governors appointed Andrew J. Fishleder, M.D., chairman of the Division of Education. A graduate of the Clinic's pathology training program, Fishleder's interest in education was well known through his service on the Physician Education Council and Education Governing Group. In recognition of the tremendous growth that had taken place in education, and with a desire to develop new programs to support the institution's educa-

tional mission, Fishleder added directors of patient education, medical student education, and allied health education to those in graduate medical education and continuing medical education. Vice chairpersons appointed to oversee these areas were charged with developing strategic initiatives aimed at enhancing the quality and diversity of their educational activities. At the same time, he focused significant energy on ensuring appropriate recognition for staff educational efforts through the development of an annual educational activities report provided to the Office of Professional Staff Affairs during the Annual Professional Review process.

The enactment of a broad-based academic partnership with Ohio State University in 1991 was a milestone for The Cleveland Clinic. Prompted by interests in medical student education and research, the agreement facilitated cooperation in many areas of mutual benefit. By 2000, more than 200 Clinic staff members had obtained full faculty appointments at the Ohio State University School of Medicine. The partnership, entitled The Cleveland Clinic Health Sciences Center of the Ohio State University, also facilitated the development of several joint research programs, most notably in biomedical engineering. Although the partnership was a major academic affiliation, it was not exclusive, and strong relationships continued with Case Western Reserve University.

The Clinic's strong commitment to medical education also extended to practicing health care professionals. With the opening of the original Education Building and Bunts Auditorium in 1964, the number of continuing medical education courses offered at the Clinic increased substantially. In the 1970s and '80s, growth was stimulated by state requirements that licensure renewal be accompanied by documentation of attendance at continuing medical education courses. Taking that cue, programs sponsored by The Cleveland Clinic grew from 20 per year in the mid-1970s to more than 90 per year in 2001, with over 7,800 physicians, nurses and allied health professionals attending annually from throughout the medical community.

Continuing education outreach was further strengthened under the leadership of William Carey, M.D., who expanded the range of continuing medical education (CME) offerings by the institution. Non-traditional programming including videoconferencing, online activities, and *Cleveland Clinic Journal of Medicine*-related CME

provided more than 45,000 CME credits in 2001. The division established a new Center for Continuing Education in 1998, incorporating both the CME and Media Services departments, to support increasingly complex programs. The division also formed Unitech Communications in 1996, a new subsidiary, to capitalize on the education-related intellectual property of the Clinic's faculty. In 2000, the Center started a new website, www.clevelandclinicmed-ed.com. By 2001, 8,500 visitors per month, on average, accessed online CME content at this site. This initiative responded to the increasing demands by physicians for online education program access and complemented the continued strength of the Clinic's live, onsite courses.

When the *Cleveland Clinic Quarterly* began publishing in 1932, there were relatively few medical research journals that provided an opportunity for physicians to share scientific expertise gained at the Clinic with other physicians. In 1987, the division changed the name of the *Cleveland Clinic Quarterly* to the *Cleveland Clinic Journal of Medicine*, and publication increased to six times per year. John Clough, M.D., was appointed editor-in-chief of the *Journal* in 1996. Under his leadership the *Journal* refocused editorial content from original research to education, dealing with the practical challenges of medical care faced by office-based physicians everywhere. The *Journal* "relaunched" itself, with a new look, increased publication frequency, and more aggressive sales of advertising space. This strategic change helped greatly to advance readership among office-based internists and cardiologists, the primary audience of the *Journal*. Deputy editor Brian Mandell, M.D., Ph.D., brought an additional strong educational commitment to the *Journal's* editorial staff.

In 1994, the division created an Office of Faculty and Curriculum Development in an effort to support the continuing enhancement of education program quality. The first director of that office, Mariana Hewson, Ph.D., was appointed in January 1995 and started the Clinic's Seminars in Clinical Teaching program. This office has evolved into a Center for Medical Education Research and Development (CMERAD) with an additional three part-time staff members. In 2001, Alan Hull, M.D., Ph.D., assumed responsibility as Director. CMERAD offered a diverse range of seminars for faculty and trainees including programs on teaching skills, curriculum development, doctor-patient communication, and clinical research topics.

In 1999, the Division of Education occupied new quarters within the Lerner Research Institute complex. These new facilities stood as a monument to the institution's commitment to education and research. Funded through philanthropy, the new Education building included classrooms, an 85-seat amphitheater, a 30,000 square-foot medical library with seating capacity for 311, and administrative space to consolidate the majority of the Division's resources. The MBNA Conference Center, located across the street in the Inter-Continental Hotel, which opened in April 2003, further enhanced the resources available to support the Clinic's academic programs and educational outreach.

With this strengthened foundation of academic commitment in place, the Clinic has embarked on plans for the establishment of a new medical school. On May 13, 2002, The Cleveland Clinic Board of Trustees approved the formation of The Cleveland Clinic College of Medicine of Case Western Reserve University. The mission of this enterprise will be to train physician investigators and scientists who will help to assure the development and application of future biomedical advances. This collaboration, linking two great academic institutions, marked a major milestone for the Clinic. On June 19, 2002, an unprecedented philanthropic gift of \$100 million by Mr. and Mrs. Alfred Lerner secured the financial foundation of this initiative. In recognition of the generosity and vision of the Lerner family, the new medical school was renamed The Cleveland Clinic Lerner College of Medicine of Case Western Reserve University. Although the challenges of this exciting endeavor are many, the establishment of The Cleveland Clinic Lerner College of Medicine, slated to enroll its first students in 2004, will help to propel the institution into the new millennium with a renewed commitment to scientific investigation and academic achievement.

¹ The Alumni Association was transferred back to the Division of Education in 1993 after being revived and reinvigorated under Frank Weaver's leadership during the 1980s.

20. LERNER RESEARCH INSTITUTE

BY PAUL DICORLETO AND GEORGE STARK

*Science is the attempt to make the chaotic
diversity of our sense-experience correspond
to a logically uniform system of thought.*

—Albert Einstein, 1950

EARLY ACTIVITIES

BOTH BASIC AND CLINICAL RESEARCH HAVE BEEN FUNDAMENTAL TO THE mission of The Cleveland Clinic since the beginning. The Clinic's founders were convinced that they could only provide the best patient care by conducting active programs of medical research in the new Clinic. In 1921, they agreed among themselves that no less than one fourth of the net income from the new organization would be devoted to research and indigent care. Later, this percentage substantially increased, and in 1928, the trustees approved construction of a building for medical research.

All of the Clinic's founders participated in research, but George Crile, Sr., M.D., was its strongest advocate. He believed that laboratory discoveries provided the essential scientific basis for modern clinical practice. From his investigations had come the original thesis linking the activity of the adrenal glands to physiologic stress.

Hugo Fricke, Ph.D., was the first scientist in charge of research in biophysics, a field that interested Crile. The latter's "bipolar theory of living processes" was based on the differences in electrical



*Irvine H. Page, M.D., Chairman,
Research Division, 1945-1966*

charges between the brains and livers of animals, as well as between the nuclei and cytoplasm of individual cells. Fricke, and later Maria Telkes, Ph.D., measured the thickness of cell membranes and showed their relationship to electrical charges in living cells. Their studies were widely recognized contributions to this complicated field.

In 1930, a team of biochemists headed by D. Roy McCullagh, Ph.D., replaced the biophysics group. McCullagh persistently tried to isolate a hormone from the testicle believed to inhibit the enlargement of the prostate gland.

Although the quest was tantalizing, no solid results ever materialized. McCullagh did, however, become a pioneer in the measurement of thyroid function through iodine levels in the blood. He collaborated with his brother, Clinic endocrinologist E. Perry McCullagh, M.D., in studies of pituitary and sex hormones.

The original Research Building was designed for types of research that no longer exist today. By 1945, it was largely empty except for a few small laboratories. During the late 1930s and early years of World War II, Crile's leadership waned, and although the laboratories remained partially serviceable until the end of the war, they had neither the resources nor the inspiration they enjoyed during the peak of Crile's influence.

THE PAGE ERA, 1945-1966

By the mid 1940s, it had become clear that the Clinic needed a research leader. In 1945, to the everlasting credit of the trustees, they persuaded Irvine H. Page, M.D., to become chairman of the Clinic's new Research Division. They had become acquainted with

Page through his treatment of Charles Bradley, a prominent Clevelander, for high blood pressure. Russell L. Haden, M.D., chief of medicine at the Clinic, had referred Bradley to Page, a chemist and clinician, whose work had addressed the cause of high blood pressure and paved the way for treatment.

To foster the cooperation of scientists in several disciplines, Page did not permit departmentalization in the Division of Research. He favored melding patient observations, animal experimentation, and work in the chemical laboratory. His disdain of committees, excessive meetings, and other administrative distractions freed everyone to concentrate on research.

Page brought two colleagues, Arthur C. Corcoran, M.D., and Robert D. Taylor, M.D., with him from Indianapolis, where cardiovascular disease, and specifically arterial hypertension and atherosclerosis, had been their main focus. Page began his work in 1931 at New York's Rockefeller Institute after spending three years as head of the brain chemistry division of the Kaiser Wilhelm Institute (now called the Max Planck Institute) in Munich, Germany. Corcoran left Montreal's McGill University to join Page in New York, where he studied renal aspects of hypertension. His use of sophisticated methods to study kidney function in hypertensive patients opened the door to the search for effective antihypertensive drugs and animal models in which new drugs could be tested. Taylor joined Page and Corcoran after they moved to Indianapolis in 1937.

At the Clinic they developed a multidisciplinary approach aimed at solving problems in cardiovascular disease. Their unique plan called for physicians with specialized training in the basic sciences to work full time with clinical researchers. This cooperation, which continues today, is responsible for some of the most significant findings in cardiovascular medicine.

Until that time, heart disease had gone largely unstudied; with the exception of the rheumatic and syphilitic varieties, it received little attention. High blood pressure was also generally considered to be a relatively harmless consequence of aging. But by the 1940s, the incidence of heart attack, stroke and hypertension, and their interrelationship, had become evident.

During the 1920s, a number of investigators tried to produce renal hypertension in dogs with varying success. In 1934, Dr. Harry Goldblatt at Cleveland's Mt. Sinai Hospital produced the first reli-

able model by clamping the renal artery and partially blocking it. Page later developed a simple, practical method of causing severe hypertension by encapsulating the kidney in cellophane, making an inelastic hull that restricted normal pulsation.

As Page began to shape the Research Division, he added Dr. Arda Green, who had just crystallized phosphorylase-A in St. Louis, Georges M. C. Masson, Ph.D., from Montreal, and, in 1950, Willem J. Kolff, M.D., Ph.D., from the Netherlands. Three younger scientists, F. Merlin Bumpus, Ph.D., Harriet P. Dustan, M.D., and James W. McCubbin, Ph.D., came to the Clinic as associate staff or post-doctoral fellows and pursued illustrious careers.

Before coming to the Clinic, Page had worked on isolating a substance formed when blood is clotted, a substance known to have a strong effect on circulation. He continued this work in Cleveland and, with the collaboration of Clinic colleagues Arda A. Green, M.D., and Maurice Rapport, Ph.D., discovered a compound that proved to be 5-hydroxytryptamine. They called it "serotonin." Few biological agents have proven to have so many varied actions as serotonin; among them are profound effects on the brain as a transmitter of nerve impulses, and an active role in the formation of certain intestinal tumors.

A long series of investigations by Page and his associates led to the isolation of a substance that the group named "angiotonin" in 1939, while the group was still working in Indianapolis. Concurrently, a group directed by Braun-Menéndez in Buenos Aires isolated the same compound. Friendly dialogue between them led to an agreement on the name "angiotensin." It has formed the basis of thousands of studies worldwide, has proven to play an important role in hypertension, and is also the chief regulator of catecholamine hormone secretion from the adrenal gland. Angiotensin II became widely available for study after Bumpus, Page, and Hans Schwarz, M.D., synthesized it at the Clinic, simultaneously with Robert Schwyzler, Ph.D., in Switzerland. This major breakthrough helped spur research that led to the development of antihypertensive drugs. Bumpus theorized that blocking the renal-adrenal blood pressure control mechanisms would lower pressure. He demonstrated this by developing the first molecular antagonists to angiotensin. This encouraged pharmaceutical companies to develop angiotensin-converting enzyme inhibitors that have evolved into

useful drugs for lowering blood pressure.

For many years, The Cleveland Clinic Foundation was the sole source of funds for research at the institution. Active antagonism met the prospect of accepting any government support. But in the late 1950s, increased competition, escalating costs, and the need for recognition caused the trustees to relax this policy. In 1962, the National Heart Institute of the National Institutes of Health awarded a major program grant to the Clinic instead of to individual investigators, as was customary. Since staff salaries were paid by the Clinic, the money was used to defray operating expenses. From this point on, grants became critical to growth, as did gifts from individuals and foundations, which helped to defray operating expenses, fund exploratory studies, and build an endowment fund.

Kolff had spent the war years in Holland working on an artificial kidney. With the same stubborn determination that allowed him to continue doing research while his country was under German occupation, he worked against great odds in Cleveland to obtain funds for his projects. Initially, only The Cleveland Clinic funded the artificial kidney, a project that seemed so unlikely that few wanted to invest in it. Eventually, private foundations saw its potential, and, together with the National Institutes of Health, later became prime sources of funds.

Both Page and Kolff had strong convictions, a trait that would later lead to conflict. Separation eventually became necessary, and Kolff continued his research in the Division of Surgery until Page's retirement in 1966.

While Kolff was working on applied research projects, Page and his group were establishing the Cleveland Clinic Research Division as the mecca for studies in high blood pressure. Early on, they showed how the principle of feedback participates in an intricate mechanism that controls blood pressure. After many experiments, they developed a general theory of hypertension, which they called the "mosaic theory." This theory postulated that hypertension rarely has one single cause, but rather results from shifts in the equilibria among its many component causes.

Carlos Ferrario, M.D., joined Page and McCubbin in 1966. Although Page retired soon thereafter, the investigations they had begun culminated in a brilliant series of cooperative experiments involving a former associate, Dr. D. J. Dickinson, in London. Fer-

rario, McCubbin, and Dickinson proved that the brain was a regulator of blood pressure. Later, Ferrario and McCubbin showed where and how angiotensin enters the brain. The blood vessels, heart, sympathetic nervous system, brain, pituitary gland, and kidneys are among the contributors to hypertension.

Under Page, one of the division's major innovations was the integration of patient care, clinical study, and laboratory investigation. This allowed an extensive study of the effects of new antihypertensive drugs on previously studied patients, and led to the development of many effective medications. A main contribution to the understanding of renal hypertension was made with the collaboration of Clinic urologist Eugene F. Poutasse, M.D., who showed that surgical removal of an obstruction in a renal artery produced a cure. Radiologist Thomas F. Meaney, M.D., provided the angiograms that were critical to the visualization and evaluation of these obstructions.

Hemodynamics, the study of flow and pressure within the cardiovascular system, has been one of the cornerstones of hypertension research. High blood pressure is a hemodynamic abnormality, and an understanding of its problems requires accurate evaluation of hemodynamic patterns associated with a rise in arterial pressure. Frederick Olmsted, a biomedical engineer assisting Page and McCubbin, was instrumental in the early design, development, and application of electromagnetic flowmeters to measure cardiac output, regional blood pressure, and other facets of circulation in healthy animals. This did much to advance understanding of the highly complex mechanisms controlling blood flow to each organ. Cardiac enlargement has always been a problem in uncontrolled hypertension. Robert C. Tarazi, M.D., and Subha Sen, Ph.D., were the first to show the effectiveness of various antihypertensive drugs in reversing cardiac hypertrophy.

The Research Division has an equally long history of research in atherosclerosis. When it became apparent that increased blood fat levels were associated with atherosclerosis under certain conditions, Clinic scientists directed their efforts towards modifying fat levels by changing the diet. Promising results in the laboratory then prompted a pioneering clinical investigation: a small group of cooperative medical students consumed experimental diets under the supervision of Helen B. Brown, Ph.D. It was found that certain diets were effective in decreasing fat levels. The U.S. Public Health

Service became interested in the program and offered substantial financial assistance, eventually assuming the complete cost of a greatly expanded, expensive program. This project, called "The National Diet-Heart Study," showed the feasibility of a much larger, long-term program that would involve the cooperation of many institutions nationwide. It ultimately provided the basis for recommending that Americans change their diet to reduce cholesterol and raise polyunsaturated fats in order to prevent heart attack and stroke. This study was the forerunner of the Framingham Study.

Page was also known for his filtration theory of the deposition of lipoproteins in the blood vessels. This was the first attempt to explain how cholesterol is deposited in the blood vessel wall during the development of atherosclerosis.

Before joining Page at the Clinic, John R. Shainoff, Ph.D., was among the first to demonstrate the deposition of lipoproteins in atherosclerotic tissue. But Shainoff's interests changed, and he began approaching atherosclerosis from another angle, believing that both the initial lesion and final closure of the diseased vessel wall involved the transformation of fibrinogen to fibrin to form blood clots. Virtually nothing was known about this. He devised methods to assess the conversion based on the freeing of "fibrinopeptides," which are soluble side products of the reaction. This enabled him to discover that fibrin could be carried in a soluble form loosely linked with fibrinogen in blood, and that these complexes are normally cleared without forming clots except when produced above a critical threshold. Today, analysis of fibrinopeptides and fibrin complexes remains the principal means for diagnosing intravascular fibrin formation.

The continuing challenge of cardiovascular disease was stimulating to investigators and clinicians alike. It provided the excitement and motivation necessary for everyone to participate in the understanding of these diseases, which are statistically among the most prevalent illnesses, and in the care of patients suffering from them. As a result of the growing national interest in cardiovascular disease, Page and local businessmen founded the American Foundation for High Blood Pressure in Cleveland in 1945. It later became the Council for High Blood Pressure Research of the American Heart Association.

Without the strength of basic programs involving cooperation

among scientists, the Clinic would not have attained its position as a national leader in medicine. Although project research was highly credible, the history of the Division of Research shows that coordination and cooperation have been the keys to success.

THE BUMPUS ERA, 1966-1985

From 1945 to 1966 the philosophy of the Division of Research had been steadfastly to maintain the cardiovascular program and add approved research projects from any department. After Page retired, Bumpus was named chairman of the division, a post he retained until his own retirement in 1985. He continued to serve in the Department of Cardiovascular Research, by then renamed the Department of Cardiovascular Biology, as emeritus staff, consultant, and researcher on the newly discovered substance, "human chymase," until his death in 1993. Bumpus created the departments of Immunology, Artificial Organs (including Biomechanics), Biostatistics, and Clinical Science.

Artificial Organs was actually a legacy from Kolff's time. His associate, Yukihiko Nosé, M.D., Ph.D., continued his experimental and developmental work with artificial kidneys and hearts. When Kolff left the Clinic in 1967, the laboratory joined the Division of Research. Bumpus also broke the long tradition of seeking no outside funding. Departing from tradition has proven to be more effective than anticipated. In 1995, the Division of Research had a \$52 million budget, half of which was funded by the Clinic. Ensuring the continued success of the Research Institute will require maintaining an excellent record of extramural support and inaugurating new collaborations with government, industry, and biomedical scientists in academia.

During the 1970s and '80s, research at The Cleveland Clinic was divided into two categories: program research, which was done by members of the Division of Research and, until 1966, concentrated solely on cardiovascular disease; and project research, which was conducted by physicians in the clinical departments. The plan for each project had to be submitted in writing and approved by the Research Projects Committee before funds and space were made available. Each project depended on the investigator's individual

interest, and was not necessarily related to any program research.

By the mid-1970s, the Division of Research contained loosely structured sections of specific research focus: Artificial Organs, Arteriosclerosis and Thrombosis, Cardiovascular Research, Immunology, and the Clinical Research Projects Committee, which evaluated projects originating in the clinical departments.

The Department of Immunology was a natural evolution in the Clinic's growing interest in organ transplantation, autoimmune diseases, and cancer. In 1974, Bumpus recruited Jack R. Battisto, Ph.D., from the Albert Einstein College of Medicine to head this department. His research focused on the immune response and immunological tolerance. He was joined by James Finke, Ph.D., who worked with cytotoxic cells. To round out immunology, he recruited Max Proffitt, Ph.D., from Harvard and Bert Del Villano, Jr., Ph.D., from the Scripps Institute to focus on leukemia; and, as a link to clinical efforts, Claudio Fiocchi, M.D., a gastroenterologist and expert in inflammatory bowel disease.

In 1981 the department's name was changed to Molecular and Cellular Biology. After Michael J. Caulfield, Ph.D., and Martha K. Cathcart, Ph.D., joined the staff, it was renamed Immunology and Cancer. In 1986, Bumpus became acting chairman, and with the addition of research laboratories unrelated to immunology, the name was changed to the Department of General Medical Sciences. Recently, it has reverted to Immunology.

THE HEALY ERA, 1985-1991

In November 1985, Bernadine P. Healy, M.D., became the first woman to chair the Division of Research. A cardiologist, experienced research investigator, and expert in science policy and funding issues, she was eager to carry on the tradition of biomedical research that was highly interactive with clinical care. To better reflect this type of collaborative investigation, she proposed that the division be renamed the Cleveland Clinic Research Institute.

An active and involved leader, Healy's philosophy was simple: impressive talent and continually better results would mean greater success in obtaining grants and other outside funding. Her leadership continued outside the institution as well, as evidenced by her

presidency of the American Heart Association in 1988-9. She felt that having a superior group of interactive scientists would create an exceptional corps of experts who could provide knowledgeable contributions to many clinical research projects and, eventually, to inventions and other patentable procedures and mechanisms. But like Page, Healy emphasized the need to translate this activity into improvements in patient care.

Healy encouraged the pursuit of creative efforts within the areas of the Clinic's priorities and greatest strengths. This, she felt strongly, would not only result in competitive work of the highest quality, but would also produce interdisciplinary programs worthy of philanthropic investment.

Among her top priorities for the Research Institute was to increase its fundamental science base, particularly in molecular and cellular biology. During her chairmanship, Healy recruited Amiya K. Banerjee, Ph.D., to chair the newly established Department of Molecular Biology. Major reorganization of the Research Institute also included splitting the Department of Cardiovascular Research into (a) the Department of Brain and Vascular Research under Carlos

Ferrario, M.D., with an emphasis on neural control of blood pressure, (b) the Department of Heart and Hypertension Research under the leadership of Robert Graham, M.D., recruited from Harvard; and (c) a new Department of Vascular Cell Biology and Atherosclerosis, later called simply Cell Biology, under Paul DiCorleto, Ph.D. In addition, she created a new Department of Cancer Biology, directed by Bryan Williams, Ph.D., who came from the University of Toronto. She consolidated two departments (Artificial Organs and Musculoskeletal Research) into a Department of Biomedical Engineering and Applied Thera-



*Paul E. DiCorleto, Ph.D., Chairman,
Lerner Research Institute, 2002-*



Lerner Research Institute, 1999. Left to right: Education Wing, Laboratories and Commons, Biomedical Engineering

peutics, under J. Fredrick Cornhill, D.Phil., from Ohio State University.

This was a time of major expansion for the Research Institute, both in promising young as well as established senior research talent, reflected in substantial growth in competitively awarded research grants. Among them were two multimillion dollar, multi-center trials: the Post-Coronary Angioplasty and Bypass Graft (Post-CABG) study and the Bypass Angioplasty Revascularization Investigation (BARI). NIH funds more than doubled, from seven million dollars in 1985 to over 17 million dollars by 1991.

Recognizing that endowment funds would provide a flexible investment for the future, Healy helped the Clinic work toward a half-billion-dollar endowment by the year 2000. A centerpiece of her stewardship was to be a new building complex, the Research and Education Institute, providing 305,000 square feet of research and education facilities encompassing laboratories, offices, classrooms, and a state-of-the-art library/telecommunications/conference facility. The first phase, named the John Sherwin Research Building and built to house three of the eight research departments, opened in 1991. The full Research and Education Institute complex, renamed the Lerner Research Institute in acknowledgement of a

major donation by Alfred Lerner, President of The Cleveland Clinic Foundation Board of Trustees, opened in 1998.

To help ensure a steady stream of bright, highly motivated students, Healy seized the chance to complement the Clinic's academic partnership with Cleveland State University by affiliating formally with The Ohio State University (see Chapter 9). Healy's far-reaching ideas, dynamic personality, and outstanding professional reputation caught the attention of President George H.W. Bush, who appointed her first woman director of the National Institutes of Health in 1991.

Banerjee, vice chairman of the Research Institute, was named acting chairman upon Healy's departure. During his vice chairmanship and acting chairmanship, he reached out to other academic institutions, improving relations with Ohio State University and collaborating with Cleveland's Case Western Reserve University (CWRU) on virology projects. He continued to build his own strong program in molecular biology.

THE STARK ERA, 1992-2002

In 1992, the Board of Governors named George R. Stark, Ph.D., chairman of the Research Institute. A molecular biologist of international repute, Stark was trained at Columbia University and began his independent career at Rockefeller University, where his work centered on protein chemistry. He then went to Stanford University, where he worked on enzyme mechanisms and developed two important methods in molecular biology known as the Northern and Western blotting techniques. In 1983, he joined London's Imperial Cancer Research Fund, where he focused on gene amplification and intracellular signaling pathways modulated by interferons.

Stark's chairmanship signaled an even greater emphasis on building depth of expertise in molecular biology. However, he recognized the need to recruit excellent staff at all levels and in all fields, as well as to maintain interaction between the clinical and basic science staffs. Coincident with Stark's arrival, The Cleveland Clinic formed the Department of Neurosciences, incorporating staff from the former Department of Brain and Vascular Research. It represented the culmination of 15 years of effort to establish research

programs linking the basic and clinical sciences to address the underlying mechanisms and treatment of nervous system diseases. Bruce Trapp, Ph.D., a prominent multiple sclerosis researcher from Johns Hopkins University, was recruited to chair the new department. From the outset, the program brought together clinicians from neurology, neurosurgery, neuropathology, and neuroradiology with neurobiologists, neuroimmunologists, and molecular biologists.

Stark's encouragement of new efforts that combined basic and clinical sciences included technology transfer. In 1994 this led to the Research Division's first free-standing spin-off company, BioSeiche Therapeutics, Inc. (later renamed Ridgeway Biosystems, Inc.), which was built on Robert H. Silverman, Ph.D.'s technique of using a new class of drugs, called "2-5A antisense," to target and destroy disease-causing RNA in viruses or tumor cells.

In 1994, Robert Graham returned to his native Australia, and the Board of Governors convened a committee to evaluate the Department of Heart and Hypertension Research in view of the other existing cardiovascular research programs at the Clinic. The committee recommended merging the department with the Jacobs Center for Thrombosis and Vascular Biology. The Center's director, Edward F. Plow, Ph.D., recruited from Scripps Research Institute in 1992, became chairman of the new Department of Molecular Cardiology, and Eric Topol, M.D., became vice chair. Also, Thomas A. Hamilton, Ph.D., was named chairman of the Department of Immunology, after several years as acting chair.

Stark established formal avenues for Research Institute investigators to create bridge programs with physicians in the Taussig Cancer Center, the Mellen Center for Multiple Sclerosis, the Center for Digestive Disease Research, the Urological Institute, and other clinical entities. Centers of Anesthesiology Research and Surgery Research were created, and a Department of Ophthalmic Research was started in the Cole Eye Institute. Stark also initiated a program in Structural Biology in collaboration with scientists at Case Western Reserve University and Cleveland State University.

In 1998, Stark sought a new chair of Molecular Biology, with Banerjee remaining head of the virology research program. Andrei Gudkov, Ph.D., an outstanding translational molecular biologist from the University of Illinois, assumed this role in 2000. Gudkov was instrumental in the relocation of a Chicago-based biotechnolo-

gy start-up company, Quark Biotechnology, Inc., to the Clinic's campus. In September 2003, Quark announced its impending move to California to concentrate on production rather than research. But Gudkov's entrepreneurial spirit fit well with the Clinic's reinvigorated efforts to commercialize its intellectual property. Supporting these efforts was new leadership in the technology transfer office (referred to as "Cleveland Clinic Foundation Innovations") by Christopher Coburn, formerly of the Battelle Institute, in the role of administrative director and Joseph Hahn, M.D., as medical director.

In the 1990s, the Department of Biomedical Engineering had grown to be the largest in the Lerner Research Institute, with over 20 faculty members. Cornhill left the institution in 2001, and the following year Peter Cavanagh, Ph.D., a distinguished researcher in biomechanics and kinesiology, was recruited from Pennsylvania State University to chair the department. Cavanagh restructured the department, creating programmatic sections. In addition, he and Joseph Iannotti, M.D., Ph.D., created a new Orthopaedic Research Center including laboratory-based and clinical researchers from both departments.

THE DICORLETO ERA, 2002-

Stark stepped down as chair of the Lerner Research Institute in 2002 after a decade of strong leadership and dramatic growth. Paul E. DiCorleto, Ph.D., succeeded him later that year. DiCorleto received his doctorate in biochemistry from Cornell University and performed postdoctoral studies in vascular cell biology at the University of Washington. His research focused on the cellular basis of atherosclerosis and other vascular diseases. DiCorleto joined The Cleveland Clinic in 1981 and served subsequently as chairman of the Department of Cell Biology, as Associate Chief of Staff, and as a member of the Board of Governors. An important part of his plan for the Research Institute was to expand two translational research areas—human genetics/genomics and stem cell biology/regenerative medicine.

DiCorleto reaffirmed the original philosophy of the Research Division, i.e., to perform outstanding basic and applied biomedical research and to educate the next generation of biomedical

researchers. The major objective remains advancement of the means of prevention, diagnosis, and treatment of disease. The research staff members receive the bulk of their support from peer-reviewed and competitively awarded external grants, the majority from the NIH. They serve as mentors to graduate students, post-doctoral fellows, medical students, and interns, and they maintain close academic ties with Case Western Reserve University, Cleveland State University, and Kent State University.

The long tradition of creative scientific interaction and innovation continues. Recent discoveries include the identification of genetic variations that are associated with premature coronary artery disease and heart attack (Eric Topol, M.D., Qing Wang, Ph.D., and Edward Plow, Ph.D.), the identification of novel diagnostics for both cardiovascular disease (Stanley Hazen, M.D., Ph.D., and Marc Penn, M.D., Ph.D.) and cancer (Andrei Gudkov, Ph.D., and Raymond Tubbs, D.O.), and the elucidation of novel genes and pathways that are involved in the pathogenesis of multiple sclerosis (Bruce Trapp, Ph.D., and Richard Rudick, M.D.) and prostate cancer (Robert Silverman, Ph.D., Graham Casey, Ph.D., and Eric Klein, M.D.). There has also been excellent progress on many fronts in applied research, such as the use of autologous stem cells to improve healing of bone fractures (George Muschler, M.D.) and the development of new imaging software for the evaluation of heart disease (Geoffrey Vince, Ph.D.). Both of these advances have opened commercialization opportunities.

Continuing in the tradition of Page, the Institute encourages scientific interactions among investigators. Program Project Grants are tangible examples of this philosophy. From these collaborations have come major program grants, including one to support atherosclerosis research headed by DiCorleto with 25 years of continuous support by the NIH, another for multiple sclerosis research headed by Richard Ransohoff, M.D., and yet another on interferons and cancer headed by Stark. Many other program grant applications are pending or in preparation. Thus, the group practice concept of research remains very much alive.

Those who have led research activity have continually renewed the principles under which the Clinic was founded: Crile understood the importance of research in providing better patient care; Page emphasized the link between basic and clinical investigation,

and the importance of training the next generation; Healy's wise planning and budgeting and her personal impetus energized the initial stages of the Research and Education Institute, increased outside funding and endowment, and attracted outstanding talent. And Stark expanded these approaches and encouraged collegial and effective joint activities to strengthen the current and future base of science talent. These leaders have ensured that the Research Institute will remain on the forefront of innovation and discovery well into the next century. DiCorleto has had strong and positive interactions with all of the previous chairs, including Page (who visited the Research Institute on a regular basis until his death in 1991), and he is committed to carrying the tradition forward during his stewardship.

21. CLEVELAND CLINIC FLORIDA

BY MELINDA ESTES, MIMI MURPHY, AND JOHN CLOUGH

Progress lies not in enhancing what is, but in advancing toward what will be.

—Kahlil Gibran

FLORIDA BECKONS

THE CLEVELAND CLINIC BEGAN ITS SIXTH DECADE IN 1981 AS THE LARGEST non-governmental employer in Cleveland. At that time, however, the city was in a deep recession and losing population. Regional economics and the expected effects of health care reform posed a challenge to the Clinic's continued growth in Cleveland. Nevertheless, desiring to build upon the Clinic's prior growth and success, Clinic leadership recognized the opportunity to expand the integrated, academic group practice-based delivery system beyond Cleveland. Thus, they began to explore potential locations across the United States. Because the Clinic's international reputation was strong, they also looked abroad, visiting locations in Europe, Africa, and the Far East at the invitation of local institutions or governments. The Clinic gave serious consideration to Morocco and Singapore, where stable governments offered substantial financial and hospital support. In the end, however, the logistics of staffing and running a clinic on another continent proved impractical, and the idea of overseas expansion was set aside.

The Clinic returned its attention to the United States—specifically Florida, where migration patterns from the midwest and northeast are strong. Moreover, many considered Florida to be the gateway to

Latin America. Because increasing numbers of patients from South America were traveling to Cleveland to seek medical care, Clinic leaders concluded that an affiliate in Florida would appeal to many of the international patients arriving in Cleveland by way of Miami. Therefore, southeast Florida, regionally known as "South Florida," emerged as the most favorable location for such an affiliate. Marketing studies indicated that The Cleveland Clinic enjoyed the greatest name recognition in Fort Lauderdale—an area where, despite a population of four million, no true multispecialty group practice existed. And, with the exception of the University of Miami, there was no significant institution for medical education in the region.

As the Clinic narrowed its focus to the Fort Lauderdale-Broward County area, a local broker who had had previous experience with the organization introduced Clinic leaders to administrators of the North Broward Hospital District. The introduction resulted in an offer from the District to establish a joint venture with the Clinic whereby the District would build an outpatient building adjacent to its Broward General Hospital especially for Clinic use. Specialty care staff would be recruited jointly and supplemented by Clinic staff. Although Clinic leaders and District officials approved the joint venture, the medical staff at Broward General Hospital vehemently opposed the agreement and demanded that the offer be withdrawn. Both parties gave way to staff hostility and dropped the proposal.

Contrary to the physicians' response, however, was the reaction of the Broward business community, which embraced the idea of the Clinic's entry into the area. Encouraged by Fort Lauderdale business leaders, Clinic officials grew confident that South Florida residents would welcome their new group practice and decided to open an independent, Clinic-owned group practice.

Demographic studies of South Florida (a single metropolitan area encompassing Broward, Dade, and Palm Beach Counties) showed that a location in west central Broward County where the primary road from Florida's west coast ("Alligator Alley") crossed a major north-south highway on the east coast was within a two-hour drive of more than six million people. The Clinic purchased 320 acres of land in this prime location near the community of Weston.

The Clinic next addressed the question of who would lead Cleveland Clinic Florida. The Board of Governors appointed William A. Hawk, M.D., chairman of the Department of Anatomic Pathology,

to the position of chief executive officer until the new facility opened. Hawk had played a key role in the construction of the Crile Building. He was to be succeeded by Carl C. Gill, M.D., a respected cardiovascular surgeon and member of the Board of Governors, who would serve as medical director until Hawk's retirement. James Cuthbertson, secretary to the Board of Governors, was appointed chief operating officer. Hawk and Cuthbertson moved to Florida in January 1987 to begin the process of building Cleveland Clinic Florida from the ground up. Gill remained in Cleveland a few months longer to start recruiting the medical staff.

PRELIMINARY RED TAPE

As in Ohio, the corporate practice of medicine in Florida is illegal. Therefore, special legislative action was necessary to allow The Cleveland Clinic organizational structure to exist there. Moreover, the Florida licensure law required physicians who passed licensing examinations other than Florida's more than ten years earlier to take the Florida FLEX examination. This process was lengthy and arduous for mid-career physicians, especially specialists. In order to open in Jacksonville, the Mayo Clinic had gotten the state to alter both statutes. In fact, the legislature had passed a new statute, similar to that for Florida's medical schools, that permitted Florida to license 25 Mayo Clinic physicians licensed in other states without further examination. The specificity of this law to Mayo was predicated on the size of the mother institution and the amount of financial support provided for education and research, and thus excluded all other institutions. Therefore, in order to establish Cleveland Clinic Florida, both laws had to be changed again. With the help of a friendly and powerful delegation of Broward County legislators and a cadre of lobbyists, the legislature passed the needed changes on the last day of the legislative session in June 1987.

The Clinic's leaders intended to establish a campus that included an outpatient clinic, hospital, research, and education facilities. In Florida, however, hospital beds cannot be occupied without approval from the Department of Health and Rehabilitative Services through the certificate-of-need process, which is closely monitored and strenuously defended by established institutions. In March 1987, the

Clinic filed an application to build a 400-bed hospital. After a series of delays, revisions and resubmissions, the Department rejected the Clinic's bid in January 1989 on the grounds that Broward County already had too many unused hospital beds. The Clinic decided not to appeal the decision at that time.

Expecting the approval and building process to take several years, the Clinic had made arrangements for temporary outpatient and hospital facilities. Even before the statutes regarding licensure were modified, construction of a 76,000-square-foot outpatient building began 10 miles northwest of downtown Fort Lauderdale. With the expectation that it would be occupied for three years, it was designed to accommodate a staff of 40 physicians in a multispecialty setting.

Gill began recruiting staff in January 1987, but made little headway until the Florida statutes were changed in June. His first goal was to recruit the nucleus of a comprehensive clinic staff that could provide the majority of adult services. These physicians had to be the highest quality available—mature clinicians with significant patient care experience. Preference would be given to Cleveland Clinic staff and graduates as well as physicians trained and recommended by Clinic alumni. He looked for physicians with strong backgrounds in research and education. He recognized that these qualities, combined with energy, collegiality, and a dedication to excellence in patient care, would help Cleveland Clinic Florida mature the culture and maintain the model of medical practice that had always been the hallmark of the parent organization. This transfer of culture was expected to be one of the most difficult aspects of building Cleveland Clinic Florida.

Simultaneous with physician recruitment was the Clinic's search for a local hospital—a place where Clinic physicians could admit Clinic patients. The search was somewhat challenging due to local physician opposition to Clinic physicians and The Cleveland Clinic practice. Several hospitals closed their staffs in order to prevent Clinic physicians from applying for privileges. The Federal Trade Commission later investigated these hospitals for restraint of trade.

One area hospital, the North Beach Hospital, went against the tide and extended privileges to Clinic physicians. The owners of this 150-bed for-profit institution located on Fort Lauderdale's beachfront, Health Trust, Inc., had everything to gain by locking in

a steady source of income. The North Beach Hospital had a small active staff and a dangerously low census. After both parties agreed on several upgrades to the hospital, the Clinic made North Beach its primary hospital.

GRAND OPENING AND PUSHBACK

Cleveland Clinic Florida opened its doors with a staff of 28 physicians on February 29, 1988—almost exactly 67 years following the opening of its parent institution in Cleveland. The Clinic's first patient was admitted to North Beach Hospital the following day. The official dedication occurred two months later, on April 8, 1988. Gill became chief executive officer, and Hawk retired, as planned. Cuthbertson remained as chief operating officer.

Although North Beach Hospital was satisfactory for most patients, it lacked the facilities and certificates of need for invasive cardiology procedures and cardiac surgery. Five hospitals in Broward County had approval to perform these services. One was Broward General, which had lost its primary team of cardiac surgeons to a competing hospital in nearby Palm Beach County. When Cleveland Clinic Florida cardiac physicians applied for privileges at this public hospital, Broward General Hospital's Medical Executive Committee postponed a review of their applications for three months. Finally, the applications were rejected as a group, and the hospital district's Board of Commissioners supported this decision. Confronted with the illegality of its action, the Board reversed its stand in January 1989 and asked the Clinic to assume control of the cardiac surgery program at Broward General. Nevertheless, the hospital's Medical Executive Committee still refused to grant privileges to the Clinic physicians. On April 27, the Commissioners were forced to import a committee of physicians from outside the state of Florida at taxpayers' expense to review the Clinic physicians' applications. They passed easily, and Gill performed Cleveland Clinic Florida's first open heart operation at Broward General on May 15, 1989, without incident, over a year after the fledgling organization's opening. Shortly thereafter, the majority of Cleveland Clinic Florida physicians obtained privileges there. Later, in 1994, a car-

diac catheterization laboratory opened at North Beach Hospital, by then owned by the Clinic and renamed Cleveland Clinic Hospital, and an application for a certificate of need for open-heart surgery was filed the same year.

The struggle for privileges at Broward General made many local physicians more determined than ever to drive The Cleveland Clinic out of Broward County. Their animosity was annoying but tolerable until it began to interfere with patient care. Local physicians who interacted with Cleveland Clinic staff received threats that referrals from their non-Clinic colleagues would stop unless they severed all relationships with the Clinic. In early 1989, a terminally ill Clinic patient needed a consultation with a pulmonologist, a specialty that Cleveland Clinic Florida did not yet have on staff. Incredibly, no pulmonologist in Broward County would see the patient! The needed consultation was eventually provided by a pulmonologist from Miami, who was given temporary privileges at North Beach for this purpose.

Although the suit was eventually dropped, it caught the attention of the Federal Trade Commission. Agents began investigating selected Broward County hospitals and physicians for antitrust activity in August 1989. Sixteen months later, armed with abundant evidence, they accused local doctors of attempting to restrain trade. At the insistence of the chief of staff at Broward General Medical Center, most physicians initially resisted the commission's order to admit wrongdoing and sign a consent decree. But faced with the consequences, by May all had signed except the chief of staff. Not until faced with criminal charges did he reluctantly back down in January 1992, ending the overt hostility and the ugliest chapter in the early history of Cleveland Clinic Florida.

Practicing side by side with local physicians at North Beach Hospital was beneficial to Cleveland Clinic Florida during these troubled first years, for it helped Clinic physicians assimilate into the community while providing the hospital with a growing number of admissions from both groups. Extensive renovations had turned North Beach into an attractive, modern hospital, and the census had climbed dramatically. The Cleveland Clinic purchased North Beach Hospital in 1990 and began to merge its operations with those of the Clinic in September 1992. On January 1, 1993, its name was changed to the Cleveland Clinic Hospital.

PROGRESS

During its early years, Cleveland Clinic Florida made a remarkable impact on the face of medicine in South Florida, which was dominated by solo practitioners. Led by Gill and chief of staff, Harry K. Moon, M.D., Clinic physicians quickly demonstrated the benefits offered by a multispecialty group practice to patients and physicians alike by providing expert diagnoses and sophisticated treatments not widely available. They began performing clinical research and publishing their findings. By September 1995, 221 projects had been approved, and almost 400 articles were published the previous year alone. A basic research program began in 1994 with the recruitment of biochemist and molecular biologist Susan R. Abramson, Ph.D.

Cleveland Clinic Florida physicians initiated weekly grand rounds in 1988, and they invited community physicians to participate. Larger continuing medical education programs offered throughout the year attracted a large audience of local, regional, national, and international physicians.

Cleveland Clinic Florida's colorectal surgery residency program was the first in the state to be approved by the Accreditation Council on Graduate Medical Education (ACGME) for two residents a year. Clinic residents and fellows from the Cleveland campus rotated through through a variety of services at Cleveland Clinic Florida, and in 1996 the ACGME approved a residency program in internal medicine for Cleveland Clinic Florida as a freestanding program.

The need for educational materials to support residents and staff physicians led Cleveland Clinic Florida to open a medical library in 1990. The funds to purchase books, periodicals, and computer services were raised through donations and special events. Known as the A. Lorraine and Sigmund Goldblatt Medical Library in honor of its major benefactors, it was open to anyone who wished to use it.

By its fourth birthday, Cleveland Clinic Florida had reason to celebrate. With 300 employees and a physician staff of 63, the young medical center had doubled in size in four years. The doctors had provided for 200,000 outpatient visits, and almost 7,000 advance appointments had been booked. The Clinic's rapid growth, coupled with its unique management style, convinced the readers of the *South Florida Business Journal* to select Cleveland Clinic Florida as the Medical Business Best Outpatient Facility in 1990.

While opposition to the Clinic initially resulted in a referral boycott, local physicians soon discovered how the Clinic could assist them with patient care. A poll taken in November 1991 showed that 25% of Clinic patients were referred by their physicians.

By 1995, the Clinic staff had grown to nearly 100 physicians who practiced in a full range of adult specialties. Nevertheless, inadequate office space constricted the rapidly growing institution. Furthermore, Cleveland Clinic Hospital's small size, its distance from the outpatient clinic, and lack of sophistication presented a growing problem. The Clinic had no choice but to expand.

EXPANSION TO WESTON

As Cleveland Clinic Florida continued to operate from its temporary office space, plans to find a permanent home near Interstate Highway 75 in southwest Broward County were well under way. As previously recounted, efforts to build a medical center in Florida had begun in March 1987, when the Clinic originally filed for a certificate of need (CON) to build a 400-bed hospital. Although the application was defeated, the Clinic's determination to establish a multi-specialty medical campus was not. The Clinic filed again for a CON in 1995. Unlike the 1987 application, the intention of the Clinic's second attempt was to build a replacement hospital for the North Beach facility. The Florida Agency for Health Care Administration (AHCA) approved the 1995 application and granted the Clinic a CON to build a replacement hospital on June 6, 1997. In late 1997, Gill left Cleveland Clinic Florida and Moon succeeded him as chief executive officer. One year later, on November 12, 1998, the Clinic broke ground on a 43-acre site in Weston, Florida.

The vision for the future medical center was a fully integrated medical campus—a single location where a patient could receive all necessary medical services. It was to be a place where traditional hospital beds, an outpatient pavilion, and physician's offices were located under one roof, just as at the main campus in Cleveland. The significance of the groundbreaking in Weston was twofold. It was, on the one hand, the product of a multi-year effort to obtain a CON to build a 150-bed, \$80 million hospital. On the other hand, it represented a joint venture between The Cleveland Clinic and the Santa Barbara,



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California-based Tenet Healthcare Corporation. Under the partnership, Tenet and the Clinic would co-own the hospital, and Tenet would manage its day-to-day operations. Although the hospital would bear the Clinic's name, it would become part of the Tenet South Florida Health System.

The Weston community eagerly awaited the arrival of Cleveland Clinic Florida. The proposed medical campus and hospital not only received unanimous approval from the Weston City Commission but a resounding endorsement as well. City commissioner Mark Myers characterized the Clinic's relocation as "the most exciting development in the City." At the time of the groundbreaking, it was estimated that the hospital would have more than 90 physicians on its staff, specializing in approximately 40 different areas of medicine. In addition to top-quality medical care, the hospital would focus on research and education. Already, the Clinic's residency programs were multiplying. Joining the colorectal residency program were programs in internal medicine, neurology, and geriatric medicine.

The Clinic's rapid growth was to be well supported by the future multi-specialty campus. In the new hospital, Clinic physicians and residents would have at their disposal a modern emergency room, a cardiac laboratory for diagnosis and a cardiac rehabilitation area, inpatient and out-patient surgical facilities, and a fully equipped diag-

nostic radiology center, all under one roof. New services at the Weston facility would include a kidney transplant program, an expanded center for minimally invasive surgery, and an expanded neurosurgery program.

As civic leaders and area residents looked forward to having a medical facility in close proximity to their work and home, Clinic physicians and administrators looked forward to working in a facility that mirrored The Cleveland Clinic in Cleveland. The facility had been specially designed to reproduce the Clinic's unique model of medicine—one that integrates inpatient and outpatient care with research and education. For Clinic physicians, the new location represented a significant milestone in the long struggle to fulfill their original mission in South Florida.

A BI-COASTAL PRESENCE

As early as 1996, Moon foresaw that the new campus would provide services to many people throughout the community, region, state, and beyond. At the time of the groundbreaking, the majority of the 220,000 patients who received care at Cleveland Clinic Florida on a yearly basis came from the southern third of the state, from Lake Okeechobee southward. Weston was an ideal location for the Clinic because of its accessibility to South Florida's three populous counties—Palm Beach, Broward, and Dade. Nevertheless, as the Clinic conducted additional demographic studies, it became evident that a growing segment of the Clinic's patient base was commuting from Florida's west coast—namely, Lee and Collier Counties.

Simultaneous with recognition of the west coast as a potential second site for the Clinic in Florida, a patient requested the Clinic to underwrite a van service to transport patients from the west coast to Cleveland Clinic Florida's Fort Lauderdale facility. This particular patient, like other patients from Naples, was so pleased with her treatment that she regularly drove from Naples to Fort Lauderdale for ongoing therapy. The Clinic funded the service and, by 1998, had transported more than 15,000 patients from Naples, Marco Island, and Fort Myers.

Clinic leaders further scrutinized Collier County's patient demographics and growth projections and determined that North Naples

would be an ideal location for a multi-specialty clinic and hospital, similar to the one under construction in Weston. On August 26, 1996, Cleveland Clinic Florida filed notice with state health-care regulators of its intent to apply for a CON to build an acute-care hospital in Collier County with up to 100 hospital beds. At the same, Columbia-HCA Healthcare Corporation filed a letter of intent to make a second application to build a 150-bed hospital. The Clinic's notice followed a year after announcing plans to build a 30,000-square foot outpatient facility on a 7.6-acre parcel purchased adjacent to Interstate Highway 75.

A myriad of factors drove the Clinic's effort to build a hospital on Florida's west coast. Projected population growth, requests from current patients, and high occupancy rates in the community's two existing hospitals, especially during peak tourist season, contributed to the decision. Historically, Collier County had only one hospital provider, the Naples Community Hospital Healthcare System (NCH), which operated the 384-bed Naples Community Hospital near downtown Naples and the 50-bed North Collier Hospital, off Immokalee Road. While NCH opposed the proposal, the residents of Collier County embraced it.

A public hearing to discuss the Clinic's application was held in Naples at the request of several Cleveland Clinic supporters. An estimated 350 people attended the public forum—all in support of Cleveland Clinic Florida. Moreover, 179 letters of support were sent to the Health Planning Council of Southwest Florida, Inc. that organized the hearing. The Collier commission chairman, John Norris, speaking on behalf of the commission, stated that the board favored Cleveland Clinic provided it accepted indigent patients. Furthermore, chairman Norris pointed to the county's future growth as another factor in determining the Commission's approval and encouraged the community to view the proposed medical campus as a complement to the existing two hospitals.

The Florida Agency for Health Care Administration denied Cleveland Clinic Florida's proposal to construct a 100-bed hospital and approved Columbia-HCA's request to construct a 150-bed facility. The Cleveland Clinic and Naples Community Hospital both appealed this decision. Approximately one year later, Columbia-HCA and the Clinic negotiated a controversial settlement, later challenged by the Federal Trade Commission, and Columbia-HCA dropped its hospital plan. Naples Community Hospital remained steadfast in objecting to

the construction of another local hospital. After months of litigation, NCH officials agreed to drop their opposition to the Clinic's proposal in exchange for concessions by The Cleveland Clinic regarding the amount of charity care the Clinic would provide in the new hospital. The settlement also stipulated that the Clinic could not open the new hospital before April 9, 2000.

The agreement between NCH Healthcare Systems and Cleveland Clinic Florida ended what promised to be a long-fought battle, as Clinic officials vowed to bring health-care competition to Collier County. The arrival of Cleveland Clinic Florida in Naples, particularly the hospital, marked a turning point in health care in the Collier County community that had been dominated by the NCH system with its two hospitals and array of medical services in years past. Collier County had been the last of the state's fast-growing counties to have only one health-care system, a situation that people who wanted choices for medical care found objectionable.

The Clinic decided to build the hospital on the same 37-acre parcel of land where it had already begun constructing a 190,000 square-foot medical office building. This outpatient medical center and diagnostic center, two buildings linked by a corridor, was halfway occupied in January 1999. By June of that year, the Naples Clinic opened its surgery center in the outpatient complex and by late fall, ground was broken for the 70-bed hospital.

The fall of 1999 was an especially busy time of year for Cleveland Clinic Florida. Six weeks prior to the October groundbreaking ceremony of the new Cleveland Clinic Florida Hospital in Naples, a "topping-off ceremony" was held at the Clinic's medical campus in Weston as a final steel beam was placed into the frame of the Clinic's east coast hospital. For Clinic officials, the completion of the Weston hospital signified a new milestone for Cleveland Clinic Florida. The Clinic's administration had succeeded in satisfying Florida's Agency for Health Care Administration that Broward County needed another hospital and finally obtained the much-desired CON to operate the facility. The Weston campus opened for business in July 2001.

As the finishing touches were being applied to the Weston medical facility, the dawn of a new era in hospital care was breaking on Florida's west coast. Cleveland Clinic Florida Hospital Naples celebrated its grand opening on April 2, 2001. This \$57-million hospital in North Naples featured 70 private rooms and was designed with the



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Clinic's "healing hospitality" approach to patient care. Of the 70 private rooms, six were dedicated for intensive care. The hospital, located behind the Clinic's sprawling two-year-old outpatient complex, was designed for a potential expansion to 120 beds.

The arrival of the Naples hospital ended Collier County's service by a single hospital provider, an unusual situation for a large community in Florida. There was great enthusiasm for the new hospital among community residents as well as civic and business leaders. Five hundred business leaders attended the dedication and over 6,000 residents attended the Clinic's self-guided tours the weekend before the grand opening. At the conclusion of the hospital's first week of operation, 299 patients had been treated in the emergency room, while 91 patients had been admitted to the hospital.

Much of the success in bringing the Cleveland Clinic Florida Hospital to reality in Naples was due to the accomplished administrative staff that oversaw the development and completion of the 350,000-square-foot medical campus. Fielding Epstein, formerly the radiology administrator at the Clinic's main campus in Cleveland, supervised the development of the clinic and subsequent construction of the hospital. In addition, Epstein was responsible for cultivating the political and community support for the hospital. Geoff Moebius, the former chief executive officer of Deaconess Hospital in



*Robert Zehr, M.D., Medical Director,
Cleveland Clinic Florida, Naples, 2003-*

Cleveland, was in charge of day-to-day hospital operations. The two administrators supervised the administration of the Naples medical campus, while the chief of staff, Robert J. Zehr, M.D., led the Naples professional staff.

MATURATION AND NEW LEADERSHIP

With the new Naples campus fully operational and the Weston campus nearing completion, the bi-coastal Cleveland Clinic Florida announced several changes in its administrative leadership and structural organization. Loop asked Melinda Estes,

M.D., the former executive director for business development at the Cleveland Clinic and the first woman to be elected to The Cleveland Clinic's Board of Governors, to serve as the new chief executive officer of Cleveland Clinic Florida. Estes replaced Moon, who became president of the Cleveland Clinic Florida Foundation and later retired. Jerry Oliphant was named Chief Operating Officer. The new administration marked a great beginning for the future of The Cleveland Clinic in Florida. The opening of the modern, patient-centered hospital in Naples was soon to be replicated in Weston. It appeared that a new era in Cleveland Clinic Florida's history was getting under way.

Big-time healthcare arrived in western Broward County with the opening of Cleveland Clinic Florida Weston. On July 2, 2001, Cleveland Clinic Florida opened its 150-bed hospital designed to provide a full range of specialty care, including open-heart surgery, adult kidney transplantation and neurosurgery. The \$150 million campus, Broward County's first new hospital since 1992, brought the Clinic's expertise in medical research to the forefront.

Shortly after its opening, Cleveland Clinic Hospital rolled out

the first comprehensive heart program in Weston, which offered South Florida residents the latest and most advanced treatments in cardiac care. Services included angioplasty, cardiac catheterization, and minimally invasive robotic heart surgery. Heart catheterizations and renal transplants were performed on a regular basis and, by the end of 2001, the multi-specialty medical campus was fully operational.

When Estes left the Clinic in 2003, Clinic leadership determined that the complexity of Cleveland Clinic Florida mandated separate governance for the east- and west-coast operations and appointed Howard Graman,



*Howard Graman, M.D.,
Medical Director,
Cleveland Clinic Florida, Weston, 2003-*

M.D., to lead Cleveland Clinic Weston and Robert Zehr, M.D., to lead Cleveland Clinic Naples. Another new era for Cleveland Clinic Florida had begun.

In less than 14 years, Cleveland Clinic Florida had grown from a small medical group into one of Florida's largest multi-specialty group practices. Advances in research, technology, and medical services continued at Cleveland Clinic Florida. Its leadership team, composed of physicians and administrative staff alike, directed each of the medical facilities using The Cleveland Clinic model of medicine. As such, the superior quality of the Clinic's brand of medicine supported its growth, and the population of South Florida was the beneficiary.