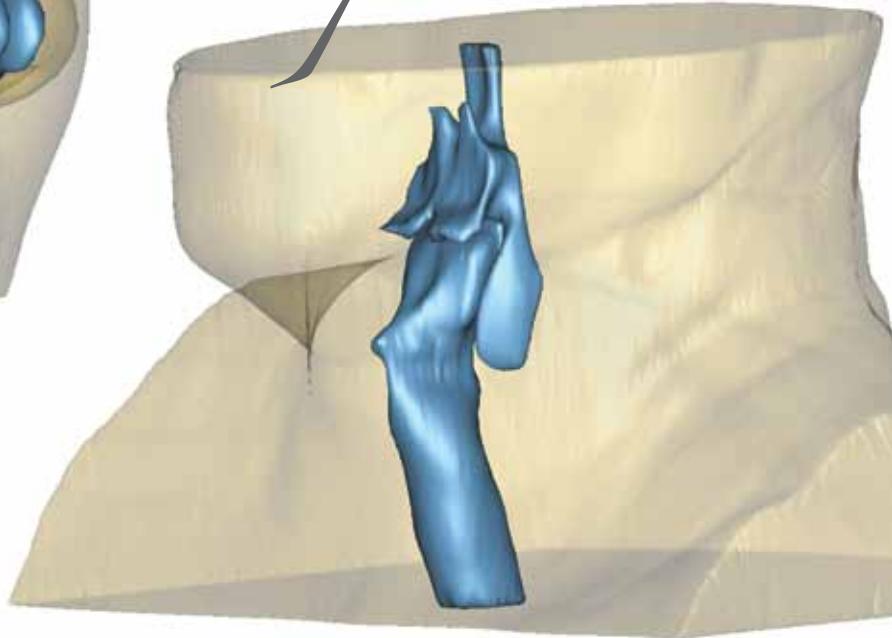
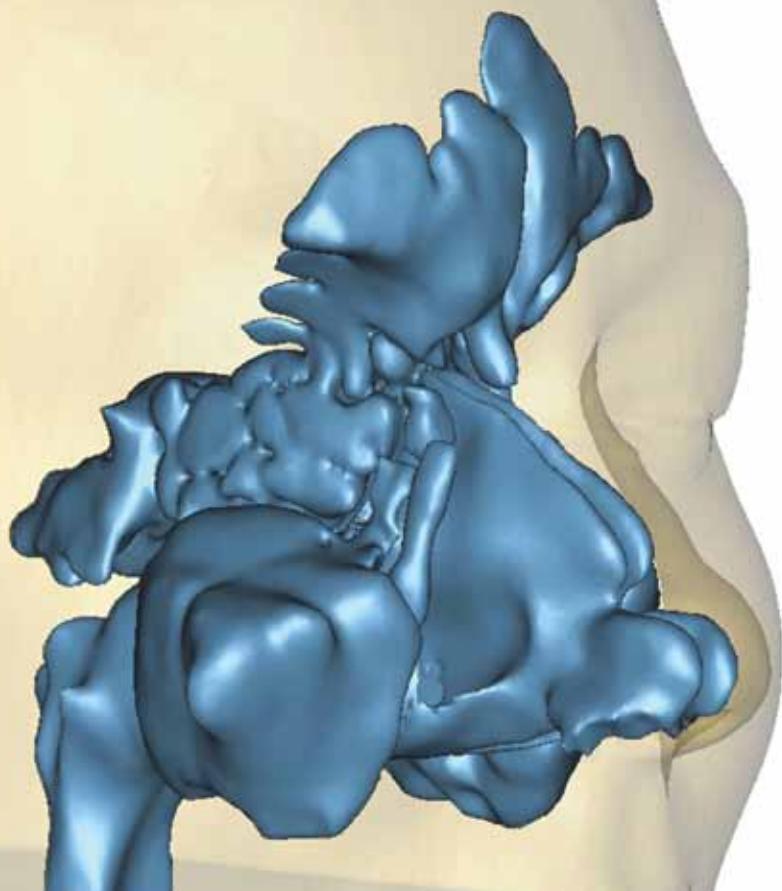


DEPARTMENT OF OTOLARYNGOLOGY / HEAD AND NECK SURGERY



*Annual  
Report*



2010



UNC  
SCHOOL OF MEDICINE



**The Ladies of ENT.** Front row, L-R: Rupali N. Shah, MD; Rose J. Eapen, MD; Baishakhi Choudhury, MD; Grace G. Kim, MD  
Back row, L-R: Deidra A. Blanks, MD; Paula J. Harmon, MD; Jessica K. Smyth, MD; Anna Hang, MD

# The Department of Otolaryngology

## Head and Neck Surgery



2010  
Annual Report

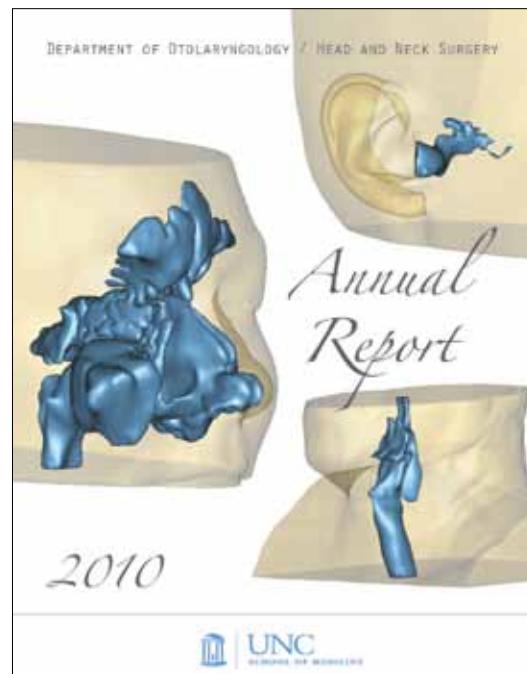
The University of North Carolina School of Medicine  
Chapel Hill, North Carolina

## About the Cover

Our cover this year features three images created by Julia Kimbell, PhD, Research Associate Professor, who joined the Department in June of 2009. These are semi-transparent reconstructions of the head and neck from maxillofacial CT scans, showing renderings (in blue) of the inner ear, the nasal passages and paranasal sinuses, and the airways of the throat. Dr. Kimbell uses Mimics, a medical imaging software package from Materialise, Inc., to create three-dimensional anatomical models based on a patient's CT scans to help doctors examine detailed structures in relation to each other and compare them in pre- and post-surgical states.

Using computational fluid dynamics techniques, Dr. Kimbell creates computational models from the anatomical reconstructions and studies structure, airflow and the nasal functions of heating, humidifying, and cleansing the air we breathe. In collaboration with Drs. John Rhee and Sachin Pawar at the Medical College of Wisconsin, Dr. Kimbell is testing the computational models for their ability to predict surgical outcome so they might one day be used to help surgical planning. In addition, Dr. Kimbell and her colleagues in the UNC Division of Rhinology, Allergy and Sinus Surgery are using the computational models to study how functional endoscopic sinus surgery affects sinus aeration and topical drug delivery to the sinus ostia. This combination of extensive clinical experience in the treatment of sinusitis, both medically and surgically, with expertise in computational modeling of the upper airways is an example how the Department of Otolaryngology is merging two multidisciplinary fields to solve complex problems and achieve better patient care.

Dr. Kimbell is an applied mathematician whose career has been devoted to creating three-dimensional models of the head airways and using computational fluid dynamics to study the effects of anatomy on nasal airflow and the uptake of inhaled gases and particulates in multiple species. She is internationally recognized in her field and has collaborated with physicians and scientists in academia, government, and private industry settings on many projects addressing respiratory health, the effects of nasal surgery, and effective drug delivery. Read more about her work and view more examples of these computational models starting on page 98.



Printed by UNC Printing Services

Content provided by members of the Department

Portrait photographs of faculty and residents by Paul Braly and Gordon Palmer

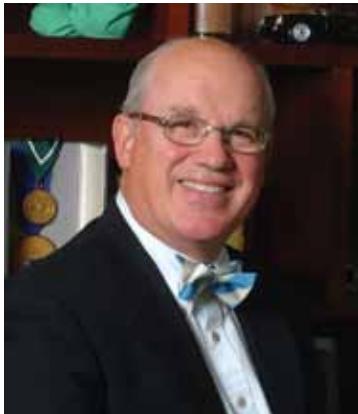
Preparation and design by Elizabeth Perry

# Contents

A Message from the Chair	5
The UNC School of Medicine	6
The Department	8
The Faculty	13
WakeMed	23
The Staff	25
The Residents	30
Educational Programs	38
Fellowship Programs	48
Outreach	50
Clinical Programs	57
Research	98
Grants	127
Distinguished Professorships	132
The Newton D. Fischer Society Meeting	137
Honors, Awards, and Achievements	139
Presentations	144
Publications	153
What Else Do We Do?	160
Giving to the Department	163



# A Message from the Chair



As I peruse this year's annual report, I am struck by the number of positive, innovative, creative, and humanitarian things in which the individuals in our Department are engaged. While I am aware of every one of them, the scope of dedication of our faculty, residents, and staff to the multiple missions of our Department is impressive. I very much doubt if there is another department in the country that embarks upon so many varied levels of activities in research, education, and patient care as we do. At a time when the future of healthcare delivery is so much in doubt, it is very stabilizing to see how devoted our Department is to lifting the spirit of all those with whom we are in contact.

It should be noted that our Department is ranked #21 in the country in *US News & World Report*, #1 in North Carolina, and the highest ranked department in our medical center. This can be traced back to the opportunities afforded by the institution for our faculty and residents to attain an incredible level of excellence, as well as their personal commitment to offer the very best care possible to every patient.

New technology such as robotic surgery, minimally invasive surgery for skull base and rhinology, endoscopic laser resections for head and neck cancer, robotic microlaryngeal surgery, and innovated otologic implants are just a few of the things that we have added in the past year to our armamentarium of state-of-the-art patient care. We are into our second year with a Pediatric Otolaryngology Fellow, and in 2011 we are instituting three new fellowships: Rhinology and Skull Base Surgery, Advanced Head and Neck Oncology, and Neurotology. To compliment these fellowships and our commitment to clinical innovation, we added Julie Kimbell to our faculty in 2009. She is a brilliant mathematician and does wonderful modeling of structures in the head and neck. Her work on the front cover is only a small example of what she can do with normal anatomy. When pathology occurs, she can be equally innovative in exploring the length and breadth of lesions in the head and neck area. She is truly a gem and a tremendous addition to our faculty.

As a result of all of these activities, I am convinced that we are equipped to become, as Dr. Roper would like us to be, the leading public institution of higher learning and medicine in the country. I sincerely hope that you enjoy meeting our Department through these pages and enjoy reading about their accomplishments as much as I do.

A handwritten signature in cursive ink.

Harold C. Pillsbury, III, MD, FACS

Thomas J. Dark Distinguished Professor of Otolaryngology/Head and Neck Surgery  
Chair, Department of Otolaryngology/Head and Neck Surgery

# The UNC School of Medicine

## Our Vision:

To be the nation's leading public school of medicine.

## Our Mission:

Our mission is to improve the health of North Carolinians and others whom we serve. We will accomplish this by achieving excellence and providing leadership in the interrelated areas of patient care, education, and research.



### Patient Care

As a key component of the UNC Health Care System, the School of Medicine will provide superb care to North Carolinians and others whom we serve. We will maintain our strong tradition of reaching underserved populations. Excellence in education and research will enhance our delivery of the very best medical care, which will be presented in an environment that is exceptionally welcoming, collegial, and supportive both for those receiving and those providing the care.

### Education

We will achieve excellence in educating tomorrow's health care professionals and biomedical researchers by providing exceptional support for outstanding teaching and research faculty. We will offer an innovative and integrated curriculum in state-of-the-art facilities. The School will attract the very best students and trainees from highly diverse backgrounds.

### Research

We will achieve excellence in research and in its translation to patient care by developing and supporting a rich array of outstanding research programs, centers, and resources. Proximity to the clinical programs of UNC Hospitals, to UNC-Chapel Hill's other premier health affairs Schools (Dentistry, Nursing, Pharmacy, and Public Health) and the other departments, schools, and programs on the UNC-Chapel Hill campus affords an exceptional opportunity for innovative, world-class research collaborations.

In all of these missions, we will strive to meet the needs of our local, state, national, and global communities.

## A Message from the Dean

### To the Members of the Department of Otolaryngology/Head and Neck Surgery:

We have a great deal to celebrate. Each and every day, the work we do at the School of Medicine provides quality patient care through path-breaking research and education of the next generation of health professionals.

I am pleased with our organization's ability to find innovative ways to achieve these goals. We have continued to expand health care access and provide care to more patients than ever before from all 100 North Carolina counties. Research and teaching efforts have again enabled our School to be counted among some of the best medical schools in the country. Your hard work and devotion to patient care have also placed us among the top hospitals in Ear, Nose and Throat care in the 2010-11 U.S. News & World Report Best Hospitals rankings.

I also am proud of our professors' commitment to preparing our students for a lifetime of achievement and our students' dedication to the medical profession. These efforts have been rewarded through our students' outstanding USMLE Step 1 pass rate of 98 percent for the second consecutive year.



This progress has been made in the face of the challenges of an ever-changing health care landscape. Health care reform has given us new responsibilities and will continue to present new challenges. At UNC we are dedicated to reform, and we are determined to be a leader, creating a new model for organizing and delivering care. We can do it — but it will stretch us like nothing we have ever done before.

To be the nation's leading public school of medicine is a lofty ambition but one I am sure we can achieve together. Thank you for your service to our students, our organization and the practice of medicine.

A handwritten signature in black ink that reads "Bill Roper". The signature is fluid and cursive, with a large, stylized "B" at the beginning.

William L. Roper, MD, MPH  
Dean, School of Medicine  
Vice Chancellor for Medical Affairs  
CEO, UNC Health Care System

August 2, 2010

# The Department

## **Administration**

Harold C. Pillsbury, MD, FACS (Department Chair)  
Craig A. Buchman, MD, FACS (Vice Chair for Clinical Affairs)  
Brent A. Senior, MD, FACS, FARS (Vice Chair for Academic Affairs)  
Carolyn H. Hamby (Clinical Academic Department Administrator)

## **The Division of Facial Plastic and Reconstructive Surgery**

William W. Shockley, MD, FACS (Chief)

## **The Division of Head and Neck Oncology / Head and Neck Cancer Research**

Mark C. Weissler, MD, FACS (Chief)	Trevor G. Hackman, MD
William W. Shockley, MD, FACS	Andrew F. Olshan, PhD
Carol G. Shores, MD, PhD, FACS (WakeMed ENT)	D. Neil Hayes, MD, MPH
Marion E. Couch, MD, PhD, FACS	Brian Kanapkey, MA
Xiaoying Yin, MD	Sean Gallagher, RN
Adam M. Zanation, MD	Susan Hayden, RN

## **The Division of Otology/Neurotology and Skull Base Surgery**

### **The UNC Ear and Hearing Center**

Craig A. Buchman, MD, FACS (Division Chief, Center Director)  
Harold C. Pillsbury, MD, FACS  
Oliver F. Adunka, MD

### **The UNC Skull Base Center**

Craig A. Buchman, MD, FACS (Director)	Marion E. Couch, MD, PhD, FACS
Harold C. Pillsbury, MD, FACS	Oliver F. Adunka, MD
William W. Shockley, MD, FACS	Adam M. Zanation, MD
Brent A Senior, MD, FACS, FARS	Charles S. Ebert, MD

## **The Division of Pediatric Otolaryngology**

Amelia F. Drake, MD, FACS (Chief)  
Carlton J. Zdanski, MD, FACS, FAAP  
Austin S. Rose, MD  
Laura Rosenthal, MD (Fellow, 2009-2010)  
Alisha N. West, MD (Fellow, 2010-2011)

## **The Division of Voice and Swallowing Disorders / The UNC Voice Center**

Robert A. Buckmire, MD (Division Chief, Center Director)  
Mark C. Weissler, MD, FACS  
Ellen S. Markus, MA, CCC-SLP, DMA  
Linda F. Hube, MS, CCC-SLP

## **The Division of Rhinology, Allergy, and Sinus Surgery**

Brent A. Senior, MD, FACS, FARS (Chief)	Michael O. Ferguson, MD (WakeMed ENT)
Harold C. Pillsbury, MD, FACS	Esa A. Bloedon, MD (WakeMed ENT)
Adam M. Zanation, MD	Allen F. Marshall, MD (WakeMed ENT)
Charles S. Ebert, Jr., MD, MPH	Julia S. Kimbell, PhD
Brett E. Dorfman, MD (WakeMed ENT)	

**The UNC Head and Neck Robotic Surgery Program**

Adam M. Zanation, MD (Director)

**The Division of Auditory Research**

Joseph W. Hall, PhD (Chief)  
Jiri Prazma, MD, PhD  
Paul B. Manis, PhD  
John H. Grose, PhD

Emily Buss, PhD  
Charles C. Finley, PhD  
Douglas C. Fitzpatrick, PhD  
Patricia A. Roush, AuD

**The Division of Research Training and Education**

Paul B. Manis, PhD (Chief)  
Joseph W. Hall, PhD  
Jiri Prazma, MD, PhD  
John H. Grose, PhD  
Emily Buss, PhD  
Charles C. Finley, PhD

Douglas C. Fitzpatrick, PhD  
Marion E. Couch, MD, PhD  
Xiaoying Yin, MD  
Julia S. Kimbell, PhD  
D. Neil Hayes, MD, MPH

**W. Paul Biggers Carolina Children's Communicative Disorders Program**

Craig A. Buchman, MD, FACS (Medical Administrative Director)  
Harold C. Pillsbury, MD, FACS (Executive Director)  
Carlton J. Zdanski, MD, FACS  
Oliver F. Adunka, MD  
Holly Teagle, AuD, CCC-A (Program Director)  
Hannah R. Eskridge, MSP, CCC-SLP, LSLS Cert. AVT (CASTLE Director)

**The Adult Cochlear Implant Program**

Marcia Clark Adunka, AuD, CCC-A (Director)  
English R. King, AuD, CCC-A (Clinical Audiologist)  
Margaret T. Dillon, AuD, CCC-A (Cochlear Implant Research Audiologist)

**Sleep and Snoring Surgery**

Brent A. Senior, MD, FACS, FARS  
Marion E. Couch, MD, PhD, FACS

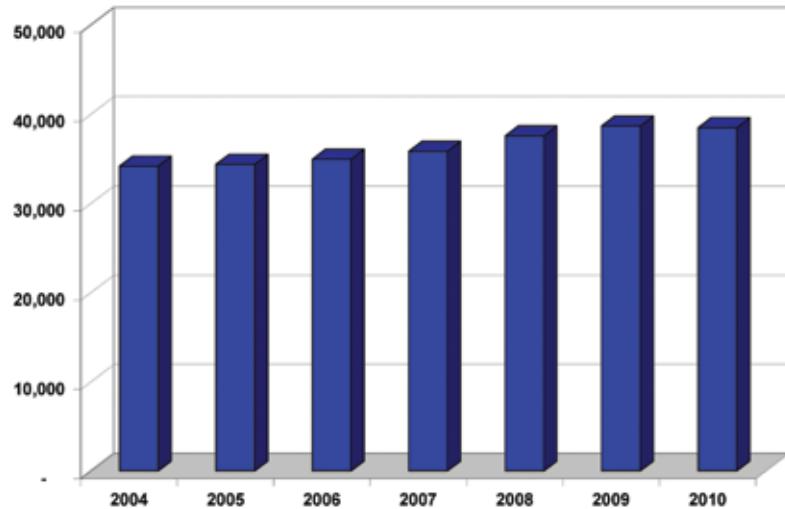
**WakeMed Faculty Physicians**

Michael O. Ferguson, MD (Chief)  
Carol G. Shores, MD, PhD  
Brett E. Dorfman, MD  
Esa A. Bloedon, MD  
Allen F. Marshall, MD

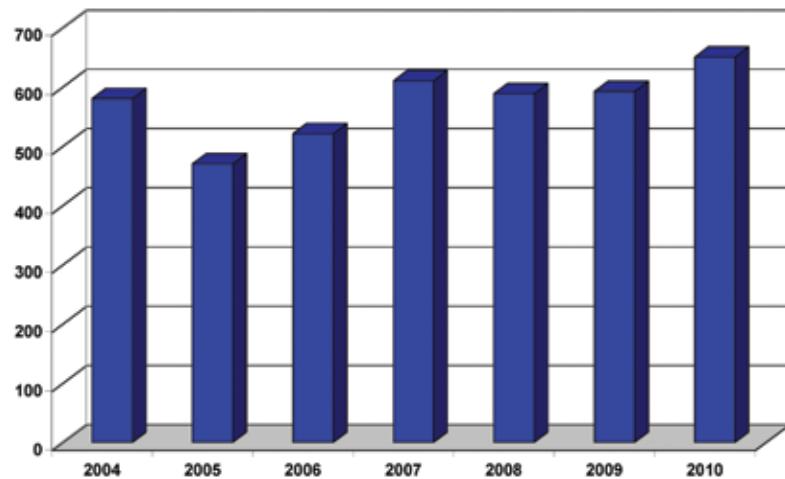
**Fellowship Programs: Directors**

Pediatric Otolaryngology: Austin S. Rose, MD  
Advanced Head and Neck Oncology: Adam M. Zanation, MD; Trevor G. Hackman, MD  
Rhinology and Skull Base Surgery: Charles S. Ebert, MD, MPH; Adam M. Zanation, MD  
Neurotology: Oliver F. Adunka, MD

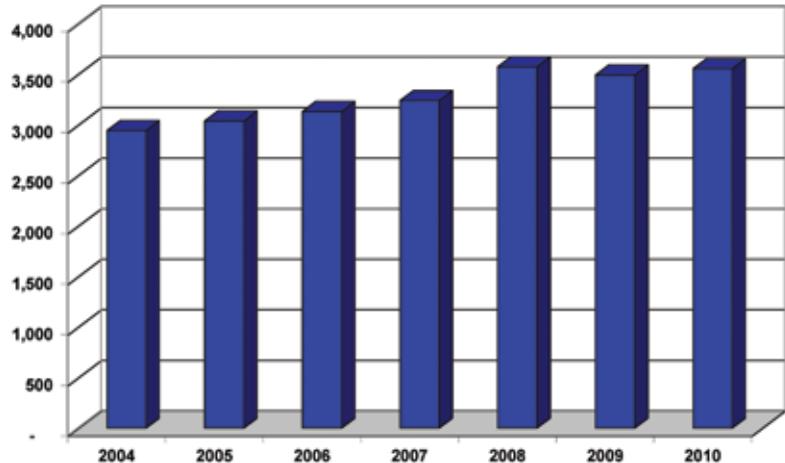
## **Outpatient Visits**



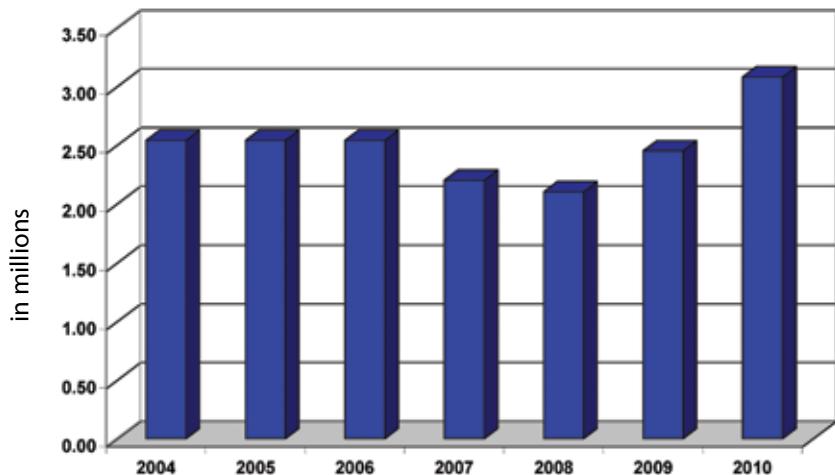
## **Inpatient Admissions**



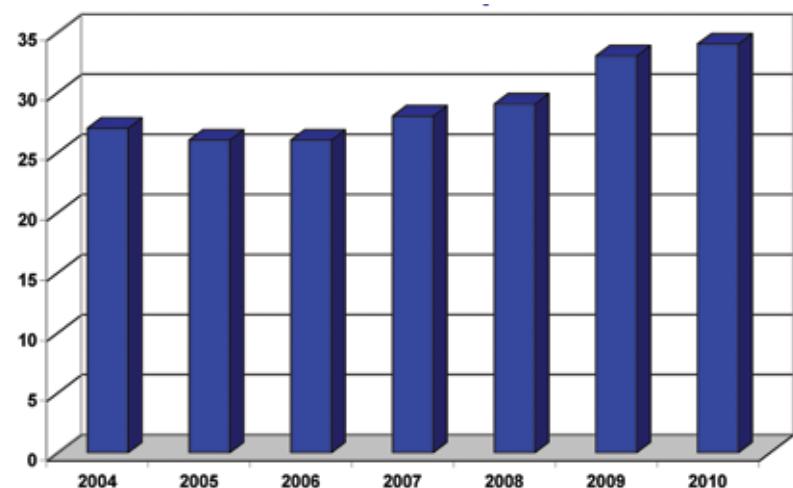
## **OR Cases**



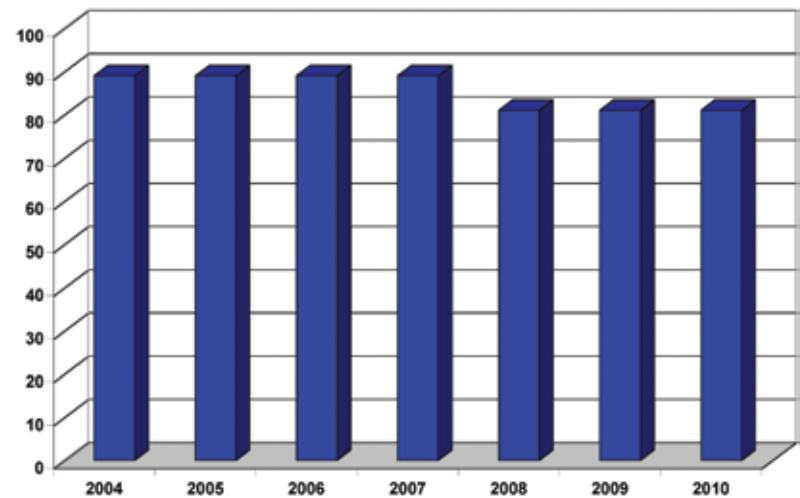
## **Grant Funding**



## **Faculty Members**



## **Staff Members**





Drs. Alisha West and Robert Buckmire. Photo by Nathan Clendenin Photography & Multimedia (<http://nclendenin.com>)

## Mission Statement

The Mission of the Department of Otolaryngology/Head and Neck Surgery is to improve health care by enhancing the field of Otolaryngology/Head and Neck Surgery and by advancing its clinical applications. To fulfill this Mission, our objectives are the following:

1. To provide excellent otolaryngologic/head and neck surgical patient care that can serve as a national model.
2. To provide outstanding undergraduate and postgraduate education that disseminates otolaryngology/head and neck surgery knowledge and facilitates more contributions to the knowledge base.
3. To carry out basic science, clinical, and health services research that advance the field of otolaryngology/head and neck surgery.

# The Faculty



**Harold C. Pillsbury, MD, FACS**, Professor and Chair  
Thomas J. Dark Distinguished Professor of Otolaryngology/Head and Neck Surgery  
Executive Director of the W. Paul Biggers, MD, Carolina Children's Communicative Disorders Program  
MD: George Washington University  
Residency: University of North Carolina School of Medicine  
Special Interests: Otolaryngology-head and neck surgery, neurotology, facial plastic surgery, otolaryngologic allergy, cochlear implantation, acoustic tumors, skull base surgery, laser utilization in head and neck cancer



**Oliver F. Adunka, MD**, Assistant Professor  
Director, Neurotology Fellowship  
MD: Medical University of Vienna, Austria  
Residency: J. W. Goethe University, Frankfurt, Germany  
Fellowship (Otology/Neurotology and Skull Base Surgery): UNC Department of Otolaryngology/Head and Neck Surgery  
Special Interests: Otology, neurotology, lateral skull base surgery, acoustic tumors, cochlear implants, hearing preservation



**Esa A. Bloedon, MD**, Assistant Professor  
Otolaryngology/Head and Neck Surgery, Wake Medical Center  
MD: Thomas Jefferson Medical College, Philadelphia, PA  
Residency: Thomas Jefferson University Hospital  
Special Interests: General and pediatric otolaryngology, endoscopic sinus surgery, thyroid and parathyroid disease, rhinology



**Craig A. Buchman, MD, FACS**, Professor  
Chief, Division of Otolaryngology/Neurotology and Skull Base Surgery  
Vice Chair for Clinical Affairs  
Medical Administrative Director, CCCDP  
MD: University of Florida  
Research Fellowship (Otolaryngology): University of Pittsburgh School of Medicine, Children's Hospital of Pittsburgh  
Residency: University of Pittsburgh School of Medicine  
Fellowship (Otolaryngology and Skull Base Surgery): House Ear Institute and Clinic, Los Angeles  
Special Interests: Otolaryngology/neurotology and skull base surgery, cochlear implantation, Otology, neurotology, lateral skull base surgery, acoustic tumors, cochlear implants, hearing preservation



**Robert A. Buckmire, MD**, Associate Professor  
Chief, Division of Voice and Swallowing Disorders  
Director, UNC Voice Center  
MD: University of Virginia School of Medicine  
Residency: University of North Carolina School of Medicine  
Fellowship (Laryngology): Vanderbilt University Voice Center  
Special Interests: Voice and swallowing disorders, diagnostic laryngeal EMG, laryngeal framework surgery, microsurgical treatment of laryngeal pathology, and micro-laryngeal, laser-control mechanisms



**Emily Buss, PhD**, Associate Professor  
MS, PhD (Psychology): University of Pennsylvania  
Post-doctoral Research Fellowship (Psychoacoustics): University of North Carolina at Chapel Hill  
Special Interest: Normative psychoacoustics, auditory development, speech perception, binaural hearing, auditory prostheses and sensorineural hearing loss



**Marion E. Couch, MD, PhD, FACS**, Associate Professor  
MD: Rush Medical College  
PhD: Rush University  
Residency: Johns Hopkins University School of Medicine  
Special Interests: Head and neck surgical oncology, thyroid and parathyroid surgery, surgical airway management, microvascular free tissue transfer reconstruction, cancer cachexia



**Brett E. Dorfman, MD**, Assistant Professor  
Otolaryngology/Head and Neck Surgery, Wake Medical Center  
MD: Emory University School of Medicine  
Residency: Duke University Medical School  
Special Interests: Rhinology, allergy, sinus surgery, care of the professional voice



**Amelia F. Drake, MD, FACS**, Professor  
Newton D. Fischer Distinguished Professor of Otolaryngology/Head and Neck Surgery  
Chief, Division of Pediatric Otolaryngology  
Director, UNC Otolaryngology/Head and Neck Surgery Residency Program  
Director, UNC Craniofacial Center  
Executive Associate Dean for Academic Programs, UNC School of Medicine  
MD: University of North Carolina School of Medicine  
Residency: University of Michigan  
Fellowship (Pediatric Otolaryngology): Cincinnati Children's Hospital  
Special Interests: Pediatric otolaryngology, pediatric airway disorders, craniofacial anomalies



**Charles S. Ebert, Jr., MD, MPH**, Assistant Professor  
Co-Director, UNC Rhinology and Skull Base Surgery Fellowship  
Associate Director, UNC Otolaryngology/Head and Neck Surgery Residency Program  
MD: University of North Carolina School of Medicine  
MPH: University of North Carolina School of Public Health  
Residency: University of North Carolina School of Medicine  
Fellowship (Rhinology): Georgia Nasal and Sinus Institute  
Special Interests: Chronic sinusitis, allergic fungal sinusitis, primary and revision sinus surgery, sinonasal tumors, computer guided surgery, allergic disease, and other nasal disorders; investigation into the genetic alterations in chronic eosinophilic rhinosinusitis.



**Hannah R. Eskridge, MSP, CCC-SLP, LSLS Cert. AVT**, Clinical Instructor  
Director, Center for the Acquisition of Spoken language Through Listening Enrichment (CASTLE)  
BS (Elementary Education): College of Charleston  
MSP: University of South Carolina  
Special Interests: Pediatric hearing loss, cochlear implants, speech/language and audition development after cochlear implantation



**Michael O. Ferguson, MD**, Associate Professor  
Otolaryngology/Head and Neck Surgery, Wake Medical Center  
Director, WakeMed Faculty Physicians ENT-Head and Neck and  
Facial Plastic Surgery  
Associate Director, UNC Otolaryngology/Head and Neck Surgery  
Residency Program  
MD: University of North Carolina School of Medicine  
Residency: University of North Carolina School of Medicine  
Special Interests: General and pediatric otolaryngology, rhinology,  
allergy, sinus surgery, head and neck oncology



**Charles C. Finley, PhD**, Associate Professor  
BSEE: Georgia Institute of Technology  
PhD (Neurobiology): University of North Carolina at Chapel Hill  
Special Interests: Design of speech processors and electrode systems  
for cochlear implants using mathematical models, sources of  
variability in cochlear implant outcomes, patient assessments for  
advanced fitting and device validation using objective measures;  
biomedical instrumentation in health care delivery



**Douglas C. Fitzpatrick, PhD**, Assistant Professor  
PhD (Anatomy): University of North Carolina at Chapel Hill  
Special Interests: Physiology and anatomy of the auditory system,  
cochlear implants, electrical stimulation of the central auditory  
system, binaural hearing, auditory information processing



**John H. Grose, PhD**, Professor  
MSc: University of Southampton, United Kingdom  
PhD (Audiology): Northwestern University  
Special Interest: Psychoacoustics



**Trevor G. Hackman, MD**, Assistant Professor  
Co-Director, UNC Advanced Head and Neck Oncology Fellowship  
MD: University of Pittsburgh  
Residency: University of Pittsburgh  
Fellowship (Head & Neck/Microvascular): Washington University St. Louis  
Special Interests: Head and neck surgical oncology, endocrine surgery, parotid surgery, transoral laser microsurgery, open and endoscopic skull base surgery, head and neck reconstruction, minimally invasive head and neck surgery, sinus surgery



**Joseph W. Hall, PhD**, Professor  
Chief, Division of Auditory Research  
MS (Audiology): University of North Carolina at Chapel Hill  
PhD (Experimental Psychology): University of North Carolina at Greensboro  
Special Interests: Clinical psychoacoustics, cochlear implantation



**D. Neil Hayes, MD, MPH**, Assistant Professor  
MD: University of North Carolina School of Medicine  
MPH: Harvard School of Public Health  
Residency (Internal Medicine): Boston University School of Medicine  
Fellowship (Hematology/Oncology): Tufts New England Medical Center  
Post-Doctoral Fellowship: Dana Farber Cancer Institute  
Special Interests: Clinical research in head and neck and lung cancer; clinical application of genomic testing; cancer therapeutics and chemotherapy.



**Julia S. Kimbell, PhD**, Associate Professor  
PhD (Mathematics): Duke University  
Post-Doctoral Training: CIIT Centers for Health Research  
Special Interests: Research in biomathematical modeling; the effects of nasal anatomy and respiratory airflow patterns on the uptake and deposition of inhaled gases and particles in the nasal passages of rodents, primates, and humans



**Paul B. Manis, PhD**, Professor  
Chief, Division of Research Training and Education  
PhD (Neuroscience): University of Florida  
Postdoctoral Training (Neurobiology): Vanderbilt University School of Medicine  
Special Interests: Cellular basis of auditory information processing; central nervous system plasticity



**Allen F. Marshall, MD**, Assistant Professor  
Otolaryngology/Head and Neck Surgery, Wake Medical Center  
MD: University of North Carolina School of Medicine  
Residency: University of North Carolina School of Medicine  
Special Interests: Adult and pediatric general otolaryngology, including rhinology, allergy, endoscopic sinus surgery, thyroid and salivary gland surgery, ear disease, and hearing



**Andrew F. Olshan, PhD**, Professor  
Chair, Department of Epidemiology, UNC School of Public Health  
MS, PhD (Epidemiology): University of Washington  
Special Interests: Molecular epidemiology of head and neck and childhood cancer



**Jiri Prazma, MD, PhD**, Professor  
MD: Charles University, Prague, Czechoslovakia  
PhD (Physiology): Czechoslovak Academy of Sciences  
Residency: Charles University, Prague, Czechoslovakia  
Special Interest: Inflammation of the middle ear, nose, and larynx



**Austin S. Rose, MD**, Associate Professor  
Director, UNC Pediatric Otolaryngology Fellowship Program  
MD: University of North Carolina School of Medicine  
Residency: University of North Carolina School of Medicine  
Fellowship (Pediatric Otolaryngology): Johns Hopkins University  
School of Medicine  
Special Interests: Pediatric otolaryngology, reconstructive airway  
surgery, chronic ear disease



**Patricia A. Roush, AuD**, Associate Professor  
Director of Pediatric Audiology  
MA (Audiology): University of Iowa  
AuD: University of Florida  
Special Interests: Pediatric Audiology



**Brent A. Senior, MD, FACS, FARS**, Professor  
Chief, Division of Rhinology, Allergy, and Sinus Surgery  
Vice Chair for Academic Affairs  
MD: University of Michigan  
Residency: Boston University and Tufts University  
Fellowship (Rhinology and Sinus Surgery): University of Pennsylvania  
Medical Center  
Special Interests: Endoscopic minimally invasive management of  
sinusitis, CSF rhinorrhea, and tumors of the anterior skull base;  
surgical management of sleep apnea and snoring; allergy



**William W. Shockley, MD, FACS**, Professor  
W. Paul Biggers Distinguished Professor of Otolaryngology/Head and  
Neck Surgery  
Chief, Division of Facial Plastic and Reconstructive Surgery  
MD: Indiana University  
Residency: University of Cincinnati  
Fellowship (Head and Neck Surgical Oncology): Methodist Hospital,  
Indianapolis, Indiana  
Special Interests: Facial plastic and reconstructive surgery,  
rhinoplasty, skin cancer, salivary and thyroid gland surgery



**Carol G. Shores, MD, PhD, FACS**, Associate Professor  
Otolaryngology/Head and Neck Surgery, Wake Medical Center  
PhD (Biochemistry): University of North Carolina at Chapel Hill  
MD: University of North Carolina School of Medicine  
Residency: University of North Carolina School of Medicine  
Special Interests: Head and neck surgical oncology, including salivary malignancies, thyroid surgery, and surgical airway management.



**Holly Fryauf-Bertschy Teagle, AuD**, Assistant Professor  
Program Director, W. Paul Biggers, MD, Carolina Children's Communicative Disorders Program  
MA (Audiology): University of Iowa  
AuD: University of Florida  
Special Interests: Cochlear implants in children, childhood development after cochlear implantation, cochlear implant device efficacy and clinical management issues, audiology



**Mark C. Weissler, MD, FACS**, Professor  
Joseph P. Riddle Distinguished Professor of Otolaryngology/Head and Neck Surgery  
Chief, Division of Head and Neck Oncology  
MD: Boston University  
Residency: Harvard University  
Fellowship (Head and Neck Oncologic Surgery): University of Cincinnati  
Special Interest: Head and neck cancer, thyroid cancer, salivary gland neoplasms, skull base tumors, laser utilization in head and neck surgery, voice disorders, laryngeal/tracheal stenosis, head and neck trauma



**Xiaoying Yin, MD**, Assistant Professor  
MD: Xi'an Medical University, Xi'an, China  
Residency (Pathology): Xi'an Medical University, Xi'an, China  
Fellowship (Pathology): University of Pittsburgh  
MS (Molecular Biology): University of Pittsburgh  
Special Interests: Cancer cachexia, tumor vaccines in head and neck cancer



**Adam M. Zanation, MD**, Assistant Professor  
Director, UNC Otolaryngology/Head and Neck Surgery Medical Student Affairs  
Co-Director, UNC Rhinology and Skull Base Surgery Fellowship  
Co-Director, UNC Advanced Head and Neck Oncology Fellowship  
MD: University of North Carolina School of Medicine  
Residency: University of North Carolina School of Medicine  
Fellowship (Skull Base Surgery and Oncology/Rhinology): University of Pittsburgh Medical Center  
Special Interests: Skull base tumors, sinonasal tumors, CSF rhinorrhea, robotic and minimally invasive head and neck tumor surgery, parotid tumors, head and neck sarcomas, rhinology, sinus surgery



**Carlton J. Zdanski, MD, FACS, FAAP**, Associate Professor  
Surgical Director, North Carolina Children's Airway Center  
MD: University of North Carolina School of Medicine  
Residency: University of North Carolina School of Medicine  
Fellowship (Pediatric Otolaryngology): Children's Hospital of Pittsburgh  
Special Interests: Pediatric otolaryngology, reconstructive airway surgery, cochlear implantation, microtia repair, cleft palate, pediatric head and neck masses

## Dr. Prazma, the Father of ENT Research at UNC, Retires



Dr. Prazma in his office in the old Burnett-Womack building, 2001

After 41 years of mentoring medical students and residents in the Otolaryngology laboratories at UNC, Jiri ("George") Prazma, MD, PhD, retired from our Department on June 30, 2010. Dr. Prazma has touched many lives, significantly impacting the future careers of those he has shepherded, providing the foundation for their research in Otolaryngology.

Jiri Prazma was born in the former Czechoslovakia. He graduated from Charles University Medical School in Prague in 1960, completed his residency training in Otolaryngology, and passed the examination boards in 1965. Shortly after that, he joined the research team of the Czech Academy of Sciences, Otolaryngology Division, in Prague and began working on his scientific doctoral

level training, studying active and passive ion transport in the cochlea, which was later published in *Acta Otolaryngologica*. Just about the time he was finishing his PhD research training, the political oppression in his homeland led Dr. Prazma to make the decision to leave and pursue his passion for research in the United States. Dr. Newton Fischer offered him a position as the first full-time researcher in Otolaryngology at UNC, so in 1969 Dr. Prazma and his wife Tamara set course for Chapel Hill. With Dr. Fischer's support, Dr. Prazma was soon on his way to developing a topflight hearing research laboratory.



Dr. Prazma in the lab

Over the years, many ENT faculty have collaborated closely with Dr. Prazma, including the legendary Dr. Paul Biggers. When Dr. Pillsbury assumed leadership of the program in 1983, he developed a close association with Dr. Prazma, and they rapidly became a formidable team, attracting some of the most talented medical students and residents in the country. Dr. Prazma consistently showed an ability to frame important scientific questions in ways that could be tackled within the relatively compressed timeframe available to the young researchers. The trainees tended to wind up not only with publications, but also with top prizes for outstanding presentations at national meetings. Over the course of his career, Dr. Prazma has helped to train an enormous number of students and residents, many of whom have pursued careers in academic medicine. Most projects have investigated physiological mechanisms related to hearing, and have dealt with a wide range of topics including active ion transport, cochlear blood flow, effects of diabetes on hearing, and mechanisms of hair cell loss. Dr. Prazma has published over 100 papers in peer-reviewed journals.

When asked about his favorite memories of his time here at UNC, Dr. Prazma says, "I will never forget the times when Dr. Pillsbury would call me to his office and introduce me to a medical student who was exceptionally interested in Otolaryngology research." This is what has always given Dr. Prazma the biggest thrill – sharing his love of research with interested students and residents. Dr. Prazma recalls several special occasions in which he was recognized for his outstanding contributions to the teaching of research skills, one being when the medical students designated him an Honorary Member of the John B. Graham Student Research Society, and another time when Dr. Pillsbury, as President of the American Academy of Otolaryngology-Head and Neck Surgery, gave him a "Presidential Citation."

Dr. Prazma has been aptly named the Father of ENT Research at UNC. His accomplishments have been remarkable and his influence has been wide reaching. He will be missed as much for the force and warmth of his personality as the incredible productivity of his research career. The Department is grateful for its long and happy association with Dr. George Prazma.

# WakeMed Faculty Physicians

Five physicians who hold faculty appointments in the UNC Department of Otolaryngology/Head and Neck Surgery practice in Wake County at WakeMed. They are Drs. Esa Bloedon, Brett Dorfman, Michael Ferguson (Chief), Allen Marshall, and Carol Shores.

2010 has been a busy year for WakeMed ENT/Head and Neck Surgery, as again our continued success in Wake County led to our opening a third office, Wake Specialty Physicians ENT in Knightdale. Recognizing the lack of otolaryngology in the Knightdale/Wendell area, our group opened the doors in the early fall of 2009, and as predicted, Dr. Marshall and Dr. Bloedon have been an instant hit, and the practice continues to see progressive growth.

As a group we are now five strong, and we continue to cherish our teaching relationship with the UNC residents. We are confident that we provide a unique training experience for the residents that few programs can boast. Given our relatively small group size and our persistent focus on clinical training, the residents continue to thrive under the careful guidance of our



Drs. Carol Shores and Allen Marshall



Drs. Paula Harmon and Yu-Tung Wong, with WakeMed staff (behind desk, L-R) Christy Mitchell, Latoya Ricks, and Sara Harry.

physicians. The continuity of care and the repetition that the residents receive working so closely with each individual attending makes for an ideal training ground for the building blocks of our specialty. The six-month experience of the second year residents has them arriving with almost no clinical experience and leaving with confidence and clinical competence in a wide range of bread and butter surgical procedures. The third year residents get their first real look at sinus and nasal surgery, middle ear surgery and the management of thyroid disease. And as always, our fourth year residents leave with a wealth of knowledge in the realm of head and neck surgical oncology.

We couldn't be prouder of our practice, and we again anticipate the arrival of new residents to come into our fold. We relish the opportunity to participate in their training while continuing to provide top-level care to the citizens of Wake County and beyond.

To make an appointment with one of the WakeMed ENT physicians, please call (919) 350-1630 or (919) 350-2800.



Drs. Rupali Shah and Michael Ferguson



Dr. Esa Bloedon examines Sara's ears with Dr. Joseph Roche.



Drs. Yu-Tung Wong, Brett Dorfman, and Scott Shadfar.

# The Staff

Carolyn Hamby, Clinical Academic Departmental Administrator  
Holli Gall, Director of Development

## **Administrative Academic Affairs**

Jonna Apple  
Kathy Bogie  
Ellen Doutt  
Cheryl Goodrich  
Kelly Hair  
Kathy Harris  
Dawn Wilson  
Donna Woodard

## **Nursing Staff (UNC Healthcare)**

Samylia Alston, CNA  
Diane Burden, CNA  
Katie Chandler, RN  
Claire Culberson, RN  
Sherry Egodo, CNA  
Barbara Esterly, RN  
Nancy Gates, RN  
Elaine Hinkle, RN, BSN  
Lynda Lucas, RN  
Karl Mann, RN  
Judith Miles, RN  
Patricia Perry, CNA  
Shelvy Riley, CNA  
Soon Young Rondinelli, RN  
Karen Short, RN  
Paula Solovey, RN  
B.J. Squires, RN  
Regina Stoffel, RN

## **Patient Business Associates**

Anna Bradshaw (Supervisor)  
Tery Armstrong  
Wendy Boyd  
Crystal Curasi  
Katherine Eng  
Earlene Howze  
Angel Jeffries  
Sheila Mayhew-Smith  
Brenda Vernon  
Sandra Yates

## **Research Affairs**

Madhu Dev  
Meg Dillon, AuD  
Shana Jacobs, AuD  
Heather O'Donohue  
Steve Pulver  
Tara Steplowski

## **CCCDP**

Lisa DiMaria  
Deb Hatch  
Robert Humphreys  
David Perry  
Jennifer Woodard

## **CASTLE (Durham Location)**

Sandra Hancock  
Lillian Henderson  
Lori Parker  
Cynthia Poole  
Erin Thompson

## **CASTLE (Wilmington Location)**

Meagan Evans  
Francisca Hernandez-Casillas  
Marcelo Nascimento

## **UNC P&A (UNC Healthcare)**

**Surgery Schedulers:**  
Anna Bradshaw (Supervisor)  
Phyllis Dixon  
Michelle Handy  
Patricia Longest

## **Medical Coders:**

Clara Frye  
Karen Kenion



Carolyn Hamby, CADA

One of the great opportunities that we have as a Department is to identify individuals who are significant contributors to our mission, who have made a difference, and who will continue to be an integral part of the Department for years to come. One such individual is Carolyn Hamby, our CADA (Clinical Academic Departmental Administrator). Carolyn has been with us for over twenty years and has been an innovative member of our team since the start. She constantly strives to make all issues better for us such that she can represent every interest in the Department seamlessly since she has seen many issues from multiple points of view. I have the highest respect for Carolyn, as do the other members of the faculty, for her intelligence and loyalty to our group. She has placed the interests of our Department at the highest level of her priorities. I cannot think

of another individual that I would rather have in her position than Carolyn. We take this opportunity to recognize her in this most significant way. -- Harold C. Pillsbury, MD



Administrative Academic Affairs Staff: Donna Woodard (Administrative Assistant to Drs. Weissler, Buchman, and Adunka), Cheryl Goodrich (Human Resources Manager), Ellen Doutt (Residency Program Coordinator and Administrative Assistant to Drs. Drake and Ebert), Dawn Wilson (Administrative Assistant to Drs. Zdanski, Rose, and Zanation), Kathy Bogie (Administrative Assistant to Drs. Senior and Buckmire), Kathy Harris (Executive Assistant to Dr. Pillsbury), Jonna Apple (Administrative Assistant to Drs. Shockley, Couch, and Hackman), and Kelly Hair (Accounting Manager)



ENT clinical nurses, L-R: Barbara Esterly, RN; Karen Short, RN; Elaine Hinkle, RN, BSN; Paula Solovey, RN; Karl Mann, RN; Claire Culberson, RN; Gina Stoffel, RN; and Katie Chandler, RN.



Sherry Egodo, CNA



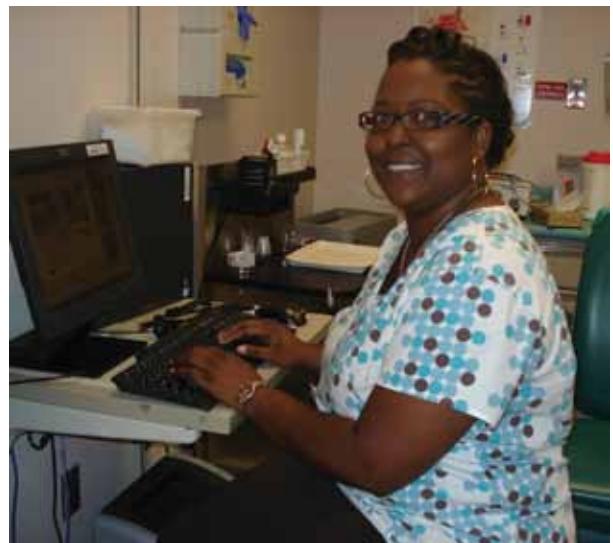
Nancy Gates, RN



Patricia Perry, CNA, works at Carolina Pointe.



Sandy Yates, PBA; Diane Burden, CNA; and Katie Chandler, RN



Samylia Alston, CNA



Patient Business Associates Tery Armstrong and Earlene Howze work the front desk, checking in patients.



Gathered at the luncheon in honor of Judy's retirement: Gina Stoffel, RN; William Shockley, MD; Patricia Perry, CNA; Carolyn Hamby, CADA; Judy Miles, RN; Harold Pillsbury, MD; and Elaine Hinkle, RN, BSN.



Patient Business Associates Wendy Boyd, Crystal Curasi, and Brenda Vernon make appointments and check out patients.



Patient Business Associates Angel Jeffries and Katherine Eng work at the ENT clinic at Carolina Pointe.



Michelle Handy is a Surgery Scheduler, and Anna Bradshaw supervises the Patient Business Associates.



At the Open House sponsored by the Voice Center at Carolina Pointe: Kathy Bogie, Dawn Wilson, Ellen Doutt, and Kathy Harris.

## Farewell to Judith Miles, RN

On August 31, 2010, Judith Miles, RN, retired after 35 years of state service (31 years with ENT). Judy began working as an inpatient surgical nurse in 1973. Around 1977, Dr. Paul Biggers started the ENT Allergy Clinic along with nurse Libby Drake, RN, and Judy joined the team in 1979. "I'll never forget my interview," Judy says. "I had been a trauma nurse, a cardiovascular nurse, and an oncology clinician prior to allergy. The supervisor interviewing me was concerned I would be bored with this job and become unhappy. I took the job and I have never been bored and have never had any regrets." Judy and Libby worked together, mixing serums and administering shots in the ENT Allergy Clinic at UNC, until 2005, when Carolina Pointe opened its doors and Judy took over as the allergy nurse there. The timing was perfect, because Judy had just broken her leg and was using a wheelchair and crutches for several weeks, so driving to and parking at Carolina Pointe made things easier. Libby retired in 2008, and Gina Stoffel, RN, took her position as the allergy nurse at the UNC location. Now that Judy has retired, Nancy Gates, RN, is testing and treating allergy at Carolina Pointe.

On July 22, 2010, members of the Department were invited to a luncheon in the clinic to bid Judy farewell and best wishes. On behalf of the Department, Dr. Pillsbury gave her a fine Bulova mantel clock, engraved with her name. Judy will be greatly missed by everyone! She plans to enjoy more time with her children and seven grandchildren. She has moved to an active community in Raleigh, where she is already having fun playing cards and making new friends. Having already traveled extensively abroad, Judy plans to spend more time exploring the rest of the United States.



Judy has been especially loved by all of the children she sees. Twins Will and Jack actually accompanied their mother, who is the patient.



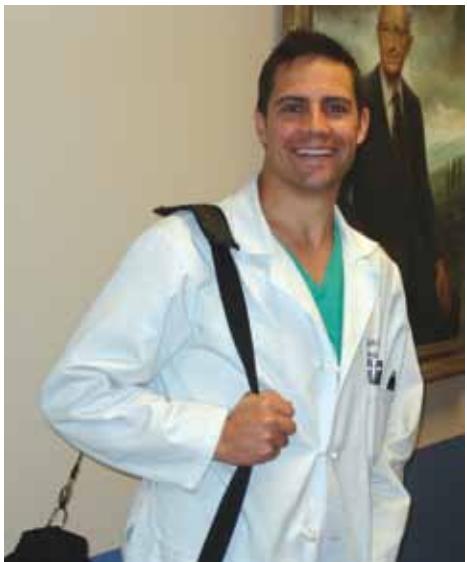
Judy gives a patient his allergy shot.



At her retirement luncheon, Judy received a beautiful Bulova mantel clock from the Department, presented to her by Dr. Pillsbury.

# The Residents

## The Chiefs: Reflections on the Program



Dr. Ladner

**Keith M. Ladner, MD:** It is a great honor to be graduating from the UNC Department of Otolaryngology, Head & Neck Surgery residency program. I have benefited immensely from the rich tradition of unparalleled patient care for the last five years. I am greatly indebted for the endless support and guidance extended to me by my peers and mentors alike. I also appreciate the support and dedication of our nurses and staff, both in the clinic and in the operating room. Next year, I will be completing a fellowship in Facial Plastic and Reconstructive Surgery with Dr. Farrior in Tampa, Florida. I am confident that no other program in the country prepares residents for their careers as well as UNC. Thank you to everyone who has allowed me to be a part of this tremendous department and participate in the care of your patients.

**Alisha N. West, MD:** The past five years have been some of the best years of my life. I am eternally grateful to have trained in a residency program with so many dedicated, brilliant, and empathetic teachers. Throughout my experience I was always encouraged to follow my dreams and to strive for the pinnacle of success. I was never limited in any facet of my training, growth, research, and surgical experience. I would like to take this opportunity to sincerely thank all of the attendings in the Department. I would also like to thank the other residents. We have become a family, and the residents in this program always care for and help each other. Dr. Pillsbury has worked hard to build the legacy that is the Department of Otolaryngology/ Head and Neck Surgery at the University of North Carolina, and I hope to carry on that legacy in my future career. I am somewhat saddened to finish my residency training, but I am also extremely excited to begin my fellowship here at the University of North Carolina in Pediatric Otolaryngology/Head and Neck Surgery. Thank you all again.



Dr. West



Dr. Basura

**Gregory J. Basura, MD, PhD:** Five years. Seems like a long period, but has truly been a blur. When I stop to reflect on the last five years, my mind swirls with thoughts and reflections of moments; moments that run the gauntlet from jubilation to frustration, from confusion to fatigue and occasionally, sheer terror. What stands out most, however, are the people. The faces of the patients; the grateful patients reassured that everything will be ok, to the frightened as we roll back to the operating room, to the confused who just were told they have cancer, to the smiles, smiles from turning off the light or getting a blanket. Residency has truly

been a ride; an emotional, physical tasking that pushes both the spirit and the body. What have sustained me in this journey are the little things. From brief moments of laughter on rounds, sitting with patients and families talking about the plan, or running the list with my colleagues, I will always look back on my residency at UNC and realize that was the time in my life when I learned the most about myself. My impetus for taking this journey has always been rooted in the desire to make a contribution. I am honored and privileged to be in a profession that allows me to contribute to the lives of others in this capacity and I will always be thankful to the department, my attendings, nurses, and fellow residents for shaping my development as a physician. Although I will shortly find myself in a land of maize and blue at the University of Michigan for a neurotology fellowship, I will keep a Carolina blue t-shirt on underneath my scrubs. Thank you, friends.

**Trinitia Y. Cannon, MD:** Once I decided that I wanted to become an Otolaryngologist, I asked for advice from my mentors on which residency program would be the best. No matter whom I asked, UNC was always at the top of the list. Image my surprise and disappointment when the denial letter came in the mail stating “they would be unable to offer me an interview at this time.” Never being one to back down from a challenge, I decided to draft a letter to Dr. Pillsbury. Many were surprised that I would be so bold, but I had nothing to lose and, hopefully, everything to gain. To my delight, I promptly received an e-mail asking me to come in for an interview. My interview day was everything that I had hoped for. The residents could not stop raving about the quality of the education that they were receiving, and they seemed to enjoy working with each other as well as spending time together outside of the hospital. In addition,



Dr. Cannon

they felt their surgical training was above par and that getting a fellowship or job with Dr. Pillsbury's support would be easy. On the day of my interview, I was offered the position as a 7-year, T-32 research resident. I would follow Dr. Carlos Ebert and become the second resident to fill this role. Because of my limited research background and desire to remain in academics, I gladly accepted and I have never regretted my decision. I worked in the lab for 2 years under the mentorship of Drs. Carol Shores and Marion Couch. In addition to being my mentors and well respected Head and Neck Surgeons, I am honored to count them as friends whom I often turn to for personal and professional advice. I am honored to say that in each discipline, I have received training from the most respected in the field of Otolaryngology. It fills me with pride to go to academic meetings and see the panelists comprised of the very people who train me on a daily basis. I am also honored to say that I have worked alongside the best residents in the country. I have forged lifelong friendships in the halls of UNC and I am very sad to leave this place behind. I will miss everyone as I head off to the Medical University of South Carolina to do a Head and Neck Fellowship.

## The Junior Residents



**Deidra A. Blanks, MD** (Research Track, 2011)

BS (Biology): East Carolina University, 2000  
MD: Brody School of Medicine (ECU): 2004



**Baishakhi Choudhury, MD** (Research Track, 2016)

BS (Psychology/Computer Science): SUNY at Binghamton University, 2002  
Post-Bac Research Fellow, National Cancer Institute, NIH, 2002-2005  
MD: SUNY at Buffalo School of Medicine and Biomedical Sciences, 2009



**John P. Dahl, MD, PhD, MBA** (2014)

BS (Biology): Villanova University, 1997

MBA: The Pennsylvania State University, 2000

PhD (Pharmacology): The Pennsylvania State University, 2001

MD: Jefferson Medical College, 2009



**Deepak Raj Dugar, MD** (2015)

BA (Biology)/MD Seven-Year Program: George Washington University, 2010



**Rose J. Eapen, MD** (Research Track, 2012)

BS (Neural Science): New York University, 2001

MD: Duke University Medical School, 2005



**Alexander Farag, MD** (2014)

BA (Chemistry): The College of Wooster, 2004

MD: The University of Toledo College of Medicine, 2009



**Mitchell R. Gore, MD, PhD** (2011)

BS (Chemistry): University of North Carolina at Chapel Hill, 1999  
PhD (Chemistry): University of North Carolina at Chapel Hill, 2004  
MD: University of North Carolina School of Medicine, 2006



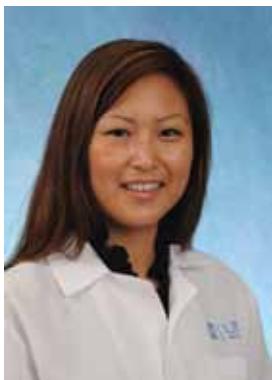
**Anna Hang, MD** (2015)

BS (Chemistry): University of Illinois at Urbana-Champaign, 2006  
MD: Uniformed Services University of the Health Sciences, 2010



**Paula J. Harmon, MD** (2011)

BS (Biology): Spelman College, 2000  
MD: Morehouse School of Medicine, 2006



**Grace G. Kim, MD** (Research Track, 2017)

BS (Biological Sciences): Carnegie Mellon University, 2003  
Post-Baccalaureate Program: University of Pennsylvania, 2004-2006  
MD: University of Medicine and Dentistry of New Jersey, Robert Wood Johnson Medical School, 2010



**Kibwei A. McKinney, MD** (Research Track, 2016)

BA (Human Biology, Spanish): Stanford University, 2001  
MD: University of Pennsylvania, 2008



**Anthony O. Okobi, Jr., MD, PhD** (2015)

BS (Neurobiology and Behavior): Cornell University, 1999  
MS (Electrical Engineering and Computer Science): Massachusetts Institute of Technology, 2002  
PhD (Speech and Hearing Bioscience and Technology): Harvard/MIT Joint Program, 2006  
MD: Brown University, Warren Alpert School of Medicine, 2010



**Mihir R. Patel, MD** (Research Track, 2013)

BA (Chemistry, Philosophy): Duke University, 1997  
MD: University of North Carolina School of Medicine, 2006



**Joseph P. Roche, MD** (Research Track, 2014)

BS (Biology): St. Mary's University of Minnesota, 2002  
MD: Medical College of Wisconsin, 2007



**Scott A. Shadfar, MD** (2013)

BS (Biochemistry, Chemistry): Oklahoma City University, 2003  
MD: University of Oklahoma College of Medicine, 2008



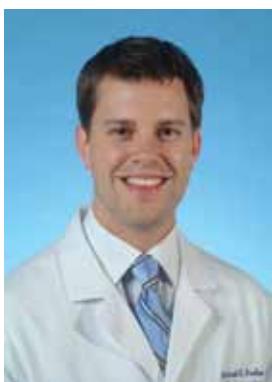
**Rupali N. Shah, MD** (2012)

BS/BA (Microbiology, Political Science): University of Georgia, 2003  
MD: Emory University School of Medicine, 2007



**Jessica K. Smyth, MD** (2013)

BS (Chemistry): United States Military Academy, 2000  
MD: Uniformed Services University of the Health Sciences, 2004  
Residency (General Surgery): San Antonio Uniformed Services Health Education Consortium, 2005  
Physician: Aerospace Medicine, Kuwait and Pope AFB, 2005-2008



**Michael E. Stadler** (2011)

BS (Biology): University of Wisconsin at Madison, 2001  
MD: University of Wisconsin Medical School, 2006



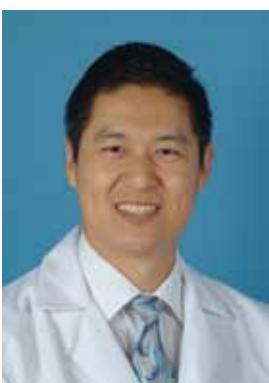
**Joshua B. Suowitz, MD (2012)**

BS (Biomedical Engineering): University of Miami, 2000  
MD: University of North Carolina School of Medicine, 2007  
Research Fellow: UNC Dept. of OHNS (NIH-funded), 2006-2007



**Brian D. Thorp, MD (2014)**

BS (Biology): James Madison University, 2005  
MD: Eastern Virginia Medical School, 2009



**Yu-Tung Wong, MD (2013)**

BS (Engineering): Harvey Mudd College, 1996  
MS (Engineering): Harvey Mudd College, 1997  
Pre-Med: University of California-Irvine, 2004  
MS (Applied Anatomy)/MD: Case Western Reserve University School of Medicine, 2008



**Maher N. Younes, MD (2012)**

BS (Biology): American University of Beirut, 1997  
MD: American University of Beirut, 2001  
Post-Doc Research Fellowship (Head and Neck Cancer): MD Anderson Cancer Center, University of Texas, 2002-2007

# Educational Programs

## Medical Students

Dr. Adam Zanation serves as Director of Medical Student Affairs within the Department of Otolaryngology/Head and Neck Surgery. This includes being third year surgery rotation coordinator and fourth year “Acting Internship” and Critical Care Selective rotation coordinator. Dr. Charles Ebert, coordinates the Head and Neck Surgery Specialty 4<sup>th</sup> Year Selective and Dr. Oliver Adunka serves as the second year Otolaryngology/Head and Neck Surgery course coordinator.



Medical students with Dr. Pillsbury on Student Research Day. Left to right: Elizabeth Rabold, Paul Swaney, Scott Owens, Mark Foster, and Alex Rich.

First-year medical students are provided a two-week intensive course in head and neck anatomy. This involves a series of one-hour lectures and includes three, four-hour afternoon sessions, including three-dimensional dissections of the head and neck, as well as multiple radiologic demonstrations. Clinical faculty members from around the state also participate in these demonstrations, donating time from their practice. This rounds out the students’ experience in head and neck anatomy and has been very well received over the years.

During the second year of medical school, the Special Senses Course is offered to medical students over a ten-week period during the fall semester. Mechanisms of disease are emphasized, covering a spectrum of diseases, disorders, and problems encountered in Otolaryngology/Head and Neck Surgery. This section of the curriculum is presented in coordination with the curriculum of Neurology and Ophthalmology. Small group sessions focus on case studies, differential diagnosis, and treatment options. Additionally, second-year medical students participate in physical diagnosis sessions in the OHNS Clinic over an eight-week period. During this time, the basics of the physical examination of the head and neck are taught by the faculty and residents.

In the third year, there are approximately 90-100 medical students rotating on the OHNS service. During this time, students attend clinics with OHNS faculty and gain exposure to operative procedures. Students make rounds each morning and are responsible for keeping up with assigned patients. At the beginning of the surgical rotation, all third year students

participate in a soft tissue course entitled Soft Tissue Laboratory: Principles and Techniques of Wound Closure. The OHNS residents and faculty serve as instructors as the fundamentals of suture techniques are introduced to the students.



Fourth year medical student Hafiz Patwa with Dr. William Shockley in the ENT Clinic.

During the fourth year of medical school, approximately 15-20 acting interns and 4<sup>th</sup> year students rotate through the OHNS service throughout the year. This constitutes a high level of activity and responsibility, with the involvement of all the housestaff and attending faculty. Many of these students apply for residency positions in OHNS throughout the country. The Department offers many resources for medical student research. During the summer between first and second years of medical school, numerous students spend 6-8 weeks in short-term research projects throughout the department. Usually, 2-5

medical students also decide to take a year between third and four year of medical school to perform dedicated research within the departments. These students and their mentors garner competitive funding through the NIH T32 programs, the UNC School of Medicine Research Programs, and the Doris Duke Medical Research Program. During this year the students explore both research and the inner workings of an academic Otolaryngology/Head and Neck Surgery department. When they apply for residency, these students are some of the most competitive and sought-after applicants due to this experience.

## Residency Program

Dr. Amelia F. Drake serves as the Director of the Residency Program and Dr. Charles S. Ebert serves as the Associate Program Director at UNC Hospitals, and Dr. Michael O. Ferguson serves as the Associate Program Director at Wake Medical Center. Responsibilities include implementing the six clinical competencies, as per ACGME guidelines, as well as ensuring the smooth transition of the residents through their specialty training.

A curriculum of lectures spans the academic year. In addition, a dissection lab occurs over the summer of commonly-performed procedures. Finally, most residents participate in



Residency Program Coordinator, Ellen Doutt (center), with residents arriving in June 2010 (L-R), Dr. Deepak Dugar, Anna Hang, Grace Kim, and Anthony Okobi.

outside educational meetings. The third year residents attend the North Carolina/South Carolina Otolaryngology meeting, the fourth year residents attend a temporal bone course, and fifth year residents attend the annual meeting of the American Academy of Otolaryngology-Head & Neck Surgery. Many residents attend the Triological meetings or the American Academy of Otolaryngologic Allergy depending on their interest.

## Responsibilities

The residency program in Otolaryngology/Head and Neck Surgery is structured to have four residents for five years of Otolaryngology/Head and Neck Surgery, one of which does seven years on the NIH T32 Training Grant. The first year, the intern year, includes six months of General Surgery, E.R., Anesthesiology, OHNS, and Surgery Intensive Care. Second-year residents participate in six months at Wake Medical Center in Raleigh, and six months of research in the OHNS laboratories. A rotation in Audiology is incorporated into the research block. The third and fourth-year house officers spend three months each at Wake Medical Center in Raleigh, as well as participate in the services of head and neck/facial plastics, pediatrics/otolaryngology, and rhinology/laryngology.

The clinical program consists of graduated responsibilities for residents at each level. Senior residents attend either the Annual Meeting of the American Academy of Otolaryngology-Head and Neck Surgery or the Combined Otolaryngology Spring Meeting. Most OHNS residents attend at least one other meeting during the year as scientific presenters. Upper level

residents learn to balance clinical and administrative responsibilities with on-call duties and academic pursuits, such as completing publications from their basic research experiences or conducting clinical research projects.

Chief resident responsibilities include: supervising the OHNS service, organizing and distributing the educational conference schedule, and assigning residents to specific clinics, call duties, consult responsibilities and operative cases.



Shelly Riley, CNA, works with all the first year residents (Dr. Deepak Dugar, seen here) doing pre-op exams and getting patients ready for surgery.



Dr. Mitch Gore

## **Resident Education**



Residents gather in the conference room of the new NC Cancer Hospital after the weekly Tumor Board meeting.

During the summer months, our residents design and coordinate a head and neck anatomy dissection course. This entails preparation and prosection of common procedures performed in OHNS. Attending physicians “take the residents through” the technical aspects of the procedure, and the discussion covers the indications, surgical options, technical highlights, and pitfalls, as well as complications associated with the procedure performed.

### A Temporal Bone Course and

Competition is scheduled in the spring. In addition, there are weekly conferences that include Journal Club, Head and Neck Conference, Radiology, Pathology, Patient of the Month Program, Morbidity and Mortality, Speech Pathology, Audiology, and Research Conferences. Each Wednesday morning residents present a case-based conference. The emphasis is on differential diagnosis, work-up, and management decisions. An in-depth discussion of the disease or disorder follows.

## **Research Opportunities**

Each resident in the Department is required to design and carry out a research project during the PGY-2 year. Many have chosen to undertake projects within the established laboratories in the Department, while others have chosen to work in related disciplines such as microbiology, molecular biology, tumor biology, audiology, or cochlear physiology. The Department also has affiliations with the Dental Research Center and the Department of Anatomy and Cell Biology.



Drs. Baishakhi Choudhury, Alex Farag, and Jake Dahl

The quality of resident research has been consistently high, tends to be collaborative and has resulted in numerous awards and publications.

The Department of Otolaryngology/Head and Neck Surgery has a number of laboratories engaged in both auditory and head and neck oncology research. Auditory research currently has separate laboratories engaged in human psychoacoustics, cochlear implant performance

and modeling, information processing and plasticity in the auditory brainstem and midbrain, the neural basis of sound localization, and inflammatory mechanisms in viral otitis media.

Head and neck oncology research includes clinical research in the form of trials involving management of patients with squamous cell carcinoma, investigation of the mechanisms and treatment of cancer cachexia, analysis of genetic mechanisms of head and neck cancer, and studies in the pathogenesis, diagnosis, treatment, and epidemiology of head and neck squamous cell carcinoma. In addition to auditory and head and neck cancer studies, research is also currently being carried out in the area of reflux, airway problems, allergies, and sinonasal disorders. The options for research by residents are limited only by imagination.



Dr. Deidra Blanks in clinic at Carolina Pointe with Dr. Pillsbury



The Southern States Rhinology Course was held on beautiful Kiawah Island, South Carolina, in April 2010. Seated, L-R: Drs. Paula Harmon, Joseph Roche, Kibwei McKinney, Trinitia Cannon. Standing, L-R: Drs. Jessica Smyth, Rose Eapen, Brent Senior (who was an instructor) and Mitch Gore.

## NIH Training Grant

In 2001, the Department was awarded a 5-year grant totaling \$580,000, from the National Institutes on Deafness and Other Communication Disorders (NIDCD) for research training in Otolaryngology/Head and Neck Surgery. With the inception of this training grant, the Department joined an elite group of about a dozen institutions that offer 2-year research training positions during residency. The grant also guarantees the Department's continued support and promotion of medical student research experiences at UNC. The training grant further extends the burgeoning research support within the Department, by providing stipends for medical students (2 for the summer and 1 for a whole year, each year of the grant) and one resident for two years for research training each year. We are currently in our second 5-year cycle of this grant.

This past year, we supported one medical student in the one-year training position. John Pike (MSI) worked over the summer with Drs. Oliver Adunka and Doug Fitzpatrick on "Evaluation of a New Cochlear Implant Electrode Design."



L-R: Tom Suberman, Dr. Doug Fitzpatrick, Dr. Oliver Adunka, and Adam Campbell. Tom and Adam were medical students working in Dr. Fitzpatrick's lab when this photo was taken.

In the 1-year training position, Mr. Thomas Suberman worked with Drs. Fitzpatrick and Adunka on a project to evaluate hearing preservation during cochlear implantation using an animal model. The purpose of this project is to develop an intracochlear recording system that will ultimately allow surgeons to assess intracochlear trauma during cochlear implantation. Previous studies have shown that cochlear trauma and poor electrode placement can lead to decreased speech perception in cochlear implant recipients. A translational model

(using the gerbil) was developed to test electrophysiological action potential (CAP) and cochlear microphonic (CM) to identify patterns of damage caused by electrode interaction with intracochlear structures. In normal hearing gerbils, he established that CM and CAP are sensitive markers of intracochlear damage, utilized a microendoscope to help guide electrode placement, and created a reduced stimulus set that has allowed us to assess if electrode insertion results in reversible or irreversible damage. They also created a noise-exposed gerbil model of sloping hearing loss and shown that CM and CAP retain their sensitivity. Their next immediate step is to use the hearing impaired model to test the sensitivity of the markers during electrode insertion through the round window, which will be

carried out by new medical students in Dr. Fitzpatrick's lab.

Mr. Suberman also worked on mapping the connections between the medial geniculate body (MGB), the inferior colliculus and the auditory cortex, in gerbils. They mapped the tonotopy in the ventral division of the medial geniculate in relation to inputs from the tonotopic map of the inferior colliculus, to test whether there are multiple pathways from the IC to the MGB.



Drs. Joseph Roche and Kibwei McKinney, two residents in the research track

Mr. Suberman also worked on a project using midbrain stimulation to establish vowel discrimination using a rabbit model. Patients who do not have a viable auditory nerve are not candidates for cochlear implants, but can have some amount of hearing restored through direct brain stimulation. A potential site for such stimulation is the inferior colliculus. The lab is testing vowel discrimination in normal hearing rabbits, with the goal of determining if the same vowel sounds can be discriminated with patterned electrical stimulation of the midbrain.

The crown jewel of the training grant is the 2-year research program for selected residents. Dr. Joe Roche has just completed his second year and has returned to the clinic. Dr. Roche held a 2-year fellowship, the Herbert Silverstein Otology/Neurotology Research Award, which is jointly sponsored by the AAO-HNS Foundation and the American Neurotology Society. This fellowship helps to support his research on synaptic plasticity and critical periods for sensory learning in auditory cortex.

Dr. Kibwei McKinney is continuing into his second year as a 2-year research resident. With Drs. Zanation and Ebert, he has been performing a patient-matched analysis of gene expression profiles and eosinophilic inflammatory pathways in allergic fungal sinusitis. The goal is to elucidate the genetic pathogenic mechanisms which underlie allergic fungal sinusitis (AFS). This disease uniquely presents unilaterally in the majority of patients, and is thought to represent a systemic allergic response of the nasal mucosa to fungi that are ubiquitous in the environment. The unilateral preponderance suggests the presence of genetic differences between the diseased and healthy mucosa. In this project, he has been performing microarray analysis on the mucosa of patients with AFS, using a patient-matched approach with the uninvolvled mucosa providing an internal control.

Dr. McKinney is also working with Drs. Kimbell and Zanation on the characterization of post-surgical changes in nasal airflow in functional endoscopic sinus surgery through a computational fluid dynamics model. The computational fluid dynamics model provides an objective measure related to the clinical response of patients who have previously undergone functional endoscopic sinus surgery for treatment of chronic rhinosinusitis. Traditionally,

objective measures have been shown to be poor predictors of a successful response to surgery. They will utilize CFD techniques to create 3-dimensional computational models from pre- and post-operative CT scans using computer aided design software. From these models, they will quantify several objective measures, including nasal airflow and heat and water transfer rates from the mucosa and correlate these to pre- and post-surgical subjective reports, documented through a quality of life clinical inventory. Dr. McKinney is currently being trained on the use of the CFD software by Dr. Kimbell, and learning how to run the fluid dynamic models.

Dr. McKinney has also been involved in the ongoing mouse cancer cachexia project, testing treatment through NF-Kappa-B inhibition using the novel compound Resveratrol, an NF-KB inhibitor. Cachexia was induced by implanting C26 adenocarcinoma cells implanted into 6-8 week old CD2F-1 mice. The experiment has now culminated and statistical analysis is being performed to quantify the effect of treatment on measures of cachexia.

Our incoming resident is Dr. Baishakhi Choudhury, who is working with Dr. Fitzpatrick on midbrain auditory prostheses. Our incoming summer students are Mr. Russell Coletti, working in Dr. Manis' lab on a project entitled "Spike-timing dependent plasticity in primary auditory cortex," and Mr. Jacob Wang, working in Dr. Fitzpatrick's lab on a project entitled "Monitoring the Status of Residual Hearing During Cochlear Implantation in an Animal Model: Use of a Clinically Relevant Electrode and Limited Stimulus Set." Our 1-year student is Faisal Ahmad, working in Dr. Fitzpatrick's lab on a project entitled "Electrophysiological characterization of an animal model for noise-induced hearing loss: Implications for cochlear implant patients with residual hearing."

The trainees have been actively submitting papers for both their basic research and in the clinical arena, as well as attending a variety of conferences to present their work. The residents in particular have also been quite successful in obtaining additional research funding for their

projects, including the Herbert Silverstein Otology/Neurotology Research Award (Dr. Roche). Additional success in the program is evident in the number of applicants we have had from institutions outside UNC Chapel Hill, attesting to the national stature of the program and the strength of the research opportunities.



Russell Coletti with Dr. Paul Manis. Russell is a medical student who worked in the Manis Lab on the T32 training grant during the summer of 2010.

So far, in the first 8 years this grant has provided research support for 9 residents for 2-year research projects, 12 medical students for a 1-year research experience, and 12 medical students for a short-term (summer) research stint. Dr. Paul Manis, the Director of Research Training and Education, is the Program Director and Principal Investigator for this grant.

## Visiting Professors

Every year the Department invites guest lecturers from across the United States and abroad to present a wide range of topics of both clinical and research interest. These visiting professors also participate in our conferences during their visits. This year we welcomed eight exceptional speakers:

### **Stil Kountakis, MD, FACS**

Vice Chairman and Professor, Department of Otolaryngology

Medical College of Georgia

Augusta, Georgia

*Frontal Sinus: Anatomy and Surgical Management*

*Rhinosinusitis: Pathophysiology, Diagnosis, and Treatment Strategies*

September 15-16, 2009

### **Paul C. Bryson, MD**

Clinical Fellow, Center for Laryngeal and Voice Rehabilitation

Harvard Medical School

Boston, Massachusetts

*Laryngology Update: Current Innovations for Benign and Malignant Disease*

November 9, 2009

### **Brian W. Downs, MD, FACS**

Blue Ridge ENT, Allergy and Facial Plastic Surgery

Morganton, North Carolina

*The Devil is in the Details: Decision Making in Facial Rejuvenation*

*Repair of Nasal Defects: Reconsidering the Paradigm*

December 15-16, 2009

### **Sigsbee W. Duck, MD, FACS**

Pinehurst Surgical Clinic, PA

Pinehurst, North Carolina

*Contract Negotiations*

January 20, 2010

### **Marvin P. Fried, MD, FACS**

Professor and Chairman, Department of Otorhinolaryngology-Head and Neck Surgery

Montefiore Medical Center

Bronx, New York

*Imaging and the Otolaryngologist*

*The Unified Airway and Its Impact on the Larynx*

January 12-13, 2010

**Krishna G. Patel, MD, PhD**

Assistant Professor, Department of Otolaryngology/Head and Neck Surgery  
Medical University of South Carolina  
Charleston, South Carolina  
*Cleft Lip Rhinoplasty*  
*Face Transplant*  
January 26-27, 2010

**C. Gaelyn Garrett, MD**

Professor, Department of Otolaryngology  
Medical Director, Vanderbilt Voice Center  
Vanderbilt University Medical Center  
Nashville, Tennessee  
*Hoarseness: Is it Really Reflux?*  
*Caring for Singers: What Every ENT Should Know*  
March 23-24, 2010

**John Rhee, MD, MPH, FACS**

Professor, Division of Facial Plastic Surgery  
Department of Otolaryngology  
Medical College of Wisconsin  
Milwaukee, Wisconsin  
*Nasal Airway Obstruction: A Model of Integrative Outcomes Research*  
June 23, 2010



Drs. William Shockley, Brian Downs, and Trinitia Cannon out for dinner during Dr. Downs' visit. He graduated from our residency program in 2005 and is now a facial plastic surgeon in Morganton, NC.



Drs. Kibwei McKinney, Jake Dahl, and Keith Ladner enjoy dinner after Dr. Downs' lecture.

# Fellowship Programs

## Pediatric Otolaryngology Fellowship



Dr. Austin Rose (Fellowship Program Director) with Dr. Laura Rosenthal (Pediatric Otolaryngology Fellow, 2009-2010)

As the UNC Division of Pediatric Otolaryngology grows, there is a clear opportunity for excellent training at the fellow level. Dr. Austin Rose serves as the Director of the Pediatric Otolaryngology Fellowship, which began in 2009 with Dr. Laura Rosenthal as our first fellow. She earned her MD from the University of Illinois, followed by residency training in Otolaryngology/Head and Neck Surgery at the Henry Ford Hospital in Detroit. She is interested in all aspects of pediatric otolaryngology, but has particular interests in the management of patients with craniofacial anomalies, such as cleft lip and palate. After a very successful year, Dr.

Rosenthal completed her fellowship here at UNC on July 1, 2010 and went on to Chicago where she joined the faculty as an Assistant Professor at Loyola University.

After graduating from our residency program, Dr. Alisha West followed Dr. Rosenthal as the next fellow in July of 2010. We know Alisha well from her great work as a resident here at UNC and are thrilled at the opportunity to continue working with her as she continues her training at the fellowship level.

As the only Pediatric Otolaryngology Fellowship in the state, the program should help to bolster the Division's position as the premier group for pediatric otolaryngology training in North Carolina. UNC is home to a free-standing Children's Hospital, Pediatric Airway Center, Craniofacial Center, and Pediatric Cochlear Implant Program, offering pediatric otolaryngologists entering the field many ways to get involved and expand upon their residency training. In addition to clinical responsibilities, there are also opportunities for research, as well as rotations in pediatric anesthesia, pediatric pulmonary medicine and pediatric genetics. With three full-time faculty and approximately 2000 cases per year in the Children's Hospital OR and Ambulatory Care Center outpatient operating rooms, the position offers a great deal of clinical and operative experience.



Dr. Alisha West (Pediatric Otolaryngology Fellow, 2010-2011)

## Neurotology Fellowship

The Division of Otology/Neurotology of the Department of Otolaryngology/Head and Neck Surgery has opened and filled the position of a Neurotology Fellow. Dr. Oliver Adunka will serve as the fellowship director. The fellowship will provide the unique opportunity to train with the Department's busy neurotologists, Drs. Buchman, Pillsbury, and Adunka. We are very fortunate that we were able to attract Benjamin Wei, MD, PhD, FRACS, who will start this position in April 2011.

## Rhinology and Skull Base Surgery Fellowship

The new Rhinology and Skull Base Surgery Fellowship will begin on July 1, 2011. Co-directed by Drs. Adam Zanation and Charles Ebert, this one-year fellowship program provides comprehensive training in the medical and surgical management of sinonasal inflammatory disease, anterior and central skull base lesions (endoscopic and/or open management), allergic disease, and orbital pathology. Emphasis is also placed on research that ranges from basic science translational work to clinical trials. Our goal is to provide the highest-quality, broad-based training that will impart fellows with the knowledge and expertise to develop a successful tertiary Rhinology/skull base surgery practice. Mitchell R. Gore, MD, PhD, has been accepted as the first fellow, following completion of his residency at UNC in 2010.

## Advanced Head and Neck Oncology Fellowship

The Department of Otolaryngology/Head and Neck Surgery has opened an Advanced Head and Neck Oncology Fellowship starting July 1, 2011. Co-directors of the fellowship, Drs. Trevor Hackman and Adam Zanation, are pleased to offer this unique one-year opportunity, which will provide the highest quality training in the medical and surgical management of all areas of Head and Neck Oncology. This includes ablative aerodigestive tumor surgery, transoral laser and robotic surgery, endocrine surgery, skull base oncology, facial reconstructive surgery and microvascular surgery.

## The Judith Gravel Fellowship in Pediatric Audiology

The UNC Pediatric Audiology team is honored to be selected as the site of a new annual fellowship, the Judith Gravel Fellowship in Pediatric Audiology, beginning on July 1, 2010. This fellowship was established by Hear the World Foundation to honor the late Judith Gravel, who died in 2009. Dr. Gravel was recognized internationally for her expertise in pediatric audiology and her commitment to the advancement of educational opportunities for clinicians and students. The Gravel Fellowship will be awarded each year to a 4<sup>th</sup> year AuD student who will complete his or her externship at UNC Hospitals, focusing on the needs of infants and young children with hearing loss and their families. Nicole Suddeth is the first recipient.

# Outreach

## Vietnam

2010 marked the 13<sup>th</sup> year that Dr. Brent Senior traveled to Vietnam with a team of otolaryngologists to work in the major teaching facilities in Ho Chi Min City in the south and Hanoi in the north. Over that time while working in conjunction with REI Vietnam of Colorado Springs, dozens of private and academic otolaryngologists from the US, Singapore, and Korea have participated as well as audiologists, nurses, and nearly a dozen otolaryngology residents from UNC and elsewhere. Millions of dollars in surgical equipment have been donated and dozens of Vietnamese otolaryngologists have been sponsored to come to the United States for mini fellowships, many of whom have gone on to become chairs of their respective departments.

In 2007, this work culminated in Dr. Senior being awarded the “Medal for People’s Health” from the Minister of Health for Vietnam.

Accompanying Dr. Senior this year were two UNC Otolaryngology/Head and Neck Surgery Chief Residents: Greg Basura and Keith Ladner. In addition, Dana Senior, Dr. Senior’s wife, returned for her 6<sup>th</sup> year, teaching English at the University of Labor and Social Affairs in Hanoi. Assisting her was their daughter, Grace, who returned to Vietnam for her second trip. “I love Vietnam and I love to see my friends when I am there!” says Grace, age 11.



Dr. Keith Ladner examines a Vietnamese child's ear. Photo by Courtney Potter.



Dr. Brent Senior, surrounded by observers, prepares for surgery at the National ENT Hospital in Hanoi. Photo by Courtney Potter, photographer and multimedia storyteller, who followed Dr. Senior on this trip to Vietnam. [www.courtney-potter.com](http://www.courtney-potter.com)

Over the last 13 years, tremendous progress in the medical realm has been seen. The technical expertise of rhinologic, otologic, and head and neck surgeries, particularly at the major teaching centers, has improved. Lectures and Grand Rounds, uncommon prior to the ENT Outreach



Dr. Greg Basura, left, operates in the National ENT Hospital in Hanoi. Photo by Courtney Potter.

trips, are now a routine part of the resident's training. Individuals trained with the assistance of UNC ENT faculty and residents now perform complex skull base and rhinologic procedures with good expertise and solid equipment. Vietnamese ENT residents who previously never saw these procedures are now finishing their training with surgical experience in these areas. And probably most gratifying is that these teachers who have learned from the experience given

to them by these outreach teams are now going out regularly to provincial hospitals to teach rural otolaryngologists and perform surgery in their hospitals, providing a reach for UNC ENT Outreach that otherwise would never be seen.

But the work and the need continue! New hospitals are being visited every year with new sets of educational and equipment needs. Dr. Senior visited the Hai Phong Medical University in the coastal city of Hai Phong for the first time in August. Plans are developing to return with a team to this university next year, yet again extending the reach of UNC ENT. And in 2010, UNC Otolaryngology/Head and Neck Surgery welcomed an otolaryngologist from Vietnam, Dr. Hang from Hanoi Medical University.

The team plans to return again in the spring of 2011, this time with the added dimension and participation of UNC neurosurgeons and oncologists. Interested physicians, nurses, or audiologists

who may like to participate should feel free to contact Dr. Senior at [BSenior@med.unc.edu](mailto:BSenior@med.unc.edu) for more information. In addition, anyone interested in contributing to the UNC ENT Outreach efforts should feel free to contact Holli Gall, Director of Development, at [holly\\_gall@med.unc.edu](mailto:holly_gall@med.unc.edu).



The picture was taken with four of our previous fellows at UNC: Seated from left to right: Dr. Phong, Vice Chair of Otolaryngology, Hanoi Medical University; Dr. Senior; Dr. Dinh, Director of ENT, Bach Mai Hospital, Hanoi; and Dr. Hung, E Hospital. Standing: Dr. Quang, Director of National ENT Hospital, Hanoi; and Rebecca, Dr. Senior's daughter (age 15), who accompanied him on the trip.

## Malawi

Word of the arrival of “Dr. Carol” spread quickly at Kamuzu Central Hospital (KCH) and our clinic was filled Monday morning with expectant faces. Landlocked Malawi ranks among the world’s most densely populated and least developed countries. Its 15 million people are served by four major hospitals, one of which is KCH, located in the capital city of Lilongwe. There is only one otolaryngologist in Malawi; consequently, it is a rare opportunity to find a surgeon who is able to treat some of the problems more unique to our specialty. Dr. Arturo Muyco,

Chair of the Surgery Department, was well aware of this fact and notified the district hospitals that Dr. Carol Shores would bring two cleft surgeons with her – Dr. Carlton Zdanski and Dr. Krishna Patel. We set up our makeshift clinic in a conference room and evaluated the assembled patients, some who had been awaiting our arrival for months. Our operating room schedule filled quickly.

Although there is a recognized need in Malawi for otolaryngologists, as well as surgeons from a multitude of specialties, short-term trips are not the most effective method to fill this void and herein lay our true objective. KCH established a surgical residency program one year ago and our goal was to teach these residents – Gift Mulima, Tiyamike Chilunjika and Rahim Ibrahim – about the principles and practice of otolaryngology. During our stay, we focused on their education. In addition to receiving a series of lectures from Dr. Zdanski and Dr.

Patel, they were actively involved in all of the operative cases. They quickly assimilated the information and by the end of our stay, Gift was able to perform a cleft lip repair.

We had the opportunity to manage several vascular malformations in children. This included the use of propranolol in a severely disfiguring hemangioma in a one-year-old child, which required the compounding of the drug. Thanks go out to Jenn Zanation who assisted us in directions for compounding



Dr. Carol Shores performing excision of a large branchial cleft cyst at Kamuzu Central Hospital in Lilongwe, Malawi, assisted by Dr. Jessica Smyth (to her right), and Dr. Arturo Muyco, the Surgical Chief of Staff.



Nelson Msiska, Clinical Officer; Dr. Arturo Muyco, Surgical Chief of Staff and Director of the Residency Program at Kamuzu Central Hospital; and Dr. Carlton Zdanski



Dr. Krishna Patel (former UNC resident, 2007), with the 3 otolaryngology residents in the KCH program (from left): Drs. Rahim Ibrahim, Gift Mulima, and Tiyamike Chilunjika.

bronchoscopes, and endoscopic foreign body forceps with him as a very generous donation from the Karl Storz Company. During our trip, three children presented with foreign body aspiration. Dr. Zdanski was able to teach techniques to the residents and clinical officers to successfully manage the foreign bodies in all of the children. Proper cleaning and care of the equipment was taught as well. At the end of the trip, the equipment was left at KCH where it will significantly improve the ability of the Malawian clinicians to better manage this common problem.

In addition to airway, cleft, and vascular malformation cases, we had the opportunity to operate on neck masses and an unfortunate case of Noma. We were able to impart new anesthetic management techniques, such as the use of local epinephrine and spontaneous ventilation during foreign body removal. We even got opportunities to share our technique for mastoidectomy – we performed two with headlights (camping headlights, that is), mallets, chisels, and curettes. Thankfully, we had brought our loupes for the clefts.

Prior to this trip, we were able to collect and send \$20,000 worth of books for the resident library and medical equipment for the theater (operating rooms) and wards thanks to the generous donations of many of you. Additionally, we collected money to provide each of the residents with a laptop computer. Each resident voiced their sincere thanks, as their access to computers had been very limited and this would be a valuable tool to their continued education.

On the trip to Malawi, Dr. Smyth read a book titled, “The Boy Who Harnessed the Wind,” by William Kamkwamba. This is a fantastic snapshot of the life of a man raised in this Malawi. One synopsis stated, “Much more than a memoir, this is a snapshot of life as a precocious teenager in contemporary Africa, and an affirmation of the notion that talent, beauty, and brilliance are distributed in equal measure around the world, even if opportunity is not. This is a story that hums with the excitement of an individual who, like the continent where he was raised is poised for greatness.” It is our mission to continue to provide opportunities and training for these residents, the talent and future of Malawi.

from here in the states. The residents from KCH inform us the child is dramatically improved. This also points to the wonderful advantages presented by this unique opportunity which allows us to work with clinicians who live and work in-country and who can provide continuing care, follow-up, and help managing potential complications.

Dr. Zdanski also brought a set of pediatric esophagoscopes,

We sincerely thank all of you who have shown interest in this endeavor and also for your continued support. Plans are already in the works for return educational trips to Malawi with Drs. Shores, Zdanski, and Patel. It is our goal to have a sustained continuing surgical educational presence in otolaryngology/head and neck surgery at KCH. If you wish to donate to the education of the residents at KCH, and the new class who will start July 2010, we have a fund established. Please contact Holli Gall, Major Gifts Officer, at (919) 843-5734, or [holli\\_gall@med.unc.edu](mailto:holli_gall@med.unc.edu).

## West Bank

During each of the last two years, Dr. Austin Rose, of the Division of Pediatric Otolaryngology, has traveled to the West Bank area of the Palestinian territories as part of an ongoing mission from UNC to improve the care of children with cleft lip and palate and other craniofacial problems in the region.

Health care services in the West Bank are coordinated by the Palestinian National Authority's Ministry of Health, though there remain significant shortages of infrastructure, supplies and medical personnel, especially in subspecialty fields. Over the past several years Dr. John van Aalst, one of our colleagues in the Division of Plastic and Reconstructive Surgery here at UNC, has traveled to the region numerous times and has helped to organize the Palestinian Cleft Society.



A mosque in Tulkarem, a small city of about 70,000 people located in the northern part of the West Bank.

Though unable to make the most recent trip, Dr. Rose, along with the help of UNC pediatric audiologists Sarah Martinho, AuD and Corinne MacPherson, AuD, was able to help coordinate

the donation of two Bone-Anchored Hearing Aid (BAHA) devices with headbands to two young children from Gaza with maximal conductive hearing loss. Both children suffered hearing loss and a resulting speech delay due to bilateral congenital aural atresia and had never been previously treated with hearing aids. The devices were transported by Dr. van Aalst, who met up with the children in the West Bank. There, he and local otolaryngologists helped to properly fit them individually for each child. When worn with a headband, the BAHA



A Cochlear BAHA sound processor device with headband and batteries.

sound processor is held against the skin behind the ear, or at another bony location of the skull, through the pressure from the band. Sound can then travel through the bone to the functioning inner ear. A BAHA device can also be fixed to a more permanent osteo-integrated titanium implant if desired. The BAHA sound processor devices themselves were generously donated by the Cochlear Corporation.



Local providers assisted these children with fitting of the BAHA devices.

Reports from the West Bank were very positive, as the children noticed an immediate improvement in hearing that they had never experienced before. Though it is sure to take time and speech therapy, their families, physicians and speech therapists hope that this intervention will also lead to an improvement in their speech and communication abilities. Members of the UNC team will also remain in contact with their local providers to help with any questions that may arise and to potentially coordinate an osteo-integrated implant, if desired, as well as microtia repair by plastic surgeon Dr. van Aalst down the road.

## The Carolina Covenant Mentoring Program

UNC was one of the first universities to establish a program that is now used throughout the country. In the Carolina Covenant, UNC covers all financial needs for admitted students whose family's incomes are at 200 percent of the federal poverty level or less. The students are given no special consideration for admission and are granted a Carolina Covenant scholarship only after they meet the admission criteria. But these are remarkable students as evidenced by the fact that a majority of the scholars are the first in their families to go to college. Each year, Dr. Marion Couch participates in a special program to be a faculty advisor to some of the undergraduate Covenant scholars.

To offer the students in the Carolina Covenant the opportunity to have mentors in the School of Medicine, the School of Public Health, and the Lineberger Comprehensive Cancer Center, Dr. Marion Couch and her colleagues have begun an additional mentoring program. The goal of the program is to give the undergraduate students the background information they need to make sound, successful career choices and to mentor them to achieve their goals.

Once a month, the students and physicians meet for Carolina Covenant Medicine and Science Mentoring program on campus. The program starts with some advice on how to prepare for a career in medicine and research. Topics include how to apply to medical school, what a career in medicine entails, and how to balance family and career. Questions are encouraged and after the meetings, the students are given the opportunity to shadow the physicians in their offices. Dinner is served to encourage professional networking. Dr. Bruce Cairns, Dr. Sam Jones, Dr. Matthew Ewend, Dr. Lisa Carey, and Dr. Peadar Noone are among many physicians who participate in this program.



Participating in the Free Oral, Head & Neck Cancer Screening in 2010: (Left to right) Sean Gallagher, RN, BSN, MA (Nurse Navigator); Cynthia Smith and Laura Miller (Head and Neck Oncology Program Coordinators); behind them is Dr. Greg Basura; continuing left to right are Drs. Trevor Hackman, Rose Eapen, Alisha West, Adam Zanation, and Brian Thorp.

## Free Oral, Head & Neck Cancer Screening at UNC

The Multidisciplinary Head & Neck Oncology program participated in the Annual Oral, Head & Neck Cancer Awareness Week (April 12th – May 18th, 2010). A free Oral, Head & Neck Cancer Screening was offered to the community on April 14<sup>th</sup>. Drs. Trevor Hackman, Adam Zanation and many of the Otolaryngology/Head and Neck Surgery residents provided screenings to 103 people from 12 counties in North Carolina – our highest turnout yet. Members of the multidisciplinary oncology team set up information tables in the lobby of UNC Hospital and provided information about Head & Neck Cancer and smoking cessation to the community.

"The true advance in health care will come with the general public practicing preventative medicine and better health maintenance," said Dr. Hackman. "We provide this screening clinics in the hopes that people will become aware of the choices they have to lead a healthier lifestyle and move towards such a goal. Particularly in the field of cancer, patients truly have the ability to prevent the illness by discontinuing the use of known carcinogens like tobacco and alcohol, and we here at UNC provide help with this endeavor with the UNC Nicotine Dependence Program."

# Clinical Programs

## Pediatric Otolaryngology



Dr. Austin Rose checks a young patient's ears.

coordination of physicians and specialists in different disciplines. For this reason, our work in Pediatric Otolaryngology is often carried out in conjunction with other providers in the fields of Pediatric Pulmonary Medicine, Pediatric Anesthesia, Pediatric Gastrointestinal Medicine and Pediatric Hematology-Oncology, as well as Pediatric Speech & Language Pathology and Audiology. Over the last few years, the North Carolina Children's Airway Center, directed by Dr. Zdanski, has helped to better organize and facilitate this coordination of care. In a similar manner, the UNC Craniofacial Clinic, led by Dr. Drake and housed in the UNC School of Dentistry, has helped to coordinate the care of patients with cleft lip and palate and other craniofacial disorders from the entire Southeast United States, and as far away as Switzerland, for since 1963.

In addition to their clinical work, the faculty of the Division of Pediatric Otolaryngology dedicates significant time to both teaching and

The Division of Pediatric Otolaryngology includes three fellowship-trained pediatric Otolaryngologists: Amelia F. Drake, MD; Carlton J. Zdanski, MD; and Austin S. Rose, MD. Together, care for infants and children with problems relating to the ears, nose and throat. They see patients in the NC Children's Hospital, UNC ENT Clinic in the North Carolina Neurosciences Hospital, as well as at the UNC ENT at the Carolina Pointe office.

Many children presenting to UNC have complicated medical problems and multi-system diseases that require the careful



Dr. Amelia Drake (Division Chief) removes a foreign body from a girl's ear canal.

research responsibilities. Dr. Drake serves as the Department's Residency Program Director and both Drs. Rose and Zdanski serve on the American Board of Otolaryngology's Task Force for New Materials. In addition, Dr. Rose is the current Course Director of the annual Newton D. Fischer Society meeting and Director of the Division's Pediatric Otolaryngology Fellowship Program.

Recent publications have included research in the areas of pediatric tracheotomy, noise-induced hearing loss, the radiographic appearance of esophageal foreign bodies, the use of high-resolution ultrasound in the diagnosis of pediatric recurrent respiratory papillomatosis and the description of a new approach to the treatment of sinonasal giant cell granuloma.

In addition to work recognized both locally and nationally, the Division has been well represented internationally, with presentations to audiences overseas, such as at the International Cleft Congress in Brazil in September 2009. They participate in medical mission trips to Malawi, the West Bank/Israel and Vietnam. The faculty has also worked to strengthen its ties with international colleagues in Pediatric Otolaryngology by hosting a number of visiting physicians from around the world, including the United Kingdom, Israel and Thailand.

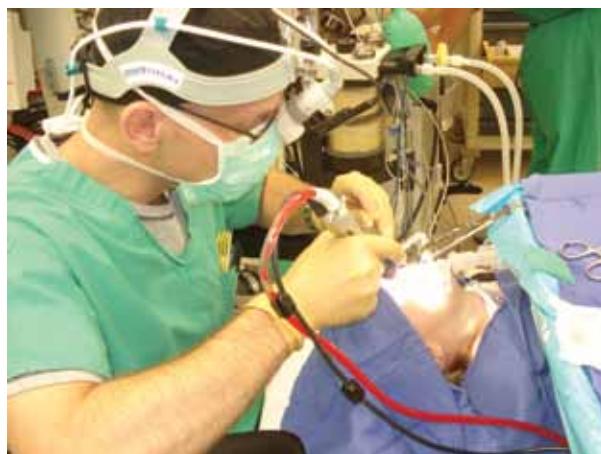
As in the past year, the future should prove exciting for the Division of Pediatric Otolaryngology as it continues to provide state of the art care, expand its services and renew its commitment to research and education in the field.



Dr. Carlton Zdanski and pediatric nurse Claire Culberson, RN



Dr. Rose Eapen operating with Dr. Laura Rosenthal (Pediatric Otolaryngology Fellow, 2009-2010)



Adenoidectomy is a well-recognized operation for the treatment of chronic rhinosinusitis in children, though even time-tested procedures can benefit from advances in technology. In this picture, Dr. Austin Rose is using a powered microdebrider to perform an adenoidectomy in a young child with chronic rhinosinusitis. Preliminary results of a study conducted by Dr. Rose and Dr. Joe Roche suggest that this technique is associated with decreased blood loss and reduced anesthesia times.

## The North Carolina Children's Airway Center

The North Carolina Children's Airway Center helped The North Carolina Children's Hospital achieve a ranking of 9th in the nation among the top 30 children's hospitals caring for children with respiratory disorders by US News & World Report in their 2009 issue of America's Best Children's Hospitals. The Center was awarded a generous grant from The Duke Endowment from 2007 to 2010 for the creation of a center to care for children with complex congenital or acquired airway problems and continues to grow clinically, educationally, and in research into children's airway disorders.

The Center is a unique endeavor, supported by the Department of Otolaryngology/Head and Neck Surgery, the Department of Pediatrics' Division of Pulmonology to provide multidisciplinary evaluation and treatment of children with complex airway disorders. The Center seeks first and foremost to provide comprehensive cutting edge care for children with these unique problems in an efficient and timely manner. Additionally, the Center will seek to instruct families, medical students, clinicians and healthcare providers, and to perform research into pediatric airway disorders. The North Carolina Children's Airway Center officially opened its doors in September 10, 2007. Since then, hundreds of children have been evaluated and treated by the multi-disciplinary team, multiple protocols established for the evaluation of children with airway problems, several collaborative research projects been established, multiple presentations at national meetings given, and numerous presentations at the state and local level. In addition, the Carolina's Pediatric Airway Course has been established in collaboration with the Medical University of South Carolina and outreach efforts extend to Africa where Dr. Zdanski is involved in the teaching of airway endoscopy and surgery to surgical residents and clinical officers at the Kamuzu Central Hospital in Lilongwe, Malawi.

The Center's core organizational structure includes Surgical Director Carlton J. Zdanski, MD; Medical Director George Retsch-Bogart, MD; Respiratory Therapist Mark Hall, RT; Tracheostomy Nurse Cynthia Reilly, PNP; OHNS pediatric nurse Claire Culberson; Speech Pathologists Leah Thompson, SLP, and Krisi Brackett, SLP; Social Worker Cathy Tutka, LCSW; and Program Coordinator Kathy Abode, RN.

The North Carolina Children's Airway Center provides an individualized, coordinated approach to each patient and the full range of pediatric medical and surgical services, including otolaryngology, pulmonology, anesthesia, radiology, ICU care, feeding and swallowing, nutrition, tracheostomy care, social work, respiratory therapy, speech and communication, are available to patients of the Airway Center. The clinicians at the Center have an interest in caring for all children with airway problems, including those with existing tracheotomies or with new airway problems. If you have a patient you would like to refer to the North Carolina Children's Airway Center, please feel free to contact the OHNS Clinic at 919-966-6485 and ask for Claire Culberson, RN, or call the Consultation Center at 800-862-6264, and request Dr. Zdanski.

# Facial Plastic and Reconstructive Surgery

The Division of Facial Plastic and Reconstructive Surgery offers services for patients with reconstructive and cosmetic problems related to the face, ears and neck. Resident education is a top priority, focusing on the principles of soft tissue surgery, facial plastic surgical techniques and the management of patients with these special needs.

## Rhinoplasty Clinic

In recent years we have established a Rhinoplasty Clinic devoted to patients with post-traumatic nasal deformities, congenital nasal anomalies, patients with nasal valve problems, and patients who have nasal obstruction and/or cosmetic deformities. The clinic offers a wide range of reconstructive procedures including rhinoplasty, septorhinoplasty, nasal valve repair and correction of other deformities such as saddle nose deformities and soft tissue injuries. The most notable change that we have seen in the past couple of years is a significant increase in the number of revision cases that are referred to UNC, especially with respect to septorhinoplasty and nasal valve repair.



Dr. William Shockley (Division Chief) and Dr. Mihir Patel performing a septorhinoplasty in a patient with a traumatic nasal deformity and a telescoping injury of the nasal septum.

## Microtia Program

The number of patients seen for microtia repair has dramatically increased over the past two years. Dr. Shockley and Dr. Zdanski offer a multidisciplinary approach to the treatment of



Drs. Carlton Zdanski, Alisha West, and William Shockley, who performed the first microtia reconstruction in the Department.

these complex congenital anomalies. Patients are seen initially by both Dr. Zdanski and Dr. Shockley. Management decisions are made as to whether further anatomical imaging will be required with respect to their congenital atresia. Those with multiple anomalies and clinical syndromes are managed through the Craniofacial Clinic. Audiometric evaluation is critical in the early phase so that aural rehabilitation can be offered to those patients where it is appropriate. Luckily, many patients have a normal ear on the opposite side with

normal hearing on that side as well. Once the patient is deemed a candidate for microtia repair the optimal age and timing of the repair is outlined for the family.

For Grade III microtias we are using the traditional four stage technique popularized by Dr. Burt Brent. We now have several children in the program at various stages of their reconstructive procedure. We have found many advantages to the two-team approach, including saving operating time by being able to perform surgery on two sites simultaneously. This allows harvesting the rib graft while removing the cartilaginous remnant and creating an appropriate recipient pocket for the auricular framework. In addition we offer two esthetic perspectives with respect to the shape, size and contour of the final reconstructed cartilaginous framework. We have been very pleased with the early success of this program and are grateful to our referring physicians.



Dr. Rose Eapen (left) working with Dr. Shockley in clinic. Elaine Hinkle, RN, BSN, has been Dr. Shockley's nurse for 15 years.

## **Facial Plastic Surgery Clinic**

The Facial Plastic Surgery Clinic sees a wide range of patients. Through this clinic we manage patient with post-traumatic facial deformities, facial scars, skin cancer and Mohs defects, long standing facial paralysis, and those that have had reconstructive or cosmetic surgeries elsewhere with unsatisfactory results. Patients may present with cosmetic concerns, some of which are candidates for surgical procedures such as brow lift, face lift, blepharoplasty, mentoplasty or other minor procedures such as fillers and Botox. With the increased incidence of skin cancer and the improved access to Mohs surgery, a large number of patients are seen with facial and nasal defects. Those with nasal, lip and ear defects present special anatomical problems with respect to reconstruction, given the unique configuration of these specialized structures. Some of the patients with nasal defects undergo multi-stage procedures, such as those requiring forehead flaps, cartilage graft reconstruction, and repair of internal nasal lining defects. Even patients with major rhinectomy defects following resections for life threatening and advanced cancers have been successfully reconstructed using multi-staged procedures to rebuild the surrounding cheek and lip, along with their nasal defects.

## **Resident Education**

Resident education remains one of the primary goals of the Division of Facial Plastic and Reconstructive Surgery. We typically have two conferences per month devoted to Facial Plastic Surgery. We are blessed to have many physicians involved with the education of our residents. In addition to the lectures and discussions provided by Dr. Shockley we also have many others who contribute each year. We need to give special recognition to Dr. Madison Clark who comes

from his practice at Alamance Regional Hospital, providing superb presentations relating to the many of the facets of facial plastic surgery. He typically comes three to four times a year. Others whom we should recognize include Dr. Cynthia Gregg (Cary), Dr. Charles Finn (Chapel Hill), and Dr. Greg Kilpatrick (Pinehurst).

We often have visiting professors who specialize in facial plastic surgery. In recent months we had Dr. John Rhee (Medical College of Wisconsin) and Dr. Minas Constantinides (NYU).

In addition to lectures and didactic discussions we also take the residents through a popular facial plastic surgery text, going over chapters covering a wide range of subjects. We typically provide a Review Course in Facial Plastic Surgery in the spring. This is done in conjunction with Neal Goldman at Wake Forest University School of Medicine. The course is open to Otolaryngology residents, Plastic Surgery residents, and fellows in Ophthalmic Plastic and Reconstructive Surgery.

## Rhinology, Allergy, and Sinus Surgery

Sinusitis is one of the most common diseases occurring in the United States with nearly 36 million cases diagnosed every year. Originally established in 1979 by W. Paul Biggers, MD, and Libby Drake, RN, the Division of Rhinology, Allergy, and Sinus Surgery provides a complete range of services for management of sinus and allergy conditions. These services include the latest in medicine, immunotherapy, and surgery.

Judy Miles, RN, and Gina Stoffel, RN, provide full allergy service to over 300 patients a month. With the use of the multi-test 11 screen, the allergy nurses have been able to test younger children. The opening of the Carolina Pointe satellite clinic has brought unparalleled convenience, offering free parking at the front door. The allergy nurses and ENT physicians



Dr. Charles Ebert performing Functional Endoscopic Sinus Surgery (FESS) on a child with cystic fibrosis.



Dr. Brent Senior (Division Chief) with Dr. Mihir Patel in clinic at Carolina Pointe.

are an integral part of educating new residents about the importance of allergy treatment in the ENT practice.

The Division is managed by Brent A. Senior, MD, with other members including Adam M. Zanation, MD; Charles S. Ebert, MD; Harold C. Pillsbury, MD; Brett E. Dorfman, MD (WakeMed); and Michael O. Ferguson, MD (WakeMed). Together, they perform a full range of minimally invasive surgery for management of diseases of the nose and paranasal sinuses, including Functional Endoscopic Sinus Surgery (FESS), a minimally invasive technique used to restore sinus ventilation and normal function in the setting of chronic infection. Recent advances in these minimally invasive techniques developed by UNC surgeons now allow for performance of minimally invasive surgery for many tumors of the nose and sinuses and, in some cases, those of the orbit and even of the brain. Recent technological acquisitions, including the latest in powered instrumentation, computer image guidance, and balloon sinus dilation, aid in these techniques and provide significant advantages over traditional approaches. In addition, the division was among the first in the world to obtain and utilize intraoperative CT imaging for real-time surgical use.

As a result of the Division of Rhinology, Allergy, and Sinus Surgery's leadership in the realm of nasal and sinus disease, UNC Otolaryngology/Head and Neck Surgery was named the first recipient of a "National Center of ENT Excellence" Award in 2004 by BrainLAB, AG, of Munich,

Germany, one of the world's leading image guidance technology companies.

A major activity of the Division is co-sponsorship of educational programs in rhinology and sinus surgery. The Division co-sponsors the Southern States Rhinology Course held each spring on Kiawah Island, South Carolina. Jointly sponsored by the Medical University of South Carolina, the Medical College of Georgia, Emory University, and the Georgia Nasal and Sinus Institute,



Soon Young Rondinelli, RN, works with Dr. Adam Zanation.



Gina Stoffel, RN, the allergy nurse in the ENT Allergy Clinic at UNC, gives a patient a shot.



Dr. Harold Pillsbury with OR Technician, Ronnie Bostic.

the course attracted over 80 participants from around the world in addition to over 30 residents. The course provided an opportunity to participate in laboratory dissections while hearing renowned rhinologists over the course of this two-day meeting. The next course will take place March 31 – April 2, 2011; more information on this annual course can be found at [www.southernstatesrhinology.org](http://www.southernstatesrhinology.org).

Research remains a major focus for the Division. This year, numerous residents and medical students participated in Division research activities resulting in several presentations at major national and international otolaryngologic meetings including the Annual Meeting of the AAO/HNS and the Annual Meeting of the American Rhinologic Society. Topics of division research have included aspects of minimally invasive pituitary surgery, image guidance, and basic science studies in the innate immunity of the paranasal sinus epithelium, leading to several papers submitted and published in peer-reviewed journals. Collaborative work with the Department of Psychiatry and the Division of Pulmonary Medicine is ongoing and yielding new insights into the nature of sinus disease and olfaction.

## Office Based Treatments for Nasal Obstruction

Nasal obstruction has long been successfully treated with septoplasty and/or submucosal resection of the inferior turbinates. Both procedures require a visit to the Operating Room, usually with general anesthesia, and frequently with septal splints and packing. Complications of these procedures include nasal septal perforation, bleeding, infection, and following over-resection of the inferior turbinates, dry nose with persistent crusting. Radiofrequency submucus resection of the turbinates (Nasal Somnoplasty) is a minimally invasive procedure that can be performed in the office with only topical anesthesia that avoids a trip to the Operating Room and has an extremely low incidence of side effects (bleeding). It is indicated for patients whose nasal obstruction does not relate to deflections of the nasal septum and whose turbinate enlargement is not due to bony hypertrophy. The procedure is well tolerated by patients, with no postoperative pain, and one to two treatment sessions will cure approximately 80-90% of appropriately-selected patients' nasal obstruction. Radiofrequency submucus resection of the turbinates is an ideal procedure for patients who do not wish to have a procedure performed in the Operating Room, and whose nasal obstruction is not related to septal deflection.

## Office Based Treatments for Snoring

Snoring is a ubiquitous problem in the United States, affecting more than 50% of middle aged men and 40% of middle aged women. Obtrusive snoring can be associated with more severe medical conditions, including obstructive sleep apnea, or upper airway resistance syndrome

(UARS), and treatments for these disorders of sleep are needed to prevent long-term problems with heart and lung disease.

For simple snoring, not associated with OSA or UARS, radiofrequency treatment of the palate (Palatal Somnoplasty) is our procedure of choice. Now available in the United States for about 10 years, It is a time tested office-based procedure, where a needle electrode is inserted into the palate, delivering radiofrequency energy to heat surrounding tissue. We have altered the technique to increase the amount of energy and the number of lesions given to the palate, thereby decreasing the number of treatment sessions needed to improve snoring. 70% of patients will be cured after two treatment sessions using our technique. The side effects of this procedure are minimal; however, palatal ulceration, fistula, and uvular slough have been reported. The relatively minor amount of post-procedure pain is the major advantage of this technique over other snoring therapies. And as opposed to other minimally invasive treatments, no implants are required with no risk of implant extrusion.

## **Obstructive Sleep Apnea Treatments**

Nearly one-fourth of middle-aged men and one-tenth of middle-aged women have problems with sleep disordered breathing ranging from simple snoring to severe breathing disorders during sleep, such as obstructive sleep apnea. Obstructive sleep apnea has been associated with decreased life span, mandating diagnosis and treatment. Working with sleep medicine specialists in the Departments of Neurology and the Division of Pulmonary Medicine, as well as surgical colleagues in the Department of Oral and Maxillofacial Surgery and Dentistry, members of the Department of Otolaryngology/Head and Neck Surgery provide unique personalized treatment plans for patients with sleep apnea including some of the following:

### **Septoplasty**

Septoplasty consists of removing pieces of deviated bone and cartilage from the nasal septum. Avoiding the need for packing of the nose or placement of splints makes this outpatient operation a remarkably painless procedure. For patients with enlargement of the turbinates alone and a straight septum, turbinate reduction may be all that is required.

### **Tongue Base Somnoplasty**

#### **(Radiofrequency Volumetric Tissue Reduction of the Tongue)**

Patients with obstructive sleep apnea frequently have obstruction at the tongue base. Many procedures are available to improve this obstruction, including genioglossus advancement, hyoid suspension, mandibulomaxillary advancement, and more recently, tongue base Somnoplasty.

The tongue base Somnoplasty uses radiofrequency energy to heat tissue surrounding a small needle which is inserted into the tongue base. The heated tissue is resorbed by the body,

leaving a scarring, reducing the size of the tongue base. This procedure has proven safe with a small incidence of tongue base abscesses being the primary complication. While proven effective by a few studies, tongue base Somnoplasty is a relatively new technique, and the ultimate utility of this modality is still unknown.

### **Uvulopalatopharyngoplasty**

Uvulopalatopharyngoplasty (UPPP) involves removing the uvula and portions of the palate and is frequently combined with tonsillectomy. Significant improvement in obstructive sleep apnea (OSA) occurs in about half of all individuals undergoing the surgery.

### **Genioglossus Advancement and Hyoid Repositioning**

Working with colleagues in the Department of Oral and Maxillofacial Surgery, genioglossus advancement is a procedure frequently performed for obstructive sleep apnea in the presence of blockage in the upper airway caused by the position of the back of the tongue. The procedure requires making an incision between the lower lip and the gum in the mouth. A small window of bone in the jaw is then cut and moved slightly, thereby pulling the tongue slightly forward and increasing the space in the breathing passage in the back of the throat. Repositioning of the hyoid bone over the front of the neck is frequently performed at the same time as genioglossus advancement in order to augment its effect.

## **Pioneering Minimally Invasive Skull Base Tumor Treatments: Minimally Invasive Pituitary Surgery (MIPS) and Expanded Endoscopic Skull Base Surgery**

In March 2000, Brent Senior, MD, along with Matthew Ewend, MD of the Department of Surgery, Division of Neurosurgery, became the first team in North Carolina to perform Minimally Invasive Pituitary Surgery (MIPS) to treat pituitary adenomas. In contrast to traditional open approaches, the nose is used as a corridor to the tumor, so no facial or oral incisions are involved, dramatically reducing the overall morbidity of the procedure. Sinus endoscopes are used to directly access and open the sphenoid sinus. The scope is held in position and the sella is then accessed using a typical two-handed technique. The tumor is removed using only the endoscopes, allowing for visualization at angles deep in the sella for removal of residual tumor that may otherwise be missed using microscopic approaches.



Drs. Brent Senior and Josh Surowitz performing Minimally Invasive Pituitary Surgery (MIPS).

Recovery is rapid and no packing is typically used. Tumor removal is potentially more complete given the ability of the angled endoscopes to see behind and under otherwise obstructing structures. “Hydroscopy,” a technique developed by Drs. Senior and Ewend, is then performed in order to assess for residual tumor. Drs. Senior and Ewend have become recognized experts in this exciting area, lecturing nationally and internationally on the topic, in addition to authoring publications in several books and journals. They have performed over 400 of these procedures, placing University of North Carolina at the forefront of minimally invasive approaches to skull base tumors.

In 2008, Dr. Adam Zanation joined Dr. Senior in the Division of Rhinology following his fellowship in Minimally Invasive Skull Base Surgery at the University of Pittsburgh. Teaming up with Dr. Anand Germanwala in the Division of Neurosurgery, they are advancing minimally invasive skull base surgery to new and exciting levels for patients with a variety of skull base, brain, spine, orbital tumors, and even certain brain aneurysms. The role of expanded endonasal skull base surgery is growing; allowing for treatment of more advanced skull base tumors. These tumors include sinonasal cancers, meningiomas, craniopharyngiomas, optic nerve and orbital tumors, and petrous apex lesions. In the last year, UNC performed over 100 expanded endoscopic tumor surgeries. In a very special case in 2008, Drs. Zanation and Germanwala performed the first endoscopic endonasal clipping of a ruptured aneurysm in the world. The one year follow up of this patient revealed complete obliteration of the aneurysms. The manuscript describing this novel approach has been accepted to the prestigious journal *Neurosurgery* and will be published in this up coming year. This case illustrates the potential of the minimally invasive endoscopic approach and shows that UNC is expanding the limits in this new field.

As techniques and experience lead us to utilize the endoscopic corridor for more complex skull base lesions, the natural progression is to utilize this approach for pediatric skull base tumors. Drs. Zanation and Senior along with our Pediatric Otolaryngology Attendings (Drs. Austin Rose and Carlton Zdanski) have successfully performed numerous pediatric skull base surgeries together. Dr. Zanation's lab has recently published one of the first papers on endoscopic pediatric skull base surgery and reconstruction in *Laryngoscope* 2009, which illustrates the hurdles and offers solutions that these pediatric cases present. Two additional follow-up manuscripts in pediatric endonasal and skull base surgery have been accepted for publication this past year. What is clear is that all pieces of this multidisciplinary puzzle are integral and needed to optimize patient care. Drs. Rose and Carlton Zdanski and the UNC Skull Base Surgery Program are all currently working together to provide the most advanced pediatric tumor care and advance the research in pediatric skull base tumor surgery.

Drs. Senior and Zanation are known nationally for their teaching efforts in the areas of pituitary and endoscopic skull base surgery. Both lecture and hold courses at the AAOHNS annual meeting, both are invited faculty for national and international skull base meetings and course. UNC is planning our first Skull Base Surgery Course for the upcoming year.



Members of the Multidisciplinary Head & Neck Oncology Team present at the Tumor Board meeting on December 4, 2009, left to right: Sue Hayden, Aimee Shea, Sean Gallagher, Adam Zanation, Neil Hayes (seated), Dale Flowers, Laura Miller, Carol Shores, Julian Rosenman, William Shockley (seated), Mark Weissler, Trevor Hackman, Mary Fleming, Ben Huang, Cynthia Smith (seated), and Bisham Chera. (Photo by Will Owens)

## The UNC Multidisciplinary Head & Neck Oncology Program

The Multidisciplinary Head & Neck Oncology Program offers a full range of leading-edge diagnostic and therapeutic techniques for the treatment of all benign and malignant tumors of the Head & Neck including, but not limited to, tumors of the oral cavity, pharynx, and larynx; soft tissues; thyroid; nose and sinuses; ear and temporal bone; skull base; salivary glands; and the cerebello-pontine angle. The Program's main goal is to cure head and neck cancer while maintaining optimal speech and swallowing function and achieving the best possible cosmetic result. We have extensive experience in minimally invasive endoscopic skull base surgery,

transoral laser resection and microvascular free flap reconstruction. Recently, transoral robotic surgery has been added to our armamentarium and a Minimally Invasive Head and Neck Surgery Center has been formed and is starting to support quality of life and functional outcomes research.



Dr. Trevor Hackman positions the microscope in preparation for a transoral CO<sub>2</sub> laser supraglottic laryngectomy.

The team consists of surgeons, medical oncologists, radiation oncologists, pathologists, diagnostic and interventional radiologists, dentists, epidemiologists, prosthetic specialists, nutritionists, speech and swallowing specialists, nurses, and social workers. The



Drs. Deidra Blanks and Marion Couch performing a thyroidectomy.

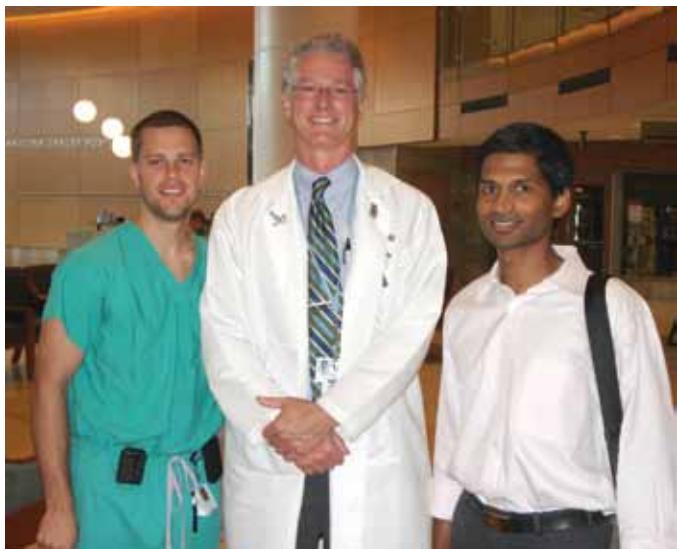
exchange of knowledge and opinions among team members ensures that the best possible treatment plan is developed for each patient. Each week, the Program holds an interactive conference attended by Program members from each discipline. Mark C. Weissler, MD; William W. Shockley, MD; Marion E. Couch, MD, PhD; Adam M. Zanation, MD, and Trevor G. Hackman, MD, serve as the Program's Head & Neck oncologic surgeons at UNC, while Dr. Carol G. Shores MD, PhD serves as the oncologic surgeon at Wake Med. This conference is also Webcast to Wilmington, NC where Head & Neck physicians participate

directly and discuss their patients. Other centers from around the state will hopefully be joining our teleconferencing efforts in the near future. Patients from Wake Med in Raleigh are presented at this conference by Dr. Shores. Our weekly tumor board now routinely discusses over 35 patients per week, actively undergoing multidisciplinary cancer therapy at UNC. In 2009, 675 new patients came through the Multidisciplinary Head & Neck Cancer Program at UNC Hospitals.

The program now performs many ultrasound examinations in the ENT clinic for the evaluation and ultrasound guided needle biopsy of thyroid and other neck masses. Trans-nasal esophagoscopy and laryngeal video stroboscopy are also available for the evaluation of Head and Neck patients with special problems. Mr. Brian Kanapkey and Mr. Byron Kubik from speech pathology works hand in hand with the surgeons in the management of post-treatment speech and swallowing dysfunction. Dr. Glen Minsley from dental prosthetics assists our patients with prosthetic management of head and neck defects. Dr. Bill Shockley has a special interest in the rehabilitation of facial palsy resulting from cancer therapy.

Sean Gallagher, RN, MA and Susan Hayden, RN serve as our nurse navigators for head and neck cancer patients. They assist patients as they navigate through their complex treatment protocols. They work closely with the patients and their families to insure that they are well informed about the multiple treatment modalities utilized in modern cancer treatment.

Ms. Laura Lyndon Miller and Cynthia Smith are our program coordinators. They arrange for initial consultations at



Drs. Michael Stadler, Mark Weissler (Division Chief), and Mihir Patel.



Dr. Adam Zanation chats with a patient.

UNC from referring physicians, gathering all the outside medical information on these often complex patients.

Elizabeth Sherwood, RN, MS, ANP-C, assists with psychological support through the trying period of treatment and follow-up. She is the Coordinator of Survivorship Programs and helps our patients by providing support during and after treatment as they transition from active treatment to surveillance. We offer a Symptom Management Clinic, which assists with follow-up of medications (i.e., anti-depressant, anti-anxiety) and emotional/

mental health issues, as well as the whole range of side effects folks deal with related to surgery, chemotherapy, and radiation.

Dale Flowers, RN, OCN serves as the Clinical Trials Nurse and works with Dr. Neil Hayes and others in medical oncology to assist patients to navigate through the complexities of treatment on the wide variety of experimental protocols available.

Xiaoying Yin, MD, MS is a full time basic science researcher in the Head and Neck laboratory within the Lineberger Cancer Center. Dr. David Neil Hayes along with Dr. Yin received a University Cancer Research Fund competitive grant in 2009 which continues in its second year to study Genomic Classification of Head and Neck Cancer in Paraffin Samples. The purpose of this research is to identify molecular fingerprints of clinically apparent subtypes of squamous cell cancer of the head and neck.

Each year we run a very successful oral cancer screening day. Under the auspices of the Head and Neck Cancer Alliance, formerly the Yul Brynner Foundation, physicians spend an afternoon in the Oto-HNS clinic screening the public for oral cancer and other diseases of the head and neck. The oncology nurse navigators and program coordinators put on an exhibit in the hospital lobby and provide information about head & neck cancer and smoking cessation. This was the busiest year ever, with over 100 people from 12 counties in North Carolina taking advantage of this special event.



Drs. Michael Stadler and William Shockley

## Clinical Trials

The Head and Neck Oncology Program continues to strive for a goal of having at least one clinical trial open for all of the clinical cancer scenarios seen frequently in our group. Present open (and pending) clinical trials are listed below.

- OSI 3602s--Phase 2 study of erlotinib, cisplatin and radiotherapy versus cisplatin and radiotherapy in patients with Stage III and IV SCCHN. First line trial
- NCI 8070—Phase II Randomized Trial of the Combination of Cetuximab and Sorafenib or Cetuximab alone in Patients with Refractory, Recurrent and/or Metastatic Squamous Cell Carcinoma of the Head and Neck.
- NCI 8271—Phase II Trial of Dasatinib (BMS 354825) for Recurrent or metastatic c-KIT expressing Adenoid Cystic carcinoma and for Non-Adenoid Cystic Malignant salivary Tumors.
- (PENDING): EGF102988—A randomized, double-blind, Placebo-controlled, multicenter Phase III Study of Post-operative Adjuvant Lapatinib or placebo and concurrent Chemoradiotherapy followed by Maintenance Lapatinib or PBO Monotherapy in High-risk subjects with resected Squamous Cell Carcinoma of the Head and Neck
- PENDING: 14E-MC-JXBA: Phase II study to evaluate the pharmacokinetics and drug-drug interaction of Cetuximab and Cisplatin in patients with recurrent or metastatic Carcinoma of the Head and Neck
- PENDING: A Randomised, Double-Blind, Placebo-Controlled, Multi-centre, Phase III Study of Post-Operative Adjuvant Lapatinib or Placebo and Concurrent Chemoradiotherapy Followed by Maintenance Lapatinib or Placebo Monotherapy in High-Risk Subjects with Resected Squamous Cell Carcinoma of the Head and Neck (SCCHN)
- PENDING: Selective IMRT for Locally Advanced Head and Neck Carcinoma, with Concurrent Panitumumab
- PENDING: Identification of a Gene Expression Signature Profile for Panitumumab Sensitivity in Untreated Locally Advanced Squamous Cell Cancer of the Head and Neck (SCCHN)



After weekly Tumor Board meeting, Dr. Neil Hayes (left) talks with Dr. Carol Shores. Dr. Rupali Shah leans over to speak with Dr. Adam Zanation, seated at right.



The North Carolina Cancer Hospital

## The New Face of Head and Neck Cancer Care

The North Carolina Cancer Hospital, the state's only public cancer hospital, opened for business in September of 2009. It is conveniently located immediately adjacent to the Neurosciences Hospital and the Otolaryngology/Head and Neck Surgery clinic. The hospital was truly designed and built with cancer patients and their families in mind. The natural light, gardens, courtyard, and artwork contribute to the healing atmosphere.

The new hospital represents the new face of cancer care at UNC Hospitals, and members of the Multidisciplinary Head and Neck Oncology Program are excited about what this means for their patients. Those requiring radiation and/or chemotherapy will receive their treatments in this beautiful new hospital, which is the new home of Radiation Oncology as well as the clinical home of the Lineberger Comprehensive Cancer Center.

The hospital contains 101 rooms for examination, treatment, consultation, and procedures, 50 inpatient oncology beds, and a new infusion center with 72 stations. It features state-of-the art diagnostic imaging equipment, and three Linear Accelerators for Radiation Therapy. This includes Intensity Modulated Radiation Therapy (IMRT), which results in better shaping the radiation dose to the shape of the cancer, and Image Guided Radiation Therapy (IGRT) to better aim the beam at the cancer. There is also a High Dose Rate Radiation Therapy room for treating localized tumors with radioactive implants.



Views of the sunny courtyard of the new hospital can also be enjoyed by those seated inside.



The hospital's main lobby displays a "Gallery of Faces" with personal stories told by patients who are fighting cancer with hope, courage, and strength.

The Multidisciplinary Head and Neck Tumor Board now meets on Friday mornings in the NC Cancer Hospital. The new conference facilities have the ability to teleconference with various sites throughout North Carolina. This capability allows the team to collaborate in real time with physicians across the state so that they can develop the best course of treatment for each individual patient. In general, 25 to 30 patients are discussed each week, including patients from WakeMed.

For more information about the Multidisciplinary Head and Neck Oncology team of experts and all that the new cancer hospital has to offer, go to <http://nccancerhospital.org>. Appointments for new patients can be made by contacting Laura Miller at 919-966-9717.

## The UNC Robotic Head and Neck Surgery Program

In March 2010, Dr. Adam Zanation performed North Carolina's first Transoral Robotic Head and Neck Surgery (TORS). This surgery was the culmination of over 12 months of work to set up a Robotic Head and Neck Surgery Program with the help of the CARES (Computer and Robotic Enhanced Surgery) Center at UNC. As of June 2010, UNC is the only center in North Carolina to offer Minimally Invasive Robotic Head and Neck Surgery. Currently, Dr. Zanation has performed robotic surgeries for transoral tumor resections, complex obstructive sleep apnea surgery and skull base tumor surgery.

In December 2008, Dr. Zanation met with Dr. John Boggess of the Department of Obstetrics and Gynecology to discuss a future robotics program for Otolaryngology/Head and Neck Surgery. Dr. Boggess is internationally renowned for his techniques and research with robotic assisted surgery for Gynecologic Oncology. With Dr. Boggess' mentorship and support, Dr. Zanation began training with the da Vinci Robotic Surgery System in the Fall of 2009. Our first patient had a base of tongue procedure without complications. Currently, Dr. Zanation has performed robotic surgeries for transoral tumor resections, complex obstructive sleep apnea surgery and skull base tumor surgery.



Dr. Adam Zanation (right) and Dr. Keith Ladner performed the first robotic head and neck surgery in North Carolina. In the background is the da Vinci Robotic Surgery System.

The da Vinci robotic surgery system is a three dimensional endoscope-based robot with three articulating instrument arms. As the surgeon operates, state-of-the-art robotic and computer technologies scale, filter and seamlessly translate the surgeon's hand movements into precise micro-movements of the da Vinci instruments. The primary advantage of the system is high definition 3D visualization, flexibility with complex instrument movements in tight spaces, and the ability to access areas of aerodigestive tract without incisions or splitting the mandible. This has the potential to reduce surgical morbidity and provide better patient functional outcomes.

Dr. Carlton Zdanksi (Pediatric Otolaryngology) and Dr. Zanation are planning one of the world's first pediatric Transoral Robotic Surgeries. The last several months have been used for planning stages and currently two patients have been recruited, the first of these innovative surgeries will be performed early this year.

The UNC Robotics Program is currently seeing patients for selected head and neck cancers, tongue base related obstructive sleep apnea, and skull base tumors. Future research plans involve expanding robotic indications for skull base surgery and merging other technologies with the robotic interface. For patient referrals call Laura Miller at 919-966-9717.

## Speech Pathology: The Head and Neck Cancer Voice Restoration and Swallowing Clinic

The Voice Restoration and Swallowing Clinic consists of a multidisciplinary team providing evaluations and therapy for a wide variety of head and neck cancer patients. Speech pathology services in the area of head and neck cancer are coordinated by speech pathologist Brian Kanapkey with additional coverage by Linda Hube and Leslie Johnson.

In 2009, Byron Kubik joined the Head and Neck Cancer Clinic Speech Pathology Team as a Clinical Fellow. He has been working on expanding speech pathology services into the



Byron Kubik, Clinical Fellow, and Brian Kanapkey, Speech Pathologist

head and neck oncology program. Working with Dr. Neil Hayes and Dr. Bisham Chera, he has established more comprehensive protocols for continued evaluation and treatment of speech and swallowing deficits for head and neck cancer patients receiving chemo and radiation therapy. Byron will be remaining on the team full-time and continuing to strengthen this program.

This year (2010) marked the first year that UNC held a regional conference on care of the laryngectomized patient. Dr. Eric Blom was the keynote speaker. The conference was multidisciplinary with several UNC School of Medicine affiliated physicians who conducted educational seminars. Additionally, several UNC nurses as well as social workers participated and provided excellent information for conference attendees. Many national vendors were present and attendees represented states as far away as Connecticut. Brian Kanapkey held a clinic in the UNC ENT Clinic in several rooms donated by Dr. Pillsbury. This gave patrons the opportunity to see laryngectomy care with professionals and patient volunteers. The conference was attended by 50 registrants and received a 4.7 out a possible 5.0 or overall information.

Patients treated in the speech pathology clinic include but are not limited to those patients with partial and total laryngectomy with or without tracheoesophageal puncture, oral cavity cancers, neck cancers, skull base tumors, short and long term tracheostomy, and chemotherapy and radiation injury patients.

The ENT surgeons within the UNC ENT Clinic, along with oncology physicians, evaluate cancers and provide proper surgical and/or chemotherapy and radiation treatment for these patients. The speech pathologist works on order from the ENT physician or oncologist and provides evaluation and treatment for the functional disorders that result from cancer treatment. Functional deficits affecting maintenance of proper nutrition by mouth and aspiration risks are treated by the speech pathologist.

The latest in technology for swallowing therapy, such as surface electromyography for biofeedback and VitalStim electrical stimulation is used here at UNC. The techniques allow for excellent data keeping for research analysis. In this way, the physicians and speech pathology team in the UNC ENT Clinic help to contribute new information in the area of swallowing rehabilitation after treatment for head and neck cancer.

Recently, a dual valve TEP prosthesis was introduced to the total laryngectomy market. The prosthesis is a new design that was pioneered here at UNC Healthcare by Brian Kanapkey. Product evolution and eventual manufacture was a result of collaboration between Kanapkey and Dr. Eric Blom of CENTA in Indianapolis, Indiana. Dr. Blom is largely responsible for historical development as well as the current state of the TEP prosthesis in the U.S. The professional collaboration between Blom and Kanapkey continues with hopes of continued contributions to the advancement of TEP prostheses and related products.

Yet another role filled by the head and neck clinic speech pathologist is teaching about tracheotomy before and after surgery. Speech Pathology is part of the team seeing this

population for the purpose of providing educational information, thus helping patients make more informed decisions.

The head and neck clinic speech pathologist also provides therapy to help restore optimal communication to the patient who has had laryngectomy and oral cavity resections and reconstruction. Additionally, Botox injection(s) evaluations are available to those who fail to develop TEP speech post-operation.

Finally, a program for remediation of oversized TEP was developed by Brian Kanapkey using silicone for creation of extended Tracheoesophageal flanges to stop around the prosthesis leakage. This process reduces pulmonary aspiration and risk of aspiration pneumonia from around the prosthesis leaks.

## The UNC Voice Center



Artist Margie Labadie, with Dr. Ellen Markus, Linda Hube, and Dr. Robert Buckmire. Behind them is one of Ms. Labadie's works of art, which is based on her own experience with a voice disorder. She donated this and three other works to the Voice Center.

The UNC Voice Center is comprised of a multidisciplinary team of highly-experienced physicians and speech pathologists providing specialized diagnostic and therapeutic services to dysphonic patients with all descriptions of voice disorders and laryngeal pathologies, including laryngeal dystonia, vocal cord paralysis and paresis, cysts, polyps, nodules, and other pathologies of the larynx in both casual and professional voice users. Available voice and speech services include behavioral assessment, videolaryngostroboscopy, acoustic

and aerodynamic measurements, assessment of vocal ergonomics, and spirometric evaluation. Beyond the treatment of voice disorders, the Voice Center also acts as an information resource to the referring medical community along with providing educational materials, seminars, and outreach programs on voice science, care of the voice, and state of the art diagnosis and treatment of voice disorders.

Diagnostic voice evaluations are performed at The UNC Hearing and Voice Center at Carolina Pointe, which celebrated its fourth anniversary in April this year, and is conveniently located at 5915 Farrington Road adjacent to the intersection of Highway 54 and Interstate 40.

The Voice Center expanded its presence at Carolina Pointe in the fall of 2009 and is now



Dr. Robert Buckmire (Division Chief) with his patient William Styons, of the Raleigh Fire Department

providing diagnostic voice evaluations one and one-half days each week, as well as all voice therapy services. (The Voice Center continues to provide one half day service at UNC in the Neuroscience Hospital for appropriate patient evaluations). In celebration of our recent move, The Voice Center sponsored an Open House on May 14<sup>th</sup>, 2010, which highlighted the art work of Margie Labadie. Ms. Labadie is a former voice patient who developed a series of art pieces about her experience with an initially devastating voice disorder, entitled "Finding My Voice." Ms. Labadie generously donated four of her works to the clinic, two of which now hang in the waiting room area.

The UNC Voice Center Team will also be presenting a one-day voice conference for speech pathologists on August 27<sup>th</sup>, 2010 entitled, "Demystifying the Management of Voice Disorders." The conference will include regionally and nationally-known guest speakers.

### **The Voice Center Team**

The Voice Center Director, Dr. Robert Buckmire joined the faculty in September of 2004 after completing a post-graduate fellowship in Laryngology and Care of the Professional Voice, and a subsequent faculty position at the University of Pittsburgh. His special clinical and research interests include care of the professional voice, the application of robotics to microlaryngeal

surgery, diagnostic laryngeal electromyography, laryngeal framework surgery and the diagnosis and treatment of swallowing disorders.

Dr. Mark Weissler has maintained an active practice in laryngology since 1986 with special emphasis on the treatment of laryngeal dystonias, benign and malignant laryngeal neoplasms, vocal fold paralysis, and laryngeal and tracheal stenosis.

Dr. Ellen Markus is the Voice Center Coordinator. She has a Master's Degree in Speech Pathology and a Doctorate in Vocal Music Performance and specializes in working with singers, from amateur to professional. She has taught singing for over 35 years and co-founded the UNC Voice Wellness Clinic in 1991 with Dr. Mark Weissler. She specializes in rehabilitating singers who have experienced vocal injury, as well as working with all other types of voice disorders. She has lectured regionally and nationally on the care and prevention of voice disorders.

Linda Hube, who holds a Master's Degree in Speech Pathology, has a background in theatre and vocal music and special training in voice and swallowing disorders. She has a special interest in the behavioral approach to the treatment of Spasmodic Dysphonia and vocal tremor and has lectured on the topic at both regional and international symposia.



Dr. Ellen Markus, right, using the Phonatory Aerodynamic System (PAS developed by KayPentax) to measure airflow and air pressure parameters related to voice production. Lesonia Mason (left) provides administrative support at the Hearing and Voice Center.



Linda Hube, right, assesses the acoustic output of the vocal folds. The KayPentax Computerized Speech Laboratory is the most advanced speech analysis system available to date and is capable of analyzing sophisticated facets of voice and speech production.

## The UNC Hospitals Hearing and Voice Center at Carolina Pointe

The UNC Hospitals Hearing and Voice Center at Carolina Pointe is a community-based Audiology and Speech Pathology clinic that works in close collaboration with the UNC Ear, Nose and Throat physician group and is conveniently located at 5915 Farrington Road adjacent to the intersection of Highway 54 and Interstate 40.

In addition to the voice program (as described on the previous pages), the audiology team at the UNC Hospitals Hearing and Voice Center provides comprehensive diagnostic and therapeutic audiology services for both pediatric and adult patients. In addition to behavioral audiometry,

a full compliment of other assessment modalities is available including: tympanometry, acoustic reflexes, otoacoustic emissions, Eustachian tube function, and auditory brainstem response testing. From a therapeutic perspective, the audiology team also can provide amplification in the form of hearing aids as well as cochlear implants for patients with more severe hearing loss.

The audiology program at the UNC Hospitals Hearing and Voice Center has experienced consistent growth over the past 4 years. The team of audiologists at the Hearing and Voice Center includes Drs. Marcia Clark-Adunka, English King, Jill Ritch and Gregory Smith. Dr. Ritch is a pediatric audiologist while Drs Clark-Adunka and King specialize in adult cochlear implant audiology. The adult cochlear implant program at UNC is amongst the largest of its kind in the world and provides some of the most innovative and cutting edge approaches to hearing loss rehabilitation.

The adult hearing aid dispensing program has also experienced steady growth over the past year. "Our goal is to provide every patient with the education they need when deciding to purchase new hearing instruments," says Smith. Focusing on patient education and the latest digital technology has contributed to the growing number of satisfied and successful hearing aid users. "Our hearing aid return rate continues to remain extremely low at around 1%," says Smith. "The bottom line is that we want our patients to be satisfied with the product they choose," adds Smith. Patients are allowed 30 days to evaluate their hearing aids and they may

return their hearing aids for any reason during the evaluation. All hearing aids purchased at the Hearing and Voice Center come with a minimum one-year warranty, which also includes loss and damage coverage. Recognizing that cost may be a concern for some patients, UNC Hospitals offers payment plans that can be arranged prior to the hearing aid purchase. Additionally, patients are encouraged to bring in hearing aids that are either broken or not functioning properly for repair or adjustment, regardless of where they were originally purchased.



Pediatric audiologist Jill Ritch, AuD, tests a patient in the sound booth at Carolina Pointe.



Greg Smith, Audiologist at the Hearing and Voice Center at Carolina Pointe

To further improve patient access to the audiology and speech pathology programs offered

at UNC Hospitals, the Hearing and Voice Center has expanded into available clinic space at Carolina Pointe adjacent to the clinic's current location, with the addition of one sound booth for audiometric testing, and two voice therapy suites. This expansion provides a much-needed opportunity for the adult and pediatric hearing aid programs to grow and will allow the UNC Voice Center to shift their clinic operations to a more convenient and accessible location.

The UNC Hospitals Hearing and Voice Center is open Monday through Friday, from 8:00 AM to 5:00 PM. For more information regarding available services, appointments or referrals, please call (919) 490-3716.

## The UNC Ear and Hearing Center



Drs. Alisha West and Craig Buchman (Division Chief) performing cochlear implantation in a child with severe inner ear malformation.

The UNC Ear and Hearing Center, directed by Dr. Craig Buchman, is a regional center that provides specialized diagnostic and surgical care to adult and pediatric patients with diseases of the ear, skull base, head, and neck. The Center represents a comprehensive multidisciplinary approach to service delivery and patient care. Multiple professionals trained in varying aspects of hearing disorders staff the Center. Specialists of the Center are from the Division of Neurotology & Skull Base Surgery, the Division of Pediatric Otolaryngology, and the Carolina Children's Communication Disorders Program (CCCDP)/CASTLE, and the UNC Hospitals Division of Audiology & Speech Pathology.

Pathology). These specialists include pediatric and adult audiologists and otolaryngologists, auditory/verbal therapists, speech pathologists, and a designated Ear & Hearing Center nurse.

The Ear and Hearing Center serves as a resource, not only for UNC Hospitals, but also for patients, physicians, nurses, audiologists, and other healthcare professionals throughout the State of North Carolina. Staff services range from consultation, diagnosis, disease treatment, and medical/surgical interventions, to rehabilitation and follow-up.

Extensive audiology services, in conjunction with Otolaryngology/Head & Neck physicians, are an integral part of the Ear & Hearing Center. Newborn to geriatric hearing screening; hearing aid assessment, fitting, and dispensing; and cochlear implantation evaluation are offered. American Sign Language interpreter service is also readily available through "Deaf Talk", a video interpreting system. Diagnostic exams available include behavioral, evoked response, and vestibular testing. Patient education, on a wide variety of hearing related conditions, has been developed for patients and families. Center staff also participate in 1) community-based efforts in the promotion of hearing wellness for schools and other groups, 2) professional organizations focused on the hearing impaired and related disorders, 3) development and involvement in local and national conferences promoting the goals of the Center and academic interests of

the University, and, 4) ongoing hearing-related research. Otology physicians, Ear and Hearing Center nurses, audiologists, speech pathologists and other staff are also committed to student teaching, and the development and provision of continuing professional education, both on the UNC Hospital campus and the state.

In the last year, the Ear and Hearing Center at UNC has been very busy locally, nationally, and internationally. Clinically, our team of professionals evaluated more than 400 children with newly identified hearing losses from around the Southeastern United States and abroad. Given our extensive experience and unique multidisciplinary approach, we continue to see a number of tertiary referrals for the diagnosis and management of challenging pediatric hearing loss cases. Last year alone, over 100 new hearing aid fittings and 120 cochlear implants were performed in the pediatric population. It has not been unusual for amplification to be undertaken before 3 months of age at UNC and cochlear implantation to occur before 12 months. Professionals from the Ear and Hearing Center continue to collaborate closely with professionals from around the state to provide additional services for these children.

The Ear and Hearing Center also evaluated more than 100 new adult patients with hearing loss for possible cochlear implantation last year, implanting nearly 100 new patients. Recent advances in surgical techniques and device technology has allowed surgeons at UNC to implant patients with more residual hearing than ever before. Patients with hearing loss no longer need to be deaf before considering cochlear implantation. Drs. Adunka, Buchman, Clark-Adunka, and Pillsbury have begun to test the effects of combining hearing-preserving cochlear implantation with amplification (also called Electro-acoustic stimulation or EAS) in an effort to serve a greater number of patients with sensorineural hearing loss. Preliminary results from these studies are very encouraging. Many of these patients have significant improvements for hearing in noise when compared to their performance with their hearing aid alone.

Another area of interest is bilateral cochlear implantation. Drs. Buchman and Pillsbury have been actively involved in bilateral implantation in selected patients more than 7 years. In their early studies, bilateral implants showed a distinct advantage for both hearing in noise and

sound localization abilities. While not for all patients, bilateral implantation is more common than ever, now being extended to the pediatric population as well. Today, more than 150 patients have received bilateral implants at UNC. Many of our previously implanted recipients are requesting second side implantation with the hope of improvements in sound localization and hearing in noise. Our research clearly demonstrates that bilateral implantation improves hearing-in-noise and these gains can continue as long as 4 years following implantation.



Dr. Harold Pillsbury with a patient who has a cochlear implant and is preparing for implantation of his second.

While cochlear implants are useful for most patients with severe to profound sensorineural

hearing loss, occasionally patients may not benefit from implantation because of disorders related to the cochlear nerve or cochlea. In such cases, direct brainstem stimulation may provide improvements in communication abilities. Such brainstem stimulation has been used for patients with tumors of the brainstem in the past but has never been applied to non-tumor patients in the United States. In an effort to provide this specialized technology to patients in need, Dr. Buchman and Dr. Matthew Ewend from the UNC Division of Neurosurgery performed a brainstem implant in a patient that suffered from cochlear ossification following meningitis. This patient

has now been using his device for more than 3 years with significant demonstrated benefits. For this patient, the brainstem implant has provided dramatic improvements in sound awareness and enhanced lipreading abilities, thereby improving quality of life substantially.

In another related area, Drs Adunka and Buchman have been participating in a clinical trial to provide patients with persistent conductive or mixed hearing loss that is not amenable to conventional surgical treatment or amplification with a device that can directly stimulate the fluids of the inner ear through the round window. This approach bypasses the ear canal and hearing bones (ossicular chain). Through a surgical approach that is similar to the cochlear implant, the device is placed directly on the round window membrane of the inner ear. The patient wears an external, quarter size, processor that drives the internal device. Four patients have been implanted thus far at UNC. These patients have noticed significant gains in their hearing. One individual that previously had no ear canal since birth is now able to hear with this ear. While this technology remains experimental, the potential future applications remain very exciting.

The Ear and Hearing Center professionals have also been very active in local, regional, national and international programs to educate others in hearing-related disorders. Some of the areas of expertise that our group has lectured on in the past year include newborn infant hearing screening programs, pediatric hearing loss, amplification, cochlear implantation, electrophysiological assessment of hearing in children, auditory neuropathy spectrum disorder (ANSD), and vestibular disorders.



Richard Collette (middle), President and CEO of MedEL, with Drs. Craig Buchman (left) and Oliver Adunka at the UNC Cochlear Implant Patient Picnic in April.

## The UNC Skull Base Center

The multidisciplinary skull base team at UNC is in full operation. The group is now routinely meeting to discuss a variety of skull base lesions and their management. We remain strongly committed to the concept of offering patients a balanced and unbiased opinion with all avenues being explored. The scope and experience of this group is vast, thereby providing patients the opportunity for a truly comprehensive evaluation.

UNC continues to be a world leader in endoscopic skull base surgery generally and minimally invasive pituitary surgery (MIPS) specifically, with nearly 70 of these surgeries performed in the last year. With this extensive experience, past UNC research has shown that MIPS results in shorter hospital stays and less overall complications compared to traditional open approaches. More recently, in work completed just this last year, a study of 50 patients undergoing MIPS at an average of two years follow-up showed no significant detrimental impact of the surgery on patient's sinonasal quality of life. Additional recent UNC research has shown a similar benefit with regards to the economics of this surgery, with a marked reduction in total healthcare costs related to MIPS compared to traditional techniques. With decreased length of stay and lower nursing costs, savings were found to be nearly 24%, averaging over 3000 dollars less for each procedure.

UNC is also a leader in the comprehensive management of acoustic neuroma (a.k.a vestibular schwannoma). This relatively common benign nerve sheath tumor arises along the cochleovestibular nerves between the brainstem and inner ear. The UNC Skull Base Team evaluates more than 75 patients per year with these lesions. While surgical excision used to be indicated for nearly all of these cases in the past, today an eclectic approach is more appropriate with some patients being managed with observation and periodic imaging, some choosing stereotactic radiosurgery, and some still undergoing surgical excision.

We recently have undertaken an outcomes review of our last 117 acoustic tumors operated at UNC in an effort to insure our patients are getting the best outcomes available surgical outcomes in the region. Using all 3 surgical approaches with an emphasis on neural preservation, complete excision is accomplished in the vast majority of cases and preservation of normal or near normal facial nerve function is achieved 96% of the time. For cases where hearing preservation is possible, we have used the middle fossa approach in most instances with successful maintenance of hearing at or near preoperative levels 70% of the time. Most patients are discharged from the hospital after 3-5 days in the hospital and complications have been very unusual.

### **Background and Philosophy**

Historically, the complex anatomical relationships of many important structures within the base of the skull have made treatment paradigms particularly morbid for afflicted patients. Recent advances in surgical approaches, cranial nerve monitoring, endoscopic visualization, intraoperative imaging and navigation, neuroendovascular techniques, as well as intraoperative and stereotactic radiation have allowed dramatic improvements in patient outcomes and quality of life. Many of these improvements have been directly attributable to close collaborations between a variety of medical disciplines including Neurosurgery, Otolaryngology-Head & Neck Surgery, Radiation Oncology, Neurointerventional Radiology, and rehabilitative disciplines. For example, surgical approaches developed by rhinologists and neurologists have allowed neurosurgeons access to tumors and other lesions involving the skull base without the need for traumatic brain retraction, resection, or in some instances, skin incisions. Moreover, working together, surgeons and radiation therapists have been able to apply precise anatomic knowledge to the delivery of highly focused radiation in an effort to avoid collateral tissue damage.

Skull base lesions are uncommon and clinical trials for treating many of these lesions are lacking. Patients are frequently left to seek opinions from a variety of clinical specialists including medical and radiation oncologists as well as surgeons in an attempt to find a consensus regarding optimal therapy. However, opinions are frequently divergent and dictated by the practitioner's area of expertise rather than by patient factors. This creates significant uncertainty among both patients as well as referring physicians during difficult times.

Nationwide, there are very few dedicated skull bases centers that provide a truly multidisciplinary approach to the management of such tumors. Most centers use either a "surgery-centric" or "radiosurgery-centric" model depending on the institution's expertise and interest. This institutional bias might not serve the patients' best interests. At UNC, we are fortunate to have a unique skull base program that combines professional experience and skills, cutting edge technologies and facilities, and a burning desire to provide a balanced and unbiased opinion of the treatment options that serves the patient's best interests. Cooperation through mutual respect for one another's skills and opinions forms the backbone for this eclectic treatment philosophy.

Both Neurosurgery and Otolaryngology-Head & Neck Surgery have recently added new faculty members with special interests and training in this area. Radiation Oncology has also recently added the Cyberknife Radiosurgical System to the radiation-based treatment armamentarium. This system has a dedicated nurse coordinator for patient care. The Cyberknife System has a number of distinct advantages over its competition in that it allows for precise frameless delivery of either single dose or fractionated dose radiation to tumors throughout the body including the skull base.

Dr. Craig Buchman serves as Director of the new UNC Skull Base Center. Others from the Department of Otolaryngology-Head and Neck Surgery who are directly involved include Drs. Oliver Adunka, Marion Couch, Harold Pillsbury, Brent Senior, William Shockley, and Adam Zanation, as well as nurses Barbara Esterly, RN, B.J. Squires, RN, Soonyoung Rondinelli, RN and Sean Gallagher, RN.

#### **Other UNC Disciplines Involved:**

Neurosurgery: Drs. Matthew Ewend and Anand Germanwala

Radiation Oncology: Dr. David Morris

Endocrinology: Dr. Julie Sharpless

Ophthalmology: Drs. Syndee Givre and Jonathan Dutton

Neuroradiology: Drs. Mauricio Castillo, Valerie Jewells, Keith Smith, Sten Solander, and Benjamin Huang

Neurology: Dr. Jerry Greenwood

Medical Oncology: Dr. Neil Hayes

Nursing: Sharon Cush, RN, and Pasha Lemnah, RN

Rehabilitation: Diane Meyer, PT

## The UNC Adult Cochlear Implant Program

The Adult Cochlear Implant Program at the University of North Carolina at Chapel Hill in collaboration with UNC Healthcare represents by far the largest cochlear implant center in North Carolina and is among the nations busiest. The program has been in existence since the late 1970s and has managed to grow and thrive throughout the years under the direction and leadership of Dr. Harold C. Pillsbury, Chairman of the Department of Otolaryngology.



Director of the Adult Cochlear Implant Program, Marcia Adunka, AuD, with Cochlear Implant Research Audiologist, Meg Dillon, AuD.

Additional team members include, Craig A. Buchman, MD; Oliver F. Adunka, MD; Marcia Clark Adunka, AuD; English King, AuD; Meg Dillon, AuD, and a valuable team of researchers, including Joseph Hall, PhD; John Grose, PhD; Emily Buss, PhD; and Charles Finley, PhD.

The number of adult cochlear implant patients evaluated and treated at UNC Hospitals continues to increase with each passing year, and we as clinicians are proud of the growth we are experiencing and the level of care and services we can deliver. The growth in numbers of interested and qualified patients to receive an implant is the result of knowledgeable

healthcare providers in the community referring their patients to our service, increased education among medical professionals and other laypeople in the community regarding candidacy criteria for implantation, and continued patient satisfaction and word of mouth referrals from content cochlear implant users across the state and beyond. Cochlear implants represent a dynamic field in the realm of hearing healthcare and the application of these devices will be changing to treat patients with more and more residual hearing in the years to come. The use of cochlear implants to treat only those individuals with profound hearing loss is truly an approach of the past!

With the continued growth of the adult cochlear implant population at UNC Healthcare, the program expanded its clinical workspace to include treatment facilities at the UNC Hearing and Voice Center at Carolina Pointe. The traditional patient care associated with cochlear implants, including hearing evaluations via speech perception testing as well as mapping and programming of external hardware, are routinely performed at our satellite location. New candidate evaluations and intraoperative monitoring of cochlear



Ellen Pearce, AuD student (left), testing a cochlear implant candidate, with Dr. Marcia Adunka.

implant surgeries remain closely tied to the main hospital campus location. The growth and development of a satellite location for cochlear implant treatment has not only provided our adult patients with comprehensive clinical care options but also served to reduce commute times for our patrons.

The definition of a cochlear implant remains the same; however the target candidates for implantation as well as the surgical approach continue to change. A cochlear implant is

an electronic device which bypasses the outer and middle ear, providing direct stimulation to the surviving auditory nerve fibers within the cochlea. The procedure involves the surgical implantation of a receiver stimulator behind the ear. The implanted equipment is stimulated by an external speech processor. Historically, cochlear implants have only applied to patients who suffered from bilateral severe to profound sensorineural hearing loss and who no longer received measurable benefit from acoustic hearing aids. Candidacy criteria have evolved with enhancements of the internal and external components of the cochlear implant technology. Surgical approaches have also evolved to include minimally invasive incisions, reducing the overall surgery time and post-operative recovery period. The current device market consists of three FDA approved manufacturers, who specialize in the development and application of cochlear implant systems. These companies include Cochlear, Advanced Bionics, and MED-EL. UNC Hospitals is proud to offer patients access and programming support for the medical technologies offered by all three cochlear implant manufacturers.

In January 2007, UNC embarked on a new clinical trial sponsored by MED-EL Corporation, entitled Electric Acoustic Stimulation (EAS). This study aimed to incorporate a hybrid cochlear implant system; a partially inserted cochlear implant array to stimulate the high frequency region of hearing within the cochlea and an acoustic hearing aid to maximize hearing in the low frequencies. The combination of acoustic amplification via a hearing aid for the low frequency in combination with high frequency stimulation via a cochlear implant has proven to be a promising method of treatment for patients with varied degrees of hearing loss, most notably those with ski-sloped configurations. The UNC Adult Cochlear Implant program has managed to lead the U.S. commitment to this clinical trial via patient enrollment and monitoring of patient outcomes as defined by the study protocol. The outcomes have been robust for all study participants; demonstrating improved hearing in noise performance as well as improvements in music appreciation for all hybrid recipients.



Drs. Harold Pillsbury and Mitch Gore performing cochlear implantation.

An extension to the current EAS protocol was an announcement in March 2010 of expanded candidacy criteria to include potential patients with normal to near normal low frequency hearing out to 1500 Hz. The second arm of this clinical trial signifies growth in the area of cochlear implantation and a more defined bridge between the technologies associated with traditional amplification and electrical implants. Our commitment to this trial will be ongoing as we continue to seek and enroll more qualified participants, who meet the candidacy criteria for both arms of the EAS clinical trial. By pursuing these research avenues and being dedicated to new advances in science, we are better able to serve our patients and their families. As hearing care professionals of UNC, this remains our primary mission. If you would like to receive information regarding our EAS investigational trial or other clinical trials associated with hearing, please contact the clinic at 919-843-1692.

UNC research in the adult cochlear implant population continues to focus on the benefits of electric acoustic stimulation, bilateral cochlear implantation, stressed listening paradigms to better evaluate real world listening with a cochlear implant, subjective benefits as measured by patient satisfaction questionnaires, benefits and limitations of depth of insertion with traditional cochlear implants. These topics are currently under investigation via our skilled team of otologists, audiologists and hearing researchers. Stay tuned to learn more.

## Pediatric Audiology

The UNC Pediatric Audiology Program, under the direction of Patricia A. Roush, AuD, is committed to providing optimal care for infants and children with hearing loss throughout North Carolina. Dr. Roush is joined by a team of pediatric audiologists that includes Paula Johnson, AuD, Corinne Macpherson, AuD, Sarah Martinho, AuD and Jill Ritch, AuD. Nissele Franco, AuD, who completed a 4<sup>th</sup> year internship at UNC Hospitals in 2009 recently joined our team. This year marks the 10<sup>th</sup> anniversary of universal newborn screening in the state of North Carolina. The legislation, passed in 1999, requires that all infants born at UNCH and at other birthing hospitals throughout the state receive hearing screening prior to hospital discharge. As a result of this legislation, many children now have the benefit of early access to hearing health care. In fact, there are now many successful school age children whose speech, language and academic outcomes are on par with their hearing peers.



Dr. Patricia Roush and her patient, Mark, undergoing testing in the sound booth.

At UNC, screening coordinator, Chris Stancil, RN, oversees hearing screening performed by nursing staff in the well baby nursery. Audiologist Patricia Reitz, MS, conducts screening for infants in the neonatal intensive care nursery. Infants who do not pass the screening at UNC and many from other birthing hospitals throughout North Carolina are seen by the UNC Pediatric Audiology Team for comprehensive diagnostic hearing assessment using auditory brainstem response evaluation (ABR), otoacoustic emissions (OAE), and other measures.

Using a battery of physiologic tests

the team is able to estimate an infant's hearing thresholds so that hearing aid fitting can be initiated. The goal is to complete the hearing aid fitting by the age of 2 to 3 months. For infants with uncomplicated birth histories the pediatric audiologists are typically able to move from diagnosis to hearing aid fitting in less than three weeks. This is in contrast to the situation that existed prior to the advent of universal newborn hearing screening when, only a few years ago, the average age of diagnosis was over 18 months. Infants born with permanent hearing loss can now have the benefit from auditory stimulation within weeks of birth.

Members of the team are also engaged in a number of research projects. In August 2008, UNC, in collaboration with the University of Iowa and Boys Town National Research Hospital in Nebraska, began a five-year study entitled "Moderators of Functional Outcomes in Children with Mild to Severe Hearing Loss." Dr. Patricia Roush and her colleague, Dr. Melody Harrison, a speech-language pathologist in the Division of Speech and Hearing Sciences, Department of Allied Health Sciences, are directing the UNC component. The primary aim of the study is to investigate how hearing loss affects communication, educational performance, social skills, and psychological development. Results from the five-year study will provide important information regarding the effects of early intervention and amplification in infants and children up to nine years of age, whose hearing losses range from mild to severe. The study, funded by a five-year, \$8.9 million grant from the National Institute on Deafness and Other Communication Disorders, NIH, differs from most other research on childhood hearing loss by focusing on children with milder degrees of hearing loss who use amplification. Across the three sites, 450 children with mild to severe hearing loss and 150 children with normal hearing will be enrolled. The project is now in year two and to date 80 children with hearing loss have been enrolled and tested at UNC by research assistants, Shana Jacobs, AuD, audiologist and Thomas Page, MS, speech language pathologist. An additional 120 children have been evaluated at Boys Town and the University of Iowa. In June 2010, Dr. Roush gave a presentation describing preliminary results from the project at the Newborn Hearing Screening Conference (NHS 2010), an international meeting held in Lake Como, Italy, with 550 delegates participating from 60 countries.



Pediatric Audiologists, L-R: Patricia Roush, AuD; Patricia Reitz, MS; Sarah Martinho, AuD; Paula Johnson, AuD, and Corinne Macpherson, AuD.

The number of children with hearing loss followed by the UNC team continues to grow with over 800 children who wear hearing aids receiving care by the pediatric audiology team and over 600 children with cochlear implants followed by the UNC pediatric cochlear implant team. In addition to children with “typical” sensorineural hearing loss, the UNC pediatric audiology team, working in collaboration with the UNC pediatric cochlear implant team, is following over 190 children diagnosed with “auditory neuropathy spectrum disorder” (ANSD), a condition that affects approximately 10% of children with permanent hearing loss. ANSD is a hearing impairment in which outer hair cell function is spared but neural transmission in the auditory pathway is disordered. While not a new problem, newer test techniques in recent years have made diagnosis of ANSD possible. This disorder presents new challenges in management for pediatric audiologists. The UNC pediatric team, in conjunction with UNC otolaryngologists, has developed an evidence-based protocol for evaluation and management so that infants diagnosed with this disorder will have early and effective treatment. In addition to providing direct service to these patients, faculty members are contributing to the education of other professionals. An article entitled “Cochlear Implants in Children with Auditory Neuropathy Spectrum Disorder” co-authored by faculty members Holly Teagle, Patricia Roush, Emily Buss, Carlton Zdanski, and Craig Buchman, along with CCCDP staff member Jennifer Woodard, was published in Ear and Hearing in 2010.

Dr. Roush was also an invited speaker on the topic of ANSD at several conferences this year, including presentations at James Madison University in Virginia in October 2009, at the British Columbia Early Hearing Program in Vancouver in November 2009 and at the Manitoba Speech and Hearing Association in Winnipeg in May 2010.

Work also continues on a clinical research project on new hearing aid technology called frequency compression, a new hearing aid processing strategy that allows access to higher frequency sounds that are not available using conventional hearing aids. These high frequency sounds are important for speech understanding. Dr. Roush is collaborating with Department of Otolaryngology faculty member Dr. Emily Buss, Division of Speech and Hearing Sciences faculty member Dr. Lori Leibold, and Drs. Holly Teagle and Lisa DiMaria from the CCCDP staff on this work.

Finally, the UNC Pediatric Audiology team is honored to be selected as the site of a new annual fellowship, the “Judith Gravel Fellowship in Pediatric Audiology.” The fellowship was established this year by Hear the World Foundation to honor the late Judith Gravel, who died in 2009. Dr. Gravel was recognized internationally for her expertise in pediatric audiology and her commitment to the advancement of educational opportunities for clinicians and students. The Gravel Fellowship will be awarded each year to a 4<sup>th</sup> year AuD student who will complete his or her externship at UNC Hospitals, focusing on the needs of infants and young children with hearing loss and their families.

The UNC Pediatric Audiology team looks forward to an exciting new academic year with continued excellence in patient care and clinical research.



Sharing a book at CASTLE

## The W. Paul Biggers, MD Carolina Children's Communicative Disorders Program: The UNC Pediatric Cochlear Implant Team and CASTLE

The number of pediatric cochlear implant surgeries performed at UNC has grown dramatically in recent years, making the program one of the largest pediatric implant centers in the country. The pediatric team performed 138 implant surgeries between July 1, 2009 and June 30, 2010. These included 55 children receiving their first implants, 67 receiving a second side, and 16 revision surgeries. The number of new surgeries has remained approximately the same over the past three years, but the number of second side surgeries has grown dramatically from 25 in 2009 and 12 in 2007. The program is providing ongoing support for more than 650 children with cochlear implants who live in Virginia, South Carolina and 77 North Carolina counties.

Early identification of hearing loss, a thorough medical work up followed by intensive audiological management, and appropriate intervention are all critical aspects of patient care that make eventual success with a cochlear implant possible. The pediatric audiologists at UNCH provide the important groundwork in diagnosis and hearing aid management for the child. When a child is referred as a potential candidate for cochlear implantation, the Team strives to identify the unique strengths and needs of the patient during the evaluation process. Counseling and

plans for subsequent intervention are aimed at enabling each child the opportunity to reach his or her full potential to communicate. Excellent clinical care begins with communication and collaboration among team members. The relationship between the patient and the program is long-term, usually lasting throughout childhood, so the collaborative approach must be maintained at a high level. The Team is committed to monitoring each patient's performance with care, as well as to staying abreast of technological changes and state-of-the-art methods to ensure the best possible result for each child.



Speech/language Pathologist Erin Thompson in a therapy session with a CASTLE preschooler

The Pediatric Cochlear Implant Program, CASTLE, and the Financial Assistance Program are all part of The W. Paul Biggers, MD Carolina Children's Communicative Disorders Program (CCCDP). Dr. Harold Pillsbury serves as Executive Director of the CCCDP Board. Dr. Craig Buchman, Medical Administrative Director, is joined by Drs. Carlton Zdanski and Oliver Adunka in performing implant surgeries for the pediatric program. The surgeons are involved with all aspects of the CCCDP, supporting the audiologists and speech-language pathologists who follow the children as they develop their listening and communication skills, often participating in clinical staff meetings, and attending professional meetings in the United States and Europe.

Holly F.B. Teagle, AuD, CCC-A, is Program Director of the CCCDP and Clinical Director of the Pediatric Cochlear Implant Program. The CCCDP audiologists, who include Lisa DiMaria, AuD, CCC-A, Debora Hatch, AuD, CCC-A, and Jennifer Woodard, AuD, CCC-A, provide audiological management for the children, ensuring their implant devices are carefully programmed and well-maintained to obtain the maximal benefit. Lillian Henderson, MSP, CCC-SLP, LSLS Cert AVT is also a member of the team, providing speech/language evaluations for every cochlear implant candidate.

The commitment to following implant patients, to supporting a team approach, and to assuring that the technology is used to its full potential are all critical aspects of the CCCDP mandate. It was for this reason that The Carolyn J. Brown Center for Acquisition of Spoken Language Through Listening Enrichment (CASTLE) was created in 2001. CASTLE is directed by Hannah Eskridge, MSP, CCC-SLP LSLS Cert AVT, who is a Clinical Instructor on the ENT faculty. She is supported by a staff of experienced teachers and speech-language pathologists: Maegan Evans, Ph.D, CCC-SLP, LSLS Cert AVEd., Sandra Hancock, MS, CCC-SLP, LSLS Cert AVT, Lillian Henderson, MSP, CCC-SLP, LSLS Cert AVT, Francisca Casillas Hernandez, MA, Chrissy Krammer, MS, CCC-SLP, Sindy Poole, BS, Erin Thompson, MA, CCC-SLP, LSLS Cert AVT, and teaching assistant Velma Gross. Meagan and Francisca are based at the Wilmington site.

The North Carolina General Assembly has provided for the core budget of the CCCDP with a recurring grant this year totaling \$577,688. With separate funding and a distinct budget, CASTLE is a public-private partnership funded by the Oberkotter Foundation, the Barnhardt

Family Foundation, Cape Fear Memorial Foundation, The Triangle Community Foundation, private family contributions and the State of North Carolina. State funding for CASTLE has been provided since 2004, with \$575,000 allocated in 2009-2010.

### New Initiatives

New initiatives at the CCCDP this past year include the institution of a periodic cochlear implant clinic at the Wilmington CASTLE. This has been a great service to patients in the southern part of the state, especially in these times of increasing gas prices. Plans are to increase this service in the upcoming year. Additionally, CCCDP audiologists collaborated with the Western NC School for the Deaf in Morganton to provide in-service training for staff and a clinic for children who use cochlear implant technology and attend the school. These efforts at making our services more accessible have a direct impact on patient performance because children are able to have their devices monitored and serviced more frequently, at a lesser cost to families.

Another new venture is our CCCDP/CASTLE Newsletter, "Hear Ye, Hear Ye!" Three issues have been produced and mailed to all CCCDP families and a number of service providers and educators in the state. Each issue included an inspirational story about a CCCDP or CASTLE child and his or her family and how the services of the program have enriched their lives. Other newsletter items included a spotlight on a staff member, updates about upcoming educational events and conferences, and news of special social events.



Audiologists Deb Hatch, Lisa DiMaria, Holly Teagle, and clinical fellow Melissa Hall with Ramses at the cochlear implant picnic.

In April, a Cochlear Implant Picnic was sponsored jointly by the Department of Otolaryngology, the UNC Hospital Speech and Hearing Division, and the CCCDP/CASTLE. This popular social event offered patients and their families the opportunity to meet and interact. Some children do not have peers with hearing loss in their schools, so seeing other children and adults of all ages wearing cochlear implant technology is a positive experience

for them. Adult patients also enjoy seeing the children and their families. This year more than 200 people attended the picnic, and we were joined by members of the UNC Women's Basketball team as well as the UNC Mascot, Ramses. There was great food, games to play, and lots of fun was had by all! Representatives from all three cochlear implant manufacturers were in attendance to provide information and the companies provided much of the financial backing for the event.

Finally, the annual CCCDP/CASTLE End of Summer Concert and Celebration takes place each August to raise awareness of the program in the Triangle Community. The Nomads, a popular and long-lived Chapel Hill band, played the event at the Southern Village community concert venue. Anyone who questioned whether children who are deaf enjoy music would have been dispelled of that notion after seeing our kids dance and participate in a group sing-along. The second annual concert and silent auction, with an impressive selection of items, came off with a splash in 2010.

### **The Financial Assistance Program**

The CCCDP Financial Assistance Program, which is funded by the North Carolina General Assembly, provides hearing aids to children across the state, and supplies and clinical support to low income families in the Pediatric Cochlear Implant Program. This allows the CCCDP and CASTLE to serve a population that reflects the true demographics of the State. No child with need is turned away, which assures substantial economic and ethnic diversity for the entire program.

The CCCDP was first proposed to the North Carolina General Assembly by W. Paul Biggers, MD, in the spring of 1992, to include a financial assistance program. It was funded later that year and continues to respond to rapidly growing demands from across North Carolina. Financial assistance is provided for certain equipment and devices to qualifying children from birth to age 21. It funds such technologies as frequency transposition hearing aids, digital programmable hearing aids, cochlear implant equipment, and UNC-provided diagnostic services for children whose families are eligible.

Qualifying children are accepted into the CCCDP financial assistance program based on such criteria as family size, income, other medical expenses, and the limitations of insurance and other resources such as Medicaid. Since its inception, the program has enrolled 1,446 children from 91 North Carolina counties. From June 1, 2009, to May 31, 2010, 65 children were enrolled for the first time. A total of 471 children were assisted.

Of the 65 new children accepted into the CCCDP Financial Assistance Program, 26 were cochlear implant patients or candidates. Thirteen of the new children have received cochlear implants since June 1, 2009, with a total of forty-four cochlear implant surgeries being provided for enrolled children this year. There are also children enrolled in the program who received their cochlear implant surgeries at other implant centers prior to being enrolled. The CCCDP accepts these children into the Financial Assistance Program to help their families with



CASTLE is a happy place!



Noah Keim, a 2005 graduate, returns to the CASTLE classroom to teach advanced reading skills.

the substantial costs of accessories, loss and damage coverage on external equipment, as well as UNC-provided cochlear implant programming and speech therapy. Insurance companies, and even Medicaid, often will not cover these items or services.

The UNC Pediatric Cochlear Implant Program and the CCCDP and CASTLE programs are truly unique: No other state offers this level of support for children and families and for students and professionals who work with children who have hearing loss. The collaboration between UNC Healthcare, the University, the North Carolina General Assembly, and a number of private individuals and organizations have directly benefitted children and families in the State by providing excellent clinical care, expert educational and therapeutic services and support, a venue for conducting important research, and the financial assistance needed by so many families.

### **CASTLE: An Exceptional Role**

CASTLE teaches children who are deaf to listen and talk, and trains school professionals and early intervention educators to support the success of such children in age-appropriate mainstream classrooms. Early diagnosis of hearing loss followed by aggressive use of hearing technology provides children with access to sound, which is the basis of all future communication development.



CASTLE preschool teacher Sindy Poole facilitates a tasty classroom project.

Children born with hearing loss can be fitted with hearing aids as early as two to three months of age or with cochlear implants as early as 12 months of age. The critical addition to this scenario is the implementation of auditory-based therapy, which maximizes the use of residual hearing and technology.

CASTLE is a unique program that is building the capacity in early intervention and public school programs to fully support the ability of children who are deaf to develop spoken language while living at home and attending local schools. Our training program is a unique aspect of what we do. There are several private schools throughout the country that are teaching children who are deaf to listen and talk. However, CASTLE's training program reaches children in their local public schools, which significantly increases the number of children that can have access to quality services. Currently in North Carolina there are almost 2000 children with hearing loss in the public school system. However, most professionals working with children who are deaf have been and are still being trained to teach children through sign language. Teaching listening and speech to children with hearing loss requires an entirely different set of skills. CASTLE is facilitating this profound transition. Our ability to improve services in the public schools implies massive cost-savings to the public sector. This project seeks to build the capacity of local public schools to support the significant number of families who are choosing a future for their children in the hearing world.

A satellite center in Wilmington helps to facilitate ease of access to both direct services and training from more North Carolina counties and school systems, making the CCCDP and CASTLE a unique regional model that is more effective than a centralized program.

CASTLE is dedicated to providing quality auditory-based early intervention and preschool services to the families of children who are deaf or hard of hearing throughout North Carolina, especially those who reside in the rural areas and/or have limited financial resources. The program focuses on educating, encouraging, and empowering parents as the primary teachers of their children, in order to promote healthy parent-child bonding and to maximize the amount of time a child spends in a language-rich environment. The several facets of CASTLE include the following:

- 1) Speech/language diagnostic evaluations determine need and eligibility for a variety of available programs.



Preparing for Halloween

2) Individual therapy is provided for infants and toddlers with hearing loss, as well as older children, including both auditory-verbal therapy and preschool speech/language therapy, to facilitate language and speech development at home.

3) A model preschool program to prepare deaf and hard-of-hearing children for kindergarten, is focused primarily on listening and talking – the development of spoken language. An infant/toddler program called 'Mommy & Me' is also offered.

4) A Family Learning Center where, in a simulated home environment, parents of infants and toddlers learn from therapists how to develop listening and language skills during normal daily activities.

5) Training and hands-on experience for professionals and graduate students in teaching children who are deaf or hard of hearing how to listen and talk. This includes practical experience with supervision in an auditory-based approach for teachers and therapists working in the field. The program is focusing particular effort on supporting school professionals in rural areas where training opportunities are limited.

Our training program consists of many different elements that include workshop presentations, internships on-site at CASTLE, school observations and attendance at IEP (individual education planning) meetings. Our most intensive training takes place when we are mentoring/coaching a professional in their own setting. Funding is currently being sought to install video-conferencing technology at both the Durham and Wilmington sites, which will allow distance coaching and will greatly improve the effectiveness and efficiency of the Training and Mentoring Program.

### **Other Training and Therapy Services**

In addition to these aspects of the program, other projects have been developed or expanded in recent years:

- 1) The CCCDP and CASTLE are proud to be part of a NC Consortium working to provide free training to NC professionals. This consortium sponsored 20 one- and two-day workshops this past year. As part of this consortium, a training protocol called



Speech/language Pathologist Lillian Henderson works with a patient.

"Recognition of Achievement for Best Practices in teaching Spoken Language to Children who are Deaf or Hard of Hearing" has been developed. This protocol requires participation in workshops and modules focused on the development of listening and spoken language skills as well as an intensive mentoring experience provided by CASTLE staff or staff from the Office of Education Resource Support Program. During our first year of this program, 12 professionals have been accepted into this program.

- 2) The 13<sup>th</sup> annual Carolina Summer Institute was a resounding success. With special fundraising, CASTLE was able to provide \$13,000 in scholarship aid, and the two week Institute again had full enrollment. Forty-seven participants came this year from North Carolina, Georgia, Florida, Indiana, Michigan, Ohio, Texas, Utah, and Trinidad.
- 3) This year the annual CCCDP Fall Conference, co-sponsored by the North Carolina A.G. Bell Association, featured Ruth Litovsky, PhD, Professor of Communicative Disorders at the University of Wisconsin in Madison. Dr. Litovsky directs the Binaural Hearing and Speech Lab, at the Waisman Center for Developmental Disabilities, where she heads a team of researchers and students investigating binaural hearing with a focus on persons who use bi-lateral cochlear implants.

### **Foundations for Research**

The diverse characteristics of the large clinical population of cochlear implant candidates seen by the Pediatric Cochlear Implant Program have been the impetus for the research projects the CCCDP team has undertaken or plans to pursue. Study of special populations of children contributes to our overall understanding of the many variables affecting outcomes. Currently, projects underway include studies of children with a common etiology or characteristic of hearing loss, such as auditory neuropathy, cochlear malformation, CMV, or a genetic marker. Management issues also provide questions for study, including outcomes for children with bilateral cochlear implants, or children who use a hearing aid in addition to a cochlear implant.

Funded research includes a multi-centered NIH-sponsored project, Childhood Development after Cochlear Implantation, which is in its seventh year. This promises to be a landmark study that will impact the direction of future cochlear implant patient management. Thirty children and their parents were initially enrolled in this study at the UNC site; they have been followed to document spoken language as well as psychosocial and academic development. With continued funding, we hope to follow this cohort of children into adulthood.

Research affiliations with the manufacturers of cochlear implants have resulted in a project with MedEl Corporation to norm test materials, a post-market performance study with Cochlear Corporation, and a bilateral cochlear implant study with Advanced Bionics Corporation. Our program is widely recognized for its depth of experience and expertise, not only among patients and professionals, but throughout the world.

# Research

**Julia S. Kimbell, PhD**, is a Research Associate Professor. She is an applied mathematician, currently conducting research on applications of computational fluid dynamics (CFD) to studies of nasal uptake and deposition. This research has three main areas of focus: (1) dose-response studies that test hypotheses about the role of dose in respiratory tract responses to inhaled materials, (2) risk assessment studies in which animal responses are extrapolated to humans on the basis of dose predictions in similar tissue types, and (3) research in medicine and therapeutics in which we are exploring a potential role for CFD in planning nasal surgery and delivering topical medications more effectively.

In this research, cross-sectional images of tissue specimens and human anatomy are used to build three-dimensional (3D), anatomically-accurate CFD models of the nasal passages of laboratory mice, rats, primates, and humans. Human subjects in Dr. Kimbell's database range in age from 9 days to 64 years old and include several ethnic types and both males and females. Dr. Kimbell and her collaborators have recently completed studies using these models on the deposition of nano-sized particles in the human olfactory area and how regional dose predictions of inhaled hydrogen sulfide gas compare among the upper respiratory tracts of several children and adults. They also recently used their human CFD models to predict how the location of small changes in the shape of the inside of the nose can make a big difference in nasal resistance, and to study objective ways to measure and predict improvements in patients' symptoms when septoplasty and turbinate reduction are used to treat nasal airway obstruction.

Dr. Kimbell is currently funded to conduct research using nasal CFD models to (1) study possible associations of patient-reported symptoms with specific variables computed from three-dimensional CFD models of the patients' nasal passages based on CT scans taken both before and after surgery (NIH/NIBIB), (2) calibrate interspecies nasal and lung dosimetry models to predict respiratory tract dose of inhaled raw fragrance chemicals in rats and humans (Research Institute for Fragrance Materials), and (3) test hypotheses about the mechanisms



Dr. Julia Kimbell

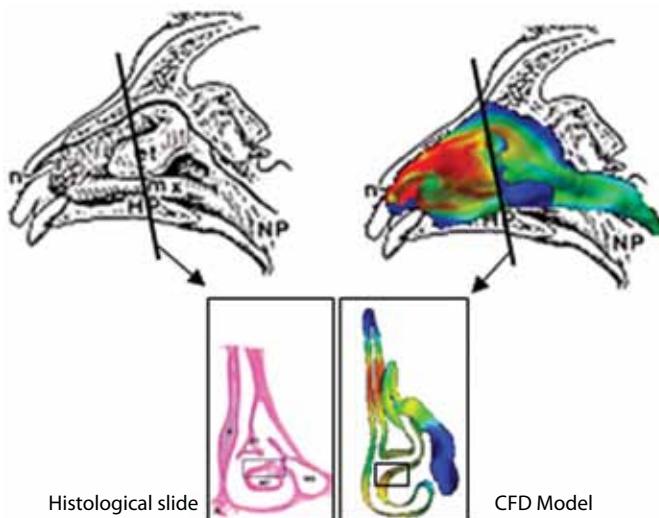
of age-related ozone toxicity in the respiratory tract lining and epithelium and to extend this research to other animal species (NIH/NIEHS). She is also collaborating with Dr. Carlton Zdanski on CFD modeling of pediatric airways, and Dr. Brent Senior, Dr. Adam Zanation, Dr. Charles Ebert, and Dr. Kibwei McKinney on CFD modeling of sinus surgery effects on nasal airflow and topical drug delivery. This year Dr. Kimbell and Dr. Zanation founded a new Otolaryngology/Head and Neck Surgery Computing and Clinical Research Lab to provide a resource for conducting this research as well as increasing departmental access to high-performance computer workstations and software to create 3D reconstructions from imaging data. A new postdoctoral fellow, Dennis Frank, PhD, from the Mathematics Department at NC State University will be joining Dr. Kimbell at UNC this summer.

**Kimbell Research Program:**  
**Using Computational Fluid Dynamics (CFD) to Study the Upper Airways**

1. Dose-response: Modeling inhaled materials in the nasal passages
2. Risk assessment: Extrapolating animal responses to humans
3. Nasal surgery: Modeling air-conditioning and drug delivery
4. Pediatric airways: Modeling surgical effects

**Dose-Response Modeling:**

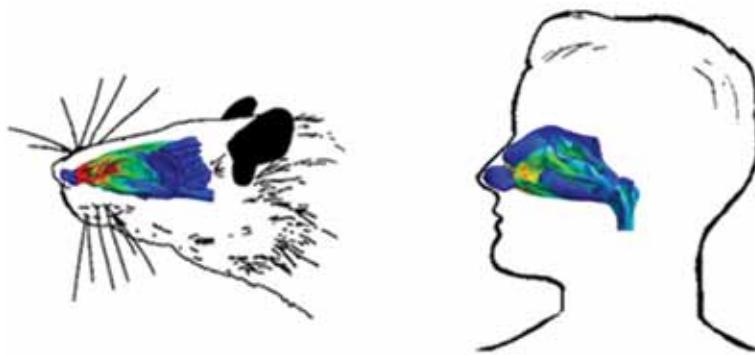
In a collaborative project with University of Alabama funded by NIH/NIEHS, we are testing hypotheses about the mechanisms of age-related ozone toxicity in the respiratory tract lining and epithelium and extending this research to other animal species.



Ozone toxicity in the infant primate nasal passages. Computer modeling (color panels) predicts how the uptake of inhaled ozone is distributed by anatomical features and inspiratory airflow. High ozone uptake regions are compared with histological evaluation of nasal lesions.

### Risk Assessment Extrapolation:

In a collaborative project with The Hamner Institutes for Health Sciences and Applied Research Associates funded by the Research Institute for Fragrance Materials, Inc., we are predicting respiratory tract dose of selected components of inhaled fragrance materials in rats and humans. Dose predictions will be used to assist in the development of safe inhalation levels of fragrance materials.

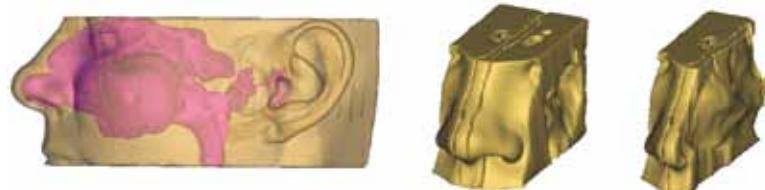


A nasal CFD model of a laboratory rat (left panel) is used to assign dose to response sites. A CFD model of human nasal passages (right panel) is used to estimate exposures that keep human tissue dose below rat response levels.

### Nasal Surgery Modeling:

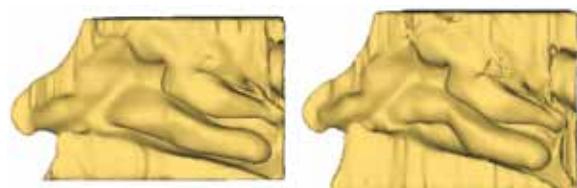
In a project funded by NIH/NIBIB, we are conducting a clinical study to determine if patient symptoms can be correlated with estimates of nasal airflow and air conditioning predicted by 3D computational fluid dynamics models made from CT scans of the nasal passages of each patient.

3-D Reconstruction from CT Scans



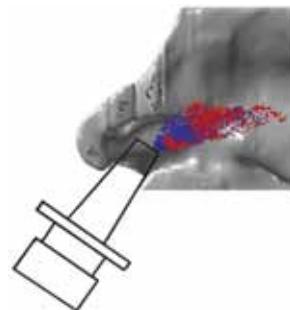
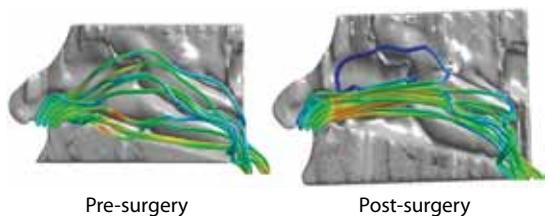
Three-dimensional reconstructions of the nasal passages are made from pre- and post-surgery CT scans showing surgical changes to the anatomy.

Right Lateral Wall – Turbinate Reduction



When inspiratory airflow is simulated through the reconstructions using CFD techniques, changes in airflow patterns can be seen as well. The CFD models also tell us how pressure, wall shear, temperature, humidity, and nasal spray deposition are affected by surgery. We hope to correlate these computational variables with patient symptoms so that CFD techniques can help guide future decision-making in nasal surgery.

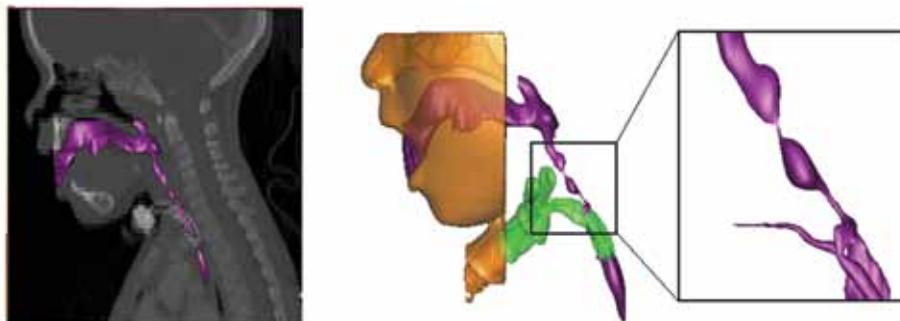
Inspiratory Airflow Patterns from CFD Simulations



Simulated spray deposition. Blue dots are pre-surgery deposition, red dots show deposition post-surgery.

### Pediatric Airways Modeling:

In a pilot project with a multi-disciplinary group at UNC, we are using computational fluid dynamics and fluid-structure interaction models to develop quantitative methods of evaluating and determining optimal management of upper airway anomalies in infants and children for improved clinical care and outcomes.



Views of a three-dimensional reconstruction of the upper airways (purple) of a 4-year-old subglottic stenosis patient with trachea tube (green). Close-up shows details of stenosis area, indicated by black arrow.

After completing Rhinology fellowship training at the Georgia Sinus and Nasal Institute, **Charles S. Ebert, Jr., MD, MPH**, returned to UNC as an Assistant Professor in the Division of Rhinology, Allergy and Sinus Surgery. As the first former resident to complete the T32 NIH Training Program, he has remained active in his research pursuits, providing mentorship to current residents and medical students, including Drs. Kibwei McKinney, Jessica Smyth, Alex Farag, and medical student Thomas Suberman. His basic science interests have been

directed at investigating the molecular basis of inflammatory diseases of the nose and paranasal sinuses. In this research, he seeks to specifically characterize the genetic expression profiles of patients with Allergic Fungal Rhinosinusitis through a comparative analysis of healthy and diseased specimens of sinonasal mucosa. Through a collaborative effort with the Department of Biostatistics in the UNC School of Public Health, he is in the process of applying for funding for this project through the NC TraCS grant mechanism. In addition, Dr. Ebert is attempting to quantify the impact of Functional Endoscopic Sinus Surgery via patient-rated quality of life (QOL) measures and through objective correlates with Computational Fluid Dynamics (CFD) models.



Drs. Kibwei McKinney and Charles Ebert

Since his return to UNC, **Adam M. Zanation, MD**, has wasted no time in initiating cutting-edge research in the area of Skull Base Surgery and Oncology and Clinical Quality of Life and Functional Outcomes Research. His passion for research began in residency and continues to grow as he embarks his career in a new surgical specialty in Otolaryngology. Dr. Zanation has involved residents, Drs. Mihir Patel, Rupali Shah, Josh Suowitz, Kibwei McKinney, Michael Stadler, Alex Farag, Brian Thorp, and Grace Kim, in studies investigating novel techniques in this area. The lab has also mentored four UNC medical students on projects related to Dr. Zanation's practice. Projects involved everything from the basic science of thyroid and skull base tumor molecular biology to radioanatomic studies in pediatric skull base surgery to clinical outcomes projects in head and neck oncology and endoscopic skull base surgery. The research team has presented over 20 abstracts this past year and published 9 papers in 2009. Dr. Patel won the 2009 Harrell Resident Research Award for his work on skull base reconstruction and Dr. Zanation has been awarded the North American Skull Base Society Research Award in 2008 for his work on endoscopic resections of sinonasal cancers. In May of 2010, Dr. Zanation was awarded a Triological Society Career Development Grant to support a clinical trial entitled "Phase II Quality of Life and Neurocognitive Outcomes Trial in Skull Base Tumor Surgery." Dr. Zanation promises to be an outstanding physician-scientist with research contributions at the forefront of Skull Base Surgery and Head and Neck Oncology.

### **The UNC Minimally Invasive Otolaryngology/Head and Neck Surgery Center**

"Minimally invasive surgery" is a hot topic in all of medicine and in the media. It has become an almost ubiquitous term that is getting harder and harder to define. What is minimally invasive surgery and how does one safely advance and study these new surgical techniques? Dr. Zanation believes minimally invasive surgery means any novel techniques that result in less functional and quality of life deficits without compromising the long-term efficacy of the surgery. For endoscopic skull base surgery, the primary benefit is no brain retraction and no need for a formal craniotomy. These advantages have the potential to limit brain trauma and improve neurocognitive and neurofunctional outcomes. And if improved cosmetic or "no incision" surgery is possible, then it is a secondary benefit. So how does a surgical team study these new techniques?

Surgical science is rooted in a foundation of step-wise thought. First, the approach or technology must be conceived, and then pre-clinical testing illustrates the feasibility of new approach prior to patient application. The next step takes the surgery to highly selected patients with the short-term goal of studying technical limitations and peri-operative safety. Lastly, longer-term primary outcomes such as tumor control must be studied. All these are within the bounds of routine clinical care; however, studying cost, quality of life and specific functional outcomes take additional effort and planning outside the realm of clinical care.

This pathway of prospective, hypothesis-driven and controlled evaluation of cost, quality of life and functional outcomes is one of keystones for the Zanation-Ebert Lab. Dr. Charles Ebert is fellowship trained and has a special interest in complex and minimally invasive surgery for sinonasal inflammatory disorders. He and Dr. Zanation have joined in a collaborative lab group



Dr. Adam Zanation

to develop and study the outcomes of novel surgical techniques and technologies. This collaboration has been immensely successful resulting in a significant volume of research ideas and data including three newly active prospective clinical surgical trials in only nine months. This success and model lead Dr. Zanation along with Dr. Robert Buckmire to conceive of the University of North Carolina Minimally Invasive Otolaryngology/Head and Neck Surgery Center.

The UNC Minimally Invasive Otolaryngology/ Head and Neck Surgery Center has been set-up as the first such center in the United States. The mission statement of the center

is *Advancing functional and quality of life outcomes in Otolaryngology/Head and Neck Surgery through technology, research and minimally invasive surgical techniques*. It is an umbrella for all types of advancements in surgical techniques and morbidity across *all* subspecialties of Otolaryngology (from Head and Neck Surgery to Laryngology to Rhinology, etc.). The goal of the Center is to advance surgical care while prospectively studying surgical outcomes. This Center is open to all fields of Otolaryngology/Head and Neck Surgery at UNC, and we hope through cross-pollination of ideas from different specialties we can even further advance minimally invasive techniques and technology, such as robotic assisted surgery, across multidisciplinary fields. The long-term goal of the Center is to obtain research funding to support these areas of development and research while advancing surgical techniques within Otolaryngology.

Currently active prospective clinical trials within the UNC Minimally Invasive Otolaryngology/ Head and Neck Surgery Center are listed below. We hope to open such outcomes trials within each division of the Department of Otolaryngology/Head and Neck Surgery. Multiple other technical, anatomic and retrospective studies are also underway.

1. Prospective Morbidity, Quality of Life and Neurocognitive Outcomes after Skull Base Surgery
2. Prospective Evaluation of the Clinical Impact and Outcomes of a Multidisciplinary Head and Neck Tumor Board
3. Analysis and Comparison of Outcomes, Gene Expression Profiles and Eosinophilic Pathways in Allergic Fungal Rhinosinusitis

For more information on the UNC Minimally Invasive Otolaryngology/Head and Neck Surgery Center, see our website coming soon at [unc-net.org](http://unc-net.org) or call 919-966-3343 for Dr. Zanation.

**Marion Everett Couch, MD, PhD**, and her colleagues continue to work on the mechanisms of cancer cachexia syndrome, a profound wasting syndrome, which affects many patients with advanced stage head and neck cancer. Previous studies had defined the clinical profile of head and neck cancer patients suffering from this metabolic derangement. It is not merely starvation and its etiology is multifactorial. Work previously done by her group in a clinical trial used anti-inflammatory agents such as cyclooxygenase II inhibitors to reverse its effects. To further elucidate the role of inflammation in this syndrome, selective NF- $\kappa$ B inhibitors were used to reduce the inflammatory cascade that contributes to cancer cachexia.



Dr. Marion Couch

In a well-established animal model of cancer cachexia, two selective NF- $\kappa$ B inhibitors were used after the induction of cancer cachexia to reverse the muscle wasting seen. They had no toxic side effects in this short-term trial, and they prolonged survival in the animals. In collaboration with Albert Baldwin, PhD, Associate Director of the Lineberger Comprehensive Cancer Center, Ashley Wysong was able to work with Monte Willis, MD, PhD, Assistant Professor in Pathology & Laboratory Medicine, to determine the cardiac effects of cachexia in this animal model. The use of selective and short term use of these

NF- $\kappa$ B inhibitors were able to reverse these effects without causing cardiac hypertrophy. These findings may contribute to better understanding of why patients do not tolerate therapy, either medical or surgical, when they are suffering from cancer cachexia. Their studies demonstrated for the first time that the function and structure of the heart were profoundly affected in a detrimental way in animals with cancer cachexia. Based on this work, Ashley Wysong, who was a Howard Hughes Fellow in Dr. Couch's lab, went on to win the AOA Research Award in Duke's School of Medicine.

Dr. Scott Shadfar (PGY3) extended these studies by looking at the effect of the muscle enhancing agent, Resveratrol, which is also a NF- $\kappa$ B inhibitor, on cancer cachexia. He used our well-established murine model to investigate the short-term use of Resveratrol on muscle mass, body weight, NF- $\kappa$ B inhibition, and cardiac function. He was able to determine that Resveratrol reversed the effects of cachexia in terms of muscle loss and cardiac muscle loss. His work won him the Edgar C. Garrabrant II Resident Research Award at the North Carolina/South Carolina Conference. He will also present his work at the American Head & Neck Society 2010 Research Workshop on Head and Neck Cancer in October of 2010.

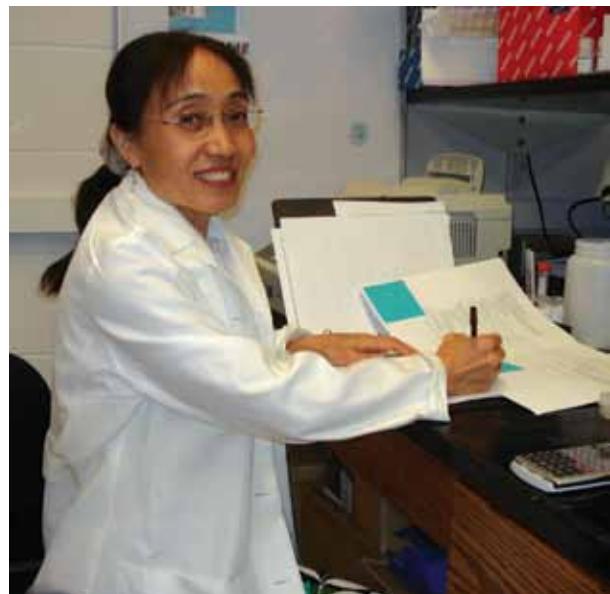
In collaboration with Dr. Thomas O'Connell, the Director of Metabolomics at UNC, an effort to better define cancer cachexia, the metabolic profile was determined in an animal model using Metabolomics. This is a platform that allows for the survey of 1,500 different metabolites using NMR spectroscopy. Cancer cachexia was found to be distinctly different from starvation

and low glucose levels, high low density lipoprotein and very low density lipoprotein levels are seen in the serum. Based on the metabolic profiles, we had evidence that cachexia could be reversed with resection of the tumor. Tumor burden alone did not account for the metabolic perturbations either. These studies will help us determine the exact metabolic derangements that exist in this condition. This will aide in future research studies as we may better define those patients who truly have cancer cachexia. In addition, these findings can be used to create a panel of metabolic markers to better define this condition in animals and in patients with cancer cachexia.

**Xiaoying Yin, MD**, is working on several research projects:

1. Evaluate the anti-tumor effect of enzastaurin, a PKC- $\beta$  inhibitor on HNSCC. Protein kinase C (PKC) is a family of serine/threonine kinases known to play critical roles in the signal transduction pathways involved in growth factor response, cell proliferation, differentiation, and apoptosis. Therefore, the PKCs are potential targets for cancer therapies. Enzastaurin is a specific protein kinase C beta (PKC- $\beta$ ) inhibitor that has been reported effective for inhibiting tumor growth in many other tumor types. In addition to specifically inhibiting tumor-derived VEGF-induced angiogenesis, it has been reported that enzastaurin can directly inhibit proliferation, and induce apoptosis, which will inhibit tumor growth *in vitro* and *in vivo*. Our research project is aimed to (1) evaluate the effect of enzastaurin on HNSCC as an antitumor agent alone and as a radiosensitizer with radiation both *in vitro* with HNSCC cell lines and *in vivo* using a novel mice model that mimics the delivery of concurrent chemoradiation in HNSCC patients, (2) help unravel the mechanism of the effect of enzastaurin and cisplatin by analyzing enzastaurin/cisplatin-induced protein level changes in signal transduction pathways and gene expression changes that are due to enzastaurin/cisplatin and radiation treatment, and (3) refine this murine model of chemoradiation responsiveness for use with other novel agents. This work was completed early this year and a paper has been submitted to the journal *Head & Neck*.

2. Genetic study of head and neck squamous cell carcinoma (HNSCC). Working with Neil Hayes, MD (Division of Medical Oncology) and Carol G. Shores, MD, PhD, we received a University cancer research fund for 2009-2011 for genetic study of head and neck cancer. Through the past 6 years, we have collected about 150 of HNSCCA tumor samples from patients at UNC. Using this tissue bank, we will (1) independently validate *a priori* two previously identified head and neck squamous cell carcinoma molecular subtypes (basal and epidermal-mesenchymal transformed) and develop an assay for clinical detection



Dr. Xiaoying Yin

tumor molecular subtypes; (2) distinguish HNSCC subtypes and identify causative genomic aberrations (amplification and deletions) as measured by high resolution DNA copy number assays; (3) evaluate clinical courses of HNSCC subtypes using a large population based cohort of HNSCC derived from The North Carolina Head and Neck Cancer Epidemiologic Study (CHANCE). HNSCC gene expression array and SNP array for copy number aberrations have been completed, and now it is in the data analysis phase.

3. Evaluate the anti-tumor effect of Hsp90 inhibitors on HNSCC. Collaborating with Biogen Idec Corporation, we have studied a novel class of chemotherapy agents, Hsp90 inhibitors, BIIB021. Hsp90 stabilizes cellular proteins, and inhibition can lead to the degradation of several tumor related proteins, thereby interrupting several pathways simultaneously. The Hsp90 inhibitor BIIB021 has been shown to radiosensitize HNSCC in a xenograft model, with minimal side effects and disruption of the expected proteins. A paper about this research was published in the International Journal of Cancer in August 2009.

4. MicroRNA alterations in human head and neck squamous cell carcinoma. We got a clinical translational research award from the UNC Lineberger Cancer Center in 2009 for analysis microRNA alterations in human head and neck squamous cell carcinoma. The aim of this study is to investigate the expression patterns of miRNA in human HNSCC and determine the diagnostic and predicting utility of specific miRNA alteration in the assessment of HNSCC patients. Using Affymetrix's microRNA array platform, we have done microRNA array for 115 HNSCC samples and validated some most expressed microRNAs by RT-PCR. Now, we are in the process of data analysis and trying to find microRNAs that can be used to predict patients' prognoses.

**Carol G. Shores, MD, PhD**, is developing several lines of cancer research in the southeastern African country of Malawi. She works closely with the UNC Project, located at Kamuzu Central Hospital (KCH) in the capital, Lilongwe. The UNC Project (<http://www.med.unc.edu/wrkunits/2depts/medicine/id/malawi/>) was established by the UNC Division of Infectious Diseases in 1990 to conduct HIV clinical trials. The program is now expanding to include surgical research in cancer and trauma care. Dr. Shores has received funding from the UNC Center for AIDS Research, the University Cancer Research Fund and NC TraCS to support research in Malawi.

Burkitt's lymphoma is the most common pediatric cancer in sub-Saharan Africa and frequently presents as a mass in the jaw or face. It is associated with Epstein Barr virus. The virus is in a latent form in the cancer, when it is resistant to treatment with antiviral therapy. Dr. Shores and Paula Harmon, MD, (UNC PGY4) in collaboration with Margaret Gully, MD, (UNC Pathology) collected tumor samples from 30 children with Burkitt's lymphoma before and after treatment (*Clin Cancer Res*. 2010 Apr 1;16(7):2055-64). The results indicate that the virus switch to a lytic infection, and should therefore be sensitive to antiviral medications, very early after the first round of chemotherapy. This suggests that pre-treating children with antiviral therapy prior to the first round of chemotherapy my increase the number of tumor cells killed. A clinical trial will begin in August 2010 to answer this question, facilitated by a NIH

Fogarty Clinical Fellowship to Dr Dan Olson (pediatrics), who will spend a year in Malawi.

Ameloblastomas are odontogenic tumors that occur primarily in teenagers and young adults. The incidence of ameloblastomas in Africans is 10 fold higher than Caucasian Americans and 5 fold higher than African Americans. This suggests an environmental factor, possibly a viral infection. To determine this, Jessica Smyth, MD, (UNC PGY2) in collaboration with Dirk Dittmer, PhD, (UNC Department of Microbiology & Immunology) wrote a protocol to collect 25 samples of ameloblastomas from patients at KCH and analyze them for the presence of virus known to be associated with human tumors. Drs. Smyth and Shores traveled to Malawi in June 2009 and March 2010, and are currently collecting and analyzing tumors for the study.

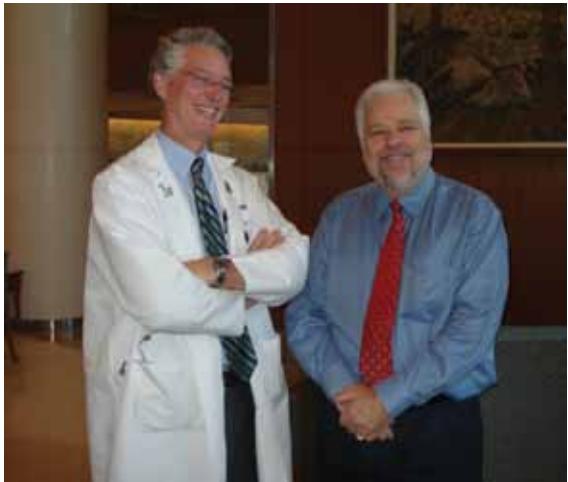


Dr. Shores changes the tracheostomy tube of a child during a visit to Malawi last year.

Understanding the incidence of cancer is key to designing cost effective prevention and treatment plans. In November 2009, the KCH Malawi Cancer Database began collecting information on cancer patients presenting to all departments at KCH. Dr. Elizabeth Bigger (PGY3, Vanderbilt University) received a Fogarty Clinical Fellowship for this work, and presented preliminary data at the 12<sup>th</sup> International Conference on Malignancies in AIDS and Other Acquired Immunodeficiencies in April 2010. Dr. Bigger's project also examines the relationship of HIV status with cancer presentation and outcomes.

Cancer is primarily a surgical disease in Malawi, as there is no radiation oncology facility and chemotherapy is too expensive for most patients. Trauma and congenital anomalies are also surgical diseases, and treatment of these depends on consistent presence of well trained surgeons. Toward this goal, Dr. Shores has worked with the surgeons in Lilongwe and UNC surgeons Anthony Charles, MD, (Trauma Surgery) and Clara Lee, MD, (Plastic Surgery) to establish a surgery resident training program at KCH. Three residents began in this College of Surgeons of East, Central & Southern Africa approved program in July 2009, and three more will begin in July 2010. Dr. Shores is committed to traveling to Malawi at least twice a year to teach in this program, and Dr. Charles and she have applied for funding to teach surgical research to the new residents.

**Andrew F. Olshan, PhD**, and **Mark C. Weissler, MD**, were funded in July of 2001 by the National Cancer Institute to conduct a study (The CHANCE study) in 46 counties in North Carolina to comprehensively evaluate the role of genetic susceptibility factors in the etiology of squamous cell carcinoma of the head and neck. The population-based case-control study, funded by the National Cancer Institute, included 1,300 cases and 1,300 controls and constituted the largest population-based study of head and neck cancer ever conducted in the United States. Polymorphisms of genes representing metabolism (activation and



Drs. Mark Weissler and Andrew Olshan

detoxification) of carcinogens and nutrients, mediators of oxidative stress, and DNA repair will be investigated using a 1,536 single nucleotide polymorphism (SNP) array. The size and population-based design should allow the investigators to more confidently confirm or reject associations raised in previous studies. The study also collected tumor blocks for future studies of “downstream” somatic alterations of tumor suppressor genes and oncogenes. A paper showing some association between markers of oral health and risk of cancer has been recently published. Manuscripts have also been developed examining tobacco and alcohol and dietary patterns. The genetic data is now available

and the team is examining the effects of specific genotypes and gene-exposure interactions. The study is part of an international project to conduct a genome-wide association study to evaluate over 500,000 genetic markers in relation to head and neck cancer risk. The study has also contributed to new grant proposals on tumor methylation and HPV serology.

Drs. Olshan and Weissler have also conducted pilot research to evaluate survivorship factors, including quality of life, among cases in the CHANCE study. This work has been extended through funding by the Lance Armstrong Foundation and has collected data on quality of life among African-American head and neck cancer survivors. The three-year, \$246,760 grant will examine the influence of social, clinical, access to care, and behavioral factors on quality of life, especially among African-Americans for which there is little available quality of life information. Patient information will be collected one year after diagnosis and three years after diagnosis. To date information on quality of life has been obtained from over 500 head and neck cancer survivors.

**D. Neil Hayes, MD, MPH**, of the Division of Hematology and Oncology, Department of Medicine, was given a joint appointment with the Department of Otolaryngology/Head and Neck Surgery in 2009. He has been collaborating with our head and neck oncologists on projects for many years.

Mission Statement: The Hayes Lab endeavors to bring together a collection of researchers with intersecting interests in multidisciplinary clinical cancer care, clinical trials, translational cancer research, and model systems of cancer with a focus on aerodigestive tumors.

Clinical Practice and Clinical Trials: In the clinic we provide multidisciplinary care across a spectrum of aerodigestive tumors. Our primary focus is on lung tumors and epithelial tumors of the head and neck (mouth, throat, larynx, sinuses, and salivary glands). All patient care is delivered by a full services tertiary and quaternary care facility with rich compliment of oncology care. In this context, we have endeavored to develop a palate of clinical trials

serving the spectrum of disease we treat, including focused trials appropriate to every patient stage and function. The breadth and depth of our practice leads us to an expertise in rare tumors of the head, neck, and lung as well, and the treatment of rare tumors is clearly part of our expertise.

Translational cancer research and model systems: Progress in two key areas of science has provided the foundation for the work in our group. First, the advent of personal computers along with associated progress in the field of statistical computing greatly accelerated the development of data-rich models of human disease behavior. Second, collaborative efforts across the biomedical science have made available the building blocks of normal (i.e. The Human Genome Project) and adherent genomes (i.e. The Cancer Genome Atlas). To leverage the power of computers to assess alterations in the genome associated with cancer a host of molecular technologies has become commercially available in recent years. The primary targets of these assays have been nucleic acids (DNA and RNA), although a limited number of protein assays are also included. The technologies allow labs such as ours to make broad and inclusive measurements in samples of alterations in gene expression (RNA), gene dosage (DNA amplification and deletions), gene structure (normal population variants, mutations, alternate splices, fusion genes, epigenetic modifications), protein abundance and other events such as presence of a pathogen. Primary technologies in use in our lab include array based approaches (gene expression arrays, methylation profiling, SNP chips, CGH, miRNA arrays), sequencing (targeted and deep sequencing/“NextGen”), and immunohistochemistry (including tissue microarrays).

Our lab is intimately connected with the practice of clinical medicine, and as such, our interest is not simply the detection of alterations such as those described above. All alterations are placed in their clinical context, including the frequency of the event and any relevant association with cancer outcome. To accomplish these goals, our lab works equally hard to capture both clinical and molecular data for any samples we evaluate. The hypothesis of our research is that tumor-specific predictors based on high throughput nucleic acid and protein assays will offer significant advances.

Early work by Dr. Hayes, performed in collaboration with his mentor Dr. Matthew Meyerson, included a meta-analysis of approximately 500 human lung adenocarcinoma expression arrays generated by the National Cancer Institute’s Director’s Challenge Program. We successfully reconciled discordant previous reports by demonstrating three reproducible molecular tumor subtypes of lung adenocarcinoma that are otherwise indistinguishable by routine clinical evaluation. The subtypes have statistically significant survival differences, independent of disease stage and are comprised of tumors with differing underlying rates of mutations in key lung cancer genes including KRAS and EGFR. Similar reports for squamous cell carcinoma of the lung are forthcoming, as are reports of clinically applicable diagnostic tests. More recently, in collaboration with Kwok Wong and Ned Sharpless we have documented the



Dr. Neil Hayes

frequent mutation of the gene STK11/LKB1 in human lung cancers, including squamous cell carcinoma. Numerous follow up reports of the clinical importance of these findings are forthcoming.

**Statistical Collaborations:** Data analysis of the type we routinely perform requires a strong set of statistical collaborators since standard methods are frequently lacking. In this way, we have been fortunate to build ties with numerous local and national statisticians, computer scientists, biostatisticians, and epidemiologists.



Dr. Robert Buckmire testing the biorobotic laser control device with a "live fire" experiment.

**Robert A. Buckmire, MD**, has several ongoing clinical and research projects involving voice and swallowing. The Voice center currently partners with both academic departments and local industry on research projects. In a collaborative effort with the Department of Biomedical Engineering (UNC/NC State), Joe Giallo II, was granted a Doctor of Philosophy degree in November 2008 for a project and thesis entitled: "A Medical Robotic System for Laser Phonomicicrosurgery." The resultant novel laser control device became the subject of Dr.

Yu-Tung Wong's resident research. His completed project has established the superiority of the robotic controller in laser guidance accuracy and repeatability over expert human laser operators. This project has been submitted for publication. Current research is focused on further characterizing the advantages of computer filtering in the learning and performance of microlaryngeal laser surgery. Further work on the device engineering and software programming is currently being carried out in collaboration with the robotics lab at NC State and an international consortium.

In collaborative research efforts with the Division of Gastroenterology, prospective, placebo-controlled studies regarding chronic cough, GERD and laryngoscopic signs of laryngopharyngeal research are in the final stages of data acquisition and data analysis. Both computer recognition algorithms and novel *in vivo* imaging techniques are being adapted for the purpose of developing "image guidance" in laryngeal surgery. In work with Bioptogen, a RTP start-up company, optical coherence tomography (OCT) is being utilized to acquire real-time 2D and 3D images to aid in tumor border detection and to assess subepithelial anatomic detail. Projects determining the role for quantitative laryngeal electromyography (LEMG) continue being conducted by Dr. Robert Buckmire and Dr. James Howard, who staffs the LEMG clinic, as a joint effort between the Department of Neurology and the Department of Otolaryngology.



The Manis Lab: (L-R) Joseph Roche, MD (resident finishing 2nd year of research track); Ruili Xie, PhD (Post-doctoral Research Associate); Jaime Mancilla, PhD (Post-doctoral Research Associate); Hillary Jenny (a rising junior at MIT majoring in Brain and Cognitive Science and Music, spending the summer of 2010 doing research in the Manis Lab); Paul Manis, PhD (Professor and Chief of the Division of Research Training and Education); Megan Kratz (graduate student, Neurobiology); Luke Campagnola (graduate student, Neurobiology); Heather O'Donohue (Research Technician II); and Deepti Rao (graduate student, Cell and Molecular Physiology).

**Paul B. Manis, PhD**, and his colleagues are studying cellular mechanisms of information processing in the central auditory system. The research has two principal goals. The first goal is to understand the normal cellular mechanisms and the organization and function of neural networks that are responsible for the remarkable sensory abilities of the auditory system. The second goal is to understand how these mechanisms are affected by hearing loss, and how they may contribute to tinnitus. This work is currently supported by 2 NIH R01 grants to Dr. Manis, and grants to Drs. Ruili Xie, Greg Basura and Joseph Roche.

In the first project, Drs. Manis and Mancilla, along with Heather O'Donohue, are studying the physiology of the dorsal cochlear nucleus. The dorsal cochlear nucleus (DCN) is a site for rapid and early processing of spectrally complex acoustic stimuli, and is the first point in the auditory system where auditory and non-auditory information converges. Changes in the DCN following hearing loss has been associated with central tinnitus, which is a perception of a phantom sound. Increased activity of DCN neurons can be caused by increased electrical excitability or decreased inhibition, and thus these are potential mechanisms for tinnitus. While the responses of DCN principal neurons (called pyramidal cells) to sound are strongly molded by inhibition, little is known about the functional operation of the major inhibitory networks. The goals of this project are to investigate inhibitory circuits in the DCN, and to elucidate their roles in normal sensory processing as well as in auditory dysfunction. We have found that the synaptic influence of the most populous inhibitory interneurons, the cartwheel cells, depends on the target cell type, that cartwheel cells can fire in a synchronized manner as predicted from their physiology and connections under appropriate conditions. We are

studying the spatial organization of cartwheel cell axons to determine whether and how this system, which receives non-tonotopic inputs, might operate in a tonotopic fashion. In the second aim, we are investigating short (seconds) and long-term (hours) synaptic plasticity at inhibitory synapses in the DCN. We will test whether cartwheel cells utilize glycine and GABA as co-transmitters onto the pyramidal cells and other cartwheel cells, and whether there is activity-dependent short-term modulation of inhibitory synapses. We are also testing whether the inhibitory synapses from

cartwheel to pyramidal cells, and the synapses between cartwheel cells, can undergo similar activity-dependent plastic changes. In the third aim, we have built on our existing data on electrical excitability and synaptic function to create a biologically accurate circuit model of the DCN. We will use this model to test predictions about how changes in synaptic function associated with hearing loss can affect the output of the nucleus. We have found the the model predicts patterns of synchronized firing that depend on the details of interactions between the cartwheel cells. This synchrony could be a dysfunctional activity pattern that leads to tinnitus. In the fourth aim, we are testing (using a rat model system) whether noise-induced central tinnitus is associated with decreases in inhibitory synaptic strength, or with increased intrinsic electrical excitability. These experiments will test whether changes in intracellular chloride regulation, consequent to changes in activity after hearing loss, will alter the behavior of inhibitory networks and the strength of inhibition, thus leading to abnormal activity and the

perception of a phantom sound. Ms. Heather O'Donohue has found that the spontaneous activity of cells, as measured by an optical method of calcium imaging, is greatly disrupted in noise-exposed mice. This suggests that noise exposure alters the circuitry and intrinsic properties of cells in the DCN. Tinnitus is a phenomenon that affects nearly 20% of people in the U.S., and which is debilitating to nearly 2 million citizens. There is a significant unmet need for effective treatments. Our experiments will directly evaluate specific synaptic systems and receptors that can be targeted for pharmacological intervention for treatment and cure of this persistent problem. This project is funded by NIH through 2011.

In a second research project, Dr. Manis, along with Dr. Ruili Xie and Mr. Luke Campagnola (Neurobiology



Drs. Jaime Mancilla and Paul Manis



Dr. Ruili Xie



Luke Campagnola and Heather O'Donohue recording calcium signals from neurons in the dorsal cochlear nucleus.

graduate student), are investigating the integrative mechanisms of anterior ventral cochlear nucleus (AVCN) bushy and stellate neurons in normal animals, and in animals experiencing acute and chronic hearing loss. These cells are part of a major set of pathways that are important in both speech perception and for sound localization. Central processing of the auditory environment begins with the generation of diverse, parallel, streams of information processing at the level of the first auditory center of the brain, the cochlear nucleus. These streams are created by populations of

neurons with distinct patterns of synaptic inputs and projections. Recent studies have shown that inhibition plays a much more important role in sculpting the responses of ventral cochlear nucleus (VCN) neurons to sound than previously appreciated. Inhibition can serve to enhance both the spectral and temporal processing of sound attributes that are important for sound identification and localization as well as speech processing. Our studies have revealed that the time course of inhibition, even from a single source, is different in the two principal cell types, the bushy and stellate cells. The first aim of this proposal is to clarify the functional synaptic organization of two local inhibitory synaptic circuits in the VCN. The second aim is to test the hypothesis that the synaptic currents on different cell types are mediated by different glycine receptor subunits. We are also investigating the presynaptic mechanisms that regulate the time course of release during sustained activity. A third aim is to incorporate this information into a detailed computational model, which will be used to explore the importance of different aspects of inhibition in temporal and spectral processing in the VCN. The fourth

aim is to determine how the function of these inhibitory circuits, as well as excitatory circuits, is affected by hearing loss. All of these experiments will be performed in brain slices of adult mice. Overall, our studies will identify critical mechanisms in early auditory information processing, and determine how those mechanisms contribute to the analysis of complex sounds. We will then determine how these mechanisms are affected by hearing loss, which will provide insights for alternative stimulation strategies for the hard-of-hearing and for cochlear implant users. This project received renewed funding from



Dr. Joseph Roche



Deepti Rao, 5th year PhD student, with Hillary Jenny, a rising junior at MIT who was spending the summer of 2010 doing research in the Manis Lab.

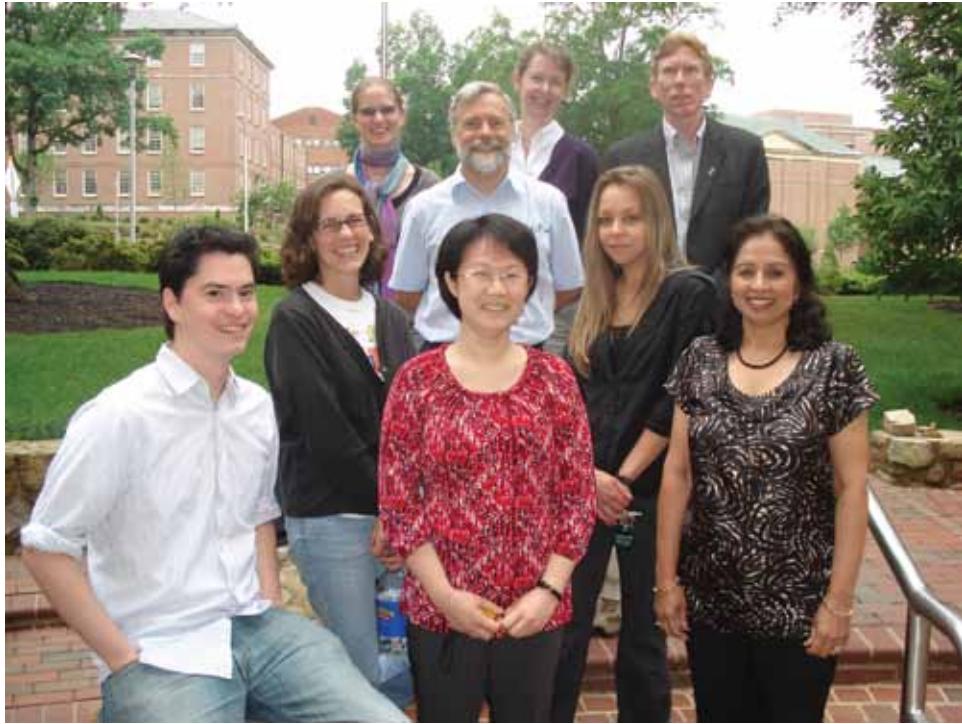
NIH this year, and will continue through 2014. Dr. Xie also has received a 2-year grant from the Deafness Research Foundation to study the development and function of inhibitory circuits in the VCN of mice that exhibit an early-onset, high frequency hearing loss.

Auditory information processed by the brainstem and midbrain auditory nuclei is ultimately analyzed in the auditory cortex, which consists of a core or primary region and several highly interconnected surrounding areas defined by their tonotopic organization and acoustic responsiveness. Recent studies have shown that the primary auditory cortex

is highly plastic, and that the properties of the cells can be modified by relevant interactions between the organism and its environment. Furthermore, it has become evident that sensory cortex not only processes sensory information, but also plays an active role in the recall of prior sensory experience. This has led to a new line of research in the laboratory that has now received additional funding from the NIH to Dr. Greg Basura, a resident in the laboratory, and AAO-HNS/ANS to Dr. Joseph Roche. Dr. Basura is studying the consequences of hearing loss on cellular processing in auditory cortex, and to study the potential role of serotonergic receptors in modulating hearing-loss induced plasticity. Ms. Deepti Rao, a graduate student from Cell and Molecular Physiology, is also working on this project. The lab is also interested in investigating synaptic changes that are associated with learning and memory in the auditory cortex. Ms. Rao, Ms. Megan Kratz (a graduate student in the Curriculum in Neurobiology) and Mr. Russell Coletti are also investigating the mechanisms and functional significance of spike timing dependent plasticity, which is thought to be a learning rule that maximizes mutual information between inputs and outputs of simple neural networks. Dr. Joe Roche along with Dr. Manis has also been studying the how spike timing dependent plasticity changes during the onset of hearing development, and how it is affected by sensorineural hearing loss.

The laboratory has also implemented several new techniques this year. Principal among these is a method of laser photostimulation of neural circuits using caged glutamate, the main excitatory neurotransmitter in the brain. This technique is being applied by Luke Campagnola to study the organization of neural circuits in the ventral cochlear nucleus, by Dr. Manis in the dorsal cochlear nucleus, and by Megan Kratz in the auditory cortex. This is an exciting, high-throughput method, that can be used to identify the organization and plasticity of neural circuits in the central auditory pathway.

Lastly, a collaborative project between the lab (Manis, Mancilla) with Drs. Patricia Maness (Department of Biochemistry and Biophysics) and Eva Anton (Department of Cell and Molecular Physiology) is examining inhibitory circuits and their role in regulating gamma rhythms in the auditory cortex in two mouse models of schizophrenia. This work is supported through the UNC Conte Center (Dr. John Gilmore, PI).



The Psychoacoustics Research Team: Top (L-R): Emily Ellis (2nd year AuD student); John Grose, PhD; Emily Buss, PhD; Joseph Hall, PhD. Bottom (L-R): Erol Ozmeral (graduate student in Psychology); Sara Mamo, AuD (Audiologist); Shuman He, MD, PhD (Post-doc Research Associate); Tara Steplowski (Research Assistant), and Madhu Dev (Social Research Specialist)

**Joseph W. Hall, PhD**, is presently the principal investigator on two R01 NIH research grants, both funded by the National Institute of Deafness and other Communication Disorders. One of these projects is Development and Plasticity in Normal and Impaired Hearing. The main experiment in this project is investigating the effect of sensorineural hearing loss on the development of hearing in children. The aim is to examine the ability of these children to obtain benefit for speech perception in noise for noise that has spectral dips, temporal dips, or both spectral and temporal dips. The ability to benefit from such spectro-temporal dips probably accounts for the relatively good ability of listeners with normal hearing to understand speech in noisy environments. It is important to assess the effect of hearing loss on these abilities, particularly in children, where experience with speech/language cues is relatively limited.

A second experiment in this NIH grant is investigating the development of auditory temporal processing in normal-hearing children. The specific focus is on the ability to use very brief temporal cues and to separate these cues from other temporally proximal acoustical information. The results of this study should aid the understanding of the ability to understand speech in difficult listening situations. The lead investigator on this project is our postdoctoral fellow, Shuman He. Dr. He recently had a paper accepted for publication on this topic and is currently working on a follow-up study.

A third study in this NIH grant is a basic science project investigating the frequency selective nature of binaural hearing. It has long been known that the frequency region responsible for binaural masking is wider than that associated with monaural (single-ear) masking. This project examines the basis for this finding and is specifically testing the hypothesis that the



Dr. Joseph Hall and Madhu Dev

dynamics of the temporal envelope of the masking noise play a crucial role.

Dr. Hall's second NIH-funded grant is Spectro-temporal Processing in Normal and Impaired Ears. A basic science study in this project is examining the sensitivity of listeners to across-frequency coherence of temporal envelope. A novel feature of the study is that it used noise bandwidths that are considerably wider than the width of the normal auditory filter. Therefore, in order to perform well on the task, the listener would have to be able to

"reconstruct" the stimulus temporal envelope by combining the outputs of multiple peripheral auditory filters. Such an ability would indicate that the listener could compensate for the loss of temporal information that occurs due to sharp frequency selectivity.

A second study in this project is examining whether sensorineural hearing loss can sometimes facilitate the encoding of some temporal auditory cues. A classic notion is that hearing-impaired listeners may be able to benefit from improved temporal envelope detail at the outputs of relatively wide auditory filters. However, most studies on temporal processing have shown either similar performance between normal and impaired ears, or slightly poorer performance by hearing-impaired listeners. One important reason that could account for the general failure to find better temporal processing in impaired listeners with poor frequency selectivity than in normal-hearing listeners with good frequency selectivity is that normal-hearing listeners appear to be very adept at combining information across multiple, relatively narrow auditory filters. Thus any advantage that reduced frequency selectivity might provide to a hearing-impaired listener in simple temporal processing paradigms may be matched by the advantage available to a normal-hearing listener due to the combination of information across multiple, peripheral auditory filters. The hypothesis we are investigating is that hearing-impaired listeners will show temporal processing that is better than normal under conditions where it is more advantageous to base performance on the output of a single, broad auditory filter than to combine information across multiple, narrow auditory filters. The information obtained should result in a better understanding of the factors that govern the perception of complex sounds in hearing-impaired patients.

A third study in this project is investigating masking release for speech in modulated noise. This study tests the hypothesis that masking release for speech in modulated noise is due in part to an interaction between the temporal distribution of cues necessary to perform the task and the probability of those cues temporally coinciding with masker modulation minima. We are using words masked by speech-shaped noise that is either steady or is modulated at a variety of rates. The results suggest that the optimal rate of amplitude modulation depends on the temporal distribution of speech cues and the information required to perform a particular task.

**John H. Grose, PhD**, is the Principal Investigator on an NIH-funded project that examines complex sound processing in normal and impaired auditory systems. The current focus of this project is on understanding the decline in temporal processing with age. He has recently demonstrated that sensitivity to inter-aural time differences (ITDs), as a measure of temporal fine-structure coding, begins to decline as early as middle age. This work will be published in the journal *Ear and Hearing*. As a complementary arm to the psychoacoustic experiments, the investigation is now concentrating on electrophysiological measures of fine-structure coding. Using the binaural beat steady state response elicited by disparate tones to the two ears as the measure of temporal processing, his lab has shown that the evoked potential is more likely to be present in younger listeners than older listeners. Dr. Grose presented this update at the 2010 International Congress of Audiology in São Paulo, Brazil.



Dr. John Grose with audiologist Sara Mamo, AuD, and 2nd year AuD student, Emily Ellis.

In addition to his major research emphasis, Dr. Grose continues to contribute to the evoked potential testing of infants and toddlers, as well as patients with cochlear implants. His current focus in this area is on electrophysiological responses in children with auditory neuropathy spectrum disorder.



Dr. Emily Buss

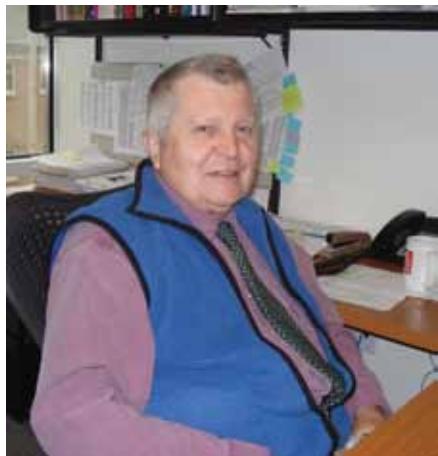
**Emily Buss, PhD**, is an auditory science researcher involved in a range of projects investigating the perception of sound in human listeners. Many of these projects focus on special populations, including adults with sensorineural hearing loss and cochlear implant users. Other projects focus on normal-hearing adults and children, with the goal of developing normative models of auditory processing and development. Experimental methods used in these studies include traditional psychophysical paradigms based on behavioral responses, such as detection or discrimination, as well as speech recognition in a wide range of backgrounds. In many cases

the resulting data can be incorporated into computer-based models that formally characterize different stages of auditory processing.

Dr. Buss is currently working on research initiatives aimed at understanding effects of level fluctuation on the encoding of spectral cues, the importance of temporal cues in speech

understanding, and the role of amplitude modulation across frequency in parsing a sound scene. One new initiative is to establish a model of the development of auditory processing based on internal noise; the goal of this work is to provide a uniform metric for comparing performance across a wide range of auditory tasks in school-aged children. Collaboration with Dr. Lori Leibold, in the Division of Speech and Hearing, focuses on better understanding susceptibility to and release from masking in infancy and childhood.

In addition to this laboratory work, Dr. Buss maintains an ongoing involvement in a number of cochlear implant and hearing aid investigations, for which she provides support in experimental design and analysis. One such project evaluates performance of hearing-impaired children fitted with frequency compression hearing aids. This project relies on collaboration with colleagues in UNC's Division of Speech and Hearing, the Department of Otolaryngology and the CCCDP.



Dr. Jiri Prazma

**Jiri Prazma, MD, PhD**, and his colleagues have continued in their study of allergy-induced Eustachian tube dysfunction. The role of allergy in the development of Eustachian tube dysfunction (ETD) and otitis media with effusion (OME) has been investigated in the laboratory for many years. While the etiology of OME most likely involves many factors, allergic inflammation in and around the nasopharyngeal portion of the Eustachian tube (ET) or within the middle ear leads to the breakdown of the protective functions of the ET, thereby resulting in increased risk for the development of otitis media. For this reason, it is theorized that by modulating the pathways that lead to the allergic response, we can limit the inflammation caused by the allergic response resulting in ETD.

We have developed a model of ETD where rats are sensitized to ova-albumin (OVA) and subsequently challenged with this allergen either trans-tympanically or through the nasopharynx. This challenge causes an allergic-like response leading to inflammation within the middle or around the nasopharyngeal portion of the ET. This inflammation consequently leads to worsening of the ET's ventilatory function manifested as increased passive opening and closing pressures as well as the impairment of the mucociliary clearance of the ET.

Supported by the Resident Research Grant of the American Academy of Otolaryngic Allergy, Stefan Mlot (MSIV) investigated the effect of concurrent lipopolysaccharide (LPS) and OVA sensitization on the development and severity of allergic otitis media and ET dysfunction. This study demonstrated that the presence of LPS in the middle ear during antigen presentation has an effect on the immune response to that antigen, and that the nature of the effect varies with LPS concentration. In addition, Adam Campbell (MSIV), Tom Suberman (MSIV), and Carlos Ebert, MD, MPH, are investigating whether the timing of LPS presentation in the middle ear could affect the development and severity of allergic otitis media. This study demonstrated that a bacterial infection (LPS) could serve as a primer for the development of future otitis media.

**Douglas C. Fitzpatrick, PhD,**

and his colleagues study the physiology and anatomy of hearing using animal models. Projects this past year include the start of a study on preserving residual hearing during cochlear implantation, as well as continuing studies on midbrain implantation, binaural hearing, and transformations of auditory information processing at different brain levels.

The new study on preserving residual hearing during cochlear implantation is being done in collaboration with Drs. Adunka

and Buchman. In their surgical practices, a growing number of patients with severe hearing loss are being treated with cochlear implants. These patients retain some residual acoustic hearing, and the best outcomes occur if this residual hearing can be preserved. In particular, retaining residual hearing improves speech understanding in noise compared to electrical stimulation alone. However, residual hearing is often compromised during the implantation surgery. Our hypothesis is that the retention of acoustic hearing will be improved if the surgeon has real-time physiological information on the state of hearing preservation during the implantation process. Current generations of cochlear implants are capable of providing such physiological information, but knowledge of physiological changes as a result of electrode interaction with cochlear structures is limited. Consequently, our experiments are aimed to correlate changes in intracochlear potentials in response to acoustic stimuli as an electrode impacts cochlear structures. Funding for this project has been provided by the Med-El company.

The studies on midbrain implants are motivated by the need to provide auditory sensation to people who lack a functional auditory nerve. These patients cannot be helped by traditional cochlear implants. We have successfully implanted multichannel electrodes in the IC of rabbits, and have measured neural and behavioral thresholds to stimulation of the implant. Further work on this project requires major changes to hardware and software to provide electrical stimulation of complex stimuli including speech sounds. This work is being done in collaboration with Dr. Charles Finley, and is supported by an R21 from NIH that began this year.

Studies on binaural hearing are continuing with a particular emphasis on the ability of the binaural auditory system at different brain levels to process temporal variations in cues to sound source location. These experiments are motivated by mismatch between behavioral and neural results, with behavioral measurements suggesting the binaural system is slow,



Dr. Doug Fitzpatrick, Dr. Oliver Adunka, Christie DeMason (4th year medical student), and Dr. Baishakhi Choudhury (resident in the research track)

or “sluggish”, while the neurons show no such sluggishness. Techniques include behavioral measurements and neural recordings in rabbits. To date, we have not observed differences in the ability of neurons at any brain level to follow temporal modulations of binaural compared to monaural cues. Consequently, our current hypothesis is that binaural sluggishness is not due to an inherent limitation in processing binaural signals, but rather an enhancement in processing AM in humans compared to rabbits. This enhancement is likely to be the result of the need to encode AM for extracting information in complex signals such as speech.

To study information processing at different brain levels, we are continuing research on processing between the inferior colliculus and the auditory cortex. In collaboration with Dr. Nell Cant from Duke, we have begun experiments to study the anatomy and physiology of the auditory thalamus in gerbils. The thalamus lies between the inferior colliculus in the midbrain and the auditory cortex. In the inferior colliculus, the central nucleus is the beginning of the core (or “lemniscal”) auditory pathway. It contains a single tonotopic representation. In contrast, the auditory cortex contains multiple “functional areas” each with a separate tonotopic organization. The transformation from a single to multiple tonotopic areas is typically thought to be due to divergence of pathways from the auditory thalamus to auditory cortex. However, Dr. Cant’s work in gerbils and our previous work in bats suggests that the transformation actually occurs in the output pathways of the IC to the auditory thalamus. Our hypothesis is therefore that multiple tonotopic representation will first occur in the auditory thalamus. Our experiments to test this are being done through a combination of electrophysiology and anatomical tract-tracing.

We made considerable progress this past year, in large part because of the efforts of two superb medical students, Tom Suberman and Adam Cambell. They both took a year for research, and were able to produce results that contributed to four submitted manuscripts (two accepted to date) from my lab, as well as publishing results from studies with other faculty.

As always, Stephen Pulver has provided superb technical assistance throughout the year.



Steve Pulver analyzes vertigo and balance system function in the clinic. In Doug Fitzpatrick's lab he performs cochlear microdissections, and is often responsible for creating unique surgical tools and apparatuses.

**Oliver F. Adunka, MD**, is primarily involved in clinical and basic science research projects in the field of electric stimulation of the auditory system and cochlear hearing preservation. Dr. Adunka is the PI of the electric-acoustic stimulation (EAS) clinical trial; a multi-center North American trial in which UNC performed the first surgeries and is leading enrollment.. In an ongoing collaboration with MED-EL North America, UNC has completed the first arm of the study and has moved to the second arm which incorporates less stringent inclusion criteria. Enrollment and data collection for the Vibroplasty (Vibrant Soundbridge placed on the round window) clinical trial has been completed and results are very encouraging. Dr. Adunka and Dr. Buchman are currently in the process of publishing these materials.

In collaboration with Drs. Fitzpatrick and Buchman, Dr. Adunka has continued to work on a series of animal experiments using gerbils focusing on the acute effects of intracochlear trauma and electrode insertion on early auditory potentials, which include cochlear microphonics from hair cells and compound action potentials from the spiral ganglion. First experiments revealed a peculiar configuration of electrophysiologic markers so that imminent intracochlear trauma can be predicted when still reversible. Subsequent data showed that these recording algorithms could be markedly abbreviated so that a near real-time intraoperative feedback might be possible in the future. Also, it was possible to use a micro-endoscope during these experiments further correlating functional and morphologic parameters during these experiments. Also, these electrophysiologic markers have been correlated with morphological data from both histological evaluations as well as from microendoscopic imaging during the experiments. Current research in this area focusses on the effects of hearing loss on these early potentials and their significance for long-term hearing preservation. Also, in a close collaboration with an implant manufacturer, these data will be used to implement this technology into future cochlear implants.



Dr. Oliver Adunka working on a translational model to improve residual hearing preservation during cochlear implantation.

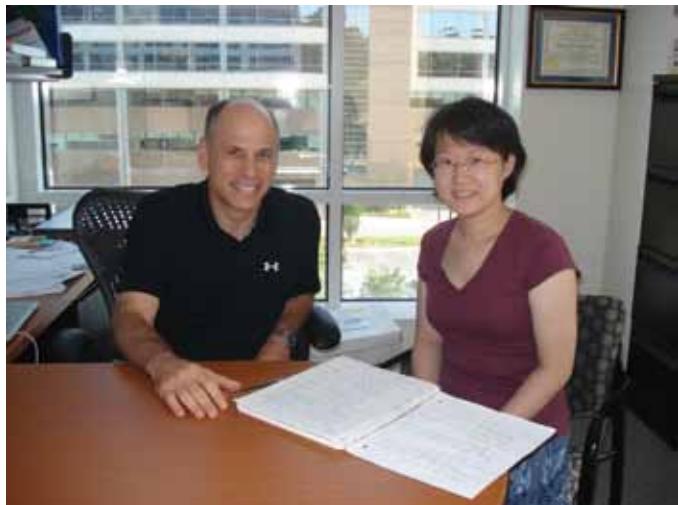
Dr. Adunka has been heading the histological temporal bone laboratory. A special sawing, grinding, polishing system allows sectioning of non-decalcified bone and hard materials such as electrode contacts but also prosthetic implants commonly used in dentistry or orthopedic surgery. Last year's efforts have focused on the evaluation of cochleostomies furnished using new laser technology. Preliminary data demonstrate a sometimes positive effect of touch-less surgical methods such as the laser for a cochleostomy approach. Future research will focus on various alternative approaches to electrostimulation and hearing preserving techniques.

In collaboration with Dr. Craig Buchman, clinical research projects include various topics in pediatric and adult cochlear implantation such as ongoing research on cochlear nerve deficiency and auditory neuropathy. Of note, UNC has identified and enrolled more subjects with absent or small cochlear nerves than any other center in the world. Clinical research has been focusing mainly on diagnostic algorithms. Also, recent work has focused on collecting imaging and clinical data on several types of inner ear malformations.

During his research efforts, Dr. Adunka has mentored medical students including Adam Campbell, MS III, who has completed a research year between his 3<sup>rd</sup> and 4<sup>th</sup> year of medical school. In this year, Adam has been extremely productive helping mainly with animal experiments centered around hearing preservation procedures mentioned above. As a clinical project, Adam had the opportunity to present data from children with enlarged vestibular aqueducts at the 113<sup>th</sup> Annual Meeting of the Triological Society in Las Vegas, NV.

Also, Thomas Suberman, MS III, has joined Dr. Fitzpatrick's lab for the past year and like Adam, Tom has been extremely productive working on multiple projects. Tom had a chance to present data from our lab at the 143<sup>rd</sup> Annual Meeting of the American Otologic Society in Las Vegas, NV. Specifically, Tom presented on noise-induced hearing loss data in the gerbil which will be used to test our intraoperative recording system in more realistic conditions. Besides this project, Tom has also helped Dr. Ebert with multiple allergy related projects and Drs. Prazma and Fitzpatrick on other research projects.

Over the past 3 years, Dr. Adunka has developed a multi-client pediatric hearing loss database. Data that has been collected from the CCCDP, the CASTLE, and the pediatric hearing aid group have been merged and the database in its current form contains information on more than 2,500 pediatric patients with conventional hearing aids and/or cochlear implants. This database has been integrated into the clinical algorithm and data entry and analysis is ongoing. More recently, speech production data has been added to the database and data entry is ongoing.



Dr. Craig Buchman and Dr. Shuman He (Post-doc Research Associate)

**Craig A. Buchman, MD**, is actively involved in research in a number of hearing-related topics. Together with a number of co-investigators from UNC and abroad, he is actively studying topics such as cochlear nerve deficiency, auditory neuropathy spectrum disorder (ANSO), CMV-related hearing loss, inner ear malformations, and a number of hearing restorative device-related topics. In the field of cochlear implantation, Dr. Buchman and colleagues continue to study the effects of combining electrical stimulation from a cochlear implant with the natural acoustic signal from

patients with preserved residual hearing following implant surgery in an attempt to improve hearing performance for patients. Also, ongoing investigations continue into the safety and efficacy of bilateral cochlear implants as well as the reliability of a variety of cochlear implant devices in both adults and children. Newer areas of study include a clinical trial for auditory brainstem implants (ABI) in adults without NF2 and use of the round window membrane for implantation of the Vibrant MedEl device for conductive and mixed hearing losses.

Investigators at UNC continue to be very interested in the field of ANSD in children. Here at UNC, we have a particularly robust clinical experience with this disorder as we are currently following more than 200 affected children. What is clear from our current research is that the findings of ANSD on hearing testing can be associated with a variety of medical conditions. We have learned that some children with ANSD can occasionally have absent or severely deficient

cochlear nerves on MRI and that these children may not benefit from hearing restorative interventions. By contrast, most children with ANSD can benefit from either hearing aids or cochlear implants depending on their native hearing abilities. Identifying which children can benefit from the various intervention strategies is a major area of investigation. Dr. Buchman, together with Drs. Grose, Roush and He have recently begun to use a variety of electrophysiological test together with imaging studies to try and better characterize which children with ANSD can benefit from amplification and those that require cochlear implantation or no intervention. We have also begun collaborations with other institutions to develop a multi-site investigation in this population of children.

Congenital inner ear malformations are very common among children with hearing loss. At UNC, we are following more than 200 children with inner ear deformities. Unique to this group of children is the fact that many have an increased risk for progressive or profound hearing loss and cochlear implantation can be significantly more challenging when compared to children with normal inner ear anatomy. We are actively trying to identify those children with inner ear malformations that are best served with cochlear implants and those that might be better served with other communicative assistance such as a brainstem implant or manual modes of communication.

Dr. Buchman continues to collaborate with audiologists at UNC, Boyertown and the University of Iowa in an NIH funded study of children with less than severe hearing loss. The OCHL (Outcomes of Children with Hearing Loss) Study, lead by Dr. Patricia Roush locally, is charged with identifying factors that predict success for young children with hearing loss. Dr. Buchman is specifically studying the influence of medical factors on outcomes in this group of children.

Together with the Office of Technology Development at UNC, Dr. Buchman and Dr. Adunka have applied for a US and International Patent to provide intracochlear measurements of acoustically evoked auditory potentials. This new technology should provide improved means to monitor hearing during hearing preservation cochlear implantation. Also, this method might be helpful in the direct assessment of hair cell function rather than to gather in-direct data via conventional audiotmetric evaluation. The patent application has recently been published with the US Patent and Trademark Office.

**Charles C. Finley, PhD**, is a biomedical engineer and neurobiologist, who investigates the design and application of cochlear implant systems. His work includes clinically-based issues such as speech processor design and fitting, as well as in situ device evaluation. He also pursues basic research in understanding the anatomical and physiological basis for variable speech reception outcomes across patients.

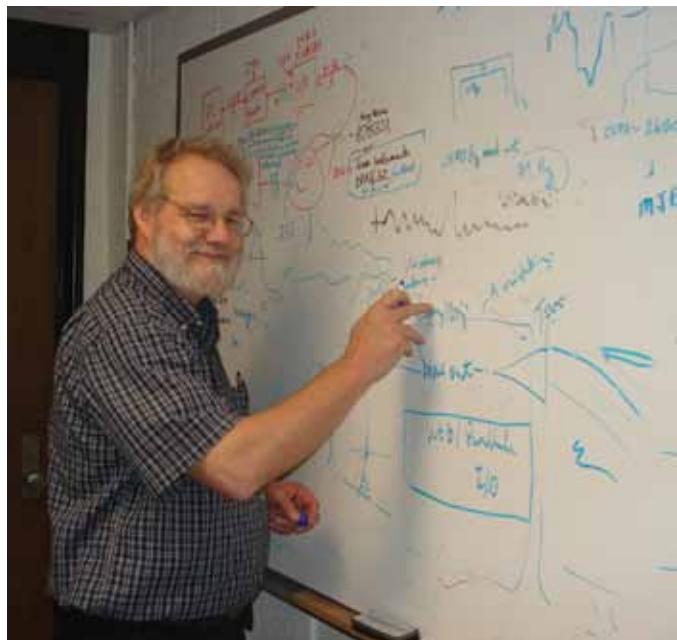
This latter area of work involves the integration of high-resolution CT imaging, measurement of intracochlear evoked potentials and computer modeling to make predictions about the neural responsiveness and neural survival patterns in various regions of an individual patient's implanted cochlea. This multidisciplinary work is being pursued in patients with the Clarion and Nucleus implant systems in collaboration with investigators at Washington University

in St. Louis. In this study patients are being assessed pre- and post-operatively using high-resolution CT techniques to determine cochlear anatomy and electrode placement. Peripheral intracochlear physiological responses are also being measured to characterize the status of the cochlea

As part of this project, techniques are also being developed to derive an anatomically-based, finite-element, cochlear model for each individual patient using the CT anatomical information. This computational model will interface with a neural response model and will be used to help interpret intracochlear evoked response data to provide insight into

neural survival patterns. Finley has pursued this work as a Renaissance Computing Institute (RENCI) Faculty Fellow. He worked with four colleagues at RENCI to implement and expand his model system which includes a full head, a detailed temporal bone and a high-resolution cochlea with implanted electrode array. The model system is implemented on various high performance computer clusters at RENCI. This latter study is motivated by CT observations to date which show that surgical variation in electrode placement across patients regarding depth of insertion and scalar positioning each significantly influence speech reception performance. This observation has resulted in new emphasis by surgeons and manufacturers to improve electrode insertion techniques.

Development of generic methods of monitoring and evaluating the functional performance of implanted cochlear implant systems in patients continues in Dr. Finley's lab. In recent years this work spawned a series of basic science studies investigating the patterns of electrical artifact potentials appearing on the scalp of cochlear implant patients. Careful measurement, analysis and modeling of these electrical potential patterns has provided new insights into the pathways along which stimulation current flows during normal operation of cochlear implant systems. Of particular significance is the observation that the current flow pathways for apical and basal stimulation sites are significantly different contrary to conventional wisdom. This observation has served as a key piece of information to link disparate findings from CT imaging, intracochlear electrophysiological measures and psychophysical perceptions to hypothesize the existence of a stimulation mechanism that leads to ectopic stimulation of the auditory nerve within the cochlear canal at the fundus of the internal auditory meatus during intracochlear stimulation. This effect is thought to be a significant factor limiting the speech reception abilities of lower performing implant subjects. In January 2010 Finley began a two-year NIH NIDCD R21 exploratory research grant to investigate the ectopic stimulation mechanism in a variety of cochlear implant patients. Results from the study indicate that the ectopic stimulation mechanism exists in cochlear implant patients regardless of the type of



Dr. Charles Finley

implant system they have and is largely a consequence of electrical stimulation in the human cochlea due to its anatomical features. This observation deviates from long-held assumptions about current flow in the implanted cochlea and will likely have impact on the design and mapping of future cochlear implant systems.

**Carlton J. Zdanski, MD**, describes his role as researcher in a variety of settings:

Through the concerted efforts of many individuals within the Department of Otolaryngology/Head and Neck Surgery, The Department of Pediatrics, and multiple individuals within the University of North Carolinas Hospitals system, we continue to build the North Carolina Children's Airway Center initially formed with the assistance of a generous grant from The Duke Endowment. The Airway Center specializes in the coordinated delivery of cutting edge, multi-disciplinary, specialized care for children with airway disorders. The Center will also seek to educate patients and their families as well as clinicians regarding airway disorders and to perform research. The Center's multi-disciplinary clinics began formally seeing patients in September of 2007. Multiple areas of research are currently being explored and protocols for efficient and safe evaluation and management of more common airway problems are being developed and fine tuned.



Dr. Carlton Zdanski

The Department co-sponsored the Carolina's Pediatric Airway Course with the Department of Otolaryngology at the Medical University of South Carolina. Dr. Zdanski and former UNC OHNS resident and Pediatric otolaryngologist Dr. David White co-directed the two day course. This year the course will be hosted at UNC with plans for future courses at both institutions.

In the laboratory with Drs. Jiri Prazma and Allen Marshall, we continue to examine the problem of subglottic stenosis of the airway in the pediatric population and to examine etiologies and diagnostic tools for Meniere's Disease. Research into the mechanisms of otitis media, continue in the laboratory with Drs. Ebert, Blanks, Eapen, and Prazma examining the role of immunomodulatory oligonucleotides in the prevention and treatment of OVA-induced Eustachian tube dysfunction.

Research is being conducted into imaging in GBJ related sensorineural hearing loss with Michael Stadler, MD. These data will be presented at the upcoming AAO-HNSF Meeting in San Diego, California this Fall.

Finally, Dr. Zdanski traveled to Malawi this year to engage in the training of surgical residents at Kamuzu Central Hospital in Lilongwe. This two week endeavor involved teaching residents and clinical officers there pediatric airway endoscopy. In addition, through a generous gift from Storz, new donated endoscopic equipment was delivered to the hospital and staff trained in their use and maintainance. Accompanying Dr. Z on this trip was another former UNC resident and now plastic surgeon Dr. Krishna Patel. Together, many cleft lips and palates were repaired and the Malawian residents were trained in aspects of cleft care and surgery. Additional surgeries were performed for vascular malformations and tumors of the head and neck. Overall, it was a very valuable experience and we look forward to providing a continuing educational and surgical presence there.

Clinical research has primarily revolved around our excellent Pediatric Cochlear Implant Program at UNC. This is one of the most active pediatric cochlear implant programs in the country. Our Internal Review Board approved protocol for the study to determine the optimal protocol for the auditory rehabilitation of children with Auditory Neuropathy/Dys-synchrony continues and data collection continues. These data were again presented at international meetings, this time in Seattle, Washington. Our group was also privileged to write about our philosophy and share some of our data for a chapter in an upcoming book. Interest has been intense on an international level and across disciplines. We plan to continue to collect, present, and publish our data on as it matures.

**Holly Teagle, AuD**, is the primary investigator for an NIH-funded study called Childhood Development after Cochlear Implantation (CDaCI) and works closely with Jennifer Woodard, AuD and Hannah Eskridge, MSP, to collect data for this long term multi-center study. Cochlear implantation provides deaf children with access to sound, which is the first step in overcoming significant delays in receptive and expressive language development and the resultant cognitive and academic deficits. Psycho-social aspects of child development, including parent-child interactions and social development are also strongly influenced by significant hearing loss. The effects of deafness and the subsequent acquisition of sound through cochlear implantation on the “whole child” has been the focus of this multi-center study in which has been renewed for a second five year term. Drs. Pillsbury, Buchman, and Zdanski are the surgeons for the project.

Other collaborative research projects underway at the CCCDP include ongoing study of the benefits of cochlear implantation in special populations of children, such as those with Auditory Neuropathy Spectrum Disorder and children with Cochlear Malformations. We also continue to collect clinical outcome results for children who have undergone cochlear implant revision surgery, children who are using bimodal technology: a hearing aid in one ear and a cochlear implant in the other, and children who have bilateral cochlear implants. CCCDP staff audiologists will be presenting papers at an International Cochlear Implant meeting this summer on these topics. New cochlear implant technology becomes available on a regular basis from the 3 manufacturers. Because of our large and diverse patient population and our depth of experience, the CCCDP is often asked to participate in clinical trials with all three cochlear implant manufacturers to evaluate new cochlear implant system features, evaluation materials, or participate in post-market approval studies.

# Grants

## **Physiological Monitoring During Cochlear Implantation: Development of an Animal Model**

Principal Investigator: Oliver Adunka  
Co-Investigators: Douglas Fitzpatrick, Craig Buchman  
Triological Society Career Development Award 2010  
07/01/10 – 07/01/11  
\$40,000

## **Electroacoustic Stimulation**

Principal Investigator: Oliver Adunka  
Co-Investigators: Craig Buchman, Marcia Clark Adunka, Harold Pillsbury  
MED-EL Corporation  
03/27/07 – 03/27/10  
\$5,500

## **Monitoring Residual Hearing During Cochlear Implantation**

Principal Investigator: Oliver Adunka  
Co-Investigator: Doug Fitzpatrick  
MED-EL Corporation  
12/01/08 – 11/30/09  
\$154,651

## **Bilateral Cochlear Implantation in Children**

Principal Investigator: Craig Buchman  
Co-Investigators: Holly Teagle, Oliver Adunka, Carlton Zdanski, John Niparko, Jill Cinnici, Nancy Fink  
Advanced Bionics Corporation  
University of North Carolina at Chapel Hill (subsite)  
03/19/08 – 03/18/11  
\$66,871

## **Auditory Brainstem Implantation in Non-NF2 Patients**

Principal Investigator: Craig Buchman  
Co-Investigators: Marcia Clark Adunka, Holly Teagle, John Grose, Matt Ewend,  
Derald Brackmann, Jose Fayad, Marc Schwartz, Steve Otto  
Cochlear Corporation  
University of North Carolina at Chapel Hill (subsite)  
03/27/07-03/27/10

## **Vibrant Med EL Clinical Trial**

Principal Investigator: Craig Buchman  
Co-Investigators: Marcia Clark Adunka, Oliver Adunka, Harold Pillsbury  
Sponsor: MED-EL Corporation  
09/21/07 – 09/21/10  
\$56,000

## **Spectral Profile Cues and Synthetic Listening**

Principal Investigator: Emily Buss  
NIH/NIDCD  
12/15/05 – 11/30/10  
\$119,797 (current year)

**Genome-wide Association Study of Craniofacial Microsomia**

Principal Sub-Investigator: Amelia Drake

Co-Sub Investigator: Luiz Pimenta

UNC School of Dentistry as part of a multi-center planning grant

12/09 – 12/11

\$40,000

**Ectopic Stimulation Limiting Cochlear Implant Outcomes**

Principal Investigator: Charles Finley

NIDCD, subcontract to Washington University in St. Louis

01/10 – 12/11

Approx. \$200.000/year

**The Inferior Colliculus as a Site of Electrical Stimulation**

Principal Investigator: Doug Fitzpatrick

Co-Investigator: Charles Finley

NIH-NIDCD

12/08 – 11/11

\$275,000 (total direct costs)

**Complex Sound Analysis in Normal and Impaired Ears**

Principal Investigator: John Grose

Co-Investigators: Emily Buss, Charles Finley

NIH/NIDCD

12/01/92 – 08/31/13

\$212,500 (current year)

**Development and Plasticity in Normal and Impaired Ears**

Principal Investigator: Joseph Hall

Co-Investigator: Emily Buss

NIH/NIDCD

09/01/86 – 08/31/12

\$212,500 (current year)

**Spectro-Temporal Analysis in Normal and Impaired Ears**

Principal Investigator: Joseph Hall

Co-Investigator: Emily Buss

NIH/NIDCD

09/01/86 – 07/31/14

\$215,711 (current year)

**Sequencing of Mutations - RET, BRAF, NTRK, and RAS for Correlative Study of AZD6244 as Part of the Clinical Trial NCI7918**

Principal Investigator: D. Neil Hayes

Translational Research Initiative

2/15/08 - 2/14/09

\$43,308

**Reliable Classification of Lung Cancer: Comparison of Morphologic and Molecular Classification**

Mentor: D. Neil Hayes (for Juneko Grilley)

Lineberger Comprehensive Cancer Center

05/18/08 - Present

\$50,000

**Genomic Classification of Head and Neck Cancer in Paraffin Samples**

Principal Investigator: D. Neil Hayes

University Cancer Research Fund'

04/01/09 – 03/31/10

\$150,000

**MicroRNA Alteration in Human Head and Neck Squamous Cell Carcinoma**

Co-Principal Investigators: D. Neil Hayes, Xiaoying Yin

UNC Lineberger Translational Research Awards

07/01/09 – 06/31/10

\$50,000

**Gene Expression Patterns in Human Tumors Identified Using Transcript Sequencing**

Co-Principal Investigators: D. Neil Hayes, Chuck Perou

NIH

09/01/09 – 08/31/14

\$15,000,000

**MicroRNA Regulation of Human Airway Epithelial Phenotype**

Co-Principal Investigators: D. Neil Hayes, Scott Randell, Scott Hammond

NIH (ARRA)

09/30/09 – 08/31/10

\$500,000

**Lung Squamous Cell Carcinoma Subtypes: Genomic Aberrations and Clinical Detection**

Mentor: D. Neil Hayes (for Matt Wilkerson)

NIH

09/30/09 – 09/29/12

\$150,000

**Flexible Statistical Machine Learning Techniques for Cancer-Related Data**

Co-Investigators: Yufeng Liu, D. Neil Hayes

NIH

04/01/10 – 03/31/15

\$285,568

**Computer Modeling of Surgical Outcomes for Nasal Airway Obstruction**

Co-Investigator: Julia Kimbell

Medical College of Wisconsin Subcontract/NIH

04/01/09 - 3/31/13

\$329,832 (total direct costs)

**Mechanisms of Species-Dependent Environmental Lung Injury**

Co-Investigator: Julia Kimbell

University of Alabama at Birmingham Subcontract/NIEHS

06/01/09 - 3/31/11

\$44,065 (total direct costs)

**Development of Specific Modifications to Multi-Path Particle Deposition Model and Software Interface: Human Nasal Region**

Principal Investigator: Julia Kimbell

The Hamner Institute Subcontract/NIOSH

06/01/09 -12/31/09

\$4,972 (total direct costs)

**3D Imaging and Computer Modeling of the Respiratory Tract**

Consultant: Julia Kimbell

The Hamner Institute Subcontract/PNNL

09/01/04-8/31/09

\$4,515 (total direct costs)

**Dose Assessment of Selected Components of Fragrance Materials in the Respiratory Tracts of Humans and Rats**

Co-Investigator: Julia Kimbell

The Hamner Institute Subcontract/Research Institute for Fragrance Materials

06/01/09 - 12/31/10

\$33,615 (total direct costs)

**Research Training in Otolaryngology**

Principal Investigator: Paul Manis

NIDCD

07/01/03 – 06/30/10

\$1,009,288 (total direct costs)

**Physiology of the Dorsal Cochlear Nucleus Molecular Layer**

Principal Investigator: Paul Manis

NIDCD

12/06 – 06/11

\$1,250,000 (total direct costs)

**Cellular Mechanisms of Auditory Information Processing**

Principal Investigator: Paul Manis

NIDCD

04/01/09 – 03/31/14

\$1,250,000 (total direct costs)

**Prospective Studies of the Pathogenesis of Schizophrenia**

Principal Investigators: John Gilmore, Aysenil Belger, Anthony-Sam Lamantia, Eva Anton, and Martin Styner

Co-Investigators: Paul Manis, Honor Wolfe, and James Reznick

UNC Center for Schizophrenia Research

08/01/08 - 07/31/12

\$1,4239,311 (total direct costs)

**Quality of Life Among African-American Head and Neck Cancer Survivors**

Principal Investigator: Andrew Olshan

Co-Investigators: Jianwen Cai

Collaborators: Mark Weissler, William Funkhouser

Lance Armstrong Foundation

2007-2010

\$81,837 (current year, direct costs)

**Study Centers for the National Children's Study (Center Grant)**

Co-Investigator: Andrew Olshan (UNC PI: Barbara Entwistle)

NICHD

2007-2010

\$9,050,651

**North Carolina Center for Birth Defects Research and Prevention (Center Grant)**

Principal Investigator: Andrew Olshan

Centers for Disease Control

2002-2013

\$900,000 yearly

**Genetic Susceptibility Factors in the Etiology of Neuroblastoma**

Principal Investigator: Andrew Olshan

NCI

2008-2013

\$2,891,925

**Training Program in Reproductive, Perinatal, and Pediatric Epidemiology**

Co-Investigator: Andrew Olshan (PI: A.M. Siega-Riz)

NICHD

2008-2013

\$1,430,220

**Moderators of Functional Outcomes in Children with Mild to Severe Hearing Loss**

Principal Investigators: Bruce Tomblin (Univ. of Iowa), Mary Pat Moeller (Boys Town National Research Hospital)  
UNC Co-Principal Investigators: Patricia Roush, Melody Harrison  
University of Iowa Subcontract/NIH-NIDCD  
08/01/08 – 07/31/13  
\$1,506,334 (total amount)

**Phase I Trial of Valacyclovir and Cyclophosphamide Therapy in Burkitt-Lymphoma**

Mentor: Carol Shores (for Dan Olson)  
NIH Fogarty International Center  
07/01/10 – 07/01/11  
\$85,000

**Comorbid Infections and Cancer in Malawi**

Principal Investigator: Carol Shores  
University Cancer Research Fund, Core Facility Grant  
04/01/10 – 04/01/11  
\$12,000

**Comorbid Infections and Cancer in Malawi**

Principal Investigator: Carol Shores  
North Carolina TraCS Institute  
05/01/10 – 05/01/11  
\$50,000

**Comorbid Infections and Cancer in Malawi**

Mentor: Carol Shores (for Elizabeth Bigger)  
NIH Fogarty International Center  
07/01/09 – 07/01/10  
\$85,000

**Cancer Database and Tissue Procurement in Malawi**

Principal Investigator: Carol Shores  
UNC Lineberger Comprehensive Cancer Center and Center for AIDS Research  
01/01/09 – 01/01/10  
\$30,000

**Childhood Development after Cochlear Implantation (CDaCI Study)**

Coordinating Center: Johns Hopkins University  
UNC Principal Investigator: Holly F.B. Teagle  
UNC Co-Investigators: Craig Buchman, Harold Pillsbury, Carlton Zdanski,  
Jennifer Woodard, Hannah Eskridge  
NIH/NIDCD  
08/01/07 – 07/30/12  
\$523,541

**Children's Hearing Intervention Program; Center for Acquisition of Spoken language Through Listening Enrichment (CASTLE)**

Principal Investigator: Holly F.B. Teagle  
Co-Investigator: Hannah Eskridge  
North Carolina Legislature  
2010-2011  
\$550,000

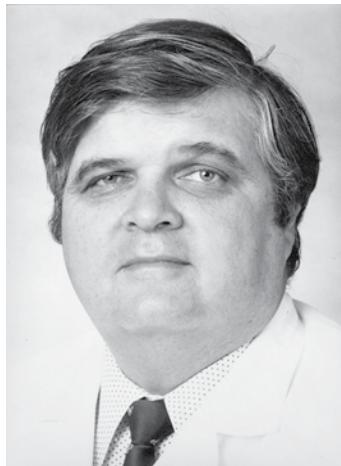
**North Carolina Children's Airway Center**

Principal Investigator: Carlton Zdanski  
Duke Endowment  
07/01/07 - 06/30/2010  
\$360,000 (total direct costs)

# Distinguished Professorships

The distinguished professorships held by faculty in the Department of Otolaryngology/Head and Neck Surgery:

## The W. Paul Biggers Distinguished Professorship



W. Paul Biggers, MD

The W. Paul Biggers Distinguished Professorship was established in 2000 to honor Dr. Biggers, who had been an integral part of the University of North Carolina since becoming a medical student in 1959.

Paul Biggers was born in 1937 in Charlotte, North Carolina, earned a B.S. at Davidson College and his M.D. at the University of North Carolina at Chapel Hill. He completed internship and residency also at UNC. In 1968 Dr. Biggers joined the faculty in Otolaryngology/Head and Neck Surgery at UNC.

Dr. Biggers offered an example of compassion, scholarly devotion, commitment to patient care, and teaching that is beyond compare. The numerous teaching awards bestowed upon him by the School of Medicine evidenced his contribution to medical teaching of students and residents.

Beyond these contributions, Dr. Biggers had a lifetime interest in speech and language and served on the Board of Examiners for Speech and Language Pathologists and Audiology. Through tireless efforts, he ensured that the state legislature establish and continue a program designed to aid children with speech and hearing disorders. This program has already benefitted thousands of children within the State of North Carolina. For these efforts, he was presented the Service to Mankind Award and was honored with the H. Fleming Fuller Award as the outstanding clinician at the UNC Hospitals.

Established in 1992, the Carolina Children's Communicative Disorders Program (CCCDP) was made possible by Dr. Biggers' insight, perseverance, and generosity of spirit. This program is funded by the State of North Carolina and aids children with speech and hearing disorders. To honor him, the name was changed to the W. Paul Biggers, MD, Carolina Children's Communicative Disorders Program. Outside of the Division of Otolaryngology/Head and Neck Surgery, Dr. Biggers was very active within the University. He helped coach the football team and served on the Executive Committee of the Board of Directors for the Educational Foundation. These accomplishments only begin to describe the service that Dr. Biggers provided to the State, the University, and to Otolaryngology/Head and Neck Surgery at UNC.

In recognition of Dr. Biggers' many contributions, the W. Paul Biggers Distinguished Professorship was established before he died in April of 2000 at the age of 62. Dr. Biggers asked that this Professorship be awarded to a physician who shares his passion for innovative teaching. On July 1, 2005, William W. Shockley, MD, was named the W. Paul Biggers Distinguished Professor of Otolaryngology/Head and Neck Surgery, to continue the tradition of excellence in patient care, compassion, teaching, and service that Dr. Biggers exemplified.

W. Paul Biggers Professor: William W. Shockley, MD (2005-present)

## The Thomas J. Dark Distinguished Professorship

The Thomas J. Dark Professorship in Otolaryngology was established in the University's School of Medicine in 1976 by Thomas Jefferson Dark of Siler City and Ft. Lauderdale, Florida.

The son of a Chatham County farmer, Dark was born in 1894. A member of the class of 1925, Dark studied in the University's School of Commerce — now the Kenan-Flagler Business School — and caught the attention and admiration of then-Dean Dudley DeWitt Carroll and John Sprunt Hill of Durham, who built and gave The Carolina Inn to the University. Dark handled John Hill's business correspondence relating to the construction of the inn and, upon its completion, was kept on for another year as social manager.



Thomas J. Dark

After receiving a Certificate of Commerce from the University in 1925, he returned to Siler City, where he organized the community's first fire department and became its chief. He worked briefly for a chair company in High Point and an automobile company in Greensboro. Then Carroll recommended him for a sales job with Collins & Aikman Corp. of Roxboro and New York.

In 1940, he invested in a small manufacturing company, the Buchmann Spark-Wheel Corp. When he became president, the company had 18 employees with varying levels of expertise in manufacturing small precision metal parts for cigarette lighters, toys, mining lamps and hardware. During World War II, under Dark's leadership, this small, obscure firm expanded, filling U.S. Army, Navy and Army Air Corps contracts for precision parts used in ordnance, radar and communications equipment for fighter and bomber planes. At this time, Dark purchased 3,000 acres of land near Athens, Georgia, and converted a rundown cotton plantation into a highly prized farm for raising Black Angus beef cattle. He continued both of these activities until his retirement in 1958.

Soon after his retirement, he bought a home in Ft. Lauderdale. He grew roses and raised bees in between recreational sailing trips. Because of family in North Carolina, he divided his time between Ft. Lauderdale and Siler City, with visits to his alma mater in Chapel Hill. An avid

sports fan, he rarely missed a home football game in the last two decades of his life. He died in Siler City in 1987 at age 93.

In addition to establishing the Dark Professorship, he provided other gifts to the University, including a scholarship fund in the School of Medicine, a challenge gift to his classmates and a gift to establish an office for the Order of the Bell Tower in the new George Watts Hill Alumni Center. He also inspired his friend, Eunice Bernhard, to endow a professorship in the School of Medicine.

In recognition of his continuing loyalty and generosity, the School of Medicine presented him with its Distinguished Service Award in 1982.

Thomas J. Dark Professors:

Newton D. Fischer, MD (1977-1991)

Harold C. Pillsbury, III, MD (1991-present)

## The Joseph Palmer Riddle Distinguished Professorship

The Joseph Palmer Riddle Distinguished Professorship in Otolaryngology was established in the University's School of Medicine in 1977 by a gift from Joseph Riddle.

Riddle was born in 1921 in Fayetteville. As the eldest son of a railroad conductor, he went to work at an early age at his family's gas station and country store. The long hours and minimal living conditions motivated the young Riddle to look to other opportunities for his future. He began working at the shipyard in Wilmington, where he met his future wife, March Floyd of Fairmont, N.C.

Riddle went on to serve for a time in the U.S. Navy. Afterwards, the newlyweds returned to Robeson County and Riddle began as a mail carrier. In 1952, Riddle, with the help of his father-in-law, began building homes in Cumberland County to respond to the military growth in the area. His construction and development company, the March Development Corp., concentrated its building efforts on the boundaries of Fort Bragg. The company is credited with contributing to the growth explosion of Fayetteville's west side beginning in the 1960s. In addition, Riddle purchased and developed the 600-acres Cross Creek Mall area to transform his hometown into a major retail shopping center.

Riddle contributed substantially to projects that benefited education, medicine and quality of life in Fayetteville and at the University. Although not an alumnus, he was a member of the School of Medicine's Co-Founders Club and a vigorous and untiring force on the Medical Foundation Board of Directors. He also served on the Board of Directors of the Educational Foundation, which supports the University's athletic programs. He was one of a growing number of individuals whose gifts have gone to support both the academic and athletic programs of the University.

In addition to establishing the professorship, Riddle contributed funds to the Division of Cardiology in the Department of Medicine and the Division of Otolaryngology in the Department of Surgery. He provided needed funding for research associates and specialized scientific equipment for the Division of Cardiology. His support of the Otolaryngology Department led to advances in the study of otolaryngologic allergy and the establishment of an otolaryngology and microsurgery laboratory that bears his name.

Riddle's continued interest and support of medical programs at the University resulted in a substantial gift to the UNC-CH Lineberger Comprehensive Cancer Research Center. In recognition of his interest and support, he was presented the Distinguished Service Award by the School of Medicine in 1980.

Riddle and his wife, March, had three children: Sharlene (B.A. '84), Joseph III (B.S. '77) and Carolyn. Riddle died in 1995 at the age of 73.

Joseph Palmer Riddle Professors:  
W. Paul Biggers, MD (1977-2000)  
Mark C. Weissler, MD (2000-present)

## The Newton D. Fischer Distinguished Professorship

The Newton D. Fischer Distinguished Professorship was established in 1993 to honor Fischer, a longtime medical school professor who established the Division of Otolaryngology/Head and Neck Surgery in 1952. It was created by the members of the Newton D. Fischer Society, who funded it, envisioning an ongoing contribution to academic otolaryngology.

Fischer was born in San Antonio in 1921. He earned three degrees from the University of Texas: a B.S. in 1942, a B.A. in 1943, and an M.D. in 1945. Fischer completed his residency at Johns Hopkins University, where he was an instructor for one year before coming to Chapel Hill in 1952. Fischer was the first Chief of Otolaryngology, a post he held for more than 30 years. He was among the first doctors to receive an otolaryngology training grant from the National Institutes of Health. In 1977, Fischer was named the Thomas J. Dark Distinguished Professor of Surgery, the chair he held until 1991.

Fischer is credited with helping the Division of Otolaryngology/Head and Neck Surgery achieve national prominence, widely recognized as one of the top 10 in training programs for residents in otolaryngology. Among the many residents Fischer trained is Harold C. Pillsbury III, who said of Fischer, "The loving care of a man of this depth is the sort of support an individual needs to really accomplish his best work."



Drs. Newton and Janet Fischer

Fischer's numerous awards include "The Professor" Award in 1977 and The Central Carolina Bank Excellence in Teaching Award in 1988. In 1984, he and his wife, Janet, a Sarah Graham Kenan Professor in the School of Medicine, won the Thomas Jefferson Award, which is given annually to the UNC-CH faculty member who best exemplifies the ideals and objectives of Jefferson through personal influence, teaching, writing and scholarship. Janet J. Fischer died after a courageous fight with breast cancer on February 24, 2007. At her memorial service, she was described by her grandson as "a remarkable woman who lived an extraordinary life."

Newton and Janet Fischer have five children: twins Jeannette (M.D. '81) and Amelia (M.D. '81), and Duncan, Anne (B.A. '83) and Helen (B.A. '81, M.A. '86), and eight grandchildren: Sarah, Jake, and Eva Stein; Luke, Kent, and Duncan Fischer; and Connor and Cliff Drake.

Newton D. Fischer Distinguished Professor: Amelia F. Drake, MD (1998-present)

## Other Distinguished Professorships

In 2006, a Distinguished Professorship was established by an anonymous donor.

The Harold C. Pillsbury Distinguished Professorship was established in 2007 to be awarded to a faculty member in the Department of Otolaryngology/Head and Neck Surgery.

The June and James Ficklen Distinguished Professorship was established in 2008 to be awarded to a faculty member in the Department of Otolaryngology/Head and Neck Surgery.

For more information, please contact Holli Gall, Director of Development, (919) 843-5734, or [holli\\_gall@med.unc.edu](mailto:holli_gall@med.unc.edu).

# The Newton D. Fischer Society Meeting

For decades the Department of Otolaryngology/Head and Neck Surgery has trained medical students and residents. The first chairman of the UNC Division of Otolaryngology/Head and Neck Surgery was Newton D. Fischer. Dr. Fischer's enduring emphasis on medical students' and residents' education, as well as research, continues to shape the philosophy of the Department to this day. Clinical practice within this field involves the medical and surgical diagnosis and management of very common to very rare diseases such as treatment of the neck in squamous cell carcinoma, chronic rhinosinusitis, and auditory neuropathy. Novel research and emerging technologies are changing how these disease processes are managed, including endoscopic approaches and external approaches. This annual meeting provides new information and surgical techniques for the practicing Otolaryngologist/ Head and Neck Surgeon.



At the Fischer Society Meeting: Drs. Deidra Blanks, Rose Eapen, and Paula Harmon.

This year, the meeting was held on June 5, 2010, at the Paul J. Rizzo Conference Center in Chapel Hill. Drs. Austin Rose and Charles Ebert served as Course Directors. Gerald B. Healy, MD, Professor of Otology and Laryngology at the Harvard Medical School, was the Keynote Speaker. At the end of the program, a banquet was held in honor of the graduating Chief Residents.

Oral presentations included:

*Candidacy for Implantable Technologies at UNC*  
Marcia C. Adunka, AuD, and Margaret T. Dillon, AuD

*Congenital Pharyngeal Masses and Velopharyngeal Insufficiency: Diagnosis, Management, and Prognosis*  
Laura H. Rosenthal, MD

*Human Control of Robotic Controllers for Microlaryngoscopic Laser Surgery and Laryngology Update 2010*  
Yu-Tung Wong, MD, and Robert A. Buckmire, MD

*Minimally Invasive Head and Neck Surgery: Where Have We Been and Where Are We Going?*  
Adam M. Zanation, MD

*Quality of Life Before and After Minimally Invasive Pituitary Surgery*  
Charles S. Ebert, Jr., MD, MPH

*Pediatric Tracheotomy Site Complications*  
Austin S. Rose, MD

*Educating Surgeons in the 21st Century*  
Gerald B. Healy, MD, FACS - Keynote Speaker

*Panel Discussion: Pediatric Otolaryngology/Head and Neck Surgery*  
Alisha N. West, MD; Amelia F. Drake, MD, FACS; Carlton J. Zdanski, MD, FACS; Austin S. Rose, MD; and Laura H. Swibel-Rosenthal, MD

*A Prospective Study of the Clinical Impact of A Multidisciplinary Head and Neck Tumor Board*  
Kibwei A. McKinney, MD

*The Diagnosis of Bronchiogenic Carcinoma: Concepts and Controversy*  
Joseph P. Roche, MD

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## More Meetings and Courses



North Carolina/South Carolina Meeting: Drs. Trinitia Cannon, Krishna Patel (UNC OHNS resident, 2007), Josh Suowitz, and Rupali Shah



COSM in Las Vegas: Drs. Harold Pillsbury, Brent Senior, and Charles Ebert



The Carolinas' Pediatric Airway Course at MUSC in Charleston: Drs. Josh Suowitz, Josh Farrar (MUSC resident), Carlton Zdanski, and Maher Younes



AAOA Basic Course in Otolaryngic Allergy in Dallas: Drs. Jessica Smyth, Maher Younes, Kibwei McKinney, and Rupali Shah

# Honors, Awards, & Achievements

This has truly been an exciting year for the Department of Otolaryngology/Head and Neck Surgery here at UNC. In the “Best Hospitals 2010-11” issue of US News and World Report, more than 1,400 hospitals are listed in the category of best places to go for care of the ears, nose, and throat. The University of North Carolina ranked #21 in the country, and we are #1 in North Carolina!

The 2009 Best Doctors in America database has been published. More than 200 UNC School of Medicine physicians are included. Many of these are also included in the list of Best Doctors in North Carolina in the November 2009 issue of Business North Carolina magazine. Only 3 to 5 percent of physicians in each country where Best Doctors is present are included in its database. The Best Doctors database contains the names and professional affiliations of approximately 45,000 doctors in the United States, all chosen through an exhaustive peer-review survey that asks: “If you or a loved one needed a doctor in your specialty, to whom would you refer them?” The peer review process as well as additional research conducted by Best Doctors determines selections for each list. The Best Doctors in the specialty of Otolaryngology includes Drs. Craig Buchman, Harold Pillsbury, Brent Senior, William Shockley, Mark Weissler, and Carlton Zdanski. That’s 5 of the 13 Otolaryngologists listed in the Triangle area. Two of the three Pediatric Otolaryngologists in the Triangle who are on this list are here at UNC: Drs. Amelia Drake and Carlton Zdanski.

The 8<sup>th</sup> edition of Castle Connolly Medical, Inc., recognized Drs. Harold Pillsbury, Mark Weissler, Brent Senior, and Marion Couch as “America’s Top Doctors” in the specialty of Otolaryngology, and Dr. Amelia Drake in the specialty of Pediatric Otolaryngology. Drs. Couch and Weissler are also listed in the 4<sup>th</sup> edition of Castle Connolly’s “America’s Top Doctors for Cancer.” They were nominated by their peers in an extensive survey process of thousands of American doctors. They were screened by the Castle Connolly physician-led research team, and then were selected as among the very best in their specialties and in their community

for inclusion in the published list of “America’s Top Doctors.”

Dean William Roper has announced several key leadership appointments in the UNC School of Medicine. “Taken together, these changes are designed to equip the School of Medicine for the next phase of our work together, and to enable us to be successful in our quest to become the nation’s leading public school of medicine and leading public academic medical center,” stated Roper. Among these new assignments, Amelia F. Drake, MD, was appointed Executive Associate Dean for

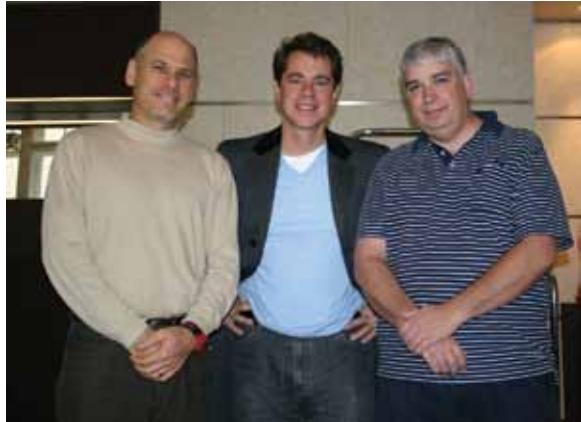


Dr. Amelia Drake waits for the bus to the ACC.

Academic Programs of the UNC School of Medicine. In this role, Dr. Drake will directly assist Marshall Runge, MD, PhD (Executive Dean), Kevin Fitzgerald, MPA (Vice Dean for Finance and Administration), and the Dean with key tasks in leading the School of Medicine academic initiatives.

Douglas C. Fitzpatrick, PhD, won the “Medical Student Research Mentor Award” from the UNC School of Medicine Academy of Educators. This award recognizes excellence in training medical students in the fundamentals of medical research and research ethics. Dr. Fitzpatrick has been

mentoring medical students and residents in the study of the physiology and anatomy of hearing since he joined the faculty in 1999.



Drs. Craig Buchman, Oliver Adunka, and Doug Fitzpatrick at the Hearing Preservation III meeting in Vienna, Austria, in October 2009.

Oliver F. Adunka, MD, has graduated the UNC Teaching Scholars Program, a year-long faculty development program designed to promote expertise in medical education. Graduation from the Program confers recognition as a scholar in medical education and provides the School of Medicine with a resource of talent in education. Dr. Adunka’s project was a partially online learning system for Otolaryngology residents.

Patricia A. Roush, AuD, was promoted to Associate Professor on October 14, 2009. Dr. Roush has been the Director of Pediatric Audiology at UNC Hospitals since 2000 and faculty in the Department since 2003. She has made tremendous contributions to the field, as she continues to strive for excellence in patient services, education of AuD students, and research. Dr. Roush is frequently invited to speak at meetings at the national and international level.

Carol G. Shores, MD, PhD, was awarded two grants for research projects in Malawi. The \$50,000 North Carolina TraCS grant is for the project entitled “Comorbid Infections and Cancer in Malawi.” NC TraCS is the academic home of the NIH Clinical and Translational Science Award (CTSA). The Study Section concluded: “This project is of great potential in that (1) it is a first step in developing a cancer registry for Malawi, (2) extends a strong existing collaborative research infrastructure, (3) opens up new and exciting research collaborations for UNC cancer researchers and (4) might serve as a platform for highly fundable research projects.” Dr. Shores has also received funding from the University Cancer Research Fund for “Cancer Database and Tissue Procurement in Malawi” in the amount of \$11,923.

Brent A. Senior, MD, will serve as President of the American Rhinologic Society beginning in September 2010 for one year. The mission of the ARS is to serve, represent and advance the science and ethical practice of rhinology. Dr. Senior is a Fellow of the American Rhinologic Society and has served in the past as First and Second Vice President, Secretary, Editor of the ARS newsletter, and on numerous committees.

Emily Buss, PhD, was elected a Fellow of the Acoustical Society of America, to be inducted in October 2010. She is also beginning a three-year term as an associate editor of the Journal of the Acoustical Society of America.



Dr. Harold Pillsbury

Harold C. Pillsbury, MD, will serve as President-Elect of the American Academy of Otolaryngic Allergy beginning in September for one year. In September 2011, he will become President of this organization. The AAOA represents over 2000 Board certified otolaryngologists and other health care providers who devote part of their practice to otolaryngology, including the diagnosis and treatment of allergic and other related upper respiratory disorders.

Oliver F. Adunka, MD, received a 2010 Career Development Award from the Triological Society in the amount of \$40,000. Dr. Adunka is the Principal Investigator for the project entitled "Electrophysiologic Correlates of Intracochlear Electrode Positioning." Dr. Doug Fitzpatrick is the Co-Investigator, and Dr. Craig Buchman is the Consultant.

On November 4, 2009, at the Raleigh Marriott City Center, more than 500 community leaders gathered to honor twelve of the most accomplished women in the Triangle at the 27th annual YWCA Academy of Women Awards. The YWCA Academy of Women honors one outstanding woman annually from each of 12 categories. Carol G. Shores, MD, PhD, was selected in the category of Science and Technology. She joined a distinguished group of extraordinary women who have been inducted into the YWCA Academy of Women since 1983. These remarkable individuals have demonstrated a commitment to the YWCA Mission: Eliminating Racism and Empowering Women.

Adam M. Zanation, MD, was inducted into the Order of the Grail-Valkyries Academic Honor Society, which recognizes students and faculty of outstanding character who have made significant contributions to our University's academic climate through excellence in scholarship, dynamic leadership, and innovative service.

Dr. Allen Marshall became a member of Alpha Omega Alpha, the only national medical honor society, during an induction ceremony at the Carolina Inn on March 26, 2010. The mission of the AOA is to recognize and enhance professionalism, academic excellence, service, and leadership within the profession.



Dr. Adam Zanation

At the annual meetings of the American Academy of Otolaryngology-Head and Neck Surgery Foundation, awards are presented to members in recognition of their volunteer contributions. Members of the Academy receive honor points for participation in a variety of activities and leadership roles. Dr. Charles Ebert, having earned 10 volunteer service points, received an Honor Award at the 2009 annual Academy meeting last October. Dr. Adam Zanation, will receive an Honor Award at the meeting in September 2010. The Distinguished Service Award is given to recognize volunteer service beyond the level of an Honor Award, after earning 50 points. These awards will be presented to Drs. Marion Couch and Brent Senior at the 2010 meeting.

Gregory J. Basura, MD, PhD, was one of six resident physicians selected to win a 2010 Robert C. Cefalo House Officer Award. The physicians were recognized for showing dedication to their patients and demonstrating clinical expertise in their respective fields. Excerpts from the letters of nomination: "Dr. Basura demonstrates true academic skill and a high level of compassion towards patients. During his residency, he has exemplified great empathy and responsibility to his patients, developing long lasting relationships. Dr. Basura's dedication to being a leader in the field of clinical and translational research has proven his professionalism and respect both toward patients and academia. His commitment to caring and understanding of patient relationships has allowed Dr. Basura to be a strong team player in his department, always putting those in need before himself."



Drs. Michael Stadler and Trinitia Cannon, at the Academic Bowl at the AAO-HNS meeting in San Diego, California.

The UNC Otolaryngology/Head and Neck Surgery Residency Program, represented by Drs. Michael Stadler and Trinitia Cannon, won the Third Annual AAO-HNS Resident Academic Bowl at the 2009 annual meeting of the American Academy of Otolaryngology-Head and Neck Surgery in San Diego. Competing teams were presented with 34 clinical questions written by Academy educational faculty. Despite being at a disadvantage (only two team members, while other teams had three, and both were under the weather), Drs. Stadler and Cannon succeeded in answering 95% of the questions correctly, tying for first place with Ohio

State University Medical Center. They share in a prize that includes travel grants to the annual meeting, as well as subscriptions to the Home Study Course for the entire residency program.

The Department established two awards in honor of William W. Shockley, MD, and Mark C. Weissler, MD, to be given annually to residents in Otolaryngology/Head and Neck Surgery. The Shockley Silver Owl Award for Excellence in Teaching is awarded to that resident who displays a sincere aptitude and excellence in teaching. The 2009 winner was Dr. Deidra Blanks, and the 2010 winner was Dr. Keith Ladner. The Weissler Ironman Award for Extra Effort is awarded to that resident who is noted to put forth extra effort every day. Dr. Michael Stadler won this award in 2009, and Dr. Rose Eapen in 2010.

The Newton D. Fischer Society Temporal Bone Dissection Award is given yearly to two residents who demonstrate the best dissection of a temporal bone. The winners in 2009 were Drs. Joseph Roche and Alisha West, and the winners in 2010 were Drs. Kibwei McKinney and Joseph Roche.

John P. Dahl, MD, PhD, MBA, has been selected to receive a Resident Research Award via the CORE grant program sponsored by the American Academy of Otolaryngology-Head and Neck Surgery Foundation. The grant title is “Flexible cartilage in microtia repair: umbilical cord stem cells on Nano-Implant”. His mentors are Dr. William Shockley and Dr. John van Aalst (Plastic Surgery). Dr. Dahl has also received the 2010-2011 Wolf and Daisy Losken Craniofacial Research award given by the UNC Division of Plastic and Reconstructive Surgery (Department of Surgery).

Scott Shadfar, MD, has won the 2010 Edgar C. Garrabrant, II, MD Award for his work on cancer cachexia. Dr. Garrabrant was a North Carolina otolaryngologist who earned his bachelors and medical degrees at UNC-Chapel Hill, where he also completed his residency training in Otolaryngology/Head and Neck Surgery in 1971. This award was created in his name in 2003 after his death to pay him tribute and is awarded to the winning presenting resident at the North Carolina Society of Otolaryngology and Head and Neck Surgery annual meeting. With the help of Drs. Marion Couch, Xiaoying Yin, Monte Willis, Kibwei McKinney, Lisa Weinstein, and Denis Guttridge, Dr. Shadfar was able to show reversal of cancer cachexia in a mouse model using the novel compound resveratrol. This was the first time a UNC resident has won the award.

CASTLE now has 6 AV certified full or part time staff. This is more than many states have total! Three speech-language pathologists at CASTLE have recently become LSLS Certified (Listening and Spoken Language Specialists). They are: Sandra Hancock, MS, CCC-SLP, LSLS Cert. AVT; Erin Thompson, MS, CCC-SLP, LSLS Cert. AVT; and Maegan Evans, PhD, CCC-SLP, LSLS Cert. AVEd.

A future otolaryngologist interested in craniofacial research, Gitanjali Madan, won the Harold C. Pillsbury Award (First Place) for her basic science poster presentation, Umbilical Cord Derived Mesenchymal Stem Cells Demonstrate Robust Osteoinduction and May Be an Ideal Source for Tissue Engineered Bone, at the John B. Graham Student Research Day on January 27, 2010. This same poster won Second Place for Outstanding Medical Student Poster at the American College of Surgeons Clinical Congress in October 2009. Ms. Madan works in the lab of Dr. John van Aalst (Department of Surgery, Division of Plastic and Reconstructive Surgery), and they have been collaborating with Dr. Amelia Drake (Chief of the Division of Pediatric Otolaryngology and Director of the UNC Craniofacial Center) on a clinical project that will be presented at COSM in April. Dr. Jake Dahl will spend 6 months in his second year of residency working in this lab to continue the project.

# Presentations

Adunka OF, Campbell AP, Suberman TA, Buchman CA, Fitzpatrick DC. *An Animal Model for a Near Real-Time Monitoring System to Assess Intracochlear Electrode Insertion Trauma.* American Neurotology Society Spring Meeting, Las Vegas, NV, May 2, 2010.

Adunka OF, Mlot S, Finley C, Buchman C, Fitzpatrick DC. *Electrophysiologic Parameters Indicating Imminent Cochlear Damage: An Animal Model for Electric Acoustic Stimulation.* 7th Asia Pacific Symposium on Cochlear Implants and Related Sciences, Singapore, December 1-4, 2009.

Adunka OF, Buchman CA, Fitzpatrick DC. *Electrophysiologic Parameters Indicating Imminent Cochlear Damage: An Animal Model for Electric Acoustic Stimulation.* Hearing Preservation Workshop VIII, Vienna, Austria, October 16-17, 2009.

Adunka OF, Mlot S, Buchman CA, Fitzpatrick DC. *Ein Tiermodell für die Hörerhaltende Cochlea Implantation.* 53rd Annual Meeting of the Austrian Society of Oto-Rhino-Laryngology, Head and Neck Surgery, Bregenz, Austria, September 9-13, 2009.

Blanks DA, Shores CG. *Patent Piriform Sinus Fistula in a Third Branchial Cleft Cyst.* Triological Society Annual Meeting, Combined Otolaryngologic Society Meetings, Las Vegas, NV, April 2010.

Buchman CA. *Auditory Neuropathy Spectrum Disorder in Children.* Colorado ENT Society, Denver, CO, April 22, 2010.

Buchman CA. *Frontiers in Pediatric Otology.* Bill Daniels Center for Children's Hearing, 2010 Lectureship, Denver, CO April 22, 2010.

Buchman CA. *Restoring Hearing Through Cochlear Implants.* Windows to the Brain: Connecting Minds and Machines, Western North Carolina Society for Neuroscience, Wake Forest University, Winston-Salem, NC, April 14, 2010.

Buchman CA. *Hearing Loss in Children.* Pinehurst Surgical Clinic, Pinehurst, NC, March 19, 2010.

Buchman CA. *The Chronic Ear.* Temporal Bone Dissection course, Department of Otolaryngology, Medical College of Georgia, Augusta, GA, February 19-20, 2010.

Buchman CA. *Cochlear Implantation in Children.* Temporal Bone Dissection course, Department of Otolaryngology, Medical College of Georgia, Augusta, GA, February 19-20, 2010.

Buchman CA, Adunka OF, Adunka MC, Pillsbury HC. *Electroacoustic Stimulation in Adults.* Ultimate Colorado Mid-Winter Meeting, Vail, CO, January 24-8, 2010.

Buchman CA, Adunka OF, Adunka MC, Pillsbury HC. *Round Window Stimulation with the Vibrant MedEL.* Ultimate Colorado Mid-Winter Meeting, Vail, CO, January 24-8, 2010.

Buss E, Hall JW, Grose JH. *Masker Modulation Regularity and its Effects on Comodulation Masking Release.* The 159<sup>th</sup> Meeting of the Acoustical Society of America, Baltimore, MD, April 2010.

Buchman CA. *Hearing Loss in Children: What's Really New.* CCCDP NC AG Bell Fall Conference, Asheboro, NC, November 5, 2009.

Buchman CA. *Canal Wall Down Mastoidectomy.* Anspach Temporal Bone Course, Palm Beach Gardens, FL, July 26, 2009.

Buchman CA. *Cochlear Implantation.* Anspach Temporal Bone Course, Palm Beach Gardens, FL, July 26, 2009.

Buckmire R, Hube L. *Taking Care of Your Voice*. VPS Voice Care Seminar, Garner, NC, April 19, 2010.

Buckmire R, Markus E. *Taking Care of Your Voice*. UNC Music Department, Chapel Hill, NC, February 22, 2010.

Buckmire R. *Endoscopic Airway Management*. Carolinas Pediatric Airway Course, Charlestown, SC, October 16, 2009.

Campbell AP, Adunka OF, Buchman CA. *Correlation of Imaging Characteristics and Clinical Markers in Children with Enlarged Vestibular Aqueducts*. Annual Meeting of the Triological Society, Las Vegas, NV, April 30, 2010.

Couch ME. *Head and Neck Cancer: Surgical Innovations*. Panelist, 34<sup>th</sup> Annual Internal Medicine Conference, University of North Carolina, Chapel Hill, NC, April 9, 2010.

Couch ME. *Controversies in Airway Management*. Moderator, Triological Society Combined Otolaryngology Meetings, Orlando, FL, February 4, 2010.

Couch ME. *Cancer Cachexia in Head and Neck Cancer*. Department of Surgery, University of Alabama, AL, February 1, 2010.

Couch ME. *Updates on Cancer Cachexia and HPV in Head and Neck Cancer*. Department of Surgery, New Hanover Regional Medical Center, Wilmington, NC, November 12, 2009.

Couch ME. *Career Development*. Panelist, Society of University Otolaryngologists, Washington DC, November 5, 2009.

Couch ME. *Induction Chemotherapy for Head and Neck Cancer: Putting the Surgeon's Role in Context*. Symposium, San Diego, CA, October 6, 2009.

Couch ME. *The Contemporary Management of Trauma: Socioeconomic Challenges*. American Academy of Otolaryngology-Head & Neck Surgery (AAO-HNS) Annual Meeting Mini-Symposium, San Diego, CA, October 2009.

Dillon MT, Pillsbury HC, Buchman CA, Adunka MC, King ER, Adunka OF. *Objective and Subjective Benefits of EAS: Results of a Single Center*. 11<sup>th</sup> International Conference on Cochlear Implants and Other Auditory Implantable Technologies, Stockholm, Sweden, July 2, 2010.

Dillon MT, Adunka MC, Buss E. *UNC Cochlear Implant Subjective Questionnaires*. 11<sup>th</sup> International Conference on Cochlear Implants and Other Auditory Implantable Technologies, Stockholm, Sweden, July 2, 2010.

Drake AF, Rose AS, Zdanski CJ. *Coordination of Pediatric Airway Issues via the NC Children's Airway Center*. NC/SC Otolaryngology/Head & Neck Surgery Meeting, Myrtle Beach, SC, July 30 – August 2, 2009.

Drake AF, Cohen, Costello, Hathaway, Havlik, Kummer. *Families Making Difficult Decisions: The Challenges of Craniofacial Care*. Panel presentation at the American Cleft Palate Association, Ft. Worth, TX, March 16, 2010.

Eshraghi AA, Guerring R, Telischi FF, Weed DT, Civantos F, Buchman CA, Sargi Z, Gadioli M. *Temporal Bone Resection for External Auditory Canal Malignancies: Prognostic Factors and Clinical Outcome*. American Neurotology Society Spring Meeting, Las Vegas, NV, May 1, 2010.

Eskridge H, Henderson L. *Speech Babble and Critical Elements: Therapy How To*, Greenville, NC, February 2010.

Eskridge H, Heavner K. *Spoken Language Module*, AVI Standardized Curriculum, Morganton, NC, October 2009.

Eskridge H, Henderson L. *Spoken Language Module*, AVI Standardized Curriculum, Charlotte, NC, January 2010.

Eskridge H. *Development of Auditory Function/AV Techniques*. AVI Standardized Curriculum, Charlotte, NC, August 2009.

Finley CC. *The Contributions of Margaret Skinner in Understanding the Basis of Variability in Cochlear Implant Outcomes*. 2009 Conference on Implantable Auditory Prostheses, Granbilakken Conference Center, Lake Tahoe, CA, July 12-17, 2009.

Fried D, Weissler M, Shores C, Couch M, Hayes N, Chera B. *Incidence of Persistent Nodal disease after Non-surgical Therapy in Head and Neck Squamous Cell Carcinoma patients with Bilateral Nodal Disease: Can a Bilateral Neck Dissection be Avoided?* ASTRO Annual Meeting, Chicago IL, November 2009.

Germanwala AV, Zanation AM. *Endoscopic Endonasal Techniques for Intracranial Rostral Anterior Skull Base Lesions: Our Initial 20 Month Experience*. 9<sup>th</sup> International Meeting: Updates in Neuro Oncology/ Brain Tumor Symposium, Cortona, Italy, July 3, 2010.

Gore MR, Zanation AM. *Salvage Treatment of Late Neck Metastasis and Local Recurrence in Esthesioneuroblastoma: A Meta-Analysis*. North American Skull Base Society Annual Meeting, New Orleans, LA, October 17, 2009.

Gore MR, Zanation AM. *Treatment Outcomes of Sinonasal Melanoma: A Meta-Analysis*. North American Skull Base Society Annual Meeting, New Orleans, LA, October 16, 2009.

Hall JW, Buss E, Grose JH. *The Effects of Development and Hearing Impairment on the Ability to Understand Speech in Temporally and Spectrally Modulated Noise*. The 159<sup>th</sup> Meeting of the Acoustical Society of America, Baltimore, MD, April 2010.

Harmon P, Gulley M, Tang W, Kazembe P, Wokocha C, Mwansambo C, Martinson F, Hoffman M, Hoffman I, Shores C. *Viral Response to Chemotherapy in Endemic Burkitt Lymphoma*. American Academy of Otolaryngology Annual Meeting, Washington DC, September 2009.

Hayes DN. *Bioinformatics at the Lineberger Comprehensive Cancer Center*. Lineberger Cancer Center External Advisory Committee, Chapel Hill, NC, October 5, 2009.

Hayes DN. *NCI 7918: The Use of AZD6244 in Iodine Refractory Papillary Thyroid Carcinoma*. 2009 Fall CTEP Early Drug Development and IDSC Meeting, Arlington, VA, October 5, 2009.

He S, Buss E, Hall JW. *The Shape of Monaural Temporal Window in School-Aged Children and Adults*. The 33<sup>rd</sup> Midwinter Research Meeting of the Association for Research in Otolaryngology, Anaheim, CA, February 2010.

Kimbell JS. *Applications of Computational Fluid Dynamics Modeling in the Nasal Passages for Risk Assessment, Drug Delivery, and Surgical Planning*. Department of Mathematics, The University of North Carolina, Chapel Hill, NC, April 23, 2010.

Kimbell JS. *Computational Fluid Dynamics Modeling in the Nasal Passages for Drug Delivery and Surgical Effects*. Otolaryngology Grand Rounds, University of North Carolina, Chapel Hill, NC, November 18, 2009.

Kimbell JS. *Applications of Computational Fluid Dynamics Modeling in the Nasal Passages for Risk Assessment, Drug Delivery, and Surgical Planning*. Department of Mathematics, Virginia Commonwealth University, Richmond, VA, October 30, 2009.

Kimbell JS. *Applications of Computational Fluid Dynamics Modeling in the Nasal Passages for Drug Delivery and Surgical Planning*. Virtual Lung Program meeting, University of North Carolina, Chapel Hill, NC, October 27, 2009.

Kimbell JS. *Applications of Computational Fluid Dynamics Modeling in the Nasal Passages for Risk Assessment, Drug Delivery, and Surgical Planning*. Auditory Neuroscience Journal Club, University of North Carolina, Chapel Hill, NC, August 25, 2009.

Kimbell JS. *Applications of Computational Fluid Dynamics Modeling in the Nasal Passages for Risk Assessment and Drug Delivery*. World Equine Airways Symposium, Bern, Switzerland, August 7, 2009.

Lacour, J, Ebert CS. *Can Preoperative Electrocotchleography (ECOG) Predict Hearing Outcomes in Patients with Endolymphatic Hydrops Who Undergo Endolymphatic Sac Decompression?* Poster presentation, American Academy of Otolaryngology 2009 Annual Meeting. San Diego, CA, October 2009.

Manis PB. *Synaptic Dynamics and Local Circuits in the Cochlear Nucleus*. Gordon Conference, Colby-Sawyer College, NH, June 12-13, 2010.

McKinney KA, Stadler ME, Ebert CS, Wong YT, Shah RN, Rose AS, Zdanski CJ, Drake AF, Wheless SA, Senior BA, Zanation AM. *Transpalatal Great Palatine Canal Injection: How to Bend the Needle for Pediatric Sinus Surgery?* Poster Presentation, Combined Otolaryngology Spring Meeting. Las Vegas, NV, May 2010.

McKinney KA, Wheless SA, Zanation AM. *A Prospective Study of the Clinical Impact of a Multidisciplinary Head and Neck Tumor Board*. Newton D. Fischer Society Meeting, Chapel Hill, NC, June 5, 2010.

Melroy CT, Ebert CS, Bednarski KA, Considine JM, Kuhn FA. *Endoscopic Transnasal Balloon Dilation of the Nasolacrimal Duct*. American Academy of Otolaryngology 2009 Annual Meeting. San Diego, CA, October 2009.

Melroy CT, Ebert CS, Intaphan JM, Kuhn FA. *Positive Fungal Cultures in Allergic and Non-Allergic Fungal Sinusitis*. Poster presentation, American Rhinologic Society Annual Meeting, San Diego, CA, October 2009.

Niparko J, Buchman CA, Roland JT, Roland PS, Rubinstein JT, Young NM. *Cochlear Implant Candidacy 2010*. American Otological Society Spring Meeting, Las Vegas, NV, May 2, 2010.

Olshan AF. *Epidemiology as Translational Science*. University of Ulm, Ulm, Germany, July 29, 2009.

Olshan AF. *The Epidemiology of Childhood Cancer: Lessons Learned and What's Next*. Texas Children's Hospital, Houston, Texas, March 4, 2010.

Pillsbury HC. *Midlevel Providers in the OHNS Workforce*. NC/SC OHNS 2010 Assembly, Asheville, NC, July 17, 2010.

Pillsbury HC. *EAS in Adults Using the FlexEAS Electrode Array*. The 11<sup>th</sup> International Conference on Cochlear Implants and Other Auditory Implantable Technologies, Stockholm, Sweden, July 2, 2010.

Pillsbury HC. *Workforce Issues in Otolaryngology*. Queen City ENT Symposium, Cincinnati, OH, June 12, 2010.

Pillsbury HC. *Workforce Issues in Otolaryngology*. Michigan Ear Institute, Farmington Hills, MI, April 14, 2010.

Pillsbury HC. *Allergic Rhinitis*. Michigan Ear Institute, Farmington Hills, MI, April 14, 2010.

Pillsbury HC. *Workforce Issues in Otolaryngology*. Central Indiana Otolaryngology Society, Indianapolis, IN, March 17, 2010.

Pillsbury HC. *Allergic Rhinitis*. Central Indiana Otolaryngology Society, Indianapolis, IN, March 17, 2010.

Pillsbury HC. *Workforce Issues in Otolaryngology*. ENT Society of Jacksonville, Jacksonville, FL, February 17, 2010.

Pillsbury HC. *Allergic Rhinitis*. ENT Society of Jacksonville, Jacksonville, FL, February 17, 2010.

Pillsbury HC. *What's New in Rhinology and How I Incorporate it into My Practice*. Annual Clinic Day, The Nassau Surgical Society and Brooklyn & Long Island Chapter of the American College of Surgeons, Uniondale, NY, December 2, 2009.

Pillsbury HC. *Workforce Issues in Otolaryngology*. Miami/Dade ENT Society, Miami, FL, November 5, 2009.

Pillsbury HC. *Allergic Rhinitis*. Miami/Dade ENT Society, Miami, FL, November 5, 2009.

Pillsbury HC. *Workforce Issues in Otolaryngology*. Meet the Expert Luncheon, The American College of Surgeons Meeting, Chicago, IL, October 13, 2009.

Pillsbury HC. *Hot Topics in Hearing Implant Technology: The UNC Experience*. American Academy of Otolaryngology/Head and Neck Surgery Annual Meeting, San Diego, CA, October 5, 2009.

Pillsbury HC, Papel ID, Kennedy DW, Levine S, Cooper R, Sheldon G, Arriaga M. *Physician Workforce in OHNS: What's in Your Future?* American Academy of Otolaryngology/Head and Neck Surgery Annual Meeting, San Diego, CA, October 5, 2009.

Pillsbury HC. *Sublingual Immunotherapy for Inhalant Allergies*. FirstHealth Moore Regional Hospital, Pinehurst, NC, September 28, 2009.

Pillsbury HC. *What's New in Cochlear Implantation?* Georgia Society of Otolaryngology Summer Meeting, Kiawah Island, SC, July 25, 2009.

Pillsbury HC. *Complications in Cochlear Implantation*. Georgia Society of Otolaryngology Summer Meeting, Kiawah Island, SC, July 24, 2009.

Pillsbury HC. *Workforce Issues in Otolaryngology*. Georgia Society of Otolaryngology Summer Meeting, Kiawah Island, SC, July 24, 2009.

Pillsbury HC. *Future of the ENT Surgeon*. British Academic Conference in Otolaryngology and ENT Expo, Liverpool, England, July 10, 2009.

Pillsbury HC. *The American Experience*. British Academic Conference in Otolaryngology and ENT Expo, Liverpool, England, July 9, 2009.

Rivera-Serrano C, Carrau RL, Snyderman CH, Zanation AM. *Anatomy of the Rescue Flap*. Triological Society Annual Meeting, Las Vegas, NV, April 28 - May 2, 2010.

Roland JT, Buchman CA, Discoll C, Shelton C. *Cochlear Implant Panel*. Ultimate Colorado Mid-Winter Meeting, Vail, CO, January 24-8, 2010.

Rose AS, Gore MR, Hultman CS, Cairns BA. *Airway Obstruction Due to Anterior Cervical Contracture Following Burn Treated Successfully with Incisional Release*. Poster presentation at the European Society of Pediatric Otorhinolaryngology (ESPO) 12<sup>th</sup> International Conference on Pediatric ORL, Pamplona, Spain, June 2010.

Rose AS. *Pediatric Tracheotomy Site Complications*. Newton D. Fischer Society Annual Meeting, Chapel Hill, NC, June 2010.

Roush P, Harrison M. *Outcomes of Children with Hearing Loss: A Study of Children with Mild to Severe Hearing Loss*. International Newborn Hearing Screening Conference, Como, Italy, June 8-10, 2010.

Roush P. *Auditory Neuropathy Spectrum Disorder (ANSD), Diagnosis and Management*. Manitoba Speech and Hearing Association Annual Conference, Winnipeg, Manitoba, May 6-7, 2010.

Roush P. *Pediatric Grand Rounds*. American Academy of Audiology Annual Convention, San Diego, NC, April 15, 2010.

Roush P. *Auditory Neuropathy Spectrum Disorder (ANSD)*. BC Early Hearing Program, Vancouver, British Columbia, November 17, 2009.

Roush, P. *Auditory Neuropathy Spectrum Disorder (ANSD), Diagnosis and Management*. Invited presentation, James Madison University 9<sup>th</sup> Innovations in Clinical Communication Sciences Conference, Harrisonburg, VA, October 3, 2009.

Senior BA. *Antifungals: Is This Appropriate Therapy for CRS*. New York Rhinology Update, New York, NY, May 21, 2010.

Senior BA. *Surgical Complications: Recognition, Avoidance, Intraoperative Management*, New York Rhinology Update, New York, NY, May 21, 2010.

Senior BA. *Comprehensive Management of CSF Rhinorrhea*. Keynote Rhinology Lecture, New York Rhinology Update, New York, NY, May 21, 2010.

Senior BA. *Pearls in the Management of Sinus and Skull Base Tumors*. Panel, Triological Society Annual Meeting COSM, Las Vegas, NV, April 30, 2010.

Senior BA. *Revision Sinus Surgery: Identifying Causes of Failure*. Endoscopic Surgery of the Sinuses and Eustachian Tube, Harvard Medical School, Boston, MA, April 22, 2010.

Senior BA. *Avoiding and Managing Complications*. Endoscopic Surgery of the Sinuses and Eustachian Tube, Harvard Medical School, Boston, MA, April 22, 2010.

Senior BA. *Endoscopic Pituitary Surgery*. Endoscopic Surgery of the Sinuses and Eustachian Tube, Harvard Medical School, Boston, MA, April 22, 2010.

Senior BA. *Endoscopic Resection of Sinonasal Tumors/Image-Guided Surgery*. Southern States Rhinology Course, Kiawah, SC, April 9, 2010.

Senior BA. *Surgical Anatomy*, Southern States Rhinology Course, Kiawah, SC, April 8, 2010.

Senior BA. *Chronic Sinusitis – Managing the Difficult Patient*. Panel, Southern States Rhinology Course, Kiawah, SC, April 8, 2010.

Senior BA. *Chronic Sinusitis - Where Does It Come From?* Southern States Rhinology Course, Kiawah, SC, April 8, 2010.

Senior BA. *Causes and Solutions for Sinus Surgery Failure*. National ENT Hospital, Hanoi, Vietnam, March 31, 2010.

Senior BA. *My Most Difficult Case*. Panel, Asian Research Society in Rhinology, Ho Chi Minh City, Vietnam, March 27, 2010.

Senior BA. *Management of CSF Leaks and Encephaloceles of the Skull Base*. Asian Research Society in Rhinology, Ho Chi Minh City, Vietnam, March 27, 2010.

Senior BA. *Evolution of Minimally Invasive Pituitary Surgery – Lessons Learned*. Asian Research Society in Rhinology, Ho Chi Minh City, Vietnam, March 27, 2010.

Senior BA. *Endoscopic Skull Base and Pituitary Surgery*. Moderator, Asian Research Society in Rhinology, Ho Chi Minh City, Vietnam, March 27, 2010.

Senior BA. *Causes and Solutions for Sinus Surgery Failure*. Plenary Keynote Speaker, Asian Research Society in Rhinology, Ho Chi Minh City, Vietnam, March 26, 2010.

Senior BA. *Image Guided Surgery*. International Symposium on Functional Endoscopic Sinus Surgery, Manila, Philippines, February 25, 2010.

Senior BA. *Revision Endoscopic Sinus Surgery*. International Symposium on Functional Endoscopic Sinus Surgery, Manila, Philippines, February 25, 2010.

Senior BA. *Outcome Assessment of Sinus Surgery*. International Symposium on Functional Endoscopic Sinus Surgery, Manila, Philippines, February 24, 2010.

Senior BA. *Headache and CRS*. International Symposium on Functional Endoscopic Sinus Surgery, Manila, Philippines, February 24, 2010.

Senior BA. *Frontal Sinus Surgery*. 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 15, 2010.

Senior BA. *Special Session: Aviation Medicine & Otolaryngology*. Panel, 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 15, 2010.

Senior BA. *Special Session: Fungal Sinusitis: Unsolved Questions*. Panel, 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 15, 2010.

Senior BA. *Mini-seminar: Medical Management of the Inflammatory Side of Sinusitis, "Post-Op Maintenance*. 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 14, 2010.

Senior BA. *Special Session: Endoscopic Skull Base Surgery Programme*. Panel, 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 14, 2010.

Senior BA. *Managing CSF Leaks*. 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 14, 2010.

Senior BA. *Revision Sinus Surgery*. 7<sup>th</sup> Annual Middle East Update in Otolaryngology Conference and Exhibition 2010, Dubai, United Arab Emirates, February 14, 2010.

Senior BA. *Complications of Endoscopic Sinus Surgery, Immediate Paradigms and Management of Orbital Complications, Treatment of CSF Leaks*. USC Advanced Endoscopic Courses, Los Angeles, CA, February 5, 2010.

Senior BA. *Causes of Failures in Endoscopic Sinus Surgery and Solutions*. USC Advanced Endoscopic Courses, Los Angeles, CA, February 5, 2010.

Senior BA. *Endoscopic Orbital Surgery: Orbital Decompression for Grave's Orbitopathy*. USC Advanced Endoscopic Courses, Los Angeles, CA, February 5, 2010.

Senior BA. *Balloons*. AAO/HNS Annual Meeting, San Diego, CA, October 7, 2009.

Senior BA. *Sinus Anatomy*. AAO/HNS Annual Meeting, San Diego, CA, October 6, 2009.

Senior BA. *Mini-Seminar Endoscopic Skull Base Surgery Evolution*. AAO/HNS Annual Meeting, San Diego, CA, October 6, 2009.

Senior BA. *Minimally Invasive Pituitary Surgery*. AAO/HNS Annual Meeting, San Diego, CA, October 5, 2009.

Senior BA. *Microscopic Sinus surgery, State of the Art Update*. AAO/HNS Annual Meeting, San Diego, October 5, 2009.

Senior BA. *Point of Service Imaging*. American Rhinologic Society Meeting, San Diego, CA, October 3, 2009.

Senior BA. *Minimally Invasive Pituitary Surgery*. Beijing Institute of Otolaryngology, Beijing, China, August 13, 2009.

Senior BA. *Complications in Endoscopic Sinus Surgery*. Hai Phong Medical University, Hai Phong, Vietnam, August 10, 2009.

Shah RN, Swibel-Rosenthal L, Rose AS. *Endoscopic Use of Bipolar Radiofrequency Plasma Ablation (Coblation) for Lymphatic Malformation of the Larynx*. Poster presentation at the American Society of Pediatric Otolaryngology (ASPO) Annual Meeting, Las Vegas, NV, May 2010.

Shockley WW. *Facial Soft Tissue Injuries and Scar Revision Techniques*. University of Virginia Facial Trauma and Plating Workshop, University of Virginia. Charlottesville, VA, June 12, 2010.

Shockley WW, Cannon TY. *Management of Frontal Sinus Fractures*. University of Virginia Facial Trauma and Plating Workshop, University of Virginia. Charlottesville, VA, June 12, 2010.

Shockley WW. *Midface and LeFort Fractures*. University of Virginia Facial Trauma and Plating Workshop, University of Virginia. Charlottesville, VA, June 12, 2010.

Shockley WW. *Practical Tips in the Management of Facial Scars*. Department of Otolaryngology, Vanderbilt University Medical Center. Nashville, TN, May 21, 2010.

Shockley WW. *Facial Plastic Surgery: Case Discussions*. Department of Otolaryngology, Vanderbilt University Medical Center. Nashville, TN, May 20, 2010.

Shockley WW. *Traumatic Injuries of the Auricle*. AAFPRS, 10<sup>th</sup> International Symposium of Facial Plastic Surgery. Hollywood, FL, May 2, 2010.

Shockley WW. *Moderator for Panel on Auricular Trauma and Reconstruction*. AAFPRS, 10<sup>th</sup> International Symposium of Facial Plastic Surgery. Hollywood, FL, May 2, 2010.

Shockley WW, Alam DS. *Repair of Major Soft Tissue Injuries of the Face*. Focused Learning Opportunity, AAFPRS, 10<sup>th</sup> International Symposium of Facial Plastic Surgery. Hollywood, FL, April 30, 2010.

Shockley WW. *Practical Tips in the Management of Facial Scars*. NorthEast Medical Center. Concord, NC, October 27, 2009.

Shockley WW: *Panel on Facial Skin Malignancies*. Case Discussions on Risk Factors and Reconstruction of Facial and Nasal Defects, AAFPRS Fall Meeting. San Diego, CA, October 3 2009.

Shockley WW: *Interpolated Cheek Flaps: Design and Surgical Technique*. Nasal Reconstruction Course, AAFPRS Fall Meeting. San Diego, CA, October 1, 2009.

Smyth JK, Dorfman BE. *Saccular Cysts*. Annual Meeting of COSM, Las Vegas, NV, April 2010.

Suberman TA, Campbell AP, Buchman CA, Adunka OF, Fitzpatrick DC. *Residual Hearing Preservation during Cochlear Implantation in Gerbils with Noise Induced, High-Frequency Hearing Loss*. American Otological Society Spring Meeting, Las Vegas, NV, May 2, 2010.

Suowitz JB, Shah RN, Zanation AM, Weissler MC, Shores CG. *A Three Layer Closure Technique Diminishes Fistula Rates in Previously Chemoradiated Total Laryngectomy Patients*. American Head and Neck Society Meeting, Phoenix, AZ, May 2009.

Tatreau J, Kibwei M, Shah R, Patel M, Zanation AM. *Anatomical Limitations for Endoscopic Endonasal Skull Base Surgery in Pediatric Patients*. Triological Society Southern Sections Meeting, Orlando, FL, February 4, 20010.

Teagle, HFB. *New for Now: Cochlear Implant Technology and Assistive Listening Devices*. NC Spring Camp, Camp Cheerio, NC, May 2010.

Weissler, MC. *Evaluation and Management of Neck Masses: Management Pearls in the OR*. Panelist, American College of Surgeons, Clinical Congress, Chicago, IL. October 12, 2009.

West AN, Rosenthal LH, Drake AF, Rose AS, Zdanski CJ. *Panel Discussion: Pediatric Otolaryngology*. Newton D. Fischer Society Annual Meeting, Chapel Hill, NC, June 2010.

Wheless, SA, McKinney KA, Zanation AM. *A Prospective Study of the Clinical Impact of a Multidisciplinary Head and Neck Tumor Board*. Doris Duke Clinical Research Fellow Meeting, Dallas, TX, June 1-3, 2010.

Wheless SA, Germanwala AV, Snyderman CH, Carrau RL, Zanation AM. *Classification of Approaches for Endonasal Endoscopic Resection of Infratemporal Fossa Tumors*. American Head & Neck Society Annual Meeting, Las Vegas, NV, April 28-29, 2010.

Wheless SA, Carrau RL, Snyderman CH, Germanwala AV, Zanation AM. *Nasoseptal Flap Repair of Traumatic Skull Base Cerebrospinal Fluid Leaks*. Triological Society Annual Meeting, Las Vegas, NV, April 28 - May 2, 2010.

Wong Y, Buckmire R. *Human Control of Robotic Controllers for Microlaryngoscopic Laser Surgery and Laryngology*. Newton D. Fischer Society Meeting, Chapel Hill, NC, June 4, 2010.

Zanation AM, Germanwala AV. *Surgical Management of Vascular Lesions: Do Minimally Invasive Approaches Have a Role?* Seminar, 4th World Congress for Endoscopic Surgery of the Brain, Skull Base and Spine, Pittsburgh, PA, April 26-28, 2010.

Zanation AM. *Skull Base Reconstruction*. Panel, 4th World Congress for Endoscopic Surgery of the Brain, Skull Base and Spine, Pittsburgh, PA, April 26-28, 2010.

Zanation AM. *Updates in Pediatric Tumor Surgery*. Updates in Pediatric Otolaryngology, University of Nebraska Ski Meeting, Vail, CO, March 13, 2010.

Zanation AM. *Options for Regional Flaps in Endonasal Skull Base Reconstruction*. Panel, North American Skull Base Society Annual Meeting. New Orleans, LA, October 16, 2009.

Zanation AM. *Management of Sinonasal Cancers: Open Skull Base Surgery*. Panel, North American Skull Base Society Annual Meeting. New Orleans, LA, October 16, 2009.

Zanation AM. *Advances in Endoscopic Skull Base Reconstruction*. Panel, American College of Surgeons 95<sup>th</sup> Annual Clinical Congress, Chicago, IL, October 13, 2009.

Zanation AM, Snyderman C. *Ventral Skull Base Anatomy*. CME Course, 2009 AAOHNS Annual Meeting, San Diego, CA, October 6, 2009.

Zanation AM. *Sinus Surgery: State of the Art Update*. Miniseminar, 2009 AAOHNS Annual Meeting, San Diego, CA, October 2009.

Zanation AM. *Frontal and Cranial Base Trauma Surgery*. 2009 MUSC Foundations Course on Facial Trauma, Charleston, SC, September 19, 2009.

Zanation AM. *Treatment and Reconstruction of Advanced Skin Cancers*. UNC Dermatology Grand Rounds, Chapel Hill, NC, August 14, 2009.

Zanation AM. *Endoscopic Orbit Decompressions and Endoscopic Orbital Tumor Surgery*. UNC Ophthalmology Grand Rounds, Chapel Hill, NC, August 21, 2009.

Zanation AM. *Skull Base Cancer Surgery: Where does the endoscope fit in?* 2009 NC/SC Otolaryngology Annual Meeting, Charleston, SC, July 31, 2009.

Zdanski CJ. *Airway Surgery*. Fellows Clinical Conference, Chapel Hill, NC, February 22, 2010.

Zdanski CJ. *Management of Pediatric Congenital Facial and Neck Masses*. Panelist, Combined Sections Meeting, Orlando, FL, February 4-7, 2010.

Zdanski CJ. *The Carolinas' Pediatric Airway Course*. Charleston, SC, October 15-16, 2009.

Zdanski CJ, Retsch-Bogart G, Henry M, Drake AF. *Airway Cases*. The NC Pediatric Society 2009 Annual Meeting, Asheville, NC, August 22, 2009.

# Publications

## Textbooks:

Adunka OF, Buchman CA (eds). *Otology, Neurotology & Skull Base Surgery, An Illustrated Manual*. Stuttgart, Germany: Thieme, 2010.

Olshan OF (ed). Epidemiology, Pathogenesis, and Prevention of Head and Neck Cancer. Springer-Verlag, 2010.

## Book Chapters:

Buchman CA, Adunka OF, Zdanski CJ, Pillsbury HC. Chapter 8: Hearing loss in children: The otologist's perspective. In: *Comprehensive Handbook of Pediatric Audiology*, Seewald and Tharpe (eds). San Diego: Plural Publishing, 2010.

Buchman CA, Roush PA, Teagle HFB, Zdanski CJ. Chapter 20: Clinical management of children with auditory neuropathy. In: *Clinical Management of Children with Cochlear implants*. Eisenberg L (ed). San Diego: Plural Publishing, 2009.

Buchman CA, Adunka OF. Translabyrinthine vestibular nerve section. In: *Surgery of the Ear*. Brackmann D, Shelton C, Arriaga M (eds). 3<sup>rd</sup> editio. Philadelphia: Elsevier Publishing, 2010.

Burkey B, Couch M, Lorenz R. Head and Neck Cancer. In: *Sabiston's Textbook of Surgery*, 19<sup>th</sup> edition, Elsevier, Inc., 2010.

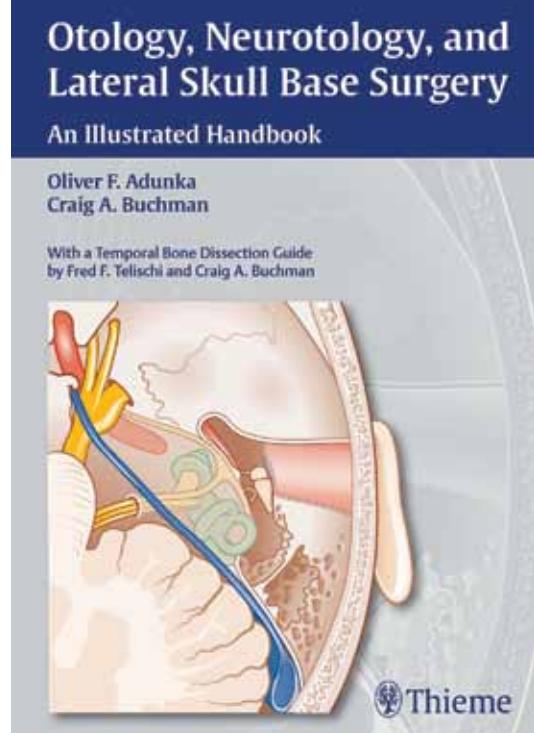
Eddins DA, Hall JW. Binaural processing and auditory asymmetries. In: *Handbook of Auditory Research: The Aging Auditory System*, Gordon-Salant S, Frisina RD, Popper AN, and Fay RR (eds). New York: Springer, 2010.

Patel MR, Cannon T, Shores CG. Complications of Airway Devices. In: *Emergency Medicine: A Comprehensive Study Guide*, 7<sup>th</sup> Edition. Tintinalli JE, Stapczynski JS, Ma OJ, Cline D, Cydulka R and Meckler G (eds). New York: McGraw-Hill, (Pub date Oct 2010)

Shah RN, Cannon T, Shores CG. Infections and Disorders of the Neck and Upper Airway. In: *Emergency Medicine: A Comprehensive Study Guide*, 7<sup>th</sup> Edition. Tintinalli JE, Stapczynski JS, Ma OJ, Cline D, Cydulka R and Meckler G (eds.). New York: McGraw-Hill, (Pub date Oct 2010)

Teagle HFB, Eskridge H. Predictors of success for children with cochlear implants: The impact of individual differences. In: *Perspectives on Individual Differences Affecting Therapeutic Change in Communication Disorders*, Weiss A (ed). Taylor & Francis (Psychology Press), 2010.

Teagle HFB. Cochlear Implants. In: *Knowledge is Power: a program to help students learn about their hearing loss*. Edition 5. Bettendorf, IA: Mississippi Bend Area Education Agency, 2009.



## **Journal Articles:**

Adunka OF, Pillsbury HC, Buchman CA. Minimizing intracochlear trauma during cochlear implantation. *Adv Otorhinolaryngol.* 2010;67:96-107.

Adunka OF, Pillsbury HC, Buchman CA. Is electric acoustic stimulation better than conventional cochlear implantation for speech perception in quiet? *Otol Neurotol.* 2010 Sep;31(7):1049-54.

Allen CT, Hackman TG, Lewis JS, Haughey BH. Pathology quiz case 2: Rhabdomyoma, adult type. *Arch Otolaryngol Head Neck Surg.* 2009 Oct;135(10):1057, 1059-60.



Drs. Trevor Hackman and Mitch Gore

Andrews E, Shores C, Hayes DN, Couch M, Southerland J, Morris D, Seaman WT, Webster-Cyriaque J. Concurrent human papillomavirus-associated tonsillar carcinoma in 2 couples. *J Infect Dis.* 2009 Sep 15; 200(6):882-7.

Ang M-K and Hayes DN. Imaging: Mass spectrometry in HNSCC—a peek at response prediction? *Nature Reviews Clinical Oncology.* 2010 Apr;7(4)193-5.

Ardeshirpour F, Shockley WW, Zdanski CJ. Lipoblastoma in the masticator space of an infant. *Eur J Pediatr Surg.* 2010 May;20(3):201-3.

Basura GJ, Eapen R, Buchman CA. Bilateral cochlear implantation: current concepts, indications, and results. *Laryngoscope.* 2009 Dec;119(12):2395-401.

Beahm DD, Peleaz L, Nuss DW, Schaitkin B, Sedlmayr JC, Rivera-Serrano CM, Zanation AM, Walvekar RR. Surgical approaches to the submandibular gland: a review of literature. *Int J Surg.* 2009 Dec;7(6):503-9.

Buckmire RA, Bryson P, Patel M. Type I Gore-Tex Laryngoplasty for Glottic Incompetence in Mobile Vocal Folds. *Journal of Voice.* 2010 Epub Mar 16.

Burton MJ, Couch ME, Rosenfeld RM. Extracts from the Cochrane Library: homeopathic medicines for adverse effects of cancer treatments. *Otolaryngol Head Neck Surg.* 2009 Aug;141(2):162-5.

Buss E, Hall JW. The role of off-frequency masking in binaural hearing. *J Acoust Soc Am.* 2010 Jun;127(6):3666-77.

Buss E, Hall JW. Monaural temporal integration and temporally selective listening in children and adults. *J Acoust Soc Am.* 2010 June;127(6):3643-53.

Buss E. Spectral profile cues in comodulation masking release. *J Acoust Soc Am.* 2010 June;127(6):3614-28.

Buss E, Hall JW. Effects of masker envelope coherence on intensity discrimination. *J Acoust Soc Am.* 2009;126:2467-78.

Buss E, Grose JH, Hall JW. Features of across-frequency envelope coherence critical for comodulation masking release. *J Acoust Soc Am.* 2009;126:2455-66.

Buss E, Whittle LN, Grose JH, Hall JW. Masking release for words in amplitude-modulated noise as a function of modulation rate and task. *J Acoust Soc Am.* 2009 Jul;126(1):269-80.

Cabanski CR, Qi Y, Yin X, Bair E, MC, Fan C, Li J, Wilkerson M, Marron JS, Perou, CM, Hayes DN. SWISS MADE: Standardized WithIn class Sum of Squares to evaluate Methodologies And Dataset Elements. *PLoS One.* 2010 Mar 26;5(3):e9905.

Campbell AP, Suberman TA, Buchman CA, Fitzpatrick DC, Adunka OF. Flexible cochlear microendoscopy in the gerbil. *Laryngoscope*. 2010 Aug;120(8):1619-24.

Davies JM, Dhruva NS, Walko CM, Socinski MA, Bernard S, Hayes DN, Kim WY, Ivanova A, Keller K, Hilbun LR, Chiu M, Dees EC, Stinchcombe TE. A phase I trial of sorafenib combined with cisplatin/etoposide or carboplatin/pemetrexed in refractory solid tumor patients. *Lung Cancer*. 2010 Jun 24 [Epub ahead of print]

Dellon ES, Cullen NR, Madanick RD, Buckmire RA, Grimm IS, Weissler MC, Couch ME, Shaheen NJ. Outcomes of a combined antegrade and retrograde approach for dilation of radiation induced esophageal strictures. *Gastrointest Endoscopy*. 2010 Jun;71(7):1122-9.

Divaris K, Olshan AF, Smith J, Bell ME, Weissler MC, Funkhouser WK, Bradshaw PT. Oral health and risk for head and neck squamous cell carcinoma: The Carolina Head and Neck Cancer Study. *Cancer Causes Control*. 2010 Apr;21(4):567-75.

Eapen RJ, Buchman CA. Bilateral cochlear implantation: current concepts. *Curr Opin Otolaryngol Head Neck Surg*. 2009 Oct;17(5):351-5.

Ebert CS, Senior BA. A review of minimally invasive pituitary surgery: the evolution from maximally to minimally invasive surgery. *Otorinolaringol* 2009;59:97-105.

Fitzpatrick DC, Roberts JM, Kuwada S, Kim DO, Filipovic B. Processing temporal modulations in binaural and monaural auditory stimuli by neurons in the inferior colliculus and auditory cortex. *J Assoc Res Otolaryngol*. 2009 Dec;10(4):589-93.

Fleming RL, Manis PB, Marrow AL. The effects of acute and chronic ethanol exposure on presynaptic and postsynaptic gamma-aminobutyric acid (GABA) neurotransmission in cultured cortical and hippocampal neurons. *Alcohol*. 2009 Dec;43(8):603-18.

Garcia GJ, Rhee JS, Senior BA, Kimbell JS. Septal deviation and nasal resistance: an investigation using virtual surgery and computational fluid dynamics. *Am J Rhinol Allergy*. 2010 Jan-Feb;24(1):e46-53.

Garcia GJ, Kimbell JS. Deposition of inhaled nanoparticles in the rat nasal passages: dose to the olfactory region. *Inhal Toxicol*. 2009 Dec;21(14):1165-75.

Gaudet MM, Olshan AF, Chuang SC, Berthiller J, Zhang ZF, Lissowska J, Zaridze D, Winn DM, Wei Q, Talamini R, Szeszenia-Dabrowska N, Sturgis EM, Schwartz SM, Rudnai P, Eluf-Neto J, Muscat J, Morgenstern H, Menezes A, Matos E, Bucur A, Levi F, Lazarus P, La Vecchia C, Koifman S, Kelsey K, Herrero R, Hayes RB, Franceschi S, Wunsch-Filho V, Fernandez L, Fabianova E, Daudt AW, Dal Maso L, Paula Curado M, Chen C, Castellsague X, Benhamou S, Boffetta P, Brennan P, Hashibe M. Body mass index and risk of head and neck cancer in a pooled analysis of case-control studies in the International Head and Neck Cancer Epidemiology (INHANCE) Consortium. *Int J Epidemiol*. 2010 Feb 1 [Epub ahead of print]

Gore MR, Zanation AM. Salvage treatment of late neck metastasis in esthesioneuroblastoma: a meta-analysis. *Arch Otolaryngol Head Neck Surg*. 2009 Oct;135(10):1030-4.

Grose JH, Mamo SK. Processing of temporal fine structure as a function of age. *Ear Hear*. 2010 June 29 [Epub ahead of print]

Grose JH, Mamo SK, Hall JW. Age effects in temporal envelope processing: speech unmasking and auditory steady state responses. *Ear Hear*. 2009 Oct;30(5):568-75.



Dr. Charles Ebert and Paula Solovey, RN

Harris SL, Kimple RJ, Hayes DN, Couch ME, Rosenman JG. Never-smokers, never-drinkers: unique clinical subgroup of young patients with head and neck squamous cell cancers. *Head Neck*. 2010 Apr;32(4):499-503.

Hayes DN (one of approximately 100 listed and unordered contributors). The International Cancer Genome Consortium. International network of cancer genome projects. *Nature*. 2010 Apr 14;464(7305):9993-9996.

He S, Buss E, Hall JW. Monaural temporal integration and temporally selective listening in children and adults. *J Acoust Soc Am*. 2010 Jun;127(6):3643-53.

Hua X, Zeman KL, Zhou B, Hua Q, Senior BA, Tilly SL, Bennett WD. Noninvasive real-time measurement of nasal mucociliary clearance in mice by pinhole gamma scintigraphy. *J Appl Physiol*. 2010 Jan;108(1):189-96.

Huang BY, Roche JP, Buchman CA, Castillo M. Brain stem and inner ear abnormalities in children with auditory neuropathy spectrum disorder and cochlear nerve deficiency. *Am J Neuroradiol*. 2010 Jul 1 [Epub ahead of print]

Johnston KN, John AB, Kreisman NV, Hall JW, Crandell CC. Multiple benefits of personal FM system use by children with auditory processing disorder (APD). *Int J Audiol*. 2009;48(6):371-83.

Kim WY, Perera S, Zhou B, Carretero J, Yeh JJ, Heathcote SA, Jackson AL, Nikolinakos P, Ospina B, Naumov G, Brandstetter KA, Weigman VJ, Zaghlul S, Hayes DN, Padera RF, Heymach JV, Kung AL, Sharpless NE, Kaelin WG Jr, Wong KK. HIF2alpha cooperates with RAS to promote lung tumorigenesis in mice. *J Clin Invest*. 2009 Aug; 119(8):2160-70.

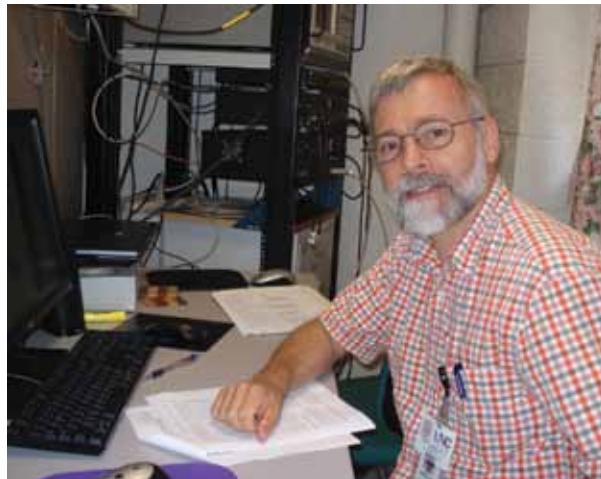
Leibold LJ, Hitchens JJ, Buss E, Neff DL. Excitation-based and informational masking of a tonal signal in a four-tone masker. *J Acoust Soc Am*. 2010;127:2441-50.

Liang MC, Ma J, Chen L, Kozlowski P, Qin W, Li D, Thomas R, Hayes DN, Meyerson M, Kwiatkowski DJ, Wong KK. TSC1 loss synergizes with KRAS activation in lung cancer development in the mouse and confers rapamycin sensitivity. *Oncogene*. 2010 Mar 18;29(11):1588-97.

Lubin JH, Gaudet MM, Olshan AF, Kelsey K, Boffetta P, Brennan P, Castellsague X, Chen C, Curado MP, Dal Maso L, Daudt AW, Fabianova E, Fernandez L, Wünsch-Filho V, Franceschi S, Herrero R, Koifman S, La Vecchia C, Lazarus P, Levi F, Lissowska J, Mates IN, Matos E, McClean M, Menezes A, Morgenstern H, Muscat J, Eluf Neto J, Purdue MP, Rudnai P, Schwartz SM, Shangina O, Sturgis EM, Szieszenna-Dabrowska N, Talamini R, Wei Q, Winn D, Zhang ZF, Hashibe M, Hayes RB. Body mass index, cigarette smoking, and alcohol consumption and cancers of the oral cavity, pharynx, and larynx: modeling odds ratios in pooled case-control data. *Am J Epidemiol*. 2010 Jun 15;171(12):1250-6.

Lund VJ, Stammberger H, Nicolai P, Castelnuovo P, Beal T, Beham A, Bernal-Sprekelsen M, Braun H, Cappabianca P, Carrau R, Cavallo L, Clarici G, Draf W, Esposito F, Fernandez-Miranda J, Fokkens W, Gardner P, Gellner V, Hellquist H, Hermann P, Hosemann W, Howard D, Jones N, Jorissen M, Kassam A, Kelly D, Kurschel-Lackner S, Leong S, McLaughlin N, Maroldi R, Minovi A, Mokry M, Onerci M, Ong YK, Prevedello D, Saleh H, Sehti DS, Simmen D, Snyderman C, Solares A, Spittle M, Stamm A, Tomazic P, Trimarchi M, Unger F, Wormald PJ, Zanation A; European Rhinologic Society Advisory Board on Endoscopic Techniques in the Management of Nose, Paranasal Sinus and Skull Base Tumours. European position paper on endoscopic management of tumours of the nose, paranasal sinuses and skull base. *Rhinol*. 2010 Jun 1 Suppl;22:1-143.

Mancilla JG, Manis PB. Two distinct types of inhibition mediated by cartwheel cells in the dorsal cochlear nucleus. *J Neurophysiol*. 2009 Aug;102(2):1287-95.



Dr. John Grose

Marple BF, Stringer SP, Batra PS, Bhattacharyya N, Chiu AG, Citardi MJ, Han JK, Kern RC, Kingdom TT, Lane AP, Orlandi RR, Ryan MW, Senior BA, Stewart MG; Task Force of the Rhinology and Paranasal Sinus Committee. Going to the next level: health care's evolving expectations for evidence. *Otolaryngol Head Neck Surg.* 2009 Nov;141(5):551-4.

Marron M, Boffetta P, Zhang ZF, Zaridze D, Wünsch-Filho V, Winn DM, Wei Q, Talamini R, Szeszenia-Dabrowska N, Sturgis EM, Smith E, Schwartz SM, Rudnai P, Purdue MP, Olshan AF, Eluf-Neto J, Muscat J, Morgenstern H, Menezes A, McClean M, Matos E, Mates IN, Lissowska J, Levi F, Lazarus P, La Vecchia C, Koifman S, Kelsey K, Herrero R, Hayes RB, Franceschi S, Fernandez L, Fabianova E, Daudt AW, Dal Maso L, Curado MP, Cadoni G, Chen C, Castellsague X, Boccia S, Benhamou S, Ferro G, Berthiller J, Brennan P, Møller H, Hashibe M. Cessation of alcohol drinking, tobacco smoking, and the reversal of head and neck cancer risk. *Int J Epidemiol.* 2010 Feb;39(1):182-96.

Marshall AF, Jewells V, Kranz P, Lee Y, Lin W, Zdanski CJ. Magnetic resonance imaging of guinea pig cochlea after vasopressin-induced or surgically induced endolymphatic hydrops. *Otolaryngology-Head and Neck Surgery.* 2010 Feb;142(2):260-5.

Mlot S, Buss E, Hall JW. Spectral integration and bandwidth effects on speech recognition in school-aged children and adults. *Ear Hear.* 2010 Feb;31(1):56-62.

Niparko JK, Tobey EA, Thal DJ, Eisenberg LS, Wang NY, Quittner AL, Fink NE; CDaCI Investigative Team. Collaborators: Eisenberg LS, Johnson K, Critton T, DesJardin J, Gillinger M, Luxford W, Martinez A, Mebane L, Regnery J, Visser-Dumont L, Niparko JK, Bowditch S, Chinmici J, Clark J, Francis H, Mertes J, Ostrander R, Yeagle J, Visaya J, Coresh J, Mellon N, Kane MO, Wainscott S, Wallace J, Hodges A, Balkany T, Lopez A, Goodwin L, Payne S, Zwolan T, Donaldson A, Arts HA, Butler B, El-Kashlam H, Heavner K, O'Sullivan MB, Telian S, Thomas E, Vereb A, Brown CJ, Teagle HF, Buchman CA, Zdanski C, Eskridge H, Pillsbury HC, Tobey EA, Loy B, Bauer P, Boyd A, Cantu L, Cokely C, Florence S, Gisclair J, Levitan L, Penrad J, Raby S, Rasmus J, Roland P, MacFadyen H, Pearson D, Rekart DM, Sacar L, Sweeney M, Wagner L, Weissner N, Williams B, Fink NE, Bayton P, Habtemarian D, Powe NR, Vilche T, Wang NY, Quittner AL, Barker D, Leibach P, Cruz I, Niparko JK, Eisenberg LS, Fink NE, Quittner AL, Thal D, Tobey EA, Wang NY, Cohen N, Evans J, Geers A, Kirk KI, Lalwani A. Spoken language development in children following cochlear implantation. *JAMA.* 2010 Apr 21;303(15):1498-506.

Nooshmehr H, Weisenberger DJ, Diefes K, Phillips HS, Pujara K, Berman BP, Pan F, Pelloski CE, Sulman EP, Bhat KP, Verhaak RGW, Meyerson M, Hoadley KA, Hayes DN, Perou CM, Ding Li, Van Den Berg D, Shen H, Bengtsson H, Neuville P, Cope LM, Buckley J, Herman JG, Baylin SB, Laird PW, and Aldape K. Identification of a CpG Island Methylator Phenotype that Defines a Distinct Subgroup of Glioma. *Cancer Cell.* 2010. May 18;17(5):510-22.

Patel MR, Deal AM, Shockley WW. Oral and plunging ranulas: what is the most effective treatment? *Laryngoscope.* 2009 Aug;119(8):1501-9.

Patel MR, Zdanski CJ, Abode KA, Reilly CA, Malinzak EB, Stein JN, Harris WT, Drake AF. Experience of the school-aged child with tracheostomy. *Int J Pediatr Otorhinolaryngol.* 2009 Jul;73(7):975-90.

Patel MR, Bryson PC, Shores CG, Hart CF, Thorne LB, Deal AM, Zanation AM. Trefoil factor 3 immunohistochemical characterization of follicular thyroid lesions from tissue microarray. *Arch Otolaryngol Head Neck Surg.* 2009 Mar;135(6):590-6.

Patel MR, Shah RN, Snyderman CH, Carrau RL, Germanwala AV, Kassam AB, Zanation AM. Pericranial flap for endoscopic anterior skull-base reconstruction: clinical outcomes and radioanatomic analysis of preoperative planning. *Neurosurgery.* 2010 Mar;66(3):506-12; discussion 512.

Pawar SS, Garcia GJ, Kimbell JS, Rhee JS. Objective measures in aesthetic and functional nasal surgery: perspectives on nasal form and function. *Facial Plast Surg.* 2010 Aug;26(4):320-7.

Pignon JP, le Maître A, Maillard E, Bourhis J; MACH-NC Collaborative Group. Meta-analysis of chemotherapy in head and neck cancer (MACH-NC): an update of 93 randomized trials and 17,346 patients. *Radiother Oncol.* 2009 Jul;(1):4-14.

Prevedello DM, Kassam AB, Gardner P, Zanation A, Snyderman CH, Carrau RL. "Q-tip" retractor in endoscopic cranial base surgery. *Neurosurgery.* 2010 Feb;66(2):363-6; discussion 366-7.

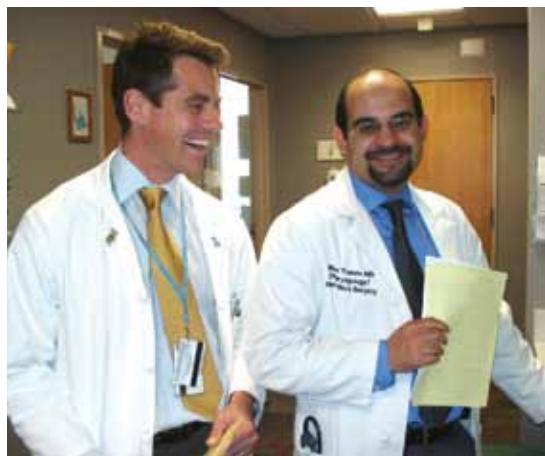
Prevedello DM, Barges-Coll J, Fernandez-Miranda JC, Morera V, Jacobson D, Madhok R, dos Santos MC, Zanation A, Snydeman CH, Gardner P, Kassam AB, Carrau R. Middle turbinate flap for skull base reconstruction: cadaveric feasibility study. *Laryngoscope*. 2009 Nov;119(11):2094-8.

Reickert S, Buckmire R, Sulica L. Cricoid chondrosarcoma presenting as breathy dysphonia. *Ear Nose & Throat Journal*. 2009 Oct;88(10):1144-1146.

Rhee JS, Weaver EM, Park SS, Baker SR, Hilger PA, Kriet JD, Murakami C, Senior BA, Rosenfeld RM, DiVittorio D. Clinical consensus statement: Diagnosis and management of nasal valve compromise. *Otolaryngol Head Neck Surg*. 2010 Jul;143(1):48-59.

Roberts J, Shores C and Rose AS, Surgical treatment warranted in aggressive central giant cell granuloma: a report of two cases. *Ear Nose Throat J*. 2009;88:E8-E13.

Roche JP, Huang BY, Castillo M, Bassim MK, Adunka OF, Buchman CA. Imaging characteristics of children with auditory neuropathy spectrum disorder. *Otol Neurotol* 2010 Jul;31(5):780-8.



Drs. Oliver Adunka and Maher Younes

Roche JP, Younes MN, Funkhouser WK, Weissler MC. Branchigenic carcinoma of a first branchial cleft cyst. *Otolaryngol Head Neck Surg*. 2010 Jul;143(1):167-8.

Schroeter JD, Garcia GJ, Kimbell JS. A computational fluid dynamics approach to assess interhuman variability in hydrogen sulfide nasal dosimetry. *Inhal Toxicol*. 2010 Mar;22(4):277-86.

Sudhoff HH, Ebmeyer J, Bernhal-Sprekelsen M, Hansen S, Pytel J, Fraenzer JT, Adunka OF. Temporal bone histopathology after deep cochlear implantation. *Laryngorhinootologie*. 2010 Feb;89(2):95-97.

Tang W, Harmon P, Gulley ML, Mwansambo C, Kazembe PN, Martinson F, Wokocha C, Kenney SC, Hoffman I, Sigel C, Maygarden S, Hoffman M and Shores C. Viral Response to Chemotherapy in Endemic Burkitt Lymphoma. *Clin Cancer Res*. 2010 Apr 1;16(7):2055-64.

Teagle HF, Roush PA, Woodard JS, Hatch DR, Zdanski CJ, Buss E, Buchman CA. Cochlear implantation in children with auditory neuropathy spectrum disorder. *Ear Hear*. 2010 Jun;31(3):325-35.

Wilkerson MD, Hayes DN. ConsensusClusterPlus: a class discovery tool with confidence assessments and item tracking. *Bioinformatics*. 2010 Jun 15;26(12):1572-3.

Wilkerson MD, Yin X, Hoadley KA, Liu Y, Hayward MC, Cabanski CR, Muldrew KL, Miller CR, Randell SH, Socinski MA, Parsons AM, Funkhouser WK, Lee CB, Robert PJ, Thorne L, Bernard PS, Perou CM, Hayes DN. Lung squamous cell carcinoma mRNA expression subtypes are reproducible, clinically-important and correspond to different normal cell types. *Clin Cancer Res*. 2010 Jun 19 [Epub ahead of print]

Verbist BM, Skinner MW, Cohen LT, Leake PA, James C, Boëx C, Holden TA, Finley CC, Roland PS, Roland JT Jr, Haller M, Patrick JF, Jolly CN, Faltys MA, Briaire JJ, Frijns JH. consensus panel on cochlear coordinate system applicable in histologic, physiologic, and radiologic studies of the human cochlea. *Otol Neurotol*. 2010 Jul;31(5):722-30.

Verhaak RG, Hoadley KA, Purdom E, Wang V, Qi Y, Wilkerson MD, Miller R, Ding L, Golub T, Mesirov JP, Alexe G, Lawrence M, O'Kelly M, Tamayo P, Weir BA, Gabriel S, Winckler W, Gupta S, Jakkula L, Feiler HS, Hodgson JG, James CD, Sarkaria JN, Brennan C, Kahn A, Spellman PT, Wilson RK, Speed, TP, Gray JW, Meyerson M, Getz G, Perou CM, Hayes DN; Cancer Genome Atlas Research Network. Integrated genomic analysis identifies clinically relevant subtypes of glioblastoma characterized by abnormalities in PDGFRA, IDH1, EGFR and NF1. *Cancer Cell*. 2010 Jan 19;17(1):98-110.

Vidal L, Tsao MS, Pond GR, Cohen EE, Cohen RB, Chen EX, Agulnik M, Hotte S, Winquist E, Laurie S, Hayes DN, Ho J, Dancey J, Siu LL. Fluorescence in situ hybridization gene amplification analysis of EGFR and HER2 in patients with malignant salivary gland tumors treated with lapatinib. *Head Neck.* 2009 Aug; 31(8):1006-12.

Yin X, Zhang H, Lundgren K, Wilson L, Burrows F and Shores CG. BIIB021, A novel Hsp90 inhibitor, sensitizes head and neck squamous cell carcinoma to radiotherapy. *Int J Cancer.* 2010 Mar 1;126(5):1216-25.

Zanation AM, Carrau RL, Snyderman CH, Germanwala AV, Gardner PA, Prevedello DM, Kassam AB. Nasoseptal flap reconstruction of high flow intraoperative cerebral spinal fluid leaks during endoscopic skull base surgery. *Am J Rhinol Allergy.* 2009 Sep-Oct;23(5):518-21.

**Online:**

Bryson PC, Buckmire RA. Stroboscopy. In: eMedicine from WebMD. Updated October 29, 2009. <http://emedicine.medscape.com/article/866178-overview>

Drake AF, Lee S. Pathology - Rhabdomyosarcoma. In: eMedicine from WebMD. Arlen D. Meyers, MD, MBA, chief editor. Updated August 26, 2009. <http://www.emedicine.medscape.com/article/873546-overview>

Larsen RS, Rao D, Manis PB, Philpot BD. STDP in the developing sensory neocortex. In: Frontiers in Synaptic Neuroscience. Published June 9, 2010. [http://frontiersin.org/synaptic\\_neuroscience/10.3389/fnsyn.2010.00009/abstract](http://frontiersin.org/synaptic_neuroscience/10.3389/fnsyn.2010.00009/abstract)



Dr. Pillsbury met with the four new residents during their orientation at UNC in June of 2010. Left to right: Grace G. Kim, MD; Deepak R. Dugar, MD; Anna Hang, MD; and Anthony O. Okobi, Jr., MD, PhD. We expect great things to come from these fabulous four, so stay tuned!

## What Else Do We Do?



Carlos Ebert organized an outing for residents, attendings, medical students, and their families at the Durham Bulls Athletic Park. Dubbed the Annual Ebert ENT Family Baseball Outing, a great time was had by all, including many children.



Jessica Smyth, Rose Eapen, Laura Rosenthal, and Katie Chandler ran the Kidney Kare 5k to raise money for the UNC Kidney Center in March.



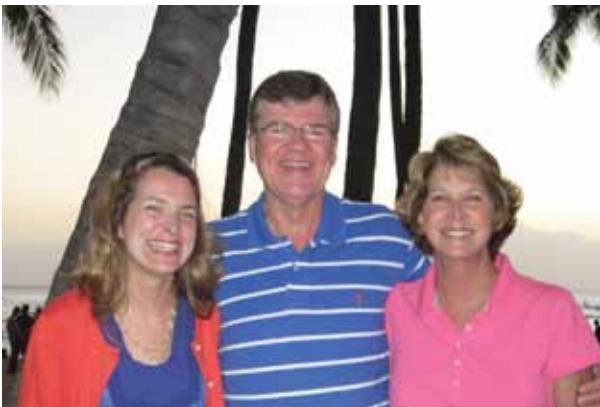
Carlos Ebert, Stephen Wheless, and Adam Zanation took a side trip to the Las Vegas Motor Speedway while at COSM. They did the "Richard Petty Driving Experience" and drove race cars. Austin Rose also drove.



Amelia Drake (facing forward) has rowed off and on since high school. She met her husband, Craig, on the docks during their college days. Now she rows with the Carolina Masters rowing group, sponsored by club sports at UNC. They practice on University Lake and compete in mostly regional regattas, though sometimes they participate in the National Masters races.



Carol Shores submitted this photo from her son Jason's wedding in November 2009. L-R: Her husband Russ, daughter-in-law Rachael, Jason, Carol, son Robin. It was a Renaissance themed wedding at the Shores' house. Rachael is wearing her grandmother's wedding dress; Robin is wearing the suit Russ was married in.



The Shockleys vacationed in Hawaii in January of 2010. L-R: Lindsey, Bill, and Linda. Lindsey recently signed a contract with NBC and is now a staff writer for a new TV sitcom called "Perfect Couples," scheduled to air in early 2011.



Brent Senior took time out from lecturing in Beijing, China, to visit the Olympic Stadium "Birdcage." His daughter Rebecca, who had been spending the summer in Vietnam, joined him in Beijing for a week.



Austin Rose learned to skate when he was a kid since he was born in Canada, but never played hockey until recently. He takes classes and plays pick-up hockey over at the Triangle Sportsplex in Hillsborough 2 or 3 times a week.



The Radical Necks basketball team. Standing, L-R: Kibwei McKinney, Kelen Beacham, Jessica Smyth, Yu-Tung Wong, Greg Basura, Austin Rose. Kneeling, L-R: Pali Shah, Carlos Ebert, Michael Stadler. They're not going to be playing in any championship games, but they're having a great time!



**Rick's Angels.** "Once upon a time there were eight brilliant women who went to medical school, and they each demonstrated extraordinary promise in the field of Otolaryngology/Head and Neck Surgery. They matched with UNC's residency program, and now my colleagues and I train them. My name is Rick."

Front row, L-R: Rupali "Ballpark" Shah, Rose "The Encourager" Eapen, Baishakhi "Busy Bee" Choudhury, Grace "Sweetness" Kim  
Back row, L-R: Deidra "Princess" Blanks, Paula "Mama Bear" Harmon, Jessica "Maverick" Smyth, Anna "Stealth" Hang



Residents who graduated from our program in 2010: Keith M. Ladner, MD; Alisha N. West, MD; Trinitia Y. Cannon, MD; and Gregory J. Basura, MD

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The Supreme Turbinators play for the UNC Hospitals Softball League at Homestead Park in Chapel Hill. Although their record is not worth mentioning, Dr. Pillsbury did catch a fly ball to outfield. Standing: Tom Suberman, Kibwei McKinney, Carlos Ebert, Adam Campbell, Stephen Wheless, Doug Fitzpatrick, Michael Stadler, Austin Rose, Oliver Adunka. Front row: Trinitia Cannon, Pali Shah, Katie Chandler, Laura Rosenthal.



Oliver and Marcia Adunka took their son, Max, to Topsail Island. Maximilian Franz Adunka was born on June 7, 2010. Apparently he liked the wind, but wasn't ready to get his feet wet.



Rick and Carol Pillsbury enjoy taking their American Sail 14.6 on Lake Pinehurst with friends. Above: Rick Pillsbury and George Feller.

# Giving to the Department

If you or someone you love has fought serious ear, nose, or throat diseases, you know how important hope can be. UNC wants to give you and your loved ones that hope, and you can help. Your gift, whether or not it is in memory or honor of someone, can help the Department continue its national excellence in patient care, OHNS disease research, and patient education. We're seeing breakthroughs in a wide range of ear, nose, and throat diseases. We've also taken the lead in innovative and compassionate patient care. And we're training the best future OHNS physicians so that they can help your children and grandchildren.

You can help make all this possible with your gift. Please send it today! Copy or tear out this page, fill in the information, and mail it with your check or credit card information to: The Medical Foundation of North Carolina, Inc., Attn. Otolaryngology/Head and Neck Surgery, 880 Martin Luther King Jr. Boulevard, Chapel Hill, NC 27514.

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Thank you!

