# DIVISION of NEUROSURGERY

## PROPOSAL FOR DEPARTMENT STATUS

March 2006

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EXECUTIVE SUMMARY

- The medical specialty of neurosurgery is comprised of a unique body of knowledge, with a distinct residency program, and separate Neurosurgery Residency Review Committee and certification board (the American Board of Neurological Surgery).

- Over 85% of comparable Neurosurgical programs across the US are departments as are three of the other UC Neurosurgery programs.

- UCLA in recent times has provided departmental status to other surgical disciplines, namely Orthopedics and Urology, that are of comparable size, fiscal and administrative viability and academic excellence.

- With the tremendous growth in scientific knowledge there will be an increasing need for specialization – a trend that is already occurring profoundly in the neurosciences and neurosurgery. Because of the imaging and non-invasive methods of gaining information about patients there will be an explosion of new information in the neurosciences in the 21st century.

- The practice of neurosurgery will be transformed by the leap in information, molecular medicine, genetics and imaging. A tremendous need will develop for interrelationships and collaborative practice in the neurosciences. This will be the interdisciplinary medicine and neuroscience of the future. Neurosurgery will be transformed because of the knowledge of the importance of every area of the brain to a minimally invasive specialty.

- Neurosurgery plans to develop this strategy in detail and needs the freedom to expand its programs with the independence that departmental status will allow. Neurosurgery wants the opportunity to pioneer these developments.

- The Neurosurgery faculty are best qualified to advocate effectively for opportunities to further neurosurgery teaching, research and patient care missions and are therefore seeking departmental status. Because key decisions are being made about programmatic utilization planning and construction, and to remain competitive and draw the highest
caliber talent, the Neurosurgery faculty desires a direct voice in institutional planning.

- The Division of Neurosurgery's residency training program received over 120 applications for three positions for the FY07 match year. The program consistently ranks as one of the top choices in the country as measured by our success in matching within our top 15 selections.

- The Division of Neurosurgery has research programs in collaboration with many other academic departments. The programs in neurovascular stroke, traumatic brain injury, brain tumor/neuro oncology and epilepsy surgery are among the top programs nationwide.

- UCLA's Division of Neurosurgery is one of the few neurosurgical programs in the country to engage in clinical, teaching and research activities in all neurosurgical subspecialties: brain injury, brain tumors, epilepsy surgery, neurovascular surgery, pediatric neurosurgery, spinal neurosurgery and stereotactic radiosurgery. Concurrently, Neurosurgery faculty participate extensively in multidisciplinary research throughout the David Geffen School of Medicine at UCLA.

- The Division of Neurosurgery faculty secured funding from NIH sufficient to rank in the top 5 Neurosurgery Programs across the country, according to the most recent data provided by NIH for FY04. The Division's faculty currently have 26 NIH grants, including 17 RO1's. In addition there are currently 16 NIH grants submitted and pending approval, including 9 RO1's. Total lifetime NIH funding of present members of the neurosurgery faculty has been $45.3 million in direct costs. Total lifetime non-NIH funding is approximately $52.3 million dollars.

- From 2001 to the present, the Neurosurgery faculty has produced over 300 separate peer reviewed journal articles, books and book chapters.

- The Division of Neurosurgery is among the largest surgery subspecialties within the David Geffen School of Medicine at UCLA. In FY05 Neurosurgery admissions at UCLA Medical Center amounted to 17% of all surgical admissions with 2300 total admissions at UCLA Medical Center and Santa Monica UCLA Medical Center. This
represents 32% growth over three years.

- The Division of Neurosurgery's clinical service has the dominant regional market share in a number of areas, widely recognized in Southern California as the premiere tertiary referral center for neurosurgical disorders.

- The Division of Neurosurgery has a proven track record to create fiscally responsible budgets and to maintain itself in spite of rising institutional overhead and drastic state funding cuts incurred over the last few years.

- The Division of Neurosurgery has been a key fundraising unit responsible for securing donations for several major facilities and pieces of equipment to be installed in the Ronald Reagan UCLA Medical Center including the participation in the Henry E. Singleton Neuro-Diagnostic and Treatment Center and the Clinical Neuro-Imaging Research Center.
INTRODUCTION AND OVERVIEW

Overview of the UCLA Neurosurgery Program 2006

With the tremendous growth of scientific knowledge there will be an increasing need for specialization. This trend is already occurring rapidly in the neurosciences and neurosurgery. There will be an explosion of new information in the 21st century in the neurosciences because of the imaging and non-invasive methods of gaining information about patients.

This huge leap in information and molecular medicine and genetics and molecular imaging will transform the way neurosurgery, neurology and psychiatry are practiced. All will find that there will be a tremendous need for inter-relationships and collaborative practice in the neurosciences coupled with the integration with basic sciences. Multiple diseases treated by neurosurgery or neurology such as epilepsy, stroke, pain disorders, movement disorders, cancer and others will require that neurologists, neurosurgeons and psychiatrists work together to solve these problems. This will be the interdisciplinary medicine and neuroscience of the future.

Neurosurgery promises to be transformed because of the knowledge of the importance of every area of the brain to a minimally invasive specialty with progressively less invasive surgical approaches to solve the diseases of the nervous system.

Because of these intense developments, it makes no sense for Neurosurgery to remain in Surgery, as the future will bring it into much closer relationship with other neurodisciplines.

In order to exercise an appropriate level of participation in the administrative, planning, and strategic processes of the David Geffen School of Medicine at UCLA, the UCLA Faculty Practice Group, and the UCLA/Westwood and UCLA/Santa Monica Medical Centers, and in order to remain competitive with other elite neurosurgical programs, it is imperative that the UCLA Division of Neurosurgery become a department. It is the request of the faculty of the Division of Neurosurgery that this proposal be reviewed expeditiously, with a requested target of the granting of departmental status by the time of transition into the new Ronald Reagan UCLA Medical Center.
Neurosurgery has plans to develop this strategy further for the 21st century and needs the freedom to expand its programs with the independence that departmental status will allow it. It needs to ability to assert and grow its leadership in the world of neuroscience and to build for the future.

Neurosurgery as a part of surgery is leftover of the development of surgery as a special discipline that had its origin in the early 1900s. However, times have changed and will change more in the 21st century. Neurosurgery wants the opportunity to pioneer these developments with other neuro departments and specialties including non-medical disciplines such as computer science, radiation physics, engineering, and public health.

The medical speciality of neurosurgery at UCLA is comprised of a unique body of knowledge, with a distinct residency program, a Neurosurgery Residency Review Committee and certification board (the American Board of Neurological Surgery). The Division of Neurosurgery plays a unique and distinct role in the UCLA Medical Center, explained in detail in the following sections. The Neurosurgery faculty are best qualified to advocate effectively for opportunities to further Neurosurgery teaching, research and patient care missions, and are therefore seeking departmental status.

The Division of Neurosurgery at UCLA is the largest UCLA surgical subspecialty program, and is recognized year after year as one of the top 10 nationally. Seven of its clinicians have been repeatedly cited as among the "Best Doctors in America" and several of its scientists are recognized as authorities in clinical neuroscience and basic neurobiology. UCLA Division of Neurosurgery is one of the few programs in the country to engage in clinical, teaching, and research activities in all major neurosurgical subspecialities: brain injury, brain tumors, epilepsy surgery, neurovascular surgery, pediatric neurosurgery, spinal neurological surgery, and stereotactic and functional neurosurgery. An annual budget in excess of $16 million supports 28 full time faculty members, 6 joint appointment faculty members (including two from Orthopedics, three from Interventional Neuroradiology, and one from Statistics), 18 residents, 11 fellows, 8 academic researchers, and more than 75 administrative support staff. It has been essential for UCLA's Division of Neurosurgery to exist within a decentralized structure due to space constraints placed upon the Division. From a clinical standpoint, patients are evaluated and treated in three separate locations. Basic science laboratories exist in five separate
buildings. Division Administration staff occupy space in four separate buildings. Faculty offices exist in 100 Medical Plaza, 200 Medical Plaza, 300 Medical Plaza, Reed Neurological, NPI, CHS, Factor, the 16th Street Building in Santa Monica, Harbor/UCLA Medical Center, and the Wadsworth Veterans Administration Medical Center.

**Residency Training Program**

The UCLA Neurosurgical Residency Training Program includes rotations at UCLA/Westwood, Santa Monica-UCLA, the West Los Angeles Veterans Administration Medical Center, and Harbor/UCLA Medical Center. In 2002, the Neurosurgical Training Program underwent its regularly scheduled review by the Neurosurgical Residency Review Committee. The program received the highest level of accreditation, through 2008. We now support three neurosurgical residents every year. The stated goal of the residency training program is to prepare candidates for a career in academic neurosurgery, and this has been done with extraordinary success: over the last 15 years, 16 of our 34 graduates occupy academic positions. Each year, during the match, the residency program receives over 120 applications for the three residency training slots. Virtually all of the 30 top applicants who are granted interviews annually have Board scores above the 90th percentile, are in the top group of their medical school class academically, and have significant research experience.

**Research Activities**

The Division of Neurosurgery has research programs in collaboration with a number of other UCLA academic departments in the areas of neurovascular/stroke, seizure disorder/epilepsy, brain tumor/neuro-oncology, pituitary tumor/neuroendocrine disorders, traumatic brain injury/trauma surgery, and medical informatics. The programs in neurovascular/stroke, traumatic brain injury, brain tumor/neuro-oncology, and epilepsy surgery are recognized nationally among the top three or four such programs anywhere. More than two-thirds of the neurosurgical faculty members have been funded, as principal investigators, through the NIH. The Traumatic Brain Injury Program has received program project funding from the NIH as a Head Injury Center from 1991 to 2004. Currently, 17 separate NIH-supported neurotrauma RO1's are active, as are two K08's, 2 R21's, 1 P50, 1 PO1, and 1 K01. The Program receives unique annual support from the State of California for the Comprehensive Multi-Campus
Neurotrauma Program, which was funded and continues to be directed by the UCLA Brain Injury Research Center.

Clinical Program

The Division of Neurosurgery at UCLA has, by a significant margin, more admissions than any other UCLA surgical program (numbering 1,837 in Westwood plus 462 in Santa Monica in FY05). UCLA is widely recognized in Southern California as the premiere tertiary referral center for neurosurgical disorders, and has a dominant regional market share in a number of specific areas including intracranial aneurysms, cerebral arteriovenous malformations, pituitary tumors, surgery for the treatment of epilepsy, stereotactic radiosurgery, and deep brain electrode implantation for the control of Parkinson's Disease.

New and innovative clinical programs are under way in tumor vaccines/dendritic cell therapy for malignant brain tumors, neuroendoscopy and minimally invasive brain and spine surgery, spinal stereotactic radiosurgery, and microvascular reconstruction for the treatment of refractory cerebral ischemia and inoperable intracranial aneurysms.

In 1995 the Division of Neurosurgery was the first surgical program at UCLA to initiate a systematic program to transfer surgical cases (in spinal surgery) from the Westwood to the Santa Monica facility. In conjunction with the Department of Orthopedics and the Department of Anesthesia (Pain Medicine), the Division of Neurosurgery has established a now flourishing Comprehensive Spine Center at Santa Monica, achieving the enterprisal goal to shift spine surgery admissions from Westwood to Santa Monica.
Rationale for the Proposal for Neurosurgical Departmental Status

The medical specialty of neurosurgery is comprised of a unique body of knowledge. Neurosurgery is a medical specialty concerned with the diagnosis and treatment of patients with injury to, or diseases of, the brain, spine, or peripheral nerves. Unique among all the medical specialists, a neurosurgeon may provide either surgical or non-surgical care of the nervous system, depending on the nature of the illness or injury.

Neurosurgery has a distinct and unique residency program that is separate from that of other surgical disciplines after the first year of internship. Neurosurgical training programs are overseen and reviewed by a distinct Neurosurgery Residency Review Committee. Neurosurgery has a distinct certification board, the American Board of Neurological Surgery, which is a member board of the American Board of Medical Specialties. The American Board of Neurological Surgery was incorporated in 1940 as a new examining board in medical specialties after gaining approval of the Advisor Board for Medical Specialties in collaboration with the AMA Council on Medical Education.

The vast majority of comparable neurosurgical programs at U.S. academic medical centers are Departments. A 1980 survey by the Society of Neurological Surgeons found that 42% of neurological surgery training programs were organized as departments. In 1990, the same survey reported that the number of departments increased to 72%. It is now estimated that over 85% of all North American academic neurosurgical programs are departments, including 8 of the top 10.

The University of California has endorsed the organization of neurosurgical training programs as Departments. The neurosurgery programs at three of the five University of California medical schools, UC Davis, UCSF, and UC Irvine are departments. The Department of Neurological Surgery at UCSF, which is most similar to that at UCLA, has been established as a department for more than 25 years.

Comparable surgical specialties at UCLA are departments. UCLA in recent times has provided departmental status to other surgical disciplines (Orthopedic Surgery and Urology) of comparable size, fiscal and administrative viability, and academic excellence.
Why departmental status now? The unique clinical, educational, and research elements of Neurosurgery make it a distinct program with unique requirements that are often not appreciated by or of similar significance to academic surgeons in other specialty areas. Due to the inherent complexity of neurological diseases, the highly specialized nature of the neurosurgical discipline and training program, the multidisciplinary nature of clinical neuroscience patient care and research programs, and the rapid development of technology specific to neurosurgical practice, it is crucial for the UCLA Neurosurgery Program to have direct participation at the highest levels of administration and decision-making in the David Geffen School of Medicine at UCLA, in the Faculty Practice Group, and in the UCLA Medical Center. Neurosurgery programs and faculty must have direct, unfiltered access to institutional information sources in order to function most effectively. It is not realistic to expect another administrative entity (such as the Department of Surgery) to act effectively on behalf of Neurosurgery's complex, organ- and disease-specific programs in teaching, research, and patient care. Furthermore, the Division of Neurosurgery has assumed responsibility for fundraising for several major facilities and pieces of equipment to be installed in the new Ronald Reagan UCLA Medical Center. These include the Advanced Imaging Surgical Suite, and the Clinical Neuro-Imaging Research Center (with PET/CT and 3-T MRI scanners adjacent to the 6th floor neurosurgical intensive care unit). The large-scale fundraising required of Neurosurgery to meet these obligations will be best served by Neurosurgery's establishment as a Department.

At this time, it is particularly important for the Neurosurgical Program to have a direct voice in the planning of institutional facilities and strategy. Key decisions will be made over the next several years regarding programmatic utilization of the Medical Centers in Westwood and Santa Monica; development, planning, and construction of the new Hospital/Neuropsychiatric Institute; development of a multidisciplinary program in the basic and clinical neurosciences (through the Neuroscience Academy Planning Committee); and future planning and construction of new facilities for the David Geffen School of Medicine at UCLA.

Finally, in order to remain competitive with other high-profile neurosurgical departments, and to draw the highest caliber talent (faculty and residents) to UCLA, it is imperative that UCLA's Division of Neurosurgery becomes a department.

Neil A. Martin, MD  And the faculty of the Division of Neurosurgery
David Geffen School of Medicine at UCLA
NEUROSURGERY EDUCATION

Program Design

UCLA's Division of Neurosurgery maintains vigorous and innovative academic and research programs that are recognized both nationally and internationally. The Residency Program consistently ranks as one of the top choices in the country as measured by applicant preferences. The Division of Neurosurgery has developed a strong tradition of national and international education, impacting hundreds of students, from undergraduate to visiting professorship, since 1953. For example, since 1987, the neurosurgery faculty has trained 129 clinical fellows, research fellows and visiting professors from countries including Brazil, Uruguay, Germany, Japan, Korea, China and Sweden. In addition, 290 third year David Geffen School of Medicine students have rotated through Neurosurgery since academic year 1999.

Dr. Paul Vespa sponsors 10 selected students every academic quarter in the undergraduate Student Research Program (SRP) program which provides undergraduates pursuing pre-med or pre-PhD degrees the opportunity to gain real-life experience in neurointensive medicine and research. Specialized courses have also proven to be successful. Under the directorship of Dr. Neil Martin, 276 participants have been trained in the three-day Cerebral Blood Flow Lab Fellowship since 1996. Additionally, twelve fourth year medical students have been trained under the Short Term Training Program (STTP) in the last five years. This extraordinary spectrum of students and subject matter facilitates information flow across all levels and contributes to positive national and international relations for UCLA.
UCLA's Division of Neurosurgery is responsible for neurosurgical education and training at four locations including UCLA Medical Center Westwood, Wadsworth VA, Harbor/UCLA (Torrance), and Santa Monica-UCLA. The current academic program led by Neurosurgery Chief, Neil Martin, MD, trains three new residents per year with a present total of 18 resident positions. It currently offers 3 clinical fellowship positions, 5 to 10 research fellowship positions, and 1 to 2 visiting professorships each year, encouraging the pursuit and sharing of knowledge at many different levels. In addition to offering a multitude of research fellowships, clinical fellows can specialize in spine, functional and stereotactic surgery, and neurocritical care at the UCLA facility.

Residents and fellows have the opportunity to teach summer courses in neuropathology and neuropharmacology. The Division hosts numerous international trainees and international physicians who visit UCLA annually for demonstrations of specialized treatments and techniques in addition to collaborative work with Neurosurgery faculty.

The Division of Neurosurgery leads one of the most prestigious training programs in the Country. The Division is committed to resident education and provides a stimulating and academic environment in which learning continuously prospers. UCLA's Division of Neurosurgery is supported by 28 full time faculty including 15 MDs, 3 MD-PhDs, and 10 PhDs.

Neurosurgery faculty maintain the highest caliber of academic pursuits in order to provide unparalleled training programs for students of all levels. The faculty sit on multiple editorial boards, for leading journals including: Brain Research, Journal of Neurotrauma, Journal of Neuro-Oncology, Journal of Neurosurgery, Neurosurgery, and Surgical Neurology. Collectively, Neurosurgery faculty also serve as expert reviewers for dozens of scientific journals and National Institute of Health committees. Neurosurgery faculty publications have appeared in over 170 different books and periodicals, and addressed topics in more than 40 neurosurgical disorders. In addition, the Division enjoys collegial relationships that enable it to maintain joint faculty appointments with Pediatrics, Orthopedic Surgery, Interventional Radiology, and Statistics. Neurosurgery faculty strive to facilitate the sharing of medical advances among physicians through numerous conferences and visiting professorships.
Neurosurgical Residency Training

It is the overall goal of The Division of Neurosurgery to introduce the principles of evaluation and treatment of the patient with nervous system dysfunction who might need surgical intervention. The Division of Neurosurgery's Resident Training Program has been designed and is continuously improved to present residents with unparalleled opportunities for learning and growth. The rigorous curriculum offers a great deal of variety, in both subspecialties and neurosurgical hospital settings. Through a schedule of four to six-month rotations, residents gain experience with patient care concepts and surgical skills, non-neurosurgical specialties, research, and supervision of lower level trainees. Areas addressed include neurovascular surgery, neuroendoscopy, spinal instrumentation, stereotactic surgery, and intracranial aneurysm surgery.

UCLA's Division of Neurosurgery resident graduates are well prepared to go on to either subspecialty fellowship positions or directly into academic positions, due to their extensive training with national experts and exposure to cutting edge research while training at UCLA. This program has graduated excellent doctors and skilled specialists; some have achieved international fame, and others national or regional recognition.

Before completion of the Division's Neurosurgery training program, each resident performs distinctive rotations at the West Los Angeles Veterans Administration Medical Center (VA), Harbor/UCLA Medical Center, and Westwood's UCLA Medical Center. Santa Monica-UCLA was added as an RRC-approved rotation in November 2003. At each institution, operating rooms are equipped with state-of-the-art equipment for the most up-to-date training. The VA offers exposure to a private practice environment, affording the residents opportunity for autonomy.

The atmosphere at Harbor/UCLA is similar, but the neurosurgical team is larger and, as a Level 1 Trauma Center, provides experience with a busier and more diverse service. At Harbor/UCLA, residents practice longitudinal patient care evaluating patients pre-operatively in the clinic or the emergency room, making diagnoses, participating in the surgery and inpatient hospital care, and following patients post-operatively in the clinic to evaluate patient
progress. During the rotation at UCLA Medical Center, a chief resident gains unique experience leading a large team at a major medical center including neurosurgery residents at the senior and junior levels, a surgical intern, nurse practitioners, ICU fellows, and rotating medical students. UCLA Medical Center residents are able to further refine their surgical skills and gain experience in surgeries only seen at a tertiary medical center with a large regional referral base.

With four participating hospitals running very busy and complex neurosurgery services, there is more than adequate residency experience. The UCLA Neurosurgery Residency Training Program provides 42 months of required clinical neurological surgery, 36 months of which is required by the American Board of Neurological Surgery.

Each resident intern (R1) rotates monthly on a different surgical service, i.e. Pink/CHS; Peds/CHS; Liver/CHS; CT/VA; H& N/VA, etc. During these rotations, the resident is the primary person to see patients on the unit. He/she admits the patient, works up an initial management plan under the supervision of the chief resident and attending faculty member responsible for the patient, manages the entire pre- and postoperative course of the patient, and assists in the operating room.

The second year resident (R2) serves as the Junior House Officer at the UCLA Center for Health Sciences for 12 months. Neurosurgical patients are divided by Neurosurgery Sub-Specialty Service and assigned to each Junior Resident. The assignment includes primary ward rounding responsibilities as well as contact points for the administrative staff regarding pending admissions, transfers, and discharges.

During this time, extensive experience is gained in general and neurological history taking, examination, and detailed monitoring of all patients. The junior resident learns responsibility for the daily management of all ward and intensive care unit patients including pre-and postoperative management decisions, all ICU invasive procedures, ward treatments, and dressing care. Instruction is given in basic surgical procedures, monitoring techniques and instrumentation, and in the evaluation and care of the acute neurosurgical patient. R2s see all inpatient and emergency room consultations, and act as a first or second assistant in major
surgical procedures and first assistant in all minor cases. The R2 participates directly in the education and supervision of interns and medical students.

The third year resident (R3) spends 4 to 12 months on elective rotations including Neurology, Functional Neurosurgery, Radiology, Interventional Radiology, and Pathology and begins their pre-Harbor night calls at the Harbor/UCLA facility. The R3 is also an active participant in neuropathology and neuroradiology weekly conferences and journal clubs and makes formal presentations at the various teaching conferences including Neurosurgery Grand Rounds.

The third year resident (R3) spends two months receiving instruction from the Department of Radiology, Division of Neuroradiology at UCLA Center for Health Sciences. Residents focus on learning a selection of appropriate imaging studies for particular clinical problems and diagnostic interpretation of plain x-rays, MR, CT, PET and nuclear scans, and myelograms. Neuroanatomical and neuropathological correlations are emphasized. Residents attend weekly neuroradiology/neurosurgery and neurovascular/neuroradiology conferences.

The Neurology rotation is divided into three month long blocks devoted to the inpatient service at UCLA Center for Health Sciences including Stroke, Consult, and Neurophysiology. While on the inpatient neurology service, the resident functions as a neurology house staff officer, cares for a specified group of patients, attends daily rounds, evaluates newly admitted patients and presents to the attending Neurology staff. Residents spend a month on the neurology consult service. Under the supervision of neurology faculty members, new and follow-up patients are seen in the multiple sclerosis, movement disorder, rehabilitation, and seizure clinics. Additionally, residents are assigned to electrodiagnostics. During this time, they become familiar with the technical aspects of performing electromyography (EMG) and electroencephalography (EEG). A weekly telemetry meeting, a neonatal EEG conference, and a meeting to discuss potential surgical candidates with epilepsy are also attended. Furthermore, residents work in concert with the Pediatric Neurology attendings, fellows, and rotating Neurology residents in evaluating new pediatric cases.

Three months are spent with the Stereotactic & Functional Radiosurgery Program learning the nuances and complexities of focused beam radiation therapy. During this time, the resident
is responsible for engaging in consultations with clinic patients by initially observing patients with physicians progressing to direct patient contact. In order to establish efficient patient care, the resident initiates a Radiosurgery Treatment Plan for the patients, facilitating communication between necessary services and interacting with a multidisciplinary team: a neurosurgeon, a radiation oncologist, and a physicist.

Two months are spent under the direction of the Department of Pathology, Division of Neuropathology. Residents attend brain cutting and gross neuroanatomy review sessions twice per week. They also attend rounds with the neuropathologist to discuss all frozen sections and become familiar with the preparation and evaluation of frozen specimens procured from the operating room. Residents also engage in research projects within the realm of neuropathology.

The Harbor senior resident becomes proficient in minor procedures such as ventriculostomy, cervical tong/traction placement, and halo vest placement. The R3/4 oversees the Harbor ICU, and supervises all invasive procedures. In addition, the R3 is responsible for the upkeep of the consultation service as general surgery R2s present patients directly to him/her. The consultation service provides the resident confidence in the evaluation and management of neurosurgical cases. The Harbor senior is the first assistant in many of the operative cases. At the end of the rotation, the R3 is capable of performing the various craniotomies required for tumor, trauma, and intracranial aneurysm.

The fourth year resident (R4) performs as senior resident at UCLA Center for Health Sciences for four months, as Santa Monica Spine resident for four months, and UCLA Super senior for four months. The R4 is first assistant in all cases specified by the chief resident. The spectrum of cases ranges widely from trauma and elective spine to craniotomy for tumor resection, aneurysm and other vascular malformations, and epilepsy surgery. The management of adult and pediatric epilepsy, and dorsal rhizotomy for cerebral palsy are all to be learned. As the senior resident's maturity and skill progress, increasingly difficult cases are performed under faculty supervision. The R4 supervises junior resident evaluations of all trauma cases and non-emergent consultations in addition to coordinating the presentations to the Attending on call. The senior resident assists the chief resident in leading and conducting morning and afternoon rounds. All conferences are attended by the senior resident. The senior resident
directly supervises all neurosurgical procedures performed by the junior resident in the ICU and the ER.

At this stage of residency training, the resident can take full advantage of the microsurgical laboratory or one of several research laboratories in the Division of Neurosurgery under the supervision of a member of the Neurosurgery faculty or the Brain Research Institute. The resources of the David Geffen School of Medicine, Brain Research Institute, Neuropsychiatric Institute, and the Department of Graduate Schools of UCLA are available and provide a broad source of training in the basic, as well as clinical neurosciences. The resident performs multiple dissections of human cadavers and practices micro dissection and anastomosis in rats using surgical microscopes. To enhance learning, residents take advantage of videos of various operations performed by faculty. The R4 is eligible to take the written national neurosurgical board exam for credit.

During this time, the resident is responsible for engaging in consultations with clinic patients by initially observing patients with physicians progressing to direct patient contact. In order to establish efficient patient care, the resident initiates a Radiosurgery Treatment Plan for the patients, facilitating communication between necessary services and interacting with a multidisciplinary team: a neurosurgeon, a radiation oncologist, and a physicist.

This rotation is divided into six-week blocks devoted to the inpatient service at UCLA Center for Health Sciences, Stroke, Consult, and Neurophysiology. While on the inpatient neurology service, the resident functions as a neurology house staff officer, cares for a specified group of patients, attends daily rounds, evaluates newly admitted patients and presents to the attending Neurology staff.

Residents spend a month on the outpatient neurology service. Under the supervision of neurology faculty members, new and follow-up patients are seen in the multiple sclerosis, movement disorder, rehabilitation, and seizure clinics. Additionally, residents are assigned to electrodiagnostics. During this time, they become familiar with the technical aspects of performing electromyography (EMG) and electroencephalography (EEG). A weekly telemetry meeting, a neonatal EEG conference, and a meeting to discuss potential surgical candidates
with epilepsy are also attended. Furthermore, residents work in concert with the Pediatric Neurology attendings, fellows, and rotating Neurology residents in evaluating new pediatric cases, as well as participating in various afternoon clinics.

The fifth year resident (R5) spends four to twelve months either with a Neurosurgery subspecialty attending or on a focused research project. This elective involves the resident in outpatient clinical care, preoperative evaluation, surgery, inpatient care, and follow-up care of patients, as well as research in this focused area. The resident gains a deeper understanding of the requirements demanded in this subspecialty equal to a fellowship experience and as the chief resident at UCLA/Wadsworth VA Hospital for four to six months.

The sixth year resident (R6) serves as chief resident at both the Harbor/UCLA Medical Center and the UCLA Center for Health Sciences at Westwood. During both of these four to six month rotations, the resident supervises all patient admissions and acts in the role of responsible surgeon or first assistant in a wide variety of operative procedures. Additional responsibilities include: delegating daily operative assignments to the senior resident and two junior residents, conducting patient rounds twice daily, organizing and presenting the monthly report at the Quality Assurance Conference, responsibility for the presentation of films/video portions for the weekly Case Presentation Conference, responsibility for all record keeping, participation in the instruction and supervision of all junior residents and medical students, and serving as the ombudsman for all residents in the program. The resident is directly responsible to the Chief of the Service for satisfactory functioning of the service. At the completion of the chief resident year, the resident is capable of managing all major neurosurgical problems with the utmost professional and ethical standards, having attained an excellent foundation for pursuit of a career in academic neurosurgery.

A formal Neuroscience seminar series is conducted once a week. Guest specialists in all areas of the neurosciences teach the residents neuroanatomy, neurophysiology, neuroradiology, neuropathology, and neurology. Additionally, neurophysiology and neuroanatomy are integrated into teaching in the Neuro ICU and the operating room.

Neurosurgery residents also have the opportunity to gain teaching experience at Mount St.
Mary's College, leading courses in Neuropathology and Neuropharmacology and Diagnostics for graduate students pursuing a Doctor of Physical Therapy. The monthly Clinical Neurosurgical Symposia and Visiting Professor Program provides state-of-the-art controversial and innovative neurosurgical challenges in the neurosciences.

Present residents include Drs. Tarun Arora, Garni Barkhodarian, Andrew Cannestra, Nestor Gonzalez, Jason Hauptman, Sandi Lam, Jean-Philippe Langevin, Adebukola Onibokun, Shayan Rahman, Murisiku Raifu, Mark Sedrak, Nouzhan Sehati, Donald Shields, Zachary Smith, Theodore Spinks, Eric Stiner, Vartan Tashjian, and Kristen Upchurch.

**Neurosurgery Fellowships**

The Division of Neurosurgery has three clinical fellowships: a Spinal Neurosurgery Fellowship, an ABNS- and AAN-recognized Fellowship in Neurocritical Care for neurologists and neurosurgeons, and Stereotactic and Functional Neurosurgery.

The **Spinal Neurosurgery Fellowship** is based at Santa Monica-UCLA Medical Center and is under the direction of Larry Khoo, MD and Langston Holly, MD. Because of our enhanced relationship with Orthopedics, this fellowship now includes training with both orthopedic and neurological spine surgeons.

The Spine Fellow's time will be divided to allow 60% clinical and 40% research time. The Spinal Fellowship has three important aims: clinical experience in all aspects of major spinal surgery, teaching responsibilities of residents and medical students, and clinical or basic science research related to spinal surgery. The clinical duties of the fellow focus on further experience in the management of complex spinal disorders involving degenerative spinal disease, failed spine syndromes, treatment of traumatic injuries, management of primary and secondary neoplasms and infections affecting the spine and spinal cord.

The treatment of spinal trauma at UCLA is coordinated with the Neurosurgery and Orthopedic Spine Programs on an alternating basis, with the other service being consulted on all cases. This cross consultation process assures that both services have participation in all spinal trauma cases for the benefit of both clinical training programs. There are also
opportunities to acquire experience in the management of spinal cord neoplasms, vascular abnormalities, syringomyelia, and spasticity.

The teaching responsibilities of the Spinal Fellow enhance the efforts of the attending staff by providing greater one-on-one teaching for resident and medical student education. The Spine Fellow coordinates with the Orthopedic Spine Surgery Fellows at the weekly UCLA Comprehensive Spine Program Conference, the focal point of the spinal teaching program. The Orthopedic Spine Surgery staff, fellows, and residents currently participate in selected operative procedures on the Neurosurgery Spine Service enhancing the educational program of both specialties. The fellow participates in daily morning rounds as a consultant to the chief resident and his/her team, with instruction of the residents, interns, and medical students in areas of treatment planning for the spine program, interpretation of radiological studies, critical care, and cost-effective resource utilization. The fellow participates in teaching of residents in the areas of selection of surgical approaches, particularly related to pre-operative decision-making, operative planning, and post-operative care. The Fellow participates in intraoperative teaching only in advanced and complex spinal surgical cases, and is on call for spinal cases as an initial consultant for the Chief Resident. The fellow also participates in the presentations and discussions of selected spine surgery cases for the weekly Neurosurgery Grand Rounds. The fellow serves as a spinal consultant to the neurosurgery residents on morning rounds, on-call, and in the operating room for cases so complex or advanced that these procedures would ordinarily be performed entirely by the attending surgeon.

The Spine Fellow pursues scholarly endeavors in an area of spinal surgery as desired. Clinical research and basic science laboratories are available with programs relating to neural injury, neural metabolism, image and guided surgical techniques. Laboratories in bone biology and biomechanics are available for collaboration in specific research areas to suit the interest of the Spinal Neurosurgery Fellow.

The Division of Neurosurgery's Neurocritical Care Fellowship is a clinical training program in neurosurgical and neurological critical care, one of only 10 such training programs in the United States. The American Academy of Neurology (AAN) Section of Emergency and Critical Care has recently recognized this fellowship as a training program and has adopted
preliminary training guidelines. UCLA's program meets and exceeds these guidelines.

The Neurocritical Care Fellowship, under the directorship of Paul M. Vespa, MD, is an alternative fellowship pathway available to neurosurgeons and other similarly trained clinicians interested in research. The Fellowship consists of one to two years dedicated to clinical training and research in Neurosurgical Critical Care and Trauma; one year is protected time dedicated to research. Currently the program consists of two fellows and five attending physicians, though it expects to earn an NIH fellowship-training grant that will increase these numbers.

Two basic science research faculty members mentor the fellows in experimental design and statistical methods. The Neurocritical Care curriculum is focused on three main areas: critical care, research, and neurophysiology. Fellows are exposed to a large volume of clinical material and a broad range of experience; the UCLA Neuro-ICU has a yearly census of as many as 1,000 new admissions. Neurocritical Care fellows participate in weekly conferences, including Critical Care/Cardiology conference, Neurosurgery case conference, Neurology Grand Rounds, Neurosurgery residents' conference, Neurology outpatient conference, Neurosurgery Grand Rounds, and Stroke/Cerebrovascular conference. Guest one-month rotations in anesthesia and other ICUs are available, as is an introduction into interventional radiology. A basic science neurotrauma laboratory, the clinical laboratory, and the ICU are highly innovative and dedicated to teaching fundamental principals of neurocritical care and neurotrauma. Fellows conduct a closely mentored research project, publish abstracts and full-length manuscripts, and participate in ongoing research efforts.

Using an integrated approach, Dr. Vespa and the attending neurosurgeon of the case co-attend on all ICU patients. Serving as the main ICU physician for the patient, the fellow is responsible for treatment decisions as a "primary team" member. A nurse practitioner functions as a unit resident. The Neurocritical Care Fellowship is structured to not displace any resident from completing the ICU portion of their training, but to provide service for an unmet patient care need. Together this training in neurointensivist/critical care neurology allows each Fellow a pathway to matriculate as an academic neurointensivist with specialized training and expertise in critical care.
The Stereotactic and Functional Neurosurgery Fellowship is intended to provide advanced subspecialty training in the areas of movement disorder surgery, radiosurgery, and refractory pain surgical procedures for neurosurgeons preparing for a full-time academic career. The program is a 12 to 24 month Stereotactic and Functional Neurosurgery Fellowship with an emphasis on movement disorders, surgical procedures for medically refractory pain, and radiosurgery, and includes training in the areas of teaching, patient care, and research.

The Stereotactic and Functional Neurosurgery Fellow participates in the initial evaluation, management decision-making, surgical planning, surgical procedures, postoperative care, and follow-up of patients with movement disorders (Parkinson's Disease, tremor of various etiology, Cerebral Palsy related disorders of movement, etc), refractory pain (cancer and chronic), brain tumors (pituitary tumors, meningiomas, acoustic neuromas, craniopharyngiomas, chordomas, epidermoid tumors, gliomas, metastatic brain lesions, etc.), and neurovascular lesions (AVMs, cavernous angiomas, microvascular compression of cranial nerves, etc.). The fellow also follows patients with neurovascular lesions treated by endovascular therapy, and patients with skull base tumors or vascular lesions treated by Stereotactic radiosurgery.

The Stereotactic and Functional Neurosurgery Fellow participates as a consultant with the residents on daily rounds, provides on-call coverage for emergent cases, and participates in teaching conferences, including Neuroradiology/Neurosurgery Grand Rounds, Neurovascular Conference, Tumor Board, Movement Disorder Board, Radiosurgery Board, etc. The research experience consists of clinical projects within the Radiosurgery, Movement Disorder, and Pain Programs or participation in clinically relevant basic science laboratory projects. The Fellow contributes directly to the quality of patient care by acting as a liaison with the interventional neuroradiologists, neurologists, radiation oncologists and electrophysiologists in the peri-procedural management of patients undergoing functional neurosurgical and radiosurgical therapies.
Neurosurgery Education for Medical Students

Second Year Medical Student Training: Laboratory projects focus on analyzing neuronal activity while patients perform cognitive tasks to discover how brain cells function in cognition. Dr. Gary Mathern teaches one class per year to second-year medical students on epilepsy neurosurgery as part of the core neurology section. Both foreign and domestic medical and PhD students visit his laboratory for extended periods of study. Dr. Linda Liau's students – both graduate and medical – have been involved in laboratory research in microbiology and tumor immunology as well as brain cancer gene therapy.

Third Year Medical Student Training: The Division of Neurosurgery supports the education of third year medical students by 1) conducting eight or more lectures per year on select Neurosurgery topics; 2) providing faculty to preside over four oral exams per year, 3) conducting eight or more problem based learning (PBL) case presentations per year, and 4) facilitating a one-week clinical rotation with the neurosurgery resident team. Skills gained by the MSII students during the Neurosurgery rotation include completion of comprehensive evaluations of patients with neurological disorders, taking patient history and performing a neurological examination in both inpatient and outpatient settings; exposure to imaging techniques such as CT, MRI and angiography; experience in the neuro intensive care unit monitoring such as intracranial pressures, and introduction to operating room procedures.

Fourth Year Medical Student Training: The Division of Neurosurgery provides an advanced, three-week clinical elective course in the David Geffen School of Medicine at UCLA Curriculum. The course, SU362.01, is designed to introduce principles of evaluation and treatment of the patient with neurological dysfunction needing surgical intervention. Some of the activities of the three-week clinical rotation include rounding and daily management of neurosurgical patients in the inpatient, outpatient and emergency room setting. Course objectives include acquiring a knowledge of neurosurgical conditions expanded beyond core clerkship exposure; developing an understanding of surgical treatment of neurologic disease including pain; familiarity of diagnostic armamentarium; understanding of risks and complications of neurosurgical procedures; training in pre- and post op care; and preparation of short scientific presentations, both written and oral. Over the last several years 80% of
fourth-year medical students who have taken this elective course submit applications to the UCLA Neurosurgery Residency Program.

**Neurosurgery Education for Graduate Students**

Neurosurgery graduate research takes places at a variety of levels. Dr. Antonio DeSalles, for example, trains a number of research fellows (anywhere from three to four per year), focusing on areas of radiosurgery and deep brain stimulation. Each fellow compiles data related to their field of interest and helps to apply these data to the clinical program at UCLA. Under the direction of Dr. Itzhak Fried, graduate students and postdoctoral fellows perform innovative research in collaboration with Brandeis University, the California Institute of Technology, and the University of Minnesota, as well as the Department of Psychology at UCLA. The laboratory also hosts visiting students from the University of Tel Aviv each summer.

Dr. Valeriy Nenov involves graduate students in the development of potentially commercializable systems for noninvasive monitoring of clinical parameters from brain trauma patients. Dr. Fernando Gomez-Pinilla teaches several courses about, and employs postdoctoral students in research on, the effects of exercise on trophins, trophic factors and neural regeneration, traumatic brain injury and plasticity, protein quantification, robotic devices for controlling brain metabolism, and spinal cord abnormalities.

Dr. David Hovda teaches a course each year on ethical issues related to science, graduate, post-graduate education and careers in scientific investigation.

**Neurosurgery Education for Undergraduates**

Dr. Paul Vespa annually lectures to undergraduates at UCLA in Psychology 298, C144 and PS241. He also sponsors 10 pre-med and pre-PhD students each academic quarter from the UCLA Student Research Program (SRP), who gain real-life experience in research and medicine. This program features several elements that introduce the students to medicine and specifically to neurointensive care, including didactic lectures about brain injury, neuroanatomy, and clinical neuroscience, plus practical laboratory experience running neurochemical analyses and bedside observation of nurses and doctors in the Neuro ICU.
Dr. Gary Mathern leads a Neuroscience 101 course introducing undergraduate students to real families to complement the basic science focus of their coursework. Undergraduates often volunteer in his laboratory under the SRP program and often go on to conduct independent research studies.

**Neurosurgery Continuing Education**

Continuing education is a basic priority for Neurosurgery faculty, and the Division currently hosts a variety of conferences and update meetings to facilitate information sharing. For example, the Brain Tumor Center of Excellence Conference Series, led by Dr. Donald Becker, is a program addressing topics such as benign brain tumors, interventional MRI, malignant and metastatic brain tumors, orbitocranial surgery, and stereotactic radiosurgery. The Annual Neurotrauma Conference facilitates knowledge sharing among the University of California programs; the UCLA Brain Injury Research Center hosted the Conference each of the last 7 years, providing updates related to research progress and plans for future work. A continuing series of presentations on neurosurgical advances is made by Neurosurgery Faculty at Encino-Tarzana Regional Hospital. Neuroendoscopy, endonasal pituitary surgery, stroke, advances in brain tumor therapy, and the design of the advanced neurological intensive care unit are among recent topics of special continuing education presentations for neurosurgeons.

Ongoing training also includes the Monthly State-of-the-Art Multidisciplinary Symposia of Controversial and Innovative Neurosurgical Challenges, a series focused on various disciplines within the Neurosurgery program. Presentations in this series address the latest diagnostic and therapeutic techniques along with current clinical trials and basic science research relevant to the practice of physicians in the clinical neurosciences and of present and future patients. Additionally, special training is regularly provided to nurses and technicians in the field of trauma, cerebral blood flow, and stereotactic radiosurgery.

Neurosurgery sponsors or co-sponsors courses in spinal instrumentation and instruction, "Brain Attack" (with the UCLA Stroke Center), advances in pituitary, pediatric, endovascular, Novalis treatment, trauma nursing, precepting nurse practitioners, and cerebral blood flow assessment.
Expanding Relationships

UCLA’s Division of Neurosurgery falls within the broad category of Neurosciences at the David Geffen School of Medicine at UCLA, a field that also encompasses the Brain Research Institute and Neuropsychiatric Institute. UCLA’s Division of Neurosurgery faculty contribute to these and other multidisciplinary institutes. Departmental status is critical for Neurosurgery to effectively negotiate with these prestigious entities and to earn an equal voice in decision-making among other contributors (e.g., Departments of Neurology, Neurobiology, Human Genetics, and Psychiatry and Biobehavioral Sciences).

UCLA’s Division of Neurosurgery has a multi-faceted approach to future growth. The faculty are committed to continue expanding the scope and depth of clinical treatment and research in their respective subspecialties, ultimately improving patient care. Top priorities include the development of a Skull Base Laboratory and Minimally Invasive Surgery Center, both of which will advance academic and clinical neurosurgery. UCLA’s Division of Neurosurgery has specific and ambitious goals for the new Ronald Reagan UCLA Medical Center, development of a world-class spine center in Santa Monica, and creative IT solutions to improve patient record management. This expansiveness requires that Neurosurgery develop working relationships with each institution and many departments, a process that would be greatly facilitated if Neurosurgery were granted the decision-making power associated with departmental status.
NEUROSURGERY FACILITIES

While UCLA’s Division of Neurosurgery is centered at the main UCLA Medical Center at Westwood, its clinical and research programs reach multiple locations, with faculty practicing at Harbor/UCLA Medical Center in Torrance, West Los Angeles Veterans Administration Medical Center, and the Santa Monica-UCLA Medical Center. Not only does the presence of Neurosurgery in these locations enable specialty expertise, it fosters collaboration with other scientific and medical disciplines. Neurosurgery faculty work closely with the Department of Neurology, the Department of Pharmacology, the Department of Physiological Sciences, the Department of Pediatrics, the Department of Bioengineering, the Neuropsychiatric Institute, the Department of Physiological Sciences, the Department of Pediatrics, and the Department of Bioengineering at UCLA; and collaborate with other UC campuses for Brain Injury Research Center and Neuroscience specific issues.

Basic science research is conducted at UCLA-Westwood, Harbor/UCLA, and the VA Wadsworth. There are three neurotrauma laboratories in Westwood that occupy 1,443 square feet in the Center for Health Sciences (CHS). In addition, there is a 3,300 square foot Neurotrauma Laboratory at Harbor/UCLA focused on studying vascular function, in vitro models of intracranial pressure, and effects of trauma on cerebrovascular reactivity. Other research space at Harbor/UCLA consists of 200 square feet dedicated to the study of hypopituitarism and traumatic effects. Brain tumor and immunology research takes place in a 973 square foot CHS laboratory. Neurosurgery supports a Skull Base Research Laboratory that occupies 412 square feet, and a Cognitive Neurophysiology laboratory that occupies 911 square feet, both in CHS. Finally, the Neurobiology of Epilepsy Laboratory conducts research in 350 square feet of the Reed Neurological Institute.

UCLA Medical Center provides excellent outpatient and inpatient facilities for training in the CHS and in the three Medical Plaza Buildings (100, 200, 300). Inpatient care is provided principally in the Center for Health Sciences’ facility with 644 inpatient beds, and offers a diverse operative experience in the most complex of neurosurgical procedures. The majority
of outpatient surgical procedures are conducted in 200 Medical Plaza with outpatient clinic visits occurring principally in 300 Medical Plaza. Most outpatient diagnostic studies are conducted in 200 Medical Plaza which is the location for laboratories for appropriate evaluation in neuroradiology, clinical neurophysiology-EEG, EMG, cerebral blood flow, neuropsychology, and clinical chemistry.

UCLA Medical Center has been recognized as the best hospital in the Western United States for 16 consecutive years in the annual US News & World Report independent survey. UCLA Medical Center facilities that directly support the Neurosurgery Centers for Excellence include:

- Neurosurgical operating rooms equipped for image-guided stereotaxis, neuroendoscopy, brain mapping, neurophysiological brain monitoring, and intraoperative angiography
- Dedicated suite for intra-operative MR surgery
- Novalis radiosurgery facility
- Neuro-endovascular suites for embolization and angioplasty procedures
- Neurosurgical ICU equipped for intensive brain monitoring techniques
- Clinical neuroscience wing with acute stroke unit, neuro-observation beds, and EEG telemetry
- Clinical cerebral blood flow laboratory
- Advanced neuroimaging facilities

All major neurosurgical subspecialties are well represented at the UCLA Medical Center at Westwood, utilizing the latest advances in neurosurgical technology for malignant, benign, pituitary, and metastatic brain tumors; adult and pediatric epilepsy surgery; and minimally invasive spine surgery. Neurosurgery also sponsors an extensive pediatrics program, incorporating neuroendoscopy, hydrocephalus, and pain surgery. In addition to programs within UCLA’s Division of Neurosurgery, faculty collaborate with other experts in the David Geffen School of Medicine at UCLA to advance patient care in a variety of fields. For example, at UCLA's Stroke Center patients benefit from a multi-disciplinary approach, as Neurosurgery partners with Interventional Neuroradiology and Neurology to treat patients with neurovascular disease. UCLA Neurosurgeons often collaborate with colleagues in Head and
Neck Surgery and in Ophthalmology to perform numerous skull base procedures at the main hospital. UCLA Medical Center is a Level-1 Trauma Center and a major center for neurotrauma research with significant funding from the NIH and the State of California, providing the highest quality care for head trauma patients.

UCLA Medical Center is the primary site for neuroscience research. State-of-the-art laboratories provide multi-disciplinary approaches to research in all neurosurgical diseases. The NIH supports investigating brain injury in both the clinical and laboratory settings. Several clinical trials supplemented by innovative lab research have been performed. In addition, there are ongoing projects in subarachnoid hemorrhage, ischemia, and transvenous retroperfusion. Clinical studies in cerebral microdialysis during Phase II monitoring of epilepsy patients are being performed as well as seminal studies in hippocampal cellular physiology. Laboratories for skull base dissection and spinal research provide residents with laboratory experience in various approaches. Animals are also available to develop microvascular techniques with the aid of an operative microscope.

The following number of operating rooms are blocked for neurosurgery use at UCLA Medical Center on the indicated days: Monday=4; Tuesday=3; Wednesday=3; Thursday=4; and Friday=4. In addition, it is standard for Neurosurgery to request additional rooms as necessary. With three to four operative cases seven days a week, it is expected that all residents on service regardless of the level of training will be in the operating room performing as directed by the attending on the case.

Neurosurgery is an active participant in the design of the future home of the new Ronald Reagan UCLA Medical Center, incorporating the most advanced concepts in patient care. Almost all of the new hospital’s 590 patient rooms will convert to monitored or unmonitored inpatient beds as hospital needs change on a daily basis. There will be an invasive floor that houses all the operating rooms, including an interventional MRI operative suite and interventional radiology suites. Furthermore, the new hospital will facilitate use of Neurosurgery’s Global Care Quest (GCQ) product, which allows physicians to access a computerized medical record system via handheld personal digital assistant devices. The new hospital will also house the Clinical Neuroimaging Research Center (CNRC) on the sixth floor. This will be the only facility in the world to bring cutting edge
MRI, CT, and PET scanning to the Intensive Care and Stroke Unit bedside, advancing the study of patients with traumatic brain injury, stroke, ruptured aneurysms, epilepsy, and brain tumors.

At Harbor/UCLA Medical Center, a 500+-bed hospital located in the South Bay community of Torrance, UCLA Neurosurgeons perform approximately 200-400 surgeries and 100-300 procedures each year. These cases are quite diverse, comprised of approximately 50% intracranial, 40% spine, and 10% shunts, peripheral nerve, and other procedures. Several unique pathologies rarely seen at other institutions are encountered at Harbor, such as central nervous system involvement of cysticercosis. Treatment of these patients is often complex and frequently requires neuroendoscopy or other innovative techniques in their management. Harbor/UCLA has one operating room reserved for neurosurgical care. Neurosurgical procedures are conducted on Monday, Tuesday, and Thursday.

The West Los Angeles Veterans Administration Medical Center relies on UCLA’s Division of Neurosurgery to perform many of its surgical cases, 60% of which are spine cases. The 288-bed hospital, located two miles west of the main UCLA Medical Center, is the southwest referral center in neurosurgery for the Veterans Administration and performs 150-350 surgical procedures each year. The UCLA/VA Medical Center leads active clinical trials in the treatment of movement disorders with deep brain stimulation. UCLA/VA has one operating room reserved for neurosurgical care. Neurosurgical procedures are conducted on Monday, Thursday, and Friday.

Santa Monica-UCLA Medical Center serves as the cornerstone of UCLA Healthcare's Primary Care Network, providing high-quality primary and specialty care to the Westside community. In 2000, the Division of Neurosurgery at UCLA began shifting a large portion of its spine surgery practice to Santa Monica-UCLA Medical Center to further development of the UCLA Comprehensive Spine Center, which promotes a multi-dimensional, collaborative approach to treating diseases of the spine. This move allowed for expansion of the existing spine program, and facilitated access to more patients in the Westside community. Neurosurgery performed 344 cases in FY04 and 466 cases in FY05 at the Santa Monica-UCLA Medical Center. These cases include basic spine surgery,
spinal instrumentation, and minimally invasive spine surgery. This number continues to grow. The Santa Monica-UCLA Medical Center is also undergoing a massive renovation, and with a combination of orthopedic and neurosurgical services, Santa Monica-UCLA Medical Center is the headquarters of UCLA's developing multidisciplinary spine surgery program. The goal of the UCLA Comprehensive Spine Center is to address all patients' spine care needs, from initial MRI scans to ongoing out-patient treatment. While Neurosurgery has been ambitious in developing the UCLA Comprehensive Spine Center, its partner in this venture, Orthopedics, is a Department, and thus able to procure greater bargaining power in negotiations. Plans to develop rehabilitation facilities in the UCLA Comprehensive Spine Center are actively being designed. This plan entails a likely partnership with the hospital-based UCLA Rehabilitation Program.

The UCLA Comprehensive Spine program is one of the few spine programs in this country in which neurosurgeons and orthopaedic spine specialists work as a unit. The faculty each have reciprocal appointments in the Department of Orthopaedics and the Division of Neurosurgery. There are joint teaching conferences. Residents and fellows have the opportunity to work with patients from both services, and spine trauma call is handled equally on an alternating-day basis, with reciprocal consultation as needed. This has resulted in a very collegial, noncompetitive atmosphere ultimately providing better total patient care.
NEUROSURGERY RESEARCH

Despite increasing competition for private and government funding, the Division of Neurosurgery has increased the depth and scope of many current research programs; its faculty strive to improve patient care by remaining at the forefront of medical advancements in Neurosurgery. This section highlights major research activities that include multiple faculty members; a following section notes research interests for each faculty member.

The Division of Neurosurgery is actively conducting dozens of separate projects in the areas of brain injury, spinal instrumentation, radiosurgery, neuroperfusion, hydrocephalus, neuroimaging, epilepsy, and brain tumor research both in the laboratory and clinical setting. Most research activities are performed in collaboration with other School of Medicine Departments and affiliated institutions. Much of the research incorporates national and cooperative grants from the National Institutes of Health, National Institute of Neurological Disorders, American Cancer Society, National Brain Tumor Foundation, and the Public Health Service.

The Brain Injury Research Center, also known as BIRC, is the largest research program within the Division of Neurosurgery. Led by Dr. David Hovda, this program has robust funding, including the National Institute of Neurological Disorders and Stroke and the State of California, and employs many basic science and clinical investigators. Over the years this center has developed into one of the very few leading programs in the country that continues to advance Neurotrauma research in both basic science and clinical neuroscience arenas. Although the BIRC supports many different areas of research addressing questions related to development and neuroplasticity, cerebral metabolism has remained its primary focus. Specifically, the team strives to understand not only the metabolic needs of cells that survive the initial traumatic insult, but (as highlighted in the current application) how the metabolic pathways may themselves be affected by injury. The underlying concept is that following traumatic brain injury (TBI), energy demands change in the face of compromised and/or overwhelmed metabolic pathways. The team’s proposal
is to provide the appropriate means to generate required energy, which will not only enhance cell survival but also markedly reduce the vulnerability of surviving cells to secondary insults.

Focusing previous efforts on describing the changes in cerebral glucose metabolism following TBI, BIRC has published extensively that indeed the brain is not metabolically quiescent after injury. More importantly, through the combined use of arterial-venous differences, cerebral microdialysis and positron emission tomography (PET), the team has documented the temporal and regional changes in cerebral glucose metabolism as it relates to cerebral blood flow, oxidative metabolism and changes in extracellular neurochemistry in patients. In order to accomplish this, BIRC developed means with which to study very severely injured human subjects during the first few hours and days following admission. These findings confirmed that following both experimental and human TBI surviving cells are exposed to dynamic ionic fluxes across their membranes producing an energy demand to activate ionic pumps that is supported acutely by glycolysis.

Over the last funding cycle BIRC researchers have focused on determining the incidence of increases in glucose metabolism in patients who sustain TBI. Animal studies indicated that in every case levels of glucose metabolism during the first few minutes following injury were recorded at rates higher that normal (absolute hyperglycolysis). However, when patients were studied (either with arterial-venous differences or with PET) during the first few days following admission the observations of absolute hyperglycolysis were relatively rare. It wasn't until the team controlled for the rates of oxidative metabolism that they began to see the more common finding that glucose metabolism in these TBI patients was higher than needed to support aerobic metabolism (relative hyperglycolysis).

BIRC has published how the use of multiple tracers related not only to oxidative metabolism but also to oxygen extraction and cerebral blood flow (CBF) has helped over the last few years to define the mechanism(s) driving this acute need for glucose metabolism. From these studies it has become clear that classic cerebral ischemia is not a major factor. Furthermore, this increase in glucose metabolism can occur in the absence of seizures. Taken together with arterial-venous differences and neurochemistry obtained via
cerebral microdialysis, clinical data confirm initial experimental findings that glucose metabolism does play an important role in the pathophysiology of TBI. However, hyperglycolysis may be more of a marker of energy demand than pathological in and of itself.

Following both experimental and human TBI, increases in glucose metabolism alone do not result in a more injurious cascade following trauma. In general this is not surprising since it is well known that increases in cerebral glucose utilization (even those uncoupled to oxidative metabolism) are part of the normal response to neuronal activation and are well tolerated by the normal healthy brain. Experimental studies have demonstrated that increases in injury severity do not result in corresponding higher levels of cerebral glucose metabolism. Furthermore, in patients studied with PET, the rate of cortical glucose metabolism is not related to the level of coma (as measured by the Glasgow Coma Score (GCS) exhibited by the subject at the time of the study. Finally when global measurements are employed using arterial-venous differences, the absolute level of glucose metabolism is a poor predictor of outcome.

Although altered glucose metabolism itself may not be deleterious to the injured brain, it does appear to be a reliable marker for energy demands associated with secondary injury, which are known to result in additional damage. As documented in published experimental models, secondary activation of excitatory amino acids, the application of potassium (K+) or the direct stimulation of the sensory motor cortex all result in corresponding increases in glucose metabolism. Not surprisingly, the secondary insults all result in an increase in cell death due to the inability of the tissue to generate the ATP necessary to meet demands in spite of increased glucose metabolism. BIRC has also published similar types of findings seen in patients who sustain secondary hypoxia or seizures.

Other BIRC projects include studies on NMDA receptor dysfunction, loss of developmental plasticity, brain-derived neurotrophin factors, and delayed cell death occurring after traumatic brain injury. The BIRC is actively pursuing research in the biochemistry and physiology of the central nervous system following trauma, how glucose is blocked or diverted from the usual key glycolytic pathway, and how metabolic consumption of lactate
and other alternative fuels may bypass the glycolytic obstruction. There may also be metabolic advantages that mitigate energy failure, protect cells from secondary damage, and promote recovery. Primary investigators for these projects include Dr. Christopher Giza, Dr. David Hovda, Dr. Fernando Gomez-Pinilla, and Dr. Stephan Lee, respectively. Neurosurgical residents participate in both clinical and basic science research projects at BIRC, including topics such as post-concussive hyperglycolysis and excitotoxicity.

The UCLA BIRC program, a subspecialty within Neurosurgery, collaborates with other UC campuses to advance brain injury research. For example, BIRC is an active sponsor of the UC Neurotrauma Meeting, making a concerted effort to bring together every person in the UC system associated with traumatic brain injury. This meeting has met with enormous success and has grown from 57 attendees to 175. Additionally, the UCLA BIRC supports researchers at other UC campuses with competitively awarded cash grants in significant amounts, $1.4 million in total to date. However, BIRC is constrained by operating as a subspecialty program within the Division of Neurosurgery, though it has the research strength, academic acumen, and financial means to qualify for Division status itself.

The BIRC features translational research on the topic of recovery of function after TBI. Following injury, cells that are biomechanically and irreversibly injured are lost, whereas those that survive remain in a vulnerable state compromising their ability to survive a secondary injury as well as to exhibit plasticity. This injury-induced state is defined by marked changes in both the intracellular and extracellular milieu as a result of neurochemical and ionic cascades. Theses cascades cause molecular and metabolic responses that fundamentally alter the way neurons respond to input. In both basic and clinical neuroscientific research programs, this work has helped define much of the pathophysiology associated with TBI. Recent emphasis in developmental neurobiology has revealed how, following concussion, the young brain is compromised in its ability to respond appropriately to important stimuli, which under normal circumstances would result in extensive neuroplasticity. Utilizing cerebral microdialysis, neuroimaging and metabolic assessment, many of these basic science discoveries have been translated to the clinic.
Techniques include neuroimaging (MRI, PET and CT), neurochemistry (cerebral microdialysis, HPLC, histochemistry), metabolic measurements (autoradiography, 13C labeling, arterial-venous differences, 133xenon, xenon CT), quantitative histology, behavior, TBI animal models (cortical controlled impact, fluid percussion) and molecular neurobiological methods (gene array, northern and western blot).

The Division of Neurosurgery has an active Brain Tumor Research Laboratory in which brain tumor immunotherapy, currently in clinical trials, is being developed by a team led by Dr. Linda Liau. The Brain Tumor Program (BTP) is a Center of Excellence consisting of highly trained physicians, nurses, researchers, and personnel dedicated to the compassionate, multi-disciplinary treatment of patients with brain tumors. The BTP is nationally and internationally recognized as a leader among major academic brain tumor centers, because of its unique strengths in all aspects of the academic mission: patient care, teaching, and research. Because of the Program’s cutting-edge technology and unique expertise in intra-operative brain mapping and imaging, it routinely receives referrals of brain tumor patients from all across the country and around the world. Within the past few months, staff have performed surgeries on brain tumor patients from Alaska, Hawaii, England, Germany, Romania, Thailand, Brazil, and New Zealand. Such a wide international referral base attests to the unique elements of our patient care program that draws patients worldwide.

The basic science research in Dr. Lianu’s laboratory has focused on the identification and characterization of novel genes associated with primary tumors of the brain. This group was one of the first to publish on the use of cDNA microarray analysis for brain tumors [Liau et. al., Cancer Research 60:1353-1360, 2000], and has published several invited review articles on this topic (in Current Genomics, Clinical Neurosurgery, Genomic and Molecular Neuro-oncology, Surgical Neurology, etc.). Using established and innovative approaches of subtractive cloning in combination with cDNA microarray technology, Dr. Lianu’s laboratory has isolated several differentially expressed genes in various types of central nervous system (CNS) tumors and is currently in the process of evaluating the biological relevance and function of some of these candidate clones. This basic science work has resulted in several peer-reviewed publications in high-impact journals (Cancer Research,
Journal of Immunology, the New England Journal of Medicine) and two awarded patents (UC Case #2000-236 for granulin D and UC Case #2000-479 for GDOX, glioma-derived oncogene on X).

Dr. Liau's laboratory is also considered a leader in translational research in animal models of brain tumor immunotherapy. This work was funded by grants received from the NIH, the American Cancer Society, and the American Brain Tumor Association. Dr. Liau and her team have several published research papers on the use of different types of tumor vaccines for intracranial gliomas: gene-modified tumor cell inoculations (Neurological Research), tumor peptide-pulsed dendritic cell vaccines (Journal of Neurosurgery), adenovirus-transduced immune cell injections (Journal of Neuro-Oncology), recombinant Listeria-based tumor vaccines (Cancer Research), and MAA-pulsed DC vaccines (Cancer Research).

Over the last seven years, the BTP at UCLA Neurosurgery has developed into an internationally recognized leader in the basic science and clinical research of brain tumors. The BTP is also internationally recognized as a training center for visiting neurosurgeons from all around the world. Over the past three years, four visiting neurosurgeons have participated in one-year fellowships in brain tumor research, both clinical and basic science. Two of these neurosurgeons have gone on to become Department Chairmen of Neurosurgery at their respective universities in Taiwan and Korea.

UCLA's Division of Neurosurgery partnered with industry's technological leaders to develop a state of the art Skull Base and Spine Laboratory, with all the equipment of a full operating room, including BrainLAB neuronavigation. This laboratory, led by Dr. Donald Becker, has been used for investigation of novel cranial base approaches, endoscopy research, and research of the use of neuronavigation for spinal instrumentation. The Laboratory has concentrated on developing outlines, illustrations, videos, lectures, and hands-on instruction in reference to surgical anatomical dissections as they apply to clinical situations. Under the guidance of Dr. Dennis Malkasian, current work includes advanced levels of anatomical dissections for medical students interested in neurological surgery; specific required surgical dissections for the Neurosurgical residents with the use of the
microscope, microsurgical techniques, and application of imaging anatomical studies to the operative surgical anatomy; faculty education in the category of developing new or modifying routine surgical approaches; training of postgraduate neurosurgeons from Third World Countries; and educational seminars with “hands-on” experience for community doctors and for specialists outside the immediate area. The Laboratory supports an ongoing training program for outside medically related industries, integrating with industry to teach anatomical points to engineers and sales-persons as part of a multidisciplinary approach to better coordinate applied science with the basic and clinical sciences, with involvement by Storz Endoscopic Division, Medtronic, Zeiss, BrainLAB, and others.

Projects in planning include expanding the anatomical course material to surgical dissections of the nerves to the upper and lower extremities chest, and abdomen. This effort may become of greater importance in the next five years in respect to the Iraq War injuries that are severely damaging the extremities of soldiers. Concentrating on nerve repairs and nerve grafting may become a need. Also planned is a focus on brain neuro-anatomical pathways and molecular biology as they apply to tumor treatment; an anatomical surgical dissection course accepting up to four neurosurgeons from outside the UCLA training program for a one-week tuition-financed course; and a new surgical anatomical illustration book with methodological and comprehensive approaches to the drawings and photographs.

With the joint support of the Department of Orthopedic Surgery, the UCLA Comprehensive Spine Center is in the process of establishing an integrated Image-Guided Laboratory for Spinal Surgery. Working with several major industry partners including Siemens and Medtronics, the laboratory will serve as a nexus to evaluate and deploy these emerging technologies.

Under the direction of Dr. Itzhak Fried, the Cognitive Neurophysiology Laboratory has become a world leader in studies of brain function during cognition at the level of the single neuron. Dr. Fried and his team record the firing of neurons while patients perform visual memory tasks. With publications in major journals such as Nature, Nature Neuroscience, Neuron and Neurosurgery, this work is consistently expanding the boundaries of knowledge on how the brain functions. The team’s ultimate goal is to “crack the neuronal
code” to benefit patients with Alzheimer’s, epilepsy and other diseases that involve cognitive decline.

The Brain Monitoring and Modeling Laboratory (BMML) serves as the research and development arm of the Division of Neurosurgery in the field of Neurosurgical intensive care. The laboratory's mission is to put existing and emerging technologies in the hands of practicing clinicians, nurses and caregivers for the benefit of patient care and improved patient safety as well as for improvement of the workflow and cost effectiveness of the medical enterprise. Besides the multitude of research papers and four patents originating at the BMML, a number of commercial medical software packages also have their origins in the laboratory. One notable software package is Teletrend, a system for remote access and analysis of multichannel EEG, vitals and trends developed in collaboration with Nicolet Biomedical (Viasys). Another is Global Care Quest (GCQ), a system for wireless remote access to the entire electronic health information system throughout the Medical Center using both desktop and handheld computers. The GCQ system utilizes auto generated notes that save on average one hour of clerical work per day for every intern, resident, and attending in the enterprise. BMML also hosts the databases of major research projects and clinical fellows including the BIRC, Neurosurgery QI, Pituitary, Transcranial Doppler, and Quality Improvement Stroke Patient Database.

Neil Martin, MD, and Val Nenov, PhD, are the Co-PI's on Project 4 of a major DOD funded grant called TATRC. Project 4 of the grant is entitled Clinically Empowered Novel Telepresence Application Using Robotic Wireless Systems or "CENTAURWS." CENTAURWS focuses on the development of a clinically empowered novel telepresence system using robotic wireless technology. This system will allow skilled medical professionals to be telepresent during rounds of the companion robot while at the same time having online access to the entire hospital (labs, ADT), clinical bedside monitors and radiological (PACS) information systems. Building on the foundation of proven commercial technology the newly developed system will integrate two best-of-breed wireless mobile applications, the GCQ system and the InTouch Companion Robot, to
achieve functionality and performance quality above and beyond the capabilities of each system by itself.

Exciting advancements are being made in the interdisciplinary field of Quantitative Neurosurgery. Xiao Hu, PhD, Assistant Researcher, is pursuing the long-term goal of developing and disseminating predictive, diagnostic and therapeutic systems that integrate neurological and neurosurgical physiopathology with the engineering techniques of mathematical modeling, signal processing, and process control. He uses a data-mining framework capable of noninvasively assessing intracranial pressure using cerebral circulation parameters and cerebral blood flow auto-regulation. The approach is being further improved to noninvasively assess intracranial pressure in hydrocephalus patients after shunt implantation, in severe brain injury patients that are not candidates for an invasive procedure, and in liver transplant patients. While quantitative characterization of auto-regulation was formerly limited to simple linear tools, Dr. Hu and his team now employ continuous monitoring and titrate the status of auto-regulation with a nonlinear interdependency measure.

The Stereotactic Radiosurgery and Functional Neurosurgery Program (SRFNP) is unique in the field of academic neurosurgery. Most centers have one or the other but not both. The Program is constantly pushing the envelope to develop the best possible outcome for every patient, conducting clinical review research every year to verify results. Technology is embraced to the fullest extent, meaning the SRFNP is the cutting edge, and is recognized as so worldwide.

The Stereotactic Radiosurgery Program was the first in the world to adopt the new Novalis Shaped Beam Radiosurgery Delivery System. Immediately after purchasing the system, the technology was incorporated into the Shaped Beam Radiosurgery and Functional Neurosurgery Tutorial Course. Since that time, over 200 physicians from as far away as Thailand and England have attended this three-day course. The concept is so successful that recently Henry Ford and Cleveland Clinic have started similar courses; however, UCLA remains the premiere teaching site for advanced radiosurgery. The Radiosurgery Program continues to seek novel applications of radiosurgery, including possible preventative
treatments for Parkinson's Disease, mental disorders, and epilepsy, and has recently developed methods for treating lesions of the spine as well as elsewhere in the body.

The Functional Neurosurgery Program was the first to utilize the Open MRI operating room for deep brain stimulation surgery. This allows for real time observation of the lead placement, reducing the operating time by ensuring the reliability of the lead placement without the need to reopen the burr hole to adjust it. As with the Stereotactic Radiosurgery Program, other centers have followed the lead of the SRFNP by initiating their own Open Magnet Surgical Program.

The Division of Neurosurgery plays a key role in advancing the mission of the [UCLA Stroke Center](#). The UCLA Stroke Center treats simple and complex vascular disorders by incorporating recent developments in emergency medicine, stroke neurology, microneurosurgery, interventional neuroradiology, stereotactic radiology, neurointensive care, neuroanesthesiology, and rehabilitation neurology. The Program is unique in its ability to integrate clinical and research activities across multiple disciplines and leading departments. Current research efforts are focused on the Specialized Program of Translational Research in Acute Stroke, or SPOTRIAS. SPOTRIAS is an integrated research and training program to develop innovative therapies for acute ischemic and hemorrhagic stroke; its mission can be briefly encapsulated as treating stroke faster and better. The NIH recognizes the paramount importance and urgency of this research, and has awarded the UCLA Stroke Center a $5 million grant to advance the SPOTRIAS Program.

The SPOTRIAS team has prioritized three main research projects. The first is known as MR Rescue, which will determine whether magnetic resonance imaging (MRI) can identify stroke patients who will benefit from treatment by endovascular devices up to eight hours from symptom onset. Project II, known as HEME Surgery, will test an innovative, minimally invasive surgical technique applied early after onset. In this trial, intracerebral hemorrhage will be evacuated through burr holes to minimize disruption to normal brain tissue typically associated with craniotomy. Project III is focused on Pre-hospital Stroke Studies, and aims to devise, implement, and validate strategies for rapid assessment, triage,
and treatment of acute stroke in the field. The synergies among these three interrelated projects are compelling. Together they form a seamless, mutually reinforcing Program for the development and application of new and effective stroke therapies.

The **UCLA Comprehensive Spine Center** is actively engaged in research studies concerning computer-imaged spine surgery, bone marrow aspiration as an adjunct to spinal fusion, artificial disc replacements, minimally invasive lumbar pedicle fixation, and the treatment of degenerative back pain. A current research study at the Center uses functional MRI to evaluate the activation of the cerebral cortex in patients with cervical myelopathy. This disorder is caused by damage to nerve fibers within the cervical spinal cord, and manifests with difficulty in hand function and ambulation. The research effort will compare responses of the cerebral cortex to attempts at hand and foot motor activity in cervical myelopathy patients and normal subjects, while also evaluating the cerebral cortex for any changes in activation following surgical decompression. This study seeks to elucidate information regarding the mechanisms of paraparesis in this disorder, and the potential for reversibility following surgery.

The productivity of Neurosurgery’s research efforts are perhaps easiest described by the volume of journal publications. During Dr. Martin’s tenure as Chief of the Division of Neurosurgery, from 2001 through 2005, the Neurosurgery faculty has produced over 300 separate peer-reviewed journal articles, books and book chapters in print or in press.
The great tragedy of neurological disorders (stroke, epilepsy, brain trauma, brain tumors, Alzheimer's and Parkinson's diseases) is that they destroy the very essence of human experience - cognition, perception, memory, movement. In recognition of this, clinical neuroscience has been established as a top priority for the new Ronald Reagan UCLA Medical Center. These programs are among the most innovative and productive research centers in the world. From gene mapping to brain mapping, scientists probe the human brain to discover new insights into the causes and cure of nervous system diseases. The Clinical Neuroscience Unit on the sixth floor of the new Ronald Reagan UCLA Medical Center has been specifically designed to support and enhance this research, and to bring new discoveries quickly to the front lines of medical care.

The Henry E. Singleton Neurodiagnostic and Treatment Center in the new Ronald Reagan UCLA Medical Center will include intensive care and ward beds, brain imaging facilities, clinical neurophysiology laboratories, and advanced brain monitoring capabilities. The following clinical and research programs will be supported and advanced by these facilities and the operating rooms of the new hospital.

The Neurological Intensive Care Unit has been developed as both a center for outstanding, state-of-the-art patient care, and as a technologically-advanced research facility for studying the processes of human brain injury, and recovery from brain surgery. The design team has integrated brain monitoring research studies into compassionate and effective patient care in a safe, minimally-invasive fashion. One of the innovative UCLA programs involves continuous ICU EEG brain-wave monitoring. Its use is analogous to continuous EKG monitoring in cardiac ICUs. Clinically such monitoring can identify complications in ICU patients, providing an early-warning system for physicians. Scientifically it provides an important tool to unravel the enigma of coma and to understand how brain damage occurs. UCLA has established itself as the world's foremost center of excellence in ICU EEG brain-wave monitoring.
The Neuro-ICU (NICU) on the sixth floor in the new hospital will be uniquely designed to incorporate research techniques for measuring cerebral blood flow and metabolism, brain biochemistry, and particularly, brain electrical activity (EEG). Only by thoroughly understanding these processes in patients, and correlating this knowledge with laboratory breakthroughs, will physicians and researchers be able to design innovative, safe, and effective new treatments.

Closely associated with the NICU is the **Brain Monitoring and Modeling Laboratory (BMML)**, which will conduct extensive research and development in the new intensive care facility. Work includes systems for remote access and analysis of ICU data, and high-volume electronic support of major research projects and clinical programs. These systems enable access to the entire hospital (labs, ADT), clinical bedside monitors and radiological (PACS) information systems. A particular interest is in applications of new technology to telemonitoring and telesurgery, for the enhancement of both clinical services and training. Additionally, in the Neurocognitive Laboratory, studies of brain function during cognition at the level of the single neuron are being actively explored in patients undergoing epilepsy treatment.

2 The Clinical Neuroimaging Research Center (CNRC) and Operating Room of the Future: With modern neuroimaging techniques (PET and MRI scanning) it is possible in many ways to define and study brain pathology, circulation and metabolism in patients better than can now be done in laboratory experiments. UCLA is one of the leading institutions worldwide for the use of imaging to study patients with brain disorders. The CNRC on the sixth floor in the new hospital will bring PET and MRI scanners to a facility immediately adjacent to the NICU and Stroke Unit to enable the study of patients with traumatic brain injury, stroke, ruptured aneurysms, epilepsy, and brain tumors. In the past this has been quite difficult, even impossible in some cases, because of the risks posed by transporting the patient through the hospital to remote scanners.

This path-breaking imaging facility will allow the BIRC and the UCLA Stroke Center to carry out a program of integrated research discovery to develop new, innovative therapies for trauma and acute ischemic and hemorrhagic stroke. As therapeutic options for treatment
of acute stroke evolve, brain imaging studies that immediately demonstrate how much tissue is threatened but still salvageable are assuming a critically important role. Research studies, including clinical trials for acute stroke, need the information provided by neuroimaging to enroll appropriate patients, to characterize tissue status at study entry, and to assess outcome in a quantitative, objective fashion. The UCLA CNRC will be the only facility in the world to bring cutting edge MRI, CT, and PET scanning to the Intensive Care and Stroke Unit bedside. Pioneering discoveries made here will reshape brain injury, epilepsy, brain tumor, and stroke patient care in the 21st century. Funds for this state-of-the-art equipment were earned through a tailored fundraising campaign launched by Dr. Donald Becker and Dr. Neil Martin.

Often, tumors in the brain grow near areas of normal brain function, such as motor and speech function. A few years ago many of these tumors would have been considered inoperable. However, advances in functional MR imaging and intra-operative brain mapping pioneered at UCLA are allowing neurosurgeons to precisely determine where functional brain regions are in each patient and to remove brain tumors without impacting these critical regions, thereby leaving the patient with minimal neurological loss after brain surgery. The Division has a newly established high-resolution intra-operative MRI (iMRI) operating suite. This futuristic operating room comes equipped with a 1.5 Tesla MRI scanner, which provides the highest resolution intra-operative MR images available on the west coast. Obtaining the MR images during surgery guides UCLA neurosurgeons in removing diseased tumor tissue and avoiding normal brain structures, again increasing safety and efficacy of surgery. The Clinical Neuroimaging Research Center in the new hospital will allow us to integrate pre-operative and post-operative fMRI, MR spectroscopy, and PET data with the intra-operative images that we see during surgery. This will markedly enhance cutting-edge research and development of multi-dimensional 4-D imaging of brain tumors, which will allow to more accurately correlate imaging characteristics with the genetic composition and behavior of tumors over time.

UCLA Brain Tumor Program: Brain tumors are one of the most devastating of human diseases. Commonly striking in the prime of life, these tumors can have a huge impact on patients afflicted with the disease and their loved ones, robbing patients of
physical, neurological, and mental function. Neurosurgeons at UCLA have been leading efforts to improve treatments for these devastating neoplasms and other neurological disorders. The UCLA Brain Tumor Program partners innovative surgical techniques with state-of-the-art neuro-imaging and combined novel therapeutic approaches resulting in internationally recognized cutting-edge basic science research. The UCLA Pituitary Tumor and Neuroendocrine Program is nationally-recognized in its provision of comprehensive evaluation and treatment of patients with pituitary tumors, skull base tumors and related disorders.

In addition to advanced surgical and imaging technologies, the UCLA faculty are also internationally recognized leaders in basic science and clinical research, with cutting-edge scientific discoveries on the molecular genetics of brain tumors and promising clinical trials of brain tumor vaccines currently underway. This group was the first to use cDNA microarray ("gene chip") techniques to analyze surgically excised brain tumor specimens and currently has a $5 million NIH grant to support further development of this research. Two other NIH grants for basic science research on the molecular biology of brain tumors and translational studies of brain tumor immunotherapy are underway, and the team recently received FDA approval for a multi-million dollar Phase II clinical trial of a new brain tumor vaccine, which was developed here at UCLA. With modern PET techniques available in the new CNRC, physicians and researchers hope to develop innovative ways to monitor the effects of this vaccine on immune responses in the central nervous system.

**The Cerebral Blood Flow Laboratory (CBF Lab):** The CBF Lab serves both clinical and research functions at the UCLA Medical Center. With a team of technologists, scientists, and neurologists under the guidance of the Dr. Neil Martin, the CBF Lab conducts over 1200 transcranial Doppler (TCD) and \(^{133}\)Xenon-cerebral blood flow studies annually. Using contemporary technology, the CBF Lab measures brain circulation and brain metabolism both repetitively and continuously in hospitalized patients. These critical components of brain physiology play a key role in brain injury, stroke, and aneurysm rupture. The UCLA CBF Lab has been funded by NIH for more than 10 years for human brain injury research studies of flow and metabolism using TCD, isotope, and biochemical techniques. These studies have advanced our knowledge of cerebral arterial
spasm after trauma and aneurysm rupture, and have refined the timing and administration of spasm treatment.

As a brief review, TCD is a sophisticated technique that uses harmless non-invasive sound waves to determine the way blood flows through the major blood vessels of the brain. TCD has been used to measure blood flow responses to changes in blood pressure, a process called pressure autoregulation. With the use of this technology, we have been able to show that autoregulation is impaired after brain injury and in some patients, this impairment appears to improve with time. Furthermore, TCD has many clinical applications. In addition to diagnosis of cerebral artery vasospasm, other clinical areas include assessment of stenosis, emboli monitoring, determination of cerebral vascular reserve, effects of sickle cell anemia, and diagnosis of migraine headaches.

Xenon-cerebral blood flow studies accurately determine cerebral perfusion, at the bedside of ICU patients. This technique requires the injection of a radioactive gas that can then be rapidly measured in the patient’s brain. Measurements of brain perfusion are important to determine if brain perfusion is too low as in the case of ischemia, and the efficacy of therapeutic interventions. The CBF lab staff conducts cerebral metabolic studies in both trauma and subarachnoid hemorrhage patients. Detailed analyses are conducted in the Neurochemistry Laboratory of the BIRC. These studies are enhancing our understanding of brain fuel use and are helping develop new metabolically based therapies. The CBF Lab will be moved to the sixth floor Clinical Neuroscience unit, where it will continue to support clinical studies and research investigations.

The UCLA Stroke Center: The Stroke Center is a multidisciplinary, multi-department clinical and research program in ischemic and hemorrhagic cerebrovascular disease. A center without walls, the Stroke Center was founded in 1994 and is comprised of collaborating neurologic, emergency medicine, neurosurgical, vascular, neuroradiologic, and neurorehabilitation investigators who carry out major interdisciplinary clinical and basic research studies of cerebrovascular disease. The Center includes 25 faculty members. Stroke Center members collectively hold 16 NIH cerebrovascular research grants, as well as multiple additional grants from charitable, non-governmental sponsors and pharmaceutical
sponsors. The UCLA Stroke Center is recognized as a world leader in interdisciplinary acute stroke research, and members have produced over 150 publications on cerebrovascular topics in the last 5 years. Joint research and educational work of Center members was featured in a special issue of the Journal of Stroke and Cerebrovascular Diseases, summarizing presentations at the UCLA Stroke Center's annual Brain Attack! Symposium. The fundamental theme and mission of the UCLA Stroke Center is "Developing Novel Approaches to Diagnose, Prevent and Reverse Stroke."

The UCLA Stroke Center recently received accreditation as a JCAHO-certified Stroke Center. UCLA is the first medical center in Los Angeles County to earn this distinction.

**UCLA Comprehensive Epilepsy Program:** UCLA is recognized as a world leader in both the clinical and research aspects of epilepsy treatment since its inception in 1960. Research activities range from molecular biology and ion channel biophysics to interictal behavioral disturbances and quality of life. This program has an NIH program project grant (now in its 44th year of funding) and eight other NIH grants, as well as numerous other extramural awards, and in the past five years has produced 8 books and almost 350 other publications. The Seizure Disorder Center pioneered the first EEG telemetry, the first application of PET scanning to epilepsy, the first surgical treatment for catastrophic epilepsy in infancy and early childhood, and the first use of quantitative measures of health-related quality of life in epilepsy.

Within this program is the **Epilepsy Telemetry Unit on the Ward.** Patients are admitted to the unit for continuous, long-term video and EEG monitoring (telemetry), a procedure that was pioneered at UCLA. For more complex cases electrodes are placed surgically within the brain, either surface grid electrodes or depth electrodes inserted into deep areas of the brain, procedures pioneered at UCLA. Telemetry results are combined with MRI and PET imaging data as well as neuropsychological findings in determining candidacy for surgery and delineating the surgical plan. The work of the UCLA Seizure Disorder Center has brought us close to the point where selected cost-effective surgical interventions could conceivably eliminate the disabling chronic seizures of the most common forms of human epilepsy, not only in the industrialized world, but in developing
countries as well. The program's inpatient home on the sixth floor in the new Ronald Reagan UCLA Medical Center will be the heart of the clinical and research program.

**UCLA Brain Injury Research Center (BIRC):** This world-class clinical research program is focused on study of the disturbances in brain circulation, metabolism, biochemistry, imaging characteristics and gene expression that occur after acute traumatic brain injury due to accidents and intentional violence. The latest figures demonstrate that more than one million people are affected significantly by these problems annually in North America.

Over the past 12 years a team of more than 30 UCLA neurosurgeons, neurologists, neuroradiologists, and basic neuroscientists have built a comprehensive investigative program designed to identify the key processes involved in human brain injury. The research conducted by this group has received endorsement and funding from NIH Health since 1991. The BIRC is recognized around the world as one of the leading centers for laboratory and human traumatic brain injury studies. This program represents our best hope to promote neurologic recovery, by developing new therapies that protect and repair neurons after traumatic brain injury.

**UCLA Comprehensive Spine Center:** The UCLA Comprehensive Spine Program is one of the only academic spine centers in the country where neurosurgeons, orthopaedists, and physical medicine physicians work together in a variety of different clinical, academic and teaching arenas. The program is located at Santa-Monica UCLA Hospital, and the Spine Center physicians were one of the first groups to move their practices from the Westwood campus. The Comprehensive Spine Center has grown immensely over the past several years, and receives over 4,000 phone calls per month. The Spine Center physicians perform over 1,000 operations per year, and have collectively published over one hundred manuscripts in peer referred medical journals.

Faculty of the Comprehensive Spine Center have published numerous scientific articles and book chapters on the subject of computer image-guided spine surgery. The research has largely been based on cadaver studies investigating novel methods to use computer
stereotaxis to navigate within the spine. This technology allows the location of any surgical instrument within the surgical space to be displayed within the virtual space on a computer monitor. Due to its precision and accuracy image guidance has increased the safety and efficacy of a variety of spinal procedures.

The Comprehensive Spine Center is the regional Los Angeles Depuy Spine Lumbar Artificial Disc Training Center with authoritative standing in the emerging area of spinal dynamic motion preservation and arthroplasty. Faculty are also involved in several pre-IDE pivotal data studies of new arthroplasty technologies abroad and will ultimately serve as the PI for the FDA study within the next year.

The Center established a standing fellowship from Abbott Spine for international physicians to visit UCLA and have had many foreign fellows spend up to 6 months observing and learning minimally invasive surgical techniques.
The Division of Neurosurgery at UCLA has a long and rich history of innovation in neurosurgical training. From its inception, the Division has been at the forefront in brain tumor surgery, head injury treatment, epilepsy surgery, stereotactic surgery, and the treatment of cerebral aneurysms with embolic materials. Today, UCLA’s Division of Neurosurgery faculty continues to lead in these specialties, and have also expanded to make significant contributions to progress in spinal surgery, pediatric surgery, neuronavigation, and interventional MRI guided surgery. The faculty and staff of the Division of Neurosurgery are aggressively developing the neurosurgical technologies of the future, including clinical trials in tumor immunotherapy and intraoperative optical imaging.

UCLA’s Division of Neurosurgery has grown tremendously since it was founded over 50 years ago. The Division’s first Chairman, Dr. W. Eugene Stern, launched the Neurosurgery Residency Training Program on the main Westwood campus in 1952. Regarded as an excellent clinical training program, the Division of Neurosurgery at UCLA helped pioneer the use of the operative microscope, cryothalamotomy, and embolization of intracranial aneurysms. The Division of Neurosurgery became an early leader in the surgical treatment of epilepsy and in development of microvascular decompression for trigeminal neuralgia. The 1978 issue of Surgical Neurology listed UCLA in the top seven neurosurgical training programs (out of 92) in the country. This ranking was due in large measure to the strong diagnostic and teaching acumen of Dr. Stern, President of the American Association of Neurological Surgeons (1979-80) and the Cushing Medallist of the American Association of Neurological Surgeons (1992).
1952 - 1985

There was no University hospital when Neurosurgery at UCLA was initially launched; the current site was a giant excavation area. The Wadsworth Veterans Administration Hospital, about to become the foundation for the neurosurgical program, had a surgical service under the Chiefship of Dr. John Beall and included a neurosurgical ward and attending and consulting neurosurgeons, but no residency program. Faculty from the University of Southern California, Dr. C. W. Rand, Dr. Herbert Crockett, and Dr. Henry Cuneo, served as attending neurosurgeons and assisted Dr. W. Eugene Stern in strengthening UCLA's program. After recruiting Dr. Robert Rand and Dr. Paul Crandall, the first formal Neurosurgery program was launched. The current UCLA hospital opened in 1955; the first neurosurgical case in this hospital was an open thoracic cordotomy performed by Dr. Stern. Dr. Ulrich Batzdorf completed his training at UCLA and joined the program in 1966; he remains the full-time faculty graduate longest in continuous service. Dr. John Frazee and Dr. George Gade also joined the faculty full time under Dr. Stern's leadership.

1985 - 2001

**Dr. Donald P. Becker, now the Dean of Academic Affairs for the David Geffen School of Medicine, served as the Division Chief from 1985 to 2001. Dr. Becker created a modern academic neurosurgical program that gained international recognition for state-of-the-art teaching, research, and patient management** using a divisional programmatic approach by recruiting subspecialists from the United States and around the world to develop Neurosurgery Centers of Excellence. While he led programs in cerebrovascular disease, stereotactic and functional neurosurgery, brain injury, spinal neurosurgery, and pediatric neurosurgery, Dr. Becker also directed development of the UCLA Comprehensive Brain Tumor Center and has established leading programs in pituitary, acoustic tumor, and skull base neurosurgery. Dr. Neil A. Martin joined the Division to develop what is today one of the most outstanding multidisciplinary neurovascular programs. Dr. Becker, with Dr. Keith Black, developed a renowned program in malignant disease of the brain. Dr. Warwick Peacock
joined the team and developed a prominent pediatric neurosurgery program. Dr. Paul Vespa joined to develop the neuro-intensive care unit. Dr. Val Nenov joined to lead technological innovations in neuro-intensive care. Dr. Becker recruited Dr. David Hovda, who currently leads the Brain Injury Research Center. Based on Dr. Becker’s earlier work in brain injury, this program continues to conduct cutting-edge research with support from several prestigious NIH grants. Dr. Antonio DeSalles, head of the Stereotactic and Radiosurgery Program, Dr. Itzhak Fried, director of the Epilepsy Surgery Program, and Dr. Daniel Kelly, head of the Pituitary Program, joined Neurosurgery at UCLA and continue to lead advanced subspecialty programs.

As the faculty grew during Dr. Becker’s tenure, so did Neurosurgery’s surgical caseload and residency training program. UCLA’s Division of Neurosurgery began accepting two residents each year. Today five of these residents are valued members of the Neurosurgery team; Dr. John Frazee, Dr. Linda Liau, Dr. Marvin Bergsneider, Dr. Gary Mathern and Dr. Langston Holly each lead research in their respective fields of neuro-endoscopy, brain tumors, brain injury, pediatric epilepsy, and spine surgery. In addition to developing a highly academic and active clinical service, Dr. Becker promoted a strong basic research foundation to encourage training of academic neurosurgeons. He is the recipient of the Grass Award from the Society of Neurological Surgeons for outstanding and continuing contributions to neurosurgical research (1986), was President of the Neurosurgical Society of America (1995), and holds the W. Eugene Stern Chair in Neurosurgery. Dr. Becker continues to serve as an active faculty member at UCLA as a Professor of Neurosurgery and as Director of Neurosurgery’s nationally recognized Brain Tumor Program. He is presently the Dean of Academic Affairs for the David Geffen School of Medicine and he served as the chair of the Council for Academic Promotion (CAP) for Academic Year 2005. Under his guidance, UCLA’s Division of Neurosurgery grew in national prominence to the point of being named the eighth best neurosurgery program in the country by the publication U.S. News & World Report. It was Dr. Becker’s vision that resulted in a PhD staff for Neurosurgery, now numbering 17 individuals across faculty and professional staff.
2001 - present

Dr. Neil Martin became Chief in 2001, following a lengthy tenure as a prolific faculty member. Dr. Martin is a strong advocate for research and academic neurosurgery and has published 210 peer-reviewed articles and chapters on topics including neurovascular surgery, neurosurgical intensive care, and brain trauma. As a faculty member and Director of Neurosurgery’s Neurovascular Surgery Program, Dr. Martin has been instrumental in the development of a Cerebral Blood Flow Laboratory, the nationally recognized UCLA Stroke Center (which is the only JCAHO-certified Stroke Center in Los Angeles County), and a state-of-the-art neurosurgical intensive care unit. He has been closely involved in the design of many aspects of the new Ronald Reagan UCLA Medical Center, including a hospital-wide digital data management system.

As Chief, Dr. Martin has promoted the growth of the UCLA Spine Program, building upon work by Dr. Ulrich Batzdorf and Dr. Duncan McBride. Dr. Martin recruited Dr. Larry Khoo and Dr. Langston Holly, both recipients of the prestigious Cloward Fellowship in spinal neurosurgery, and expanded the Santa Monica-UCLA Medical Center to include the development of a new UCLA Comprehensive Spine Center in July, 2001. Establishing clinical faculty at Santa Monica-UCLA Medical Center enables patients to benefit from the expertise of UCLA Neurosurgeons while being treated in the comfort and convenience of a community hospital. Dr. Martin has also been successful in the recruitment of Tien Nguyen, MD, a pediatric neurosurgeon who completed his training at Los Angeles Children’s Hospital. Neil Harris, PhD, a young researcher in the fields of hydrocephalus, stroke and traumatic brain injury, was recruited in 2003 to conduct studies in plasticity and function after trauma utilizing both light microscopy cell biology techniques as well as in vivo neuroimaging methodologies. He has been joined in 2005 by Richard Sutton, PhD, an experienced basic scientist specializing in brain trauma research, and Thomas Glenn, PhD, a experimental pathophysiologist. Starting in July 2006, Mayumi Prins, PhD, researcher in pediatric neurotrauma and Robert Prins, PhD, researcher in immunology, will join the faculty. Also added in 2006 was Ichiro Nakano, MD, a foreign-trained neurosurgeon who brings significant expertise in stem cell research. He also maintains a joint appointment with Pediatrics.
The pediatric neurosurgical program has gained international acclaim and recognition due to the separation of the two Maria’s, a venture conceived and spearheaded by Jorge Lazareff, MD, another member of our esteemed faculty.

With the forthcoming new Ronald Reagan UCLA Medical Center and its state-of-the-art technology, Dr. Martin is committed to keeping Neurosurgery at UCLA at the cutting edge of neurosurgical science and practice. Dr. Martin’s vision for the new hospital includes a digital information technology system through Global Care Quest, an ICU-rounding robot, improved patient safety initiatives, the integration of Neurosurgery into the OR of the Future and the Clinical Neuroimaging Research Center.
ULRICH BATZDORF, M.D.

- Professor Emeritus
- Member of the Neurosurgery Faculty since January 1966
- Author or co-author of 97 professional publications (55 peer-reviewed)

Dr. Batsdorf is a member of the UCLA Comprehensive Spine Center. Specializing in Spinal Neurosurgery, Dr. Batsdorf's current research is directed toward analyzing outcomes of a large series of patients with Chiari Malformation with syringomyelia and related conditions. He is involved in developing minimally-invasive techniques for intradural spinal surgery and alterations in the cerebrospinal fluid flow dynamics in patients with syringomyelia. Achievements in the area of Chiari Malformation and syringomyelia have included the reduction of cerebellar tonsils by bipolar cauterization in patients with tonsillar ectopia, development of techniques for treatment of cerebellar ptosis and treatment of primary spinal syringomyelia in a manner analogous to treatment of Chiari-related syringomyelia. Also included has been the definition of indications for subarachnoid shunting in patients with syringomyelia.

A world-recognized expert, Dr. Batsdorf's primary clinical focus is in the treatment of Arnold Chiari Malformation, syringomyelia and spinal cord tumors. Additionally, he retains a strong commitment to understanding pathophysiology of the spinal cord during the formation of syrinxes, whether they are produced by changes in CSF flow or through other types of injury to the spinal cord. Recently, he has collaborated with several neuroscientists addressing questions related to syrinx development and particularly, the evaluation of cerebral spinal flow in and around the site of injury. Particular attention is directed toward tissue gradients as they relate to transport properties of nutrients and neurochemicals.
Donald Becker, MD

- Professor
- Dean of Academic Affairs for the David Geffen School of Medicine
- Member of the Neurosurgery Faculty since September 1985
- Chief of Neurosurgery, 1985-2001
- Author or co-author of 362 professional publications (188 peer-reviewed)

Dr. Becker serves as Director of both the Brain Tumor Program and the Benign and Skull Base Tumor Program. He is an expert in the surgery of skull base tumors, other benign brain tumors and pituitary tumors, and leads a nationally recognized program in brain injury. Recognized as one of the leaders in the field of skull base surgery and neurotrauma, Dr. Becker continues to investigate novel neurosurgical approaches to tumors situated deep within the middle and posterior cranial fossa. He has continued his interest in surgical approaches to the pituitary tumors. In addition to his clinical interests in neurosurgical approaches for CNS tumors, Dr. Becker has continued his interest in the pathophysiology of traumatic brain injury. He maintains a leadership role within the UCLA Brain Injury Research Center, which addresses how cells that survive the initial traumatic insult become more vulnerable to secondary injuries. Studying both the neurochemical and neurometabolic response to traumatic brain injury, Dr. Becker has participated in revealing an injury-induced state of metabolic dysfunction that has explained much of the mechanisms associated with injury-induced vulnerability.

Marvin Bergsneider, MD

- Associate Professor In-Residence
- Member of the Neurosurgery Faculty since July 1994
- Author or co-author of 81 professional publications (31 peer-reviewed)

Dr. Bergsneider is the Director of the Intraoperative MRI Program. He specializes in minimally-invasive image-guided surgery in the UCLA intraoperative MRI (iMR) suites. This research and development project has involved developing novel
methodology for updating the neuronavigation system with intra-operative images. This technology will be key for establishing the premier neurosurgical operating room in the new hospital. He has authored two peer-reviewed manuscripts and two book chapters (in press) related to this work. Additionally, Dr. Bergsneider was presented the Mahaley Clinical Research Award, given by the National Brain Tumor Foundation, at the 2004 Congress of Neurological Surgeons Annual meeting in San Francisco. Dr. Bergsneider is also Co-Director of the NeuroEndoscopy Program, and has authored seven peer-reviewed manuscripts and four book chapters pertaining to advanced neuro-endoscopic techniques. He is Director of the Adult Hydrocephalus Program. This Program is internationally recognized, and one of only 6 similar programs nationwide. Dr. Bergsneider has surgically treated over 1000 adult hydrocephalus patients over the past decade at UCLA. He has authored 13 peer reviewed manuscripts and 2 book chapters related to this work.

In neurotrauma research, Dr. Bergsneider has studied the neurometabolic pathophysiology of traumatic brain injury. This has involved the application of positron emission tomography in the study of acute, severely head-injured patients. The research has had NIH funding (NINDS 30308) for which he has been the principal investigator of one project of a Program Project Grant. He has authored or co-authored 26 peer-reviewed manuscripts and 14 book chapters stemming from this work. The finding of hyperglycolysis acutely following human traumatic brain injury along with the documentation of dissociation of functional and metabolic states following head injury have been notable and key findings in the field.

In intracranial pressure and hydrocephalus pathophysiology research, Dr. Bergsneider’s work directly relates to both the fields of neurotraumatology and hydrocephalus. In 2000, he received a three-year NIH RO1 grant to study a proposed novel relationship between cerebrospinal fluid movement and cerebral hemodynamics. This work, which initially involved experimental porcine laboratory studies, has evolved into clinical studies measuring cerebral hemodynamics and intracranial pressure in hydrocephalic and brain-injured patients.
In a joint collaborative project with the UCLA NeuroEngineering Program, Dr. Bergsneider is developing a novel ventricular catheter incorporating micro-electronic machine systems (MEMS) technology. This work has received a UC Discovery Grant and industry support (Medtronics). A patent has been submitted pertaining to the work. In the area of brain tumor research, Dr. Bergsneider is an investigator in a multicenter convection-enhanced delivery trial for malignant gliomas (Precise trial) and a UCLA multidisciplinary study assessing PET tracers in gliomas (co-author of one peer-reviewed manuscript).

Antonio DeSalles, MD, PhD

- Professor In-Residence
- Member of the Neurosurgery Faculty since January 1990
- Author or co-author of 136 professional publications (86 peer-reviewed)

Dr. DeSalles is the Head of Stereotactic Surgery, Co-Director of the Radiosurgery Program, and Director of Surgery for Movement Disorders at UCLA. Dr. DeSalles focuses on non-invasive techniques of surgery for the management and treatment of brain disease, particularly inoperable brain tumors, arteriovenous malformations, trigeminal neuralgia and Parkinson’s Disease using the Novalis delivery system and shaped-photon beam surgery. Dr. DeSalles has extensive experience implanting brain pacemakers for Parkinson's Disease and tremors. Dr. DeSalles has been particularly interested in the application of radiosurgery to traditionally difficult CNS abnormalities. Clinically, his research has focused on inoperable brain tumors, arteriovenous malformations and functional disorders. Dr. DeSalles' recent interests incorporate investigating the potential of radiosurgery in the treatment of epilepsy and Parkinson's Disease. Through collaborations within the Department of Molecular and Medical Pharmacology, studies have been designed to determine how non-lethal doses of radiation can functionally alter neurons, thereby preventing them from developing seizures or possibly slowing the progression of Parkinson's Disease. For epilepsy, this would provide an important alternative to the standard approach.
of surgically removing the site of seizure onset allowing the patients the opportunity to avoid the complications associated with tissue removal. For Parkinson’s Disease, this would provide an entirely new method of countering the disabling symptoms non-invasively. Dr. DeSalles trains a number of research fellows (anywhere from three to four per year), focusing on areas of radiosurgery and deep brain stimulation.

John Frazee, MD
- Clinical Professor
- Director of the Neuroendoscopy Program
- Member of the Neurosurgery Faculty since July 1982
- Author or co-author of 79 professional publications (43 peer-reviewed)

Dr. Frazee specializes in neurovascular and endoscopic procedures. Most recently, Dr. Frazee has been interested in the concept of retroperfusion as a potential therapy for stroke. Within several animal studies and launching a clinical trial, Dr. Frazee has tested the viability of taking arterial blood and retroprofusing it through the venous system in order to reach areas in crisis following ischemia. This work has been published in prestigious journals and has resulted in the first clinical trial of retroperfusion, providing unique insight into how this novel technique may provide a back door therapy for stroke.

Itzhak Fried, MD, PhD
- Professor-In-Residence
- Director of the Epilepsy Surgery Program
- Co-Director of the UCLA Seizure Disorder Center
- Member of the Neurosurgery Faculty since July 1992
- Author or co-author of 80 professional publications (77 peer-reviewed)
The Epilepsy Surgery Program is dedicated to the treatment of epilepsy in cases where the seizures cannot be controlled by medications, but are focused in origin, emanating from a distinct area of the brain that can be surgically resected. The key to the success of this treatment is the evaluation of each patient prior to surgery to determine the precise area of the seizure focus as well as to limit the resection in order to minimize deficits. The UCLA Seizure Disorder Center headed by Drs. Jerome Engel, Jr., John Stern, Marc Nuwer, and Itzhak Fried, evaluates and refers patients for epilepsy surgery. Dr. Fried is involved at each stage of the decision-making process and performs the surgeries, including interoperative evaluations such as electrocorticography and language mapping.

Dr. Fried heads the Cognitive Neurophysiology Laboratory, where studies are conducted using the unique opportunity provided by those epilepsy patients who are being evaluated for seizures using depth electrodes placed in the medial temporal lobe. Recording responses from single neurons, Dr. Fried's group has reported on the neuronal basis of visual perception and memory encoding and retrieval in 98 patients. As one of the very few laboratories today with the resources to conduct such experiments directly in human subjects, investigators have made great strides in elucidating neuronal involvement in basic functions of human cognition, such as recognition of stimulus features and categories, imagery vs. direct perception, the invariance of the response to the same stimulus presented in various guises, excitatory vs. inhibitory responses, episodic memory, responses to complex audiovisual sequences and human navigation. This work has been supported by NIH/NINDS funding for nine years, in addition to several smaller foundation awards.

Dr. Fried has forged research collaborations not only with other laboratories at UCLA (Psychology and the Brain Mapping Center), but also across the country, including Caltech, Brandeis, MIT, and the University of Pennsylvania as well as Tel-Aviv University and the Weizmann Institute in Israel. Due to the novelty of the findings from Dr. Fried's laboratory, the reports have been favorably received by reviewers for major research publications including Nature (4), Nature Neuroscience (2), Science (1), Nature Reviews in Neuroscience (1), Neuron (3), and Cerebral
Cortex (1). For his contributions to understanding the physiology of human cognition, Dr. Fried has been named Fellow of the American Association for the Advancement of Science. He is also a Fellow of the American College of Surgeons. Clinically his outreach projects have included China, India and Israel, where he is concurrently Director of the Epilepsy and Movement Disorders Surgery Program, which he established at Tel-Aviv University Medical Center to serve the entire Middle East area.

Christopher Giza, MD

- Assistant Professor In-Residence
- Member of the Neurosurgery Faculty since July 2001
- Author or co-author of 23 professional publications (22 peer reviewed)

Dr. Giza serves with a secondary appointment in Pediatric Neurology. His research is aimed primarily at understanding the consequences of traumatic brain injury to the developing brain. His laboratory research investigates molecular and cellular changes following traumatic brain injury with regard to abnormal neurotransmission, experience-dependent plasticity, posttraumatic seizures and cognitive outcome. This work has been supported by two grants from NIH and continues to be recognized nationally as providing some of the current breakthroughs in understanding how the developing brain responds to traumatic brain injury. In his efforts to foster translational research, Dr. Giza has also launched a multidisciplinary project involving collaborators in pediatrics from Critical Care, Neurosurgery, Neurology, Radiology and Psychiatry. The goal of this collaboration is to translate his findings from the laboratory to the clinic and to proceed with assessment of acute physiological parameters, neuroimaging studies and neuropsychological tests in pediatric patients to understand how the brain recovers from traumatic brain injury when it occurs early in life.

Dr. Giza is co-investigator on three separate R01 research studies as well as recipient of a K08 award for study of NMDA receptor dysfunction after traumatic brain
injury. In 2002-2003 he was the recipient of the UCLA Brain Injury Research Center Young Investigator Award.

Thomas Glenn, PhD

- Assistant Adjunct Professor
- Member of the Neurosurgery Faculty since July 2004
- Author or co-author of 34 professional publications (22 peer-reviewed)

Dr. Glenn is focused on the pathophysiology of cerebral blood flow and metabolism following acute brain injury. This research has led to important contributions in the area of neurotraumatology. These clinical studies have revealed that the post-traumatic brain may require additional energy sources, such as lactate, during the acute period. Through the use of unique isotopomer forms of glucose, Dr. Glenn and his team have shown that glucose utilization after head injury may be directed down biochemical pathways other than those used for energy production. Recent studies in the lab at LABioMed (Harbor/UCLA) have characterized the control of vascular function by lactate and pyruvate. Dr. Glenn's research has led to several oral presentations at both national and international meetings.

Fernando Gomez-Pinilla, PhD

- Professor In-Residence
- Secondary appointment in Physiological Science
- Director of the Neurotrophic Research Laboratory
- Member of the Neurosurgery Faculty since July 2001
- Author or co-author of 62 professional publications (59 peer-reviewed)

Dr. Gomez-Pinilla's research laboratory has pioneered current understanding of the molecular and cellular mechanisms by which experience and life style affect brain and spinal cord plasticity and function. This research is centered on the capacity of endogenous neurotrophins to promote reorganization of neural circuits under the
action of activity. Research from this laboratory has provided novel evidence for the action of activity, cognitive challenges, and nutritional factors as determinant of the capacity of the brain and spinal cord to respond to injury insults. Currently under investigation are the mechanisms of exercise on neural regeneration after traumatic brain injury, rehabilitative strategies to improve functional recovery after brain and spinal cord injuries, and robotic approaches for controlling brain metabolism. New findings portraying neurotrophins as a pivotal system by which specific behaviors impact the function of the central nervous system have opened exciting avenues for therapeutic applications. Current efforts focus on guiding development of clinical applications after brain and spinal cord insult.

Neil Harris, PhD

- Assistant Professor
- Member of the Neurosurgery Faculty since July 2004
- Author or co-author of 39 professional publications (36 peer-reviewed)

Dr. Harris is focused on both experimental and clinical areas of traumatic brain injury. His experimental brain trauma research performed under the BIRC takes advantage of the UCLA MicroPET and microCT imaging center. This approach will soon expand to use of the BIRC small animal 7 Tesla MRI following installation in 2006, important resources that confer valuable translational research capabilities both for funding activities as well as the acquisition of clinically-relevant data using highly reproducible animal models of brain trauma. The general research emphasis of Dr. Harris’ work is on recovery of function after trauma with general goals of understanding how the initial perturbations in cerebral blood flow and metabolism affect the ability of the brain’s endogenous mechanisms to alter functional outcome, and determining how changes in the molecular environment of the extracellular space either permit or inhibit neuronal sprouting after trauma. The small animal neuroimaging capabilities allow monitoring of both the physiology and function of the injured brain and how it responds to potential treatments. Combining end-point, double-labeled deoxyglucose-autoradiographic and in situ hybridization assays
together with detailed immunohistochemistry, Dr. Harris is obtaining powerful datasets for gaining insight into the cellular basis for the neuroimaging signal. RNA and protein analysis of either growth factors or inhibitors or markers of cellular plasticity, together with behavioral measures of function are employed in parallel experiments to provide a further means to identify the mechanisms by which the injured brain responds to improve outcome.

Dr. Harris’ research is based primarily within the area of brain injury and recovery of function with some specific studies designed for application of small animal MRI/MRS and PET to monitor various experimental perturbations. Initial studies began using a rat model of infantile hydrocephalus with the major aim of determining what the underlying cerebrovascular, cellular and neurochemical mechanisms are that contribute to improved outcome after early but not delayed ventricular shunting. Numerous studies utilizing MR imaging and spectroscopy as well as histological and behavioral publications arose from this work. Studies in the field of cerebral ischemia began using both the middle cerebral artery embolic suture model as well as a novel starch-microsphere model. Publications have resulted from experiments designed to determine the physiological basis for the decrease in apparent diffusion coefficient observed on vessel occlusion as well as functional imaging work to further discriminate potentially salvageable regions of the initial cerebral infarction. Application of a novel algorithm together with specialized mapping software enabled in vivo measurements of blood-brain barrier permeability after ischemic-reperfusion injury with good correlation to values obtained using end-point techniques. Within the field of traumatic brain injury, Dr. Harris has shown using the controlled cortical impact injury model that, superimposed upon neuronal injury and a large glial and oligodendrocyte response there is an increase in neural precursors indicating a potential involvement in plasticity and recovery of function at more chronic time-points. In the same model, Dr. Harris’ work has focused on secondary axonal injury and a relationship between altered cerebral metabolism and blood flow has been found that, if alleviated, results in decreased axonal injury.
Langston Holly, MD

- Assistant Professor
- Member of the UCLA Comprehensive Spine Center
- Member of the Neurosurgery Faculty since February 2003
- Author or co-author of 15 professional publications (10 peer-reviewed)

Dr. Holly focuses on minimally-invasive and conventional techniques in the surgical management of degenerative, traumatic, and neoplastic spinal disorders. He has published numerous scientific articles and book chapters on the subject of computer image-guided spine surgery. His research has largely been based on cadaver studies investigating novel methods to use computer stereotaxis to navigate within the spine. This technology allows the location of any surgical instrument within the surgical space to be displayed within the virtual space on a computer monitor. Due to its precision and accuracy, image guidance has increased the safety and efficacy of a variety of spinal procedures.

Dr. Holly is principal investigator of a study using fMRI to evaluate the activation of the cerebral cortex in patients with cervical myelopathy. This disorder is caused by damage to nerve fibers within the cervical spinal cord, and manifests with difficulty in hand function and ambulation. His primary interest is in comparing the response of the cerebral cortex to attempts at hand and foot motor activity in cervical myelopathy patients and normal subjects. He is also evaluating the cerebral cortex for any changes in activation following surgical decompression. This study seeks to elucidate information regarding the mechanisms of paraparesis in this disorder, and the potential for reversibility following surgery. Dr. Holly is also co-investigator on two additional research programs.
David Hovda, PhD

- Professor
- Vice Chief of Research Affairs, Division of Neurosurgery
- Director of Brain Injury Research Center
- Member of the Neurosurgery Faculty since July 1989
- Author or co-author of 173 professional publications (107 peer-reviewed)

Dr. Hovda is dedicated to the understanding of the pathobiology of traumatic brain injury. His laboratory focuses on the topic of recovery of function following traumatic brain injury. Over the years, the laboratory has been able to describe the neurochemical and metabolic cascade that occurs from the moment of insult and how these parameters change when injury occurs during development. In animal models of cerebral concussion, this cascade is characterized by an increase in intracellular potassium via the stimulation of N-methyl-D-aspartate receptors resulting in a marked increase in utilization of glucose to drive sodium potassium pumps. This increase in glycolysis is transient, followed within hours by a marked depression in overall cerebral metabolism lasting several days to weeks. This injury-induced cascade dramatically alters the cellular milieu to the point where cells that are not directly and irreversibly damaged are rendered extremely vulnerable to secondary insults, compromising their ability to exhibit therapeutic plasticity. In behavioral studies, Dr. Hovda has addressed the rate and/or extent of recovery spanning several modalities ranging from sensorimotor to cognitive function. In addition to these basic research issues surrounding neuroplasticity and recovery, Dr. Hovda has also maintained an active human patient research program. In this clinical research program, head injured patients have been studied neurochemically through cerebral microdialysis and metabolically via quantitative positron emission tomography. As with the animal findings, human head injured patients have exhibited the same sequence of neurochemical and metabolic events. The strong feature of this research is the capability of bridging the basic-clinical science gap providing a foundation from which to provide translational research to enhance the development of therapeutic treatments for recovery of function from traumatic brain injury.
injury. This work has resulted in numerous publications and continues to be supported by multiple institutions and foundations.

Daniel Kelly, MD

- Associate Professor In-Residence
- Vice Chief of Clinical Affairs, Division of Neurosurgery
- Stotter Chair in Neurosurgery ‘00-‘05
- Member of the Neurosurgery Faculty since July 1993
- Author or co-author of 71 professional publications (36 peer-reviewed)

Dr. Kelly is the Director of the Pituitary Tumor and Neuroendocrine Program and Co-Director of the Clinical Brain Injury Program. Dr. Kelly's expertise is in 1) the treatment of pituitary tumors, 2) minimally-invasive treatment of brain tumors and 3) management of patients with traumatic brain injury. He is the principal investigator of a 5-year NIH R01 grant to determine the incident rate, risk factors and consequences of traumatic brain injury-induced pituitary failure. The study, which is being conducted at UCLA, Harbor/UCLA and UC Davis Medical Centers, involves two prospective randomized trials, including a hydrocortisone replacement trial in acutely injured patients with adrenal insufficiency and a growth hormone replacement trial in patients with trauma-induced chronic growth hormone deficiency. Dr. Kelly's other main research interest is in the advancement of minimally-invasive endonasal surgical techniques for removing pituitary tumors and related skull base tumors. He has worked closely with endocrinologists to form a nationally-recognized Pituitary Tumor and Neuroendocrine Program.

Larry Khoo, MD

- Assistant Professor
- Member of the UCLA Comprehensive Spine Center
- Member of the Neurosurgery Faculty since July 2002
• Author or co-author of 19 professional publications (10 peer-reviewed)

Dr. Khoo is Co-Investigator on three grant-supported research projects in spinal neurosurgery, and is involved in two ongoing IDE FDA studies. Dr. Khoo is a key participant in the regional Los Angeles Depuy Spine Lumbar Artificial Disc Training Center and is recognized as one of the authorities on the emerging area of spinal dynamic motion preservation and arthroplasty. He serves on the North American Spine Society, Neurosurgical Spine Section, and the Spine Arthroplasty Society as a member of the education committees and will serve as scientific chair this coming year in 2 major meetings with over 800 surgeons and 4 smaller meetings with 200-400 attendees on the subjects of minimally invasive surgery and arthroplasty.

Together with his colleagues at the UCLA Comprehensive Spine Center, Dr. Khoo is one of the acknowledged leaders in minimally-invasive spinal fixation and stabilization with several of the keynote academic articles, position statements, and product developments. He has presented over 60 peer-reviewed presentations and over 100 invited talks on the subject nationally and internationally since starting the spinal program three years ago. The UCLA Comprehensive Spine Center has established a standing fellowship from Abbott Spine for international physicians to visit UCLA’s MIS clinical program and has had many foreign fellows spend up to six months observing and learning the Center’s MIS techniques. Dr. Khoo and staff have helped author the definitive national guidelines for lumbar fusion.

Scott Krahl, PhD

• Adjunct Assistant Professor
• Research Physiologist at the VA Greater Los Angeles Healthcare System
• Member of the Neurosurgery Faculty since July 1998

Dr. Krahl is focused on movement disorders and epilepsy research. He has focused his research on the resulting pathophysiology of movement disorders. The altered physiology associated with these types of central nervous system diseases has both consequent and antecedent properties. Through Dr. Krahl's efforts, the hope is to
quiet the propagation component of this dysfunction while at the same time using the unique electrophysiological signatures to locate dysfunctional areas within the brain. This allows both a unique opportunity for the management as well as the treatment of patients with these devastating illnesses.

**Jorge Lazareff, MD**

- Associate Professor In-Residence
- Member of the Neurosurgery Faculty since July 1993
- Author or co-author of 43 professional publications (39 peer-reviewed)

Dr. Lazareff serves as Director of the Pediatric Neurosurgery Program. His primary focus is the treatment of children with neurosurgical disorders. As a pediatric neurosurgeon, Dr. Lazareff continues to have a strong interest in how the developing brain is affected by both disease and surgical percubations. Working with colleagues in developmental neuroscience, Dr. Lazareff has provided unique insights into developmental neurobiology as it relates to neurosurgical problems and procedures. For example, Dr. Lazareff's research endeavors include work with Pediatric Neuro-Oncology to investigate the neuronal stem cell and its relation to pediatric brain tumors, as well as projects to determine the relevance of academic performance as an indicator for Quality of Life of pediatric brain tumor survivors. His team hosts a monthly clinic and meets twice each month to discuss the progress of their patients.

**Stefan Lee, PhD**

- Assistant Professor In-Residence
- Co-Director of the Neurotrauma Laboratory
- Member of the Neurosurgery Faculty since July 1998
- Author or co-author of 36 professional publications (20 peer-reviewed)
Dr. Lee conducts innovative research focused on the pathobiology of traumatic brain injury. His laboratory has made substantial progress in our understanding of how cells that survive the initial insult enter a state of energy crisis. Through several clever experimental designs, Dr. Lee has revealed how following traumatic brain injury, cells exhibited a decrease in ATP that cannot be explained by a substantial decrease in cerebral blood flow to ischemic values. This unusual state has been discovered through a series of studies by fundamentally altering the metabolic process following brain injury in the presence of an increase in energy demand. In animal studies utilizing cortical applications of potassium following concussive brain injury, Dr. Lee has revealed how this increase in energy demand and corresponding energy crisis contributes to secondary cell death. Dr. Lee's work continues to be supported by NIH and is well recognized throughout the neuroscience community as having the highest in merit and scientific insight.

Linda Lian, MD, PhD

- Associate Professor
- Director of the Malignant Brain Tumor Program.
- Member of the Neurosurgery Faculty since January 1999
- Author or co-author of 35 professional publications (26 peer-reviewed)

Dr. Lian’s research activities within the Neurosurgery Program at UCLA include: 1) fundamental basic science research on the molecular biology and genetics of brain tumors; 2) translational pre-clinical research of brain tumor immunotherapy in animal models; and 3) clinical trials of novel vaccine strategies for brain tumor patients. As Director of the Brain Tumor Program in the Division of Neurosurgery, she has consistently obtained an average $800,000 to $1.4 million in active research funding (direct costs) each year for the past five years. This includes multiple NIH grants, various competitive private foundation grants, and some corporate research agreements.
Because of her research activities in the area, Dr. Liau was invited to author and edit a book on Brain Tumor Immunotherapy, which was published by Humana Press and reviewed in the Journal of Neuropathology and Experimental Neurology to be the definitive text in the field. She has also published several invited review articles/chapters in the area of brain tumor immunology (in *Neurosurgery, Molecular Neuro-Oncology, Frontiers in Bioscience, Neurological Research, and Expert Reviews in Neurotherapeutics*).

In the area of clinical research, Dr. Liau recently completed two investigator-initiated, FDA-approved Phase I trials on the use of dendritic cell immunotherapy for malignant gliomas, which are funded by the NIH (R21-CA91545). This work has gained popular attention, as it has been featured on Dateline NBC and National Public Radio, as well as media programs in Asia and Europe. Based on this promising Phase I clinical data, Dr. Liau will be the PI on a multi-center Phase II trial of a dendritic cell-based vaccine (DC-Vax) for the up-front treatment of newly diagnosed patients with glioblastoma. If successful, this will be the first multi-center Phase II trial of a brain cancer vaccine to be conducted in the United States, which will include many of the top medical centers in the country (UCLA, Johns Hopkins, Duke, MD Anderson, Harvard, and Stanford).

Dr. Liau currently serves on two NIH Study Sections (the Brain Cancer PPG review panel for the NCI and the CNBT study section for the NINDS), the Scientific Advisory Board of the Goldhirsh Foundation, and has been an invited reviewer for several international funding organizations. She serves on the Editorial Boards of *Neuro-Oncology*, *the Journal of Neuro-Oncology* and *Surgical Neurology*, as well as for several international neurosurgical journals, has been on the Executive Committee of the AANS/CNS Tumor Section for the past five years, and currently serves on the Executive Committee of the Congress of Neurological Surgeons (CNS) for the 2005-2008 term. She has been a Visiting Professor and invited speaker at Stanford University, Harvard University, UCSF, and the Cleveland Clinic Foundation. She has had 14 peer-reviewed papers published or accepted for publication for the year 2005 alone.
Neil Martin, MD

- Professor
- Chief of Neurosurgery
- Executive Vice-Chairman, Department of Surgery
- Head of the UCLA Stroke Center
- Director of the Cerebrovascular Program.
- Member of the Neurosurgery Faculty since October 1985
- Author or co-author of 210 professional publications (138 peer-reviewed)

Dr. Martin specializes in the research and treatment of neurovascular disorders, including arteriovenous malformation, aneurysm and stroke. Over the last 20 years on the faculty at UCLA, Dr. Martin has founded and served as Director of the UCLA Cerebral Blood Flow Clinical Laboratory (a hospital laboratory which performs all the patient transcranial Doppler and bedside CBF studies at UCLA Medical Center); and in parallel developed and directed the Cerebral Blood Flow and Metabolism Research Laboratory. The clinical laboratory is one of the busiest of its kind in the country, and has trained most of the Transcranial Doppler practitioners in Southern California, and many from around the nation and the world. The research laboratory is internationally known as a leader in the clinical investigation of cerebrovascular pathophysiology in patients with acute brain injury from trauma, hemorrhage, and stroke. He also founded and built the UCLA Neurovascular Program with colleagues in Neurosurgery and Neuroradiology. This program is recognized worldwide for joint neurosurgical/interventional neuroradiological management of the most complex cerebrovascular disorders, and for innovation in the development and application of new technologies in this field.

Dr. Martin founded and served as Co-Director of the UCLA Stroke Service along with Bruce Dobkin, MD, of the Department of Neurology. With the arrival of Jeffrey Saver, MD, and the collaboration of Sidney Starkman, MD and Fernando Vinuela, MD, the multidisciplinary UCLA Stroke Center was formed in 1995. In the 10 years since, the UCLA Stroke Center has become arguably the top academic Stroke Center in the world. Dr. Martin has served as Co-Director of the UCLA
Brain Injury Research Center with the founders Donald Becker, MD, and David Hovda, PhD. This research program, which spans basic science and clinical investigation, initiated the multicampus UC Neurotrauma Consortium, and is recognized as one of the top two or three traumatic brain injury research centers in the world. Since last year Dr. Martin has been Vice-Chairman of the Department of Surgery.

Dr. Martin served in a clinical and administrative role as Medical Director of the Neurosurgical ICU, Co-Director of the Stroke Center, and Medical Director of the Care Coordination Team for the Clinical Neuroscience Service. He served as Program Director for the UCLA Neurosurgical Residency Training Program, where he enhanced the educational conference schedule, established a new Resident Research Committee to assist in planning, funding, and monitoring of the research plan, renovated the resident's office and library, initiated a practical course for surgical technique training, and successfully applied to the Neurosurgical Residency Review Committee of the American Board of Neurological Surgery to increase the size of UCLA's Neurosurgery training program from 12 to 19 residents, making the program one of the largest in the country. Dr. Martin has participated in the training and mentoring of several neurosurgical junior faculty members, more than 40 neurosurgical residents, 20 neurosurgical clinical or research fellows, and a number of medical students and undergraduates. Many have gone on to academic appointments, and three who worked in his research and clinical program have gone on to become directors of neurovascular or neuro-endovascular programs at prominent academic medical centers.

Dr. Martin developed a busy and successful neurosurgical practice supporting the training of neurosurgical residents, fellows, and UCLA medical students. For the last 10 years, he has been one of the most active admitting physicians on the UCLA Medical Staff (often among the top 10). To support this clinical practice, which has been the primary source for resident training in neurovascular surgery, he typically spends 10-15 hours a week evaluating patients in the outpatient clinic or in the hospital; and 10-15 hours a week in the operating room. He has developed a favorable regional, national, and international reputation as a clinician and surgeon,
as well as being listed as one of the Best Doctors in America in the area of neurovascular surgery since 1994, and similarly cited in Los Angeles Magazine and Good Housekeeping Magazine. Dr. Martin is invited to speak at practical courses or seminars virtually every year at the national neurosurgical meetings, and at international meetings and courses in Europe, Asia, Mexico and South America, and the Middle East.

As Principal Investigator, Dr. Martin has been awarded three NIH grants for original clinical investigations of 1) post-traumatic cerebral arterial spasm (completed), 2) cerebral blood flow and substrate metabolism following traumatic brain injury (completed), and 3) minimally invasive endoscopic treatment of intracerebral hemorrhage (ongoing). He is Principal Investigator of a grant from TATRC (Telemedicine and Advanced Technology Research Center, Department of Defense) to study the utility of a remote-presence robot, integrated with our mobile wireless medical record system, for remote monitoring, examination, and management of critically-ill ICU patients (ongoing).

Dr. Martin has published more than 130 peer-reviewed articles. Nine of these articles represent seminal or definitive works in their respective areas, and have been cited approximately 100 times or more. These include unique work on diagnosis, epidemiology, and clinical significance of post-traumatic cerebral arterial spasm; and the first-ever comprehensive definition of the characteristics and time-course of the hemodynamic and metabolic phases that follow severe human traumatic brain injury.

Together with the Division of Neurosurgery informatics team, he developed a software program that automates the clerical tasks of resident pre-rounding, rounding list generation, progress note generation; and that also provides wireless mobile access, on PDAs and smartphones, to the patient data required for clinical decision making. This software system saves the neurosurgical residents substantial time, and eliminates some of the non-educational clerical chores that detract from meaningful clinical training. This application has proven valuable enough that it has been adopted by virtually all the surgical services, and many of the other clinical services at UCLA.
Gary Mathern, MD

- Associate Professor In-Residence
- Director of the Pediatric Epilepsy Surgery Program
- Member of the Neurosurgery Faculty since July 1996
- Author or co-author of 77 professional publications (60 peer-reviewed)

Dr. Mathern collaborates with the Epilepsy Program to provide surgical treatment for children with epilepsy. The focus of his basic science laboratory is clinical-pathological studies of epilepsy surgery patients to discern mechanisms that promote or generate seizures. The most important recent advances are related to fundamental cellular mechanisms of epilepsy in pediatric cortical dysplasia tissue. These studies were performed in collaboration with the in vitro electrophysiology laboratory of Drs. Mike Levine and Carlos Cepeda. In summary, this team found that neurons from cortical dysplasia cases display abnormal intrinsic membrane properties, especially if the cells were dysmorphic. Large balloon cells had no intrinsic membrane properties and did not respond to glutamate receptor agonists. By contrast, cytomegalic neurons showed signs of cellular hyperexcitability from voltage-gated calcium currents. In addition, NMDA receptors are known to be altered in dysplasia tissue with many cells showing reduced magnesium blockade (hyperexcitability) similar to immature developing neocortex. In collaboration with Noriko Salamon, MD (Neuroradiology), Dr. Mathern’s group determined gray and white matter volumes and neuronal densities in cortical dysplasia patients, and found more neurons than expected in a pattern supporting the concept that dysplasia involves abnormalities of late corticoneurogenesis with retained components of the prenatal pre-plate. Their most recent report is consistent with this notion by showing that GABA not glutamate is the predominant neurotransmitter in cortical dysplasia tissue. Collectively, the recurrent theme from these findings is that cortical dysplasia tissue retains cellular and network properties of developing prenatal neocortex, and some of these properties, like NMDA and GABAA receptor signaling, are probably “pro-epileptic.”
The other surgical patient group involved in clinical pathological studies are adult patients with temporal lobe epilepsy. Dr. Mathern and colleagues have published a study showing that seizures decrease postnatal granule cell neurogenesis in the human hippocampus. These data are different from rodent models that found that status epilepticus is associated with increased granule cell production. Long-term clinical-pathological studies of hippocampi from temporal lobe epilepsy patients show that the pattern of cell damage, termed hippocampal sclerosis, is most likely from an initial precipitating injury that occurs early in life followed by additional neuronal loss as a consequence of many years of epilepsy. They also studied the consequences of cell loss and aberrant mossy fiber sprouting on the epileptic hippocampus of geriatric patients in a collaborative review with other basic and clinical researchers. Finally, in a collaborative study with Tallie Baram at the University of California, Irvine, Dr. Mathern and colleagues have found changes to the hyperpolarization-activated cyclic nucleotide-gated cation channel (HCN) in dentate granule cells of temporal lobe epilepsy patients that may be a mechanism to reduce seizure spread. Future studies with this laboratory will address HCN channels in cortical dysplasia tissue.

Concurrently, Dr. Mathern continues to develop the pediatric epilepsy surgery program clinically and academically. His group has described a new technique for performing cerebral hemispherectomy tailored toward the abnormal pathologies found in young children, namely hemimegalencephaly and diffuse cortical dysplasia, and compared the “newer” procedure to traditional hemispherectomy operations for outcome and complications. The pediatric hemispherectomy cohort were clinically characterized by showing differences in seizure and developmental outcome by pathological substrate. More than five post-operative seizures denote poorer seizure control after hemispherectomy. The motor deficits of the arm and leg were characterized and found to vary by pathological substrate after hemispherectomy, similar to outcomes for language. The large hemispherectomy cohort at UCLA (now numbering over 135) is being used to discern outcomes in this unique surgical population. Dr. Mathern and his team have studied children with seizure onsets during infancy and found that poorer developmental outcomes were strongly associated with longer seizure durations. The best developmental outcomes were in
those children whose seizures were controlled by 18 to 24 months of epilepsy indicating the need for early surgical intervention. These reports contribute to the growing literature on the care and treatment of pediatric epilepsy surgery patients.

Duncan McBride, MD

- Associate Clinical Professor
- Chief of Neurosurgery at Harbor/UCLA Medical Center
- Member of the UCLA Comprehensive Spine Center
- Member of the Neurosurgery Faculty since July 1988
- Author or co-author of 34 professional publications (18 peer-reviewed)

Dr. McBride concentrates his efforts in spinal surgery with a special interest in spinal fusion, degenerative traumatic disorders, and tumors. He has had a long interest in the clinical management and treatment of disorders and diseases within the spinal cord. His research interests have focused on exploring ways to improve the outcome of patients who have received neurosurgical procedures related to spinal fusion, degenerative traumatic disease and tumors within the spinal cord.

Ichiro Nakano, M.D.

- Clinical Instructor
- Member of the Neurosurgery Faculty since 2006
- Joint appointment in the Department of Pediatrics
- Author or co-author of 13 professional publications (12 peer-reviewed)

Dr. Nakano came to UCLA from the Kyoto University Graduate School of Medicine, after completing his residency at Kitano Hospital in Japan. His research and clinical activities include treatments for pediatric patients with brain tumors, and the investigation of neural stem and tumor cell behavior.
Valeri Nenov, PhD, PhD, Dipl. Ing.,

- Adjunct Associate Professor
- Head of the Brain Monitoring and Modeling Laboratory
- Member of the Neurosurgery Faculty since July 1992
- Author or co-author of 35 professional publications (23 peer-reviewed)

Dr. Nenov works in conjunction with the Neurocritical Care Program to provide state-of-the-art computerized intensive care monitoring. Dr. Nenov's laboratory focuses on the design and development of systems for continuous physiological monitoring of the brain in traumatic brain injured patients. In addition, his work has included the computational modeling of patients' health status in the Neuro Intensive Care Unit. In studies of memory processes within the medial temporal lobe in the neocortex of epileptic patients, Dr. Nenov's work has provided great insights into the structural functional relationships in human patients. In addition to these studies, Dr. Nenov's laboratory has conducted research on computational modeling of neural networks of the hippocampus and cerebellum, and has developed high temporal resolution fMRI techniques for three-dimensional imaging of cortical and nuclear activation sequences during sensorimotor and cognitive tasks. In addition to these neuroscientific interests, Dr. Nenov's lab has incorporated World Wide Web technologies for the management and remote access to electronic patient records for both the benefit of the individual patient and of the physicians who treat them. Dr. Nenov's recent research and development efforts have been focused on the data management, warehousing and mining components of large scale, muti-center, NIH funded projects in TBI and stroke. Together with Dr. Neil Martin and Farzad Buxey, he is a founder of Global Care Quest, Inc. a UCLA startup company devoted to improving the healthcare process as experienced by physicians and patients by means of mobile wireless information technologies.
Tien Nguyen, MD

- Assistant Professor In-Residence at Harbor/UCLA Medical Center
- Member of the Neurosurgery Faculty since July 2003
- Author or co-author of 3 professional publications (1 peer-reviewed)

Dr. Nguyen specializes in pediatric neurosurgery. Dr. Nguyen's research is focused on the pathophysiology and clinical management of children who have suffered traumatic and non-traumatic brain injury. With a colleague at Harbor/UCLA Medical Center, he organized a collaborative group to evaluate the clinical and neuropsychiatric outcome of moderate and severe brain injury on children admitted to any of the five major pediatric trauma centers in Los Angeles County. At UCLA, Dr. Nguyen and a team at the Center for Cerebral Palsy are in the early stages of a funded project using positron emission tomography (PET) scans and diffusion tensor MRI to study the brains of children who sustained injury during pregnancy or birth. The study's results will identify specific areas of intervention to optimize outcomes and enhance affected children's quality of life. Dr Nguyen plans to start a laboratory to continue the research he conducted during residency, applying intrinsic signal optical imaging in rat models to study brain plasticity after cortical injury. He hopes to utilize the inherent increased potential for plasticity of the developing brain to improve outcomes for children after injury.

Mayumi Prins, PhD

- Assistant Professor-In Residence
- Member of the Neurosurgery Faculty since 2006.
- Author or co-author of 19 professional publications (19 peer-reviewed)

With experience studying plasticity following Traumatic Brain Injury in the juvenile brain as a postdoctoral fellow at Medical College of Virginia, Dr. Prins is currently focused on cerebral metabolism following Traumatic Brain Injury in the developing brain using both in vivo and in vitro approaches.
Robert M. Prins, PhD

- Assistant Professor-In Residence
- Member of the Neurosurgery Faculty since 2006.
- Author or co-author of 17 professional publications (16 peer-reviewed)

Dr. Prins’ research is primarily focused on the study of T lymphocyte-mediated immune surveillance for malignant brain tumors. Early studies addressed distinct immune defects that occur during experimental brain tumor progression; more recently, Dr. Prins has begun to apply this basic immunology experience towards developing new immunotherapeutic treatments for malignant gliomas.

Richard Sutton, PhD

- Adjunct Associate Professor
- Member of the Neurosurgery Faculty since July 2005
- Author or co-author of 36 professional publications (28 peer-reviewed)

Dr. Sutton specializes in animal and human neurotrauma research, with projects supported by state grants, the US Army and NIH. His laboratory research has focused on the development and characterization of clinically relevant models of traumatic brain injury in rodents and the development of therapeutic interventions to reduce the incidence and extent of secondary injury or to speed functional recovery after injury. Dr. Sutton was one of the first neurotraumatologists to work on development and characterization of the controlled cortical impact (CCI) model of traumatic brain injury in rodents.

Dr. Sutton's research employs multiple experimental methods to examine metabolic, neurochemical, cellular/anatomical and behavioral pathologies and responses to injury. His current projects include research to 1) assess the immune/inflammatory responses to injury, 2) determine the effects of low-dose amphetamine treatment on neurotrophic factors and behavioral recovery after injury, 3) assess differences in metabolism and energy deficits within neurons versus astrocytes after injury, 4) evaluate the effects of traumatic brain injury on changes in the use and metabolic fate
of glucose under resting conditions and depolarized states, and 5) determine if sodium pyruvate treatment can reduce neuronal injury and facilitate functional recovery after injury.

Paul Vespa, MD

• Associate Professor of Neurosurgery and Neurology,
• Director of the Neurocritical Care Program
• Member of the Neurosurgery Faculty since July 1996
• Author or co-author of 67 professional publications (50 peer-reviewed)

As a neurointensivist, Dr. Vespa focuses on critical care for the treatment of neurosurgical and neurological patients. His research is focused on in vivo measurements of brain neurochemistry and brain electrophysiology in human subjects with traumatic brain injury in the ICU. This includes direct brain monitoring research in the NICU and neurochemistry research laboratory to analyze blood CSF and microdialysis samples collected within the ICU. His published work has focused on measuring and defining excitotoxic and endogenous secondary insults in neurocritically ill patients with brain trauma, stroke and intracerebral hemorrhage. In doing this, Dr. Vespa has contributed to the understanding of the neurochemical behavior of acute injury and defined potentially new treatments to prevent or offset these secondary insults. He has advocated the use of continuous electrophysiological monitoring, microdialysis monitoring and magnetic resonance spectroscopy to diagnose and treat ongoing excitotoxicity as well as to establish work to understand significant changes in neurochemistry following human traumatic brain injury and intracerebral hemorrhage. His work has received acclaim throughout the United States and has received generous support from NIH, and his work is supported by several NIH grants and state grants. Dr. Vespa, under a K08 award, is studying the incidence and significance of epileptiform seizures that occur after traumatic brain injury. He is a member of the Board of Directors of the Neurocritical Care Society, and is a principal reviewer for the journals Critical Care Medicine and Neurocritical Care.


**Joint Appointments**

John Boscardin, PhD, is with the Department of Statistics.

Gary Duckwiler, MD, serves as Director of the Neuroradiology Fellowship Program, Division of Interventional Neuroradiology, and Associate Professor of Radiology.

Reza Jahan, MD, is an Assistant Professor holding a joint appointment in Neurosurgery and Interventional Radiology.

A. Nick Shamie, MD, FAAOS, serves the Department of Orthopedics and the Division of Neurosurgery.

Fernando Vinuela, MD, is Director, Division of Interventional Neuroradiology, and Professor of Radiology for the UCLA Department of Radiological Sciences.

Jeff Wang, MD, serves the Department of Orthopedics and the Division of Neurosurgery.

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**Clinical Voluntary Faculty**

James Ausman, MD, PhD

- Clinical Professor
- Member of the Neurosurgery Faculty since December 2003

Dr. Ausman was recruited onto the Clinical Voluntary Faculty in 2003. He is the former chairman of the Department of Neurosurgery at Henry Ford Hospital and the University of Illinois at Chicago, having built two internationally recognized departments of neurosurgery. He has been the Chairman of the Nominating Committee and Chairman of the Education Committee of the World Federation of Neurological Societies. Dr. Ausman is also the editor of the international journal
Surgical Neurology, one of the leading neurosurgical journals, and a consultant to Navigant Consulting Inc. specializing in Strategic Planning and Market Research for the Healthcare Industry specializing in the development of neuroscience centers. Beyond his formal role, he lends his deep expertise to administrative and strategic planning.

Frederic L. Edelman, MD, FACS
• Associate Clinical Professor
• Co-director of the Peripheral Nerve Clinic
• Member of the Neurosurgery Faculty since February 1970

Dr. Edelman focuses on peripheral nerve injury and peripheral nerve tumors with a special interest in brachial plexus injury. His work aids patients suffering from degenerative spine disease, tumors, traumatic injury, post-irradiation neuritis, chronic compression, and pain syndromes where an anatomic lesion is suspected. Dr. Edelman and his team utilize specialized Magnetic Resonance Neurography imaging techniques and other highly innovative tools to diagnosis patients.

Avner I. Feldman, MD, FACS
• Associate Clinical Professor
• Member of the Neurosurgery Faculty since January 1962

Dr. Feldman contributes to clinical teaching within the Division of Neurosurgery.

Dennis R. Malkasian, MD, PhD
• Associate Clinical Professor
• Member of the Neurosurgery Faculty since January 2004

Clinical Professor and Senior Anatomist, UCLA Skull Base Laboratory, is focused on rendering additional educational opportunities for neurosurgical residents, post-doctoral trainees, faculty and practicing neurosurgeons on the clinical aspects of advanced neurosurgical anatomy. In addition, Dr. Malkasian is dedicated to support and enhance clinical research projects for the faculty and residents of the Division of Neurosurgery.

Paul Zeltzer, MD

• Associate Clinical Professor

• Member of the Neurosurgery Faculty since October 2005

Dr. Zeltzer is a specialist and expert in the diagnosis and treatment of brain tumors in children and adults. He completed training at UCLA as a specialist in Pediatric Hematology and Oncology and Tumor Immunology. Dr. Zeltzer’s research includes molecular and biological based therapies for brain tumors; clinical trials for childhood cancer treatment; Phase II/III studies for treatment of glioma, medulloblastoma/PNET; home infusion of chemotherapy; and immunotherapy approaches to human cancer.
Secondary Appointments of Neurosurgery Faculty

Itzhak Fried, MD PhD, holds a secondary appointment in the Department of Psychiatry and Biobheavioral Sciences.

Christopher Giza, MD, holds a secondary appointment in the Department of Pediatrics.

Fernando Gomez-Pinilla, PhD, holds a secondary appointment in the Department of Physiological Sciences.

Langston Holly, MD, holds a secondary appointment in the Department of Orthopedics.

David Hovda, PhD, holds a secondary appointment in the Department of Pharmacology.

Larry Khoo, MD, holds a secondary appointment in the Department of Orthopedics.

Ichiro Nakano, MD, holds a secondary appointment in the Department of Pediatrics

Valeriy Nenov, PhD PhD, holds a secondary appointment in the Department of Bioengineering.

Paul Vespa, MD, holds a secondary appointment in the Department of Neurology.

Paul Zeltzer, MD, holds a secondary appointment with the Department of Pediatrics.
NEUROSURGERY STAFFING AND ADMINISTRATION

Over the last four years, UCLA's Division of Neurosurgery has adjusted overall number of faculty and staff FTE according to budgetary constraints. Fiscal year 2002 ended with a compensation account deficit. The number of faculty and staff FTE employed in July 2001 was 110. The number of FTE as of July 2002 decreased to 107 in response to the deficit generated in the prior fiscal year. After the divisional finances began to stabilize in FY04 number of FTE was reinstated. In fact the division has experience an increase in manpower of about 21% over the last four years. For the current FY06, divisional manpower breakdown by mission consists of:

- Education FTE: 43%
- Research FTE: 24%
- Clinical FTE: 24%
- Administration FTE: 9%

This balanced distribution of dedicated FTE further demonstrates Neurosurgery's commitment to the teaching, academic, and patient care mission established not only in its own mission statement, but also in the mission of UCLA and the UC System as a whole. It should be noted that the active faculty has grown by nearly 30% over the last three years.

A reliable, efficient, and proactive administration staff is critical for an academic and research program to be successful. UCLA's Division of Neurosurgery invests a great deal in ensuring its faculty members work with teams that not only support the work at hand, but also challenge and contribute to concepts and ideas to further overall goals.

With faculty and staff members spread throughout various locations in Westwood, Santa Monica, and Torrance, a decentralized structure in which various self-sufficient teams report to and collaborate with the greater institution of the Division of Neurosurgery has proven to be effective. Each team is associated with one or more Division programs, with all program leaders reporting to the Chief of Neurosurgery. The residency program is a focal point of the entire organization, and draws upon all programs and levels of support.
Despite a decentralized structure, UCLA’s Division of Neurosurgery has a remarkably cohesive team, committed to excellence in patient care, research, and education. To ensure the objectives of the faculty and administration are aligned, the Management Service Officer attends monthly faculty meetings, weekly BIRC meetings, weekly meetings with the Chief, bi-weekly outpatient clinic meetings, and weekly or as needed meetings with the Divisional Contracts and Grants MSO. There are monthly staff meetings to provide staff members with input and instruction concerning administrative and clinical procedure and protocol. Over 101 combined Compensation, Contracts and Grants and Various Donors FAU’s are reconciled on a monthly basis. Faculty are provided with monthly profit/loss statements

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<td><strong>118.50</strong></td>
<td><strong>123.75</strong></td>
<td><strong>129.50</strong></td>
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workstudy = 0.25 FTE per person
Tallied at the beginning of each fiscal year (July)

Neurosurgery Manpower Trend, ‘01-‘06
regarding their clinical practice and various donors account balances. Over 96 Contracts and Grants accounts are reconciled on a monthly basis with financial information provided to PI's on a quarterly basis or on demand as requested by the Chief or PI. The BIRC state grant is reconciled on a monthly basis and a monthly financial meeting occurs between the Contracts and Grants MSO, the BIRC Director and Divisional Administrator. A BIRC Annual Report is generated and provided to the Office of the President on or around December of each year.

**It has been essential for UCLA's Division of Neurosurgery to exist within a decentralized structure due to space constraints placed upon the Division.**

From a clinical standpoint, patients are evaluated and treated in three separate locations. Basic science laboratories exist in three separate buildings. Division Administration staff occupy space in two separate buildings. Faculty offices exist in 100 Medical Plaza, 200 Medical Plaza, 300 Medical Plaza, Reed Neurological, NPI, CHS, the Factor Building and the Santa Monica UCLA Medical Center. Whether or not departmental status is granted, it is essential that Neurosurgery secure appropriate space allocations that will enable benchwork to bedside type research endeavors to thrive. Future space requirements entail acquisition of administrative space in close proximity to clinical laboratories, allowing collaboration between the clinicians and research faculty. A comprehensive space proposal was submitted to Alan Robinson, Associate Vice Chancellor, in November 2004.

The proposed organizational chart for department status (see Appendix D) is already in place on a functional basis. The chart reflects the breadth and complexity of Neurosurgery at the David Geffen School of Medicine at UCLA as well as the extent of collaboration on all levels with other departments, schools, and affiliated medical centers. The proposed organizational structure for the new Department will entail the senior administrator reporting directly to the Chairman. This senior administrator will function as the Department's Chief Administrative Officer responsible for Strategic Planning, Management of Fiscal Affairs, Contract and Grants Administration, Academic and Staff Personnel Administration, Oversite of Information Technology, Purchasing and Accounts Payable, Facilities Management and Space Utilization, Ambulatory Care Services, Group Practice Billing and Accounts Receivable.
While in the conversion phase to become a new department, it is proposed that a Transition Planning Task Force be assembled that would include individuals from the Department of Surgery, including the existing CAO, Fiscal Affairs Officer, Academic Personnel Coordinator and Surgery Education Office Student Affairs Officer; the Dean's Office; the Medical Center; and the Department of Neurosurgery. In addition the Chairman will establish several committees in order to provide counsel to the Chair, Chief Administrator and staff. Daniel Kelly, MD, has already been appointed Chief of Clinical Affairs and David Hovda, PhD, has been appointed Vice Chief of Research Affairs in an effort to provide administrative support to the chief in the transition and into the future for the new department.

Resources exist within the current division administration in order to assume many of the newly acquired responsibilities of becoming a department, specifically in the fund management and purchasing areas. However, it will be preferable for the new Department to maintain utilization of certain services provided by the Department of Surgery in order to maintain economies of scale and the fiscal well being of the Department of Surgery. The services Neurosurgery intends to purchase from the Department of Surgery are Academic Personnel, Staff Human Resources/Payroll, and selected elements of Information Technology and Surgery Education. With respect to Academic Personnel, it will be beneficial for Neurosurgery to maintain a mechanism to solicit votes and feedback across a broader scope than merely the Neurosurgery faculty alone in order to maintain the integrity of the academic promotion process. Regarding Surgery Education, the Neurosurgery Education Office will maintain its longstanding relationship with the Department of Surgery to facilitate basic general surgery training principles across all disciplines for first year residents.

The administration is confident that should Neurosurgery earn department status, the team will respond with vigor to any new demands and welcome an opportunity to learn and grow with increasing authority. The current Chief is well poised to assume the role of Chairman as he has been acting Executive Vice Chairman for the Department of Surgery for the last one and a half years.
NEUROSURGERY FINANCES

The Division of Neurosurgery has a proven track record of establishing fiscally responsible budgets while advancing the institution's teaching, research and patient care missions. The Division's leadership has consistently taken a proactive approach to responsible fiscal management by constantly seeking new and innovative way to subsidize it's important work. Fiscal challenges experienced over the past five years have included: 19900 reductions, a shift of nursing costs to departments, cancellation of CTS funds, rising malpractice expenses, increased institutional taxes such as PSS, reductions to BIRC's state grant imposed by the Chancellor's office, and increasingly stringent NIH funding criteria. The Neurosurgery faculty are committed to overcome all these financial hurdles in order to benefit the community they serve in Southern California and society as a whole.

Supporting the Clinical Mission. The first fiscal/academic year under the leadership of Neil Martin, MD as Division Chief (FY02) ended with an annual operating deficit of over a half million dollars. At that time, the division was facing the loss of two highly productive spine faculty and the degradation of the performance of the division's billing company. The Division's

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<th>NEUROSURGERY 12-STEP PLAN FOR FINANCIAL REFORM</th>
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<td>(developed and followed by Neurosurgery, 2001-2004, and ongoing)</td>
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1. **Careful auditing and optimization** of billing and collection. Recommend outside practice management consultant to evaluate and formulate a work plan. Continuous periodic follow-up of work plan and status.

2. **Increased Professional Fee Schedule** to no less than 500% of RBRVS.

3. **Coding instruction for faculty** resulting in improved dictation for better charge capture. Ultimate goal for faculty to perform own coding.

4. **Established cost-center policy** that each faculty operates as their own cost center. Monthly profit/loss statements provided to each faculty member.

5. **Delegating expenses for as many individual practice overhead and personal academic (travel, dues, etc.) categories as possible to individual faculty Profit/Loss.**

6. **Established “break-even” policy** that each faculty must “Break Even” within their cost center. Any deficit incurred will be covered by direct payment back to the division or by reduction in salary the following year. Policy established after faculty saw favorable results of billing/collection optimization initiative.

7. **Providing statistics/data, frankly and anonymously, presented publicly in a faculty finance meeting, include faculty deficits and clinical/research productivity for each faculty member, but identified only by SSN. Goal is to promote peer pressure toward improved performance/productivity.**

8. **Established research funding policy** that resident research rotations or any rotation not covered by the hospital must be covered by grant, fellowship, or unrestricted funds.

9. **Aggressively billing** for physician extender services with a goal of break-even status. Established profit/loss statements for each physician extender.

10. **Formulated a development plan, comprehensive in scope.**

11. **Pursuing corporate partnerships** for consulting activities, and research and development funding.

12. **Pursuing opportunities for commercialization of intellectual property.**
leadership developed and executed a proactive plan of action called the "12 Step Financial Reform Program." The program, was initiated at the beginning of FY03, and resulted in year-end retained earnings or "operating profit" of $191K. This represents a monetary turnaround of over $720K in a single year. Since that time, the division has been able to demonstrate its commitment to fiscal responsibility by ending the year with operating surpluses of $109K in FY04 and $145K in FY05.

The Division of Neurosurgery's clinical programs' have experienced consistent and steady growth over the past four years. The Division of Neurosurgery has been the number one admitting surgical service to the UCLA Medical Center-Westwood over the past four years. The overall Division has averaged 8.1% growth in the number of admissions to UCLA Medical Center and Santa Monica Medical Center combined. Neurosurgical admissions to Santa Monica Hospital have tripled in that four-year period as Neurosurgery adhered to the institutional charge to move spine cases from Westwood to Santa Monica. The Division has been able to admit more complex cases for operative intervention and has seen an average admissions increase of 3% per year.
Surgeries/Procedures: The Division of Neurosurgery has experienced steady growth in surgical procedures. In FY02, 1,814 procedures were performed in the UCLA Medical Center main operating rooms, 200 Medical Plaza outpatient facilities, and Santa Monica-UCLA operating rooms. Based on the first six months of activity for FY06, the number of procedures is projected to be 2,318, a 28% increase over five years or an average increase of 5.6% per year.

Outpatient Volume: The Division of Neurosurgery has demonstrated steady growth in its number of outpatients. In FY02 the number of outpatient visits in all locations (300 Medical Plaza, 200 Medical Plaza, CRC, 1245 16th Street Building) totaled 5,613. In FY05 the Neurosurgery faculty saw 8,630 patient visits, an increase of 54% over the duration or an average of 13% annual growth.

Clinical Revenue: The Division of Neurosurgery has improved its clinical revenue processes resulting in the gross collection ratio increasing from 32% in FY02 to 40% for the current fiscal year. In October 2002, the Division leveraged its faculty's prestigious reputation for treating some of the most complicated Neurosurgical disorders and raised its fees 40%. This had a significant impact on the Division's bottom line because non-contracted insurance carriers were required to negotiate one-time rates from a higher baseline. The Division not only fulfilled its mission for overall program growth but also achieved its objective to create a culture in which everyone is responsible for assertive billing and collections, starting with the faculty. The Division's administration initiated an educational campaign to train the faculty, staff and billing company to work in a coordinated fashion to achieve maximum results. The Division contracted with a practice management firm with specialized knowledge and expertise in the field of Neurosurgery, and immediately began holding coding seminars for the faculty to ensure that their operative notes were dictated completely and accurately, citing all aspects of the procedure in the proper coding language. This education process also improved medical documentation, minimizing liability from an audit and medicolegal standpoint. The practice management consultant worked closely with the billing vendor and neurosurgery staff to help evaluate and audit all the key components to the billing processes and provided coding education to the billing collectors dedicated to our accounts. These efforts
combined with the recruitment of new clinical faculty have resulted in a 54% increase in clinical revenue from FY02 to present, or an average increase of $698,000 each year.

Other Support: The Division of Neurosurgery currently receives some funding from the UCLA Medical Center to help support inpatient services such as trauma call, nursing support for the 7 West inpatient service, and an administrative stipend for the Chief's participation in the Care Coordination initiative. The Division also receives financial support from the Department of Surgery to help compensate for the loss of intern manpower needed to run the Neurosurgery floor and step down units.

Contribution Margin to the UCLA Medical Center: The Division of Neurosurgery is a high profile service line that provides a significant contribution margin to the UCLA Medical Center. In the most recent FY05, Neurosurgery's contribution margin was nearly $16 million. This represents an increase of 32.9% over the value just three years prior.

Donations to the new Ronald Reagan UCLA Medical Center Capital Campaign: The Division of Neurosurgery was instrumental in facilitating two major gifts from the Singleton family. Based on the allegiance and high regard for the neurosurgery faculty, the family donated $15M for the Neuroscience wing in the new Ronald Reagan UCLA Medical Center. In response to a direct proposal from Dr. Neil Martin and Dr. Donald Becker, the Singletons agreed to provide an additional $4M to fund PET and MRI imaging.
equipment to establish the Clinical Neuro-Imaging Research Center, or CNRC. The CNRC will be located in the new Neurosurgery wing immediately adjacent to the Neuro-ICU to maximize patient benefits and research potential. These donations currently reside in hospital accounts for capital expenditures.

Supporting our Research Mission

Under the leadership of Neil A. Martin, M.D. the research mission has expanded in terms of the number of research faculty (from 4 full time researcher in FY02 to 12 full time researchers in FY07) breadth and depth of research capacities within the division.

Competitive Grants: Direct dollars awarded to current Neurosurgery faculty combine for a lifetime grand total of $45.4 million, with areas of study ranging from Brain Tumor Immunology, Neurotrauma, Neuroendocrinology, Stroke, Informatics, Parkinson's Disease, Epilepsy, Memory/Cognition and Spinal Cord Injury. At the time of print, 12 Neurosurgery faculty members are Principal Investigators funded by NIH, resulting in $20.3 million in total award direct costs including:

- 17 R01’s, with an additional 8 pending
- 2 K08’s
- 1 K01
- 1 K02 pending
- 2 R21’s, with an additional 4 pending
- 1 P50 plus a supplement pending
- 1 P01
- 1 Pioneer Award pending.

Non Competitive Grants: BIRC State Grant: In 1999, the Brain Injury Research Center received $5 million per year in research funding as a result of a direct state legislative initiative. Although the initiative was slated to be a permanent line item in the California State budget, over the last three years the funding has been reduced nearly in half every year. The BIRC Executive Committee has formulated a plan to work within the budgetary
cuts while maintaining the integrity of ongoing brain trauma research by Center supported researchers and continue the educational mission of the program.

Endowments: The Division of Neurosurgery currently has four endowed Chairs held by various faculty members. The first is the Eugene Stern Chair, named for the first Chief of Neurosurgery at UCLA. The capital for this endowment was raised by the faculty and resident alumni who served under Dr. Stern. The current Chair holder is Donald Becker, MD, Associate Dean of Academic Affairs. The second Chair in Neurosurgery is the Stotter Chair, a term Chair established in 1991 by a grateful patient who was interested in funding clinical research. The current Stotter Chair holder is Langston Holly, MD, who is furthering his clinical research in spinal disorders. Third, the Brawerman Chair was established to support research endeavors in Pediatric Neurosurgery in 2003. The internationally newsworthy story of the Guatemalan twins separation inspired philanthropists Geri and Richard Brawerman to fund this Chair. The current Chair holder is appropriately the lead surgeon who separated the twins, Jorge Lazareff, MD. The fourth Chair in Neurosurgery is the Ulrich Batzdorf, MD Chair. Nearly one hundred grateful patients, colleagues and students of Dr. Batzdorf funded this Chair, which was established in 2005 to support clinical research in the area of spinal neurosurgery. The Batzdorf Chair holder has yet to be named. The Gonda (Goldshmied) endowment was established in 2000 by the generosity of a grateful patient to support the Benign and Skull base surgery program. The Division plans to embark on another Endowed Chair campaign to establish the Donald P. Becker, MD Chair in Neurosurgery; in the same vein as the Stern and Batzdorf Chair. It will seek donations from multiple sources in order to raise capital.

The market value of Neurosurgery endowments has doubled over the last five years, in large part due to the faculty's effort to establish funding sources that will last in perpetuity. At the time of print, Neurosurgery Endowments were valued at $6.7 million. Endowment income in the most recent fiscal year amounted to $304K discretionary income for use by the named Chair holders or directors of the endowment.

Private Foundation Grants: With the support and guidance of the Neurosurgery Advisory Board, the Division submitted a proposal to the Joseph Drown Foundation and received $25,000 to support the research efforts of Neil Martin, MD in 2003. In addition, the W.
M. Keck Foundation contributed $25,000 to help fund the Ulrich Batzdorf, MD Endowed Chair, which was established in 2005.

Supporting our Teaching Mission

The Division of Neurosurgery has proactively pursued fund raising endeavors to support the teaching mission and commitment to training future neurosurgeons and neuroscience researchers. The division has developed an outstanding reputation for providing continuing medical education to medical professionals and the faculty have leveraged their expertise in their highly individual fields that has resulted in revenue.

Fundraising: Over the past four years, Dr. Martin has lead the Neurosurgery faculty in launching an outreach campaign to enlighten its legion of supporters about the importance of scientific advancements and training new neurosurgeons who will treat the next generation of patients with neurological ailments. Dr. Martin established an Advisory Board that has been instrumental in broadening Neurosurgery's circle of friends and raising money to support research and education programs via special events. Recent events include the 50th Anniversary Gala held on April 4, 2003 which raised over $300,000 and the Visionary Ball on October 20, 2005 which netted nearly half a million dollars. These major fundraisers are enhanced by a number of smaller more intimate cultivation events held throughout the year. The Division has hosted receptions focused on the Conjoined Twins Separation, the Malignant Brain Tumor Program, Advancements in Spinal Surgery, the Operating Room of the Future, and the Resident Education Program, each providing a touchstone for donors and opportunities for individual contributions. Neurosurgery faculty are proactive in reaching out to their grateful patients with year-end solicitation letters. The results of this outreach have been impressive, garnering more than $630,000 over the past four years.

Continuing Medical Education Revenue: The Divisions' faculty members have established educational seminars and symposiums that not only fulfill academic mission objectives but also create revenue that help to support program goals in the areas of Stereotactic Radiosurgery, Neuroendocrinology, and Cerebral Blood Flow studies. In FY05 gross revenue generated by these courses was approximately $150,000.


**FUTURE DIRECTIONS FOR UCLA’S DIVISION OF NEUROSURGERY**

In the new UCLA Medical Center, the Division of Neurosurgery plans to construct the most advanced neurosurgical operating room. This neurosurgical Operating Room of the Future will revolutionize neurosurgical care as we know it today, featuring innovative technologies, such as robotics, three-dimensional imaging, and endoscopic techniques, resulting in minimally invasive and maximally effective surgery. The technologies planned for the new hospital will enable more effective and advanced procedures in neurosurgery, not only benefitting patient care at UCLA, but also raising the standard for neurosurgical procedures across the world.

Neurosurgery faculty have designed an innovative Intensive Care Unit for the new UCLA Medical Center. This unit will employ modern neuroimaging techniques, such as MRI, CT, and PET scanning, with immediate proximity to the patient bedside. Known as the Clinical Neuroimaging Research Center, or CNRC, the facility will allow far more effective patient study than is now possible in laboratory experiments, and physicians will be able to identify and correct problems in acutely ill patients before they cause permanent damage. The CNRC will enable the Brain Injury Research Center, the UCLA Stroke Center, and several other programs to carry out integrated research to develop new therapies. Pioneering discoveries made here will reshape the treatment of patients with traumatic brain injury, ruptured aneurysms, epilepsy, brain tumor, and stroke in the 21st century.

UCLA's Division of Neurosurgery faculty and staff continue to work with experts in orthopedics to build a world-class **Comprehensive Spine Center** at the UCLA-Santa Monica Hospital. The goal is to provide patients with comprehensive spine services; the tenacity and relentless problem solving of neurosurgeons such as Dr. Ulrich Batzdorf, Dr. Larry Khoo, Dr. Langston Holly and Duncan McBride are making this vision a reality. However, Neurosurgery's partner in this endeavor, the Department of Orthopedics, is better positioned to negotiate and make decisions, as this entity's departmental status grants it greater access to information, and the power to act on commitments more efficiently. In an environment of constant growth and development, the time required to gain approval from the greater institution is often costly. The Division of Neurosurgery is the only Spine Center collaborator acting through this additional layer of bureaucracy.
The Division of Neurosurgery's contributions expand beyond traditional medical boundaries. The Neurosurgery BMML team, led by Dr. Val Nenov, has designed a hospital-wide digital record system to improve the management of patient data. The system is known as **Global Care Quest**, or GCQ, and has the potential to revolutionize healthcare records management. GCQ integrates hospital, clinical and radiological data and delivers patient information directly to caregivers' handheld devices. Doctors, pharmacists, nurses, and other healthcare professionals will access comprehensive real-time patient data at the point-of-care and anywhere there is cellular or WiFi network coverage. GCQ enables improved patient care and decreased medical errors by streamlining clinical workflow and efficiency within the medical enterprise. This system is currently used by select neurosurgeons at UCLA, will be supported by the infrastructure of the new UCLA Medical Center, and will be introduced in up to ten additional hospitals within the year.

Dr. Neil Martin is collaborating with Dr. Peter Schulam and Dr. Carlos Gracia, from UCLA's Center for Advanced Surgical and Interventional Technology, to develop a **Minimally Invasive Surgery Center** featuring high-end innovations in operating room technology, together with advances in nanosystems, biomaterials, surgical robotics and imaging research. This Center will provide an endoscopy training course for residents.

The Division is currently in the process of negotiating the promotion of two basic scientists to the full time faculty as Assistant Professors in Residence. Both have proven scientific track records and are PI's on awarded NIH grants. Most recently our distinguished faculty member Donald P. Becker, MD, W. Eugene Stern Professor of Neurosurgery at UCLA, has been named Senior Associate Dean for Academic Affairs at the David Geffen School of Medicine effective December 1, 2005, further evidence that Neurosurgery faculty thrive and contribute significantly to the academic mission of the institution. The Division is actively pursuing potential faculty recruits with interests in stem cell work and spinal cord injury to augment our teaching and research missions.

Recognizing that the Division of Neurosurgery's ambitious goals require substantial financial support, the Neurosurgery faculty and staff continue to lead an active development effort. Specific initiatives include funding an endowed chair in honor of Dr. Donald Becker, strategically approaching individuals and foundations for support of the Skull Base
lab, and hosting a series of cultivation events focused on the OR of the Future. These efforts will be greatly facilitated if departmental status is earned. The prestige associated with such status greatly improves donors' confidence that their funds will be put to proficient use and make a positive impact in the community of medicine. Departmental standing becomes critical when UCLA's Division of Neurosurgery is competing with other highly qualified neurosurgery programs for endowments; oftentimes the distinguishing criteria recognized by donors is division vs. departmental status. Neurosurgery faculty and staff are committed to remain at the cutting edge of neurosurgical science and practice; however, its current rank within the David Geffen School of Medicine at UCLA is impeding this progress. It is for this reason and the others listed herein that we request departmental status.

**Neurosurgery Board of Advisors**

To ensure future security, the Division of Neurosurgery has assembled a Board of Advisors to make the most of developing opportunities in advancing neuroscience and improving patient care, and to overcome existing challenges. This is part of Dr. Neil Martin's commitment to a comprehensive development strategy to improve and establish collaboration with the community, philanthropic individuals, and corporate partners. This effort has created an energized spirit to improve the quality of life for those afflicted with neurological disease. To deal with the nuances of business administration and financial management, local, regional, and national politics, legal issues, public relations and marketing, and modern computer and audiovisual technology, Neurosurgery seeks counsel from experts in these disparate fields of endeavor. These individuals have been a source of great support furthering Neurosurgery's public relations and fundraising goals. In addition, Neurosurgery has an internal Board Liaison to manage these VIP relationships, facilitate fundraising efforts, and develop marketing materials for the Division.

The Neurosurgery Board of Advisors is dedicated to helping the Division advance to the forefront of medicine and science, and provide the necessary counsel and guidance to aid in communicating its mission to other individuals and organizations. The Board is comprised of prominent business and community leaders who, by virtue of name, reputation and/or
position, bring increased stature and prominence to the organization. Board members represent various professional sectors, ensuring access to multiple centers of influence among the Southern California community. Members are asked to attend at least two annual board meetings per year, make an annual personal and/or corporate financial contribution to the organization, and attend key fundraising events.

Members of the Board are Donald Becker, MD, Medicine; Melvin Cheatham, MD, Medicine; Steve Garvey, Athletics; Tony Granato, Athletics; Robert Harper, Media/Communications; Louis Ignarro, Medicine; Neil Martin, MD, Medicine; Patti Neuwirth, Journalism; Emanuel and Lisa Nunez, Entertainment; Connie Padden, Medical Technology; Lowell Paxson, Media/Communications; John Simon, Real Estate; and Antonio Villaraigosa, Government.

With the assistance of the Board of Advisors, Neurosurgery faculty and staff successfully organized a 50th Anniversary Gala fundraising dinner. This celebration, held at the Regent Beverly Wilshire Hotel on April 4, 2003, honored the Division's remarkable accomplishments over the past 50 years, and reaffirmed goals for future progress. Four hundred and fifty guests were in attendance, and the event netted over $210,000 to support neurosurgical research and education at UCLA. The inaugural Visionary Ball was held at the Regent Beverly Wilshire on October 20, 2005, honoring the distinguished career of Dr. Donald P. Becker. The Division of Neurosurgery raised nearly $700,000 (gross) through ticket sales, program tributes, and straight donations. Expenses for the event were about $210,000 and there were 668 guests in attendance. The nearly half million dollars netted by this event will serve to support the Neurosurgery Education program and will also help to provide seed money for new and innovative neuroscience research projects.