

## Mayo Clinic Course in Advanced Molecular and Cellular Medicine

This issue contains the manuscripts written on the occasion of the Mayo Clinic Course in Advanced Cellular and Molecular Medicine, September 1–5, 2003, Zagreb, Croatia. The course, held in conjunction with the 3rd European-American School in Forensic Genetics, is a part of the program in advanced medical education co-sponsored and co-organized by Mayo Clinic and University of Zagreb ([www.mayo-zagreb-advancedmedicaleducation.org](http://www.mayo-zagreb-advancedmedicaleducation.org)). The mission of the program is to provide cutting-edge graduate education for medical professionals and biomedical scientists in the spirit of collegiality, cooperation, and transatlantic exchange. These aims are deeply embedded in the foundations of both Mayo Clinic and the University of Zagreb.

The program of the Mayo Clinic Course has been conceived as a graduate-level sweeping overview of the contribution of modern genetics and cell biology to the practice and promise of medicine. It starts with the session on genetics as an anthropological tool, pharmacogenetics and pharmacogenomics in promise of individualized therapy, genetics in forensic sciences and biology of xenotransplantation. The subsequent symposia offer topics on genetics of disease, pharmacogenetics, pharmacogenomics, new techniques in molecular diagnostics, gene therapy for cancer and metabolic diseases, molecular and cellular immunotherapy, stem cells and progenitor cells in treatment of disease, knowledge bases in genomics, and a session on bioethics from the perspective of major axiological systems.

Mayo Clinic partnership with the University of Zagreb in advanced medical education stems from the very nature of the institution. Mayo defines itself as "a charitable, not-for-profit organization whose mission is to provide the best care to every patient every day through integrated clinical practice, education, and research." The charitable character of the institution implies that all earnings are used to support medical practice, education, and research. This intent is not limited to the United States but, within the realm of possibilities, to the benefit of humankind.

Based on charity and compassion, Mayo Clinic has its humble beginnings in the office of the Scottish physician Dr. William Worrall Mayo, who settled in the tiny prairie town of Rochester, Minnesota, in 1864. On the foundation of medical leadership and organizational foresight of his two physician sons,

Charles and William, and the colleagues that the two brothers brought into their practice, Mayo Clinic became one of the preeminent medical institutions in the world. Today Mayo Clinic has three major campuses: Rochester, Minnesota (Fig. 1), Scottsdale, Arizona (Fig. 2), and Jacksonville, Florida (Fig. 3); primary care clinics in more than 60 communities; 21 owned or managed hospitals; ventures in medical technology, medical publishing, laboratory medicine, and pathology; and health care administration. In 2002, Mayo employed 41,527 people, who realized the revenue of US\$4,425 million.

Mayo Foundation is the umbrella structure that encompasses all Mayo activities. Board of Trustees, a body that currently includes 16 prominent Americans outside Mayo and 15 Mayo members oversees the Foundation. The Board meets quarterly and makes final decisions of all strategic matters and assures that the Foundation meets its charitable obligations. Local Boards of Governors manage each of the three Mayo Clinics (Jacksonville, Rochester, and Scottsdale) and appoint numerous committees. The most prominent are the Clinical Practice Committee, Education Committee, and Research Committee, which are in charge of the three core functions of the Foundation.

Clinical practice at Mayo is large and extensive. In 2002, 2,631 physicians, aided by more than 2,000 clinical residents and fellows and numerous allied health staff at the three Mayo Clinic sites, admitted the total of 501,000 patients. More than 124,000 were admitted to Mayo hospitals, where they spent the total of 591,000 hospital days.

Education at Mayo is organized into five schools. Since its inception in 1915, Mayo Graduate School of Medicine has trained more than 15,000 physicians in all areas of medicine. Currently some 1,200 physicians are in training. Mayo Graduate School, established in 1917, trains students for careers in biomedical sciences and confers Ph.D. degrees. At the moment, more than 150 students are working towards this goal. Mayo Medical School is the youngest among the 132 medical schools in the United States (established in 1972). Nonetheless, having conferred more than 1,000 M.D. degrees so far it has established itself among the top-tier medical schools in the country. Mayo School of Health Sciences (established in 1973) provides education in 26 different paramedical disciplines with an annual enrolment of approxi-

mately 400. Finally, Mayo School of Continuing Medical Education (established in 1996) offers some 450 courses for a total of 7,300 hours of continuing medical education every year. Mayo Clinic Course in Advanced Cellular and Molecular Medicine and the 3rd European-American School in Forensic Genetics are patterned in part after programs offered by this school.



**Figure 1.** Mayo Clinic Rochester, in the heart of the North American prairie, occupies a large part of the downtown. Above and behind the glass parking ramp at the very left is the top floor of the Charlton Building, part of the Mayo's Rochester Methodist Hospital. (The other Mayo hospital, St. Mary's, is located one km to the west.) The large building on the left is the new Gonda Building, still not fully occupied. It is connected to the Mayo Building. Behind it on the right is the partial view of the Plummer Building. Completed in 1927, Plummer Building is the oldest standing Mayo Clinic edifice.

Basic and clinical research is the third key activity of the Foundation. In 2001, 250 physician investigators and career scientists, aided by more than 2,000 allied personnel and students, pursued almost 7,000 clinical research protocols and basic research supported by more than 1,300 extramural research grants and contracts. In 2002, Mayo authors published 2,770 medical and scientific articles and reviews (excluding books, chapters, patents, meeting abstracts, and similar texts).

In the competitive market of American medicine, Mayo Clinic has gained prominence and recognition by its consistent commitment to the message formulated by Dr. Will in the early days of the institution: "The needs of the patient come first." By an organized and explicit presentation of this commitment (in business vernacular known as "evidence management") Mayo Clinic created arguably the most powerful brand in health care. In a recent study of Mayo management and business practices, the authors concluded that "Mayo's evidence-management practices



**Figure 2.** Located in Sonora Desert in Arizona, Mayo Clinic Scottsdale enjoys year-round warm climate, desert flora, and spectacular views.

rival or surpass anything in the [American] corporate sector" (1). An important factor in the maintenance of the Mayo culture is that all Mayo physicians are compensated by salaries, rather than by sharing in profits. This removes personal economic incentive from medical decision making and fosters team approach to the solution of complex medical problems.

The American health care environment requires Mayo to control costs, introduce new products and services, monitor quality, and improve facilities to meet the expectations of the patients. Consequently, the Clinic provides sophisticated laboratory tests for



**Figure 3.** Mayo Clinic Jacksonville is located on the Atlantic coast of Northern Florida. It is distinguished by its white marble façade.

other medical facilities. Mayo Medical Ventures commercializes intellectual property developed at the Clinic and runs the Clinic's publishing business. In 2002, Mayo researchers filed 252 invention and intellectual property disclosures to Mayo Medical Ventures that resulted in the filing of 175 patent applications. During the same year, Mayo was granted 50 patents and it, in turn, signed 169 licenses and options for intellectual property and technology transfer to other entities.

Mayo Clinic has always striven to create inviting and accommodating facilities devoid of the notorious "hospital feeling". An impressive example is the new Gonda Building in Rochester, a most modern facility for the practice of integrated medicine. In human interactions Mayo emphasizes unrestrained communication and unostentatious appearance. For instance, in examination rooms patients and family members sit on a sofa that is in line with the physician's desk. This arrangement does not impose a barrier between the doctor and the patient and allows easy face-to-face contact. Similarly, Mayo dress code requires that physicians wear business suits and don white coats or surgical scrubs only during a procedure. Another important Mayo feature, one that is enforced religiously, is the preservation of total patient confidentiality.

Long ago, someone concluded that Mayo is somewhat paradoxical. Essentially, it is a regional or even local organization. Some 80% of patients come to Mayo Clinic in Rochester from distances not larger than 800 km, mostly from Minnesota, Wisconsin, and Iowa. Yet, the three campuses cover some of the major areas of population in the United States. No more

than four percent of patients come from foreign countries, yet often they come to Mayo as to the place of last resort. While Mayo's reputation attracts royalty, celebrities of all sorts, and world leaders, the typical Mayo patient is of average means, often elderly, and covered by government reimbursement programs or health insurance.

Despite the current less than favorable economic climate, the Mayo system is planning for the future and is undergoing a major transformation. The opening of the new Mayo Clinic Hospital in Phoenix, Arizona (close to the neighboring Scottsdale), will likely be followed by a new hospital on the Mayo campus in Jacksonville. The National Cancer Institute – designated Mayo Clinic Comprehensive Cancer Center, has recently become the first such center that encompasses more than one campus. Consequently, both Jacksonville and Scottsdale are expanding their cancer-oriented basic and clinical research. In Rochester, these efforts are complemented by the inauguration of major efforts in complex and integrated programs, such as those in Molecular Medicine, Genomics, and Proteomics. The success of these programs is ascertained by the institutional commitment and by the unparalleled access to human pathological material and disease-related information.

Stanimir Vuk-Pavlović

- 1 Berry LL, Bendapudi N. Clueing in customers. *Harvard Business Review* 2003;81:100-6.