UNRAVELING BIOFILMS
EMPLOYING UNIQUE APPROACHES AND NOVEL THERAPIES TO TARGET BIOFILMS AND TOOTH DECAY
Shaping the Future of Care

WITH EACH ACADEMIC YEAR, Penn Dental Medicine further shapes the future of care through our accomplished graduating students, who invariably excel across all fields of dental medicine. To the Class of 2014, congratulations as you take the next step, and to our devoted faculty, staff, and alumni, thank you for all you do in support of our students and the School’s mission.

Setting a course that looks to the School’s future growth and leadership is our responsibility as stewards of this great institution. Whether it be through our research, scholarship, curriculum, student opportunities, or our educational and clinical resources, our goal is to create an environment that advances not only the academic experiences of our students, but also the science and practice of dental medicine.

On that path, faculty recruitment continues to add depth to the School’s research enterprise. As we announced in the fall, we welcomed Dr. Michel Koo as Professor in the Department of Orthodontics this September. In this issue, we introduce you to the exciting work of his lab, which focuses on building our understanding of biofilms, particularly cariogenic biofilms, and possible therapeutics against them (see story, page 10).

Within our academic programs, we continue to expand students’ learning opportunities through a growing honors program (see story, page 22) and a new dual degree, now offering a Masters in Translational Research through Penn’s Perelman School of Medicine, the seventh dual degree with other Penn schools (see story, page 3).

And we are moving our preclinical instruction forward with state-of-the-art advanced simulation that is leading the field through the use of haptic technology (see story, page 38), becoming the first school in the country to integrate this type of virtual reality into the curriculum. These advanced simulation units are among the first steps in our plans for a major transformation of facilities within the historic Evans Building. Plans that include a new space for this advanced simulation lab, a new primary care clinic, a new preclinical lab and CE training center, a new library, and new student spaces and administrative offices—a renaissance of this landmark structure, which will mark the centennial of its dedication next year, and a project vital to the School’s ongoing strength and growth.

Through the support and engagement of the entire Penn Dental Medicine community, Penn Dental Medicine continues to move forward on many fronts, and in turn, continues to be a leader in shaping the future of dental education, research, and patient care. Thank you for your shared commitment to the future of the School, our students, and dental medicine.

Denis F. Kinane, BDS, PhD
Morton Amsterdam Dean
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Targeting LGBT Health Disparities

Penn Dental Medicine is among the schools/centers on campus to partner with the Penn Medicine Program for LGBT Health. This unique and interprofessional program focuses on improving the health of lesbian, gay, bisexual, and transgender (LGBT) individuals. Penn Medicine is among just a handful of academic medical centers in the U.S. to launch such an initiative across multiple professional schools and affiliated hospitals, with Penn’s School of Nursing, Perelman School of Medicine, Center for Public Health Initiatives, and hospitals and facilities of the University of Pennsylvania Health System also participating.

Health disparities and inequalities within the LGBT community have become increasingly recognized, but are rarely addressed in today’s healthcare settings. The Penn Medicine Program for LGBT Health is focusing on five key areas to help address these gaps: institutional climate and visibility, health education, research, patient care, and outreach. The Penn Medicine Program for LGBT Health is broad by design and ranges from improving LGBT patients’ healthcare experiences, implementing new trainings on LGBT health, fostering collaborations on LGBT research, and improving outreach to better serve the needs of the LGBT community.

“We are pleased to be part of this interdisciplinary effort to address these important issues to ensure a climate of inclusion,” says Dr. Beverley Crawford, Director of Diversity Affairs at Penn Dental Medicine, who is guiding the School’s participation in the program. Already, Penn Dental Medicine has held two town hall meetings for the School community as part of the program to begin conversations on inclusion and equality.

IADR/AADR Gies Award Recognizes Biological Research

The research of Penn Dental Medicine’s Dr. George Hajishengallis, Professor, Department of Microbiology, has been recognized by the International and American Associations for Dental Research (IADR/AADR) through their annual IADR/AADR William J. Gies Awards for Biological Research.

Dr. Hajishengallis and collaborators Dr. Richard P. Darveau and Dr. Michael A. Curtis from the University of Washington and Barts and The London School of Medicine and Dentistry, respectively, received the 2014 IADR/AADR William J. Gies Award in the category of biological research for the paper, “Porphyromonas gingivalis as a Potential Community Activist for Disease,” J Dent Res. 91: 816-820. The award was presented at the AADR Annual Meeting & Exhibition in Charlotte, N.C., in March.

An extensive analysis of dental plaque samples over the years has led to the identification of “red” complex oral bacteria that have a strong association with each other and with disease. Consequently, these bacteria have been labeled ‘periopathogens’. Studies with one of these bacteria, Porphyromonas gingivalis (P. gingivalis), have revealed that it contains several different mechanisms that either impede or modulate periodontal protective mechanisms. In a mouse model of periodontitis, it has been shown that modulation of complement function by P. gingivalis facilitates a significant change in both the amount and composition of the normal oral microbiota. This altered oral commensal microbiota is responsible for pathologic bone loss in the mouse. Thus, P. gingivalis creates a dysbiosis between the host and dental plaque, and this may represent one mechanism by which periodontitis can be initiated. The authors of this study therefore termed P. gingivalis a keystone pathogen.

The annual Gies Awards recognize the best papers published in the IADR/AADR Journal of Dental Research in the preceding year and are presented in three categories: biological research, biomaterials and bioengineering research, and clinical research.
Students Active at AADR, IADR

Students Justin Kang (D'14), Mehreen Merchant (D'14), and Jordan Seetner (D'15) represented Penn Dental Medicine as part of the general exhibition at the 2014 AADR/CADR Annual Meeting, presenting posters on their research at the meeting in March in Charlotte, N.C.

Their projects were “Assaying Endogenous MMP-2,-8 in Acid Etched Dentinal Cavity Walls” by Kang, who worked with faculty preceptors Drs. Markus Blatz and Fusun Ozer of the Department of Preventive & Restorative Sciences; “Evaluation of a Power Toothbrush for Surface Roughness Effects” by Merchant, who worked on this project during her summer research with Colgate; and “In vitro adherence of Candida albicans to novel denture base materials” by Seetner, who worked with Dr. Yuanfu Yi (visiting scholar in 2012-2013), Dr. Fusun Ozer and Dr. Markus Blatz of the Department of Preventive & Restorative Sciences, and Dr. Joseph DiRienzo of the Department of Microbiology.

TOP HONORS
As part of the AADR meeting, Seetner also presented his project in the 27th annual DENTSPLY/Caulk Student Research Group (SRG) Award Competition for original research, taking first place in the Clinical Science Category. Winners were chosen from more than 100 candidates. Among the key findings of Seetner’s study was that Candida albicans exhibited the same degree of adherence to both injection and non-injection resin denture-base materials. Penn Dental Medicine’s Matthew Oishi (D’15), also attending the AADR meeting in his role as Vice President of the AADR National Student Research Group (NSRG), presented Seetner with a certificate for his winning project on behalf of NSRG.

DENTSPLY/Caulk Student Research Group Award Competition winners were chosen from more than 100 candidates.

IADR
Penn Dental Medicine students will also be participating in the research program at the IADR meeting this June in Cape Town, South Africa. Jordan Seetner will present “Wear behavior of restorative material against zirconia,” a study he also conducted with Dr. Blatz. And Chris Kim (D’15) will present his work on a study with Dr. Francis Mante, Department of Preventive & Restorative Sciences, that adopted fracture mechanics, the standardized fracture testing methodology widely used in mechanical engineering/material science, to test dental materials. Kim found that the interfacial fracture toughness of adhesives incorporated with anti-bacterial agents was heavily dependent on the extent of its solubility—adhesives that contain a protic solvent maintained their fracture toughness while those with an aprotic solvent became significantly susceptible to fracture.

New Dual Degree
Building on its interprofessional programs, Penn Dental Medicine has expanded its dual-degree options to now include a Masters in Translational Research (MTR) with Penn’s Perelman School of Medicine. This new dual degree was officially established with the start of this academic year. The program is designed to give students a strong foundation in the fundamental techniques of translational research and enable them to apply contemporary research tools to clinically relevant areas of investigation, building an understanding of the complex issues associated with conducting sound clinical research.

This new degree brings the total number of dual-degree programs at Penn Dental Medicine to seven. The other programs include a Master of Bioethics and Master of Public Health with Penn’s Perelman School of Medicine; a Master of Science in Bioengineering with the School of Engineering and Applied Science; a Master of Education with the Graduate School of Education; a Master of Business Administration with Wharton; and a JD degree in law with Penn Law.

“The sheer number of opportunities to pursue interprofessional education makes Penn Dental a truly unique institution,” says Dr. Uri Hangorsky, Associate Dean of Academic Affairs.

Dr. Kathleen Boesse-Battaglia, Professor, Department of Biochemistry, and director of the honors program as well as the research honors program, was instrumental in implementing the DMD/MTR, with one student already pursuing this dual degree.
Second-year pediatric resident Stephanie Rashevsky (GD’14) is on a mission to not only maintain the oral health of her young patients, but to build a love of reading and healthy routines as well. And now through Books, Brushing, and Bedtime (BBB), an oral health education and literacy program she developed, recall visits for early childhood patients in Penn Dental Medicine’s Pediatric Clinic will come with a book as well—from “Elmo—Ready, Set, Brush!” to “Cassandra Gets Her Smile Back.”

The idea was born when Rashevsky completed her outpatient medicine rotation at Children’s Hospital of Philadelphia and was introduced to a similar program there called Reach Out Read (ROR). Excited by the project, she contacted the ROR headquarters with the intent of introducing it within the School’s Pediatric Clinic, only to learn that it was available solely to pediatricians. Still motivated to bring this type of project to Penn Dental Medicine, Rashevsky decided to create her own program, piloting BBB in January and launching the full project in April.

“I am not sure if it is because I am the daughter of a teacher, or if it is the childhood memories that I have of my parents reading to me at bedtime, but the benefits of ROR really resonated with me,” she says. “I believed that as pediatric dentists we were in an even better position to encourage reading at bedtime because we see children more frequently than pediatricians for six-month recall visits. Plus, we already utilize the recall appointments for guidance about oral hygiene, diet, etc., so I thought that these visits would be a perfect opportunity to encourage reading and tooth brushing.”

The project involves giving an age-appropriate, dental-relevant book to children between the ages of 1 to 5 years at six-month recall visits to reinforce healthy bedtime routines—tooth brushing and reading. A wide selection of books have been purchased—nearly $5,000-worth to date—for three age categories within that one-to-five-year age range; they are given out by residents or the dental assistants to the children and parents while the children are still in the dental chairs after their exams. “We try to read at least half the book with them so the children and parents are encouraged to see how to be interactive with the book’s content—to touch the toothbrush or count the teeth—to reinforce the concepts,” says Rashevsky.

BBB is starting with 50 patients, however Rashevsky notes that once they collect data (they are surveying parents whose children receive the books using a survey modeled on the ROR program survey) they would like to open it up to all children in the clinic between the ages of 1 and 5. “Each child would receive a book at every six-month recall visit, for a maximum of nine books by the time they enter kindergarten,” says Rashevsky. “Multiple studies have shown that the first five years of life are a critical window for learning, rapid brain development, and the opportunity to establish healthy behaviors. We want our pediatric dental patients to have the educational tools that they need to be successful.”

Predoctoral students are getting involved in BBB as well. Books have been purchased for the waiting area and predoctoral students will be volunteering to read to children waiting for their appointments. In addition, a portion of the Dental Trade Alliance Foundation Grant supporting the project has been allocated to publishing a children’s book with a dental
message. Geared to toddlers and titled "Brushtime, Bedtime," it is being written by Ashley Abraham (D’16), Kelby Okada (D’16), and Giselle Galanto (D’15) with illustrations by Liz Freund (D’16). Funding for BBB is also being provided by a 2013-14 ADA Samuel D. Harris Fund for Children’s Dental Health Grant.

Rashewsky is getting recognition beyond Penn Dental Medicine for BBB, having received the American Academy of Pediatric Dentistry Resident Recognition Award this year for the project. She was one of two winners nationwide selected for the Fall/Winter cycle. The award recognizes pediatric dental residents doing innovative and interesting activities in the field of patient care, research, teaching/education, and/or community service.

“The commitment and energy Stephanie has brought to this project are tremendous,” says Dr. Rochelle Lindemeyer, Director of the Pediatric Residency Program. “It is our hope that this pilot project will plant the seeds for expanding her idea to other institutions.”

“By promoting literacy through BBB at our dental visits, we believe that we will be encouraging positive oral health and literacy behaviors for life.”

— STEPHANIE RASHEWSKY, GD’14

Rashewsky is pleased BBB will thrive at Penn Dental Medicine beyond her graduation this year with first-year pediatric resident Jessica Lee continuing the project as part of her research requirement. “We hope this will be an ongoing project in our clinic,” says Rashewsky. “These interactions that young children have with literacy and the adults in their lives are the building blocks for language, reading, and writing development. By promoting literacy through BBB at our dental visits, we believe that we will be encouraging positive oral health and literacy behaviors for life.”

Pediatric Residency Program Doubles in Size

Penn Dental Medicine has doubled the number of residents accepted into its Pediatric Residency Program each year, growing from two to four students. The new class of residents, which starts in July, will be the first at this increased size.

“This is a move we have wanted to make for some time. Four to five residents per year is the average size of other residency programs across the country. With the size of our School and Children’s Hospital of Philadelphia (CHOP), this was a natural step, especially given that we have the patient pool to support a larger program,” says Dr. Betty Harokopakis-Hajishengallis, Director of the Division of Pediatrics. “We will be able to manage more cases, which translates into greater experience and knowledge for our students.”

Dr. Rochelle Lindemeyer, Director of the Pediatric Residency Program, adds that the increased class size responds to the great interest in the School’s highly competitive program. “We routinely get over 140 applicants each year. There is big interest in our program,” she says. “With the variety of cases we have and our affiliation with CHOP, the Program offers a great educational opportunity for our residents.”

The residents conduct all outpatient care at the School’s Pediatric Clinic and provide inpatient consultation and emergency service for CHOP; residents also provide care for those children needing sedation or general anesthesia at CHOP.

Plans are underway to expand the School’s Pediatric Clinic to accommodate the growing residency class and increased patient load. An additional six chairs will be added in an open bay setting along with a residents’ room.

“We are excited about this expansion of our program,” adds Dr. Harokopakis-Hajishengallis, “and see an ongoing potential for growth.”

140 approximate number of applicants to the Pediatric Residency Program each year
CE Symposia Slated for Fall 2014

Penn Dental Medicine will present two multi-day continuing education symposia this coming fall. The first—ARONJ: An Update—will be held October 24-25 at the Smilow Center for Translational Research, followed by Endodontic Retreatment: Surgical/Non-surgical Management on November 8-9 at the Annenberg Center for the Performing Arts. Both symposia, produced through the School’s Office of Continuing Education, are appropriate for general dentists and specialists alike.

ARONJ: AN UPDATE

Bisphosphonates, a class of drugs that prevent the loss of bone mass, are used to treat a variety of bone dissolution disorders—from osteoporosis and Paget’s disease to bone loss due to cancer. While these anti-resorptive medications can offer effective therapies, several have been associated with osteonecrosis of the jaw (ONJ) with a broad health impact and economic burden.

This symposium is built on the multidisciplinary interaction between the different specialties engaged in research and clinical management of anti-resorptive-drug-induced osteonecrosis of the jaw (ARONJ) patients; Penn Dental Medicine’s Dr. Anh Le, Chair of the Department of Oral & Maxillofacial Surgery/Pharmacology, and Dr. Thomas Sollecito, Chair of the Department of Oral Medicine, are developing the program, which will feature speakers from Penn Dental Medicine, Penn Medicine, and other leading experts on the topic nationwide. Dr. Sook-Bin Woo, Associate Professor of Oral Medicine, Infection, and Immunity at Harvard School of Medicine, and Director of Clinical Affairs, Division of Oral Medicine and Dentistry, at Brigham and Women’s Hospital, Boston, will be the keynote speaker.

The symposium will address gaps in the understanding of how anti-resorptive drugs may interfere with immune function, wound healing, and bone repair, and explore how to bridge these findings in the development of new prevention and intervention strategies for ARONJ.

ENDODONTIC RETREATMENT: SURGICAL/NON-SURGICAL MANAGEMENT

This two-day program, organized by the Department of Endodontics with Dr. Syngcuk Kim, Louis I. Grossman Professor, serving as the symposium director, features Penn Dental Medicine endodontic faculty, alumni, and clinicians from around the world.

The topics presented will range from endodontic pathology to endodontic surgical and non-surgical techniques. Along with lectures, there will be a live patient demonstration of mandibular-molar surgery under the microscope, telecast in 3D. Attendees also have the option of participating in hands-on workshops to be held November 7, the day before the symposium; they will be presented in three different areas—microscope non-surgical retreatment, advanced microendodontics from theory to practice, and microsurgical endodontics. The full program of topics and speakers for this November 8-9 event can be found at www.dental.upenn.edu/endoretreat2014.

Penn Dental Medicine is an ADA CERP provider of continuing education with tuition discounts for Penn Dental Medicine alumni and faculty, as well as students. For more information on these and other continuing education programs, contact Pamela Rice, Director of Continuing Education, 215-573-6841, pamrice@dental.upenn.edu.
Advancing New Clinical Research

A new avenue of support for clinical research within Penn Dental Medicine launched this academic year with the first Schoenleber Pilot Grants awarded in support of seven new projects. Funded by the Penn Dental Medicine Schoenleber Fund, the grants provide up to $20,000 for one year for pilot clinical research projects, with priority given to those studies that also involve collaborations across basic science and other clinical disciplines.

“The purpose of the grants is to fund innovative research—to seed projects that encourage collaboration and can also lead to extramural funding,” says Dr. Dana Graves, Vice Dean for Research and Scholarship and Chairman of the recently formed Clinical Basic Research Advisory Committee, which selected the grant recipients.

The Advisory Committee, consisting of members of the School’s Board of Overseers, was established to not only evaluate clinical research projects eligible for seed funding through the Schoenleber Fund, but also to provide input on clinical research projects in their formative stages, to offer peer feedback on collaborative projects with other schools within the University, and to provide input on strategic initiatives involving both basic or clinical research at the School.

Along with Dr. Graves and Morton Amsterdam Dean Denis Kinane, the Committee includes Board of Overseers Dr. William DeVizio, Vice President for Oral Care Research & Development at Colgate-Palmolive Company; Dr. Matthew J. Doyle, Director and Senior Researcher, Procter & Gamble Company; Madeline Monaco, Senior Director of Global Scientific and Professional Affairs, Johnson & Johnson Consumer and Personal Products Worldwide; and Dr. Lewis E. Proffitt (D’73, WG’80), as well as Dr. Anh Le, Norman Vine Endowed Professor of Oral Rehabilitation and Chair, Department of Oral & Maxillofacial Surgery/Pharmacology. This year’s inaugural Schoenleber Pilot Grants were awarded for the following projects:

Effects of RANKL on mouse myeloid cells in orthodontic tooth movement
Principal Investigator (PI) Dr. Chun-Hsi Chung, Dept. of Orthodontics, with Dr. Dana Graves, Dept. of Periodontics

Correlation Between Defective Lysosome Maturation and Chronic Periodontitis
PI Dr. Jonathan Korostoff, Dept. of Periodontics, with Dr. Kathleen Boesze-Battaglia, Dept. of Biochemistry

Streptococcal GtfB as a biomarker for Early Childhood Caries Activity
PI Dr. Cyelee Kulkarni with Dr. Betty Harokopakis-Hajishengallis, Div. of Pediatric Dentistry

Growth of Cartilage on Titanium and Zirconia
PI Dr. Francis Mante, Div. of Restorative Dentistry, with Dr. Kathleen Boesze-Battaglia, Dept. of Biochemistry, and Dr. Sunday Akintoye, Dept. of Oral Medicine

Extent of DNA damage in exfoliated oral mucosal cells following CBCT radiation exposure
PI Dr. Mel Mupparapu, Dept. of Oral Medicine, with Christine Nadeau, and Dr. Faizan Alawi, Dept. of Pathology

Inactivation of Matrix Metalloproteinase-8 by Extracellular Matrix Protection Factor-2 in Dentin Cavity Walls
PI Dr. Fusun Ozer, Div. of Restorative Dentistry, with Dr. Markus Blatz, Dept. of Preventive & Restorative Sciences, Justin Kang, D’15, Dr. Marina D’Angelo, College of Osteopathic Medicine, and Dr. Lorenzo Breschi, University of Trieste, Italy

Penn Initial Phase Efficiency Study
PI Dr. Yota Stathopoulou, Dept. of Periodontics, with Dr. Denis Kinane, Morton Amsterdam Dean

Oral Cancer Walk & 5K Run

Penn Dental Medicine students once again produced a successful Oral Cancer Walk & 5K Run, building awareness of the importance of oral cancer screenings and raising nearly $19,600 in support of the Oral Cancer Foundation. Held March 29, there were a total of 425 participants, including 110 runners, 145 walkers, 4 oral cancer survivors, and 166 supporters.

In addition, faculty and residents from within oral medicine, periodontics, preventive and restorative sciences, and community health worked with students to provide free oral cancer screenings as part of the event.
ADEA Scholars

Penn Dental Medicine students Kari Hexem (D’15) and Mehreen Merchant (D’14) are recipients of the 2014 ADEA Preventive Dentistry scholarship, awarded to 12 students nationwide who have demonstrated academic excellence in preventive dentistry and community health. Both Hexem and Merchant are in Penn Dental Medicine’s community honors program. Hexem’s key honors project is working with Philadelphia FIGHT, the city’s largest provider of comprehensive care for people with HIV/AIDS, to initiate a new dental care program (see story, page 24); and through her pursuit of community honors, Merchant has been helping to provide free dental services to uninsured children through the School’s partnership with Puentes de Salud, a health clinic in South Philadelphia. Both were presented with their scholarships at the 2014 ADEA Annual Meeting in March.

Hexem was also selected as one of ten applicants from within the United States and Canada to participate in the ADEAGies Foundation/AADR Academic Dental Careers Fellowship Program (ADCFP) for the 2014-2015 academic year. ADCFP was created with the goal of providing students with a window into the day-to-day experiences of faculty members in academic dental institutions and nurture future dental educators. Hexem will work with Dr. Joan Gluch, Director of Community Oral Health and Associate Dean for Academic Policies, in the behavioral science, public health, and community health programs. Payal Verma (D’14) participated in ADCFP this academic year, working with former faculty member Dr. Andres Pinto on oral medicine courses and programs.

World Views

The international externship program continues to expand the perspective of Penn Dental Medicine students as they experience dental education and practice in far corners of the world. This academic year, 40 fourth-year students participated in the program, fulfilling their four-week hospital externship requirements at 10 sites around the globe, observing in clinics and taking part in seminars and hospital rounds.

Presently, students can select from 18 international externship sites, including three new sites added this year in Colombia, Sweden, and Sri Lanka. The schools and countries student visited this academic year include:

- Chulalongkorn University Faculty of Dentistry, Thailand
- Chung Shan Medical and Dental University, Taiwan
- Dental Institute, Sri Lanka
- Guy’s-Kings College, United Kingdom
- Princess Marina Hospital, Botswana
- Seoul National University, South Korea
- Tokyo Medical and Dental University, Japan
- Universidad El Bosque, Colombia
- University of Gothenburg Institute of Odontology, Sweden
- University of Hong Kong, Hong Kong

Penn Dental Medicine also hosted 49 international exchange students this academic year from 13 different schools.

ABOVE: Five Penn Dental Medicine students completed externships this academic year at Chulalongkorn University Faculty of Dentistry, Thailand, pictured with students and faculty from the school.
WHILE THE PENN DENTAL Medicine community may know the School’s faculty by the courses they teach or the research they conduct, this new Q&A faculty spotlight, which will become a regularly occurring part of the Penn Dental Medicine Journal, aims to get a bit more personal glimpse of them as individuals.

For this first Q&A, we talked with Dr. Robert Vanarsdall (GD’72, GD’73), Professor, Department of Orthodontics and Director of the Orthodontic/Periodontic Residency Program—a long-time member of the School’s faculty. Dr. Vanarsdall, who has held the appointment of Professor since 1993, first joined the Penn Dental Medicine faculty in 1973 after completing his postdoctoral training here in both periodontics and orthodontics. During his tenure, he has also served as Director of the Orthodontics Residency Program and Department Chairman.

What have you found most rewarding about being a member of the Penn Dental Medicine faculty?
Without a doubt, it is the students. We have a caliber of student that you simply don’t find anywhere else. Each postdoctoral class has its own personality, its own character. They challenge the faculty every day and when they do, you learn just as much as you teach. It is a true gift to be a part of a program that does that for you.

What do you view as your greatest professional accomplishment?
When I was still a student, I came to the University of Pennsylvania to do a paper. Penn had the best dental library so it was a natural resource during my studies. From my very first visit, I fell in love with the school.

When I returned years later, I had the privilege of starting the ortho/perio program. The fact that I had the opportunity to help shape and advance such an extraordinary institution—one that I idolized as a student—is without a doubt my greatest achievement.

What drew your interest to your particular field and what do you enjoy most about it?
Throughout my undergraduate studies, I was always fascinated with how people heal. The more I was exposed to periodontics and orthodontics, the more I was drawn to the idea of saving teeth. And that’s really where my passion rests: in looking beyond the cosmetic value of orthodontics to promoting orthodontics as part of a total approach to dental health.

What advice from a mentor have you carried with you in your career?
I wouldn’t say it was one specific piece of advice that stood out, but more of an approach to teaching that influenced me. When I came to Penn, I studied under and worked alongside some of the best—Mort Amsterdam, Walter Cohen—we had such an exciting group of people.

So more than any piece of advice, I studied what it was that they did to inspire me, and I have worked to emulate that in my own teaching, to hopefully inspire the next generation of leaders in our field.

What excites you most about Penn Dental Medicine today?
As someone who has been affiliated with the School for more than 40 years, there are really two things that stand out for me. First, the recent physical changes to update the facilities with state-of-the-art, cutting-edge design, equipment, and technology—the facilities have been incredibly improved. Second, our alumni are the strongest of any program that I know. And that’s important to see because it shows that they have received something in their education that they carry with them for the rest of their careers—they want to continue to be involved with our program and support Penn.

Schools/degrees?
William and Mary, BA; Medical College of Virginia, DDS, 1970; Penn Dental Medicine, postdoctoral certificates in Orthodontics, 1973, and Periodontics, 1972

If you could have dinner with anyone who would it be?
Colin Powell

Hobbies?
At home in Philadelphia I always enjoy going to see the Philly Pops and follow all the sports teams. Abroad, I love to travel.

Favorite vacation destination?
St. Barths

Best book you’ve read recently?
Wins, Losses and Lessons by Lou Holtz
“If you understand the principles of how biofilms assemble and cause diseases, we can learn how to prevent or disassemble them effectively.”

—DR. MICHEL KOO
OF KOREAN DESCENT, Dr. Hyun (Michel) Koo was born in Germany, raised in Brazil, and has worked in the United States for a decade and a half. As a result, he has mastered English, Korean, and Portuguese. But that tally does not include the fact that he is also fluent in the complementary but distinct languages of biochemistry, microbiology, and clinical dentistry.

Now a professor in the Department of Orthodontics at Penn Dental Medicine, Dr. Koo’s comfort in many realms has led him to clinically relevant discoveries in unexpected places, from the Amazon rainforest, to exotic fruits and plants, to humble beehives and cranberries.

The driving force linking these diverse discoveries is Dr. Koo’s desire to understand and find treatments against disease-causing biofilms, the sticky mix of microbes, glue-like polymers and other materials that affixes itself to many surfaces. His focus is on the biofilm known as plaque that accumulates on the tooth’s surface, leading to breakdown of enamel and onset of the disease dental caries, commonly called tooth decay or cavities.

“Our main purpose is to find out how microbes build up biofilms and cause diseases and then hopefully find a better way to prevent them,” he says.

A UNIQUE APPROACH

Dr. Koo’s interest in research emerged as a dental student in Brazil. While most students went home for summer vacation, he spent the breaks in the lab doing research that stoked his interest in biochemistry and microbiology. After graduating, he began to
practice dentistry but maintained a fervent curiosity that eventually drove him back to the classroom. But instead of seeking further dental-specific training, he entered a master’s program in food science and biochemistry at the State University of Campinas (UNICAMP), Brazil—the first dental student ever to do so.

“I thought, the oral cavity is the first point of entry for everything we consume,” he says. “I was excited to learn from the fascinating world of food science if there was anything to be discovered about preventing oral disease or promoting oral health.”

Working with a mentor (Dr. Yong Park), Dr. Koo began a search for new substances that could provide oral health benefits using biotechnology in the form of microbial enzymes and plant-food chemistry.

“Sugar is the arch criminal of dental caries as it fuels harmful bacteria to build up plaque and make acids that dissolve teeth,” says Dr. Koo. “We wanted to find specific microbes in nature that could use this sugar to produce new types of sugar molecules that have similar sweetening properties but couldn’t be metabolized in the oral cavity by bacteria.”

To find these novel sugar-metabolizing microbes, Dr. Koo collected samples in dozens of different ecosystems.

“We looked in places from the cleanest, purest ecosystems like the Amazon rainforest to rotting food and insects in São Paulo open markets,” he says.

He amassed an array of more than 3,000 samples and identified a few new microbes that could produce alternative sweetening yet non-cariogenic and non-caloric sugars; some of which are now being developed by the food industry.

A pull toward unlikely sources for discovery continued in another project Dr. Koo developed, this time looking at honeybee hives. Bees seal and protect their hives with a substance called propolis, which they produce from resins they collect as they visit a variety of plants. Dr. Koo and colleagues found that a number of small molecules isolated from propolis have anti-biofilm properties. By targeting an enzyme produced by the main culprit behind dental caries, the bacterium *Streptococcus mutans*, the researchers demonstrated that propolis-derived compounds could inhibit the formation of biofilms and the development of dental caries in rodents.

“Starting with food science and compounds found in nature, we now have a better understanding of oral diseases, and the basis of products that could prevent those diseases,” he says.

**BIOMEDICAL ARCHITECTURE IN 3D**

Dr. Koo continued his scientific inquiries in Brazil while earning a Ph.D. in oral biology (Dr. Jaime Cury, mentor) at FOP-UNICAMP in a joint program with the University of Rochester, where he subsequently joined the faculty. “At Rochester, I had an incredible opportunity for academic growth, particularly working with Dr. William Bowen, a world-authority in dental caries research,” says Koo. While continuing to look for tooth decay therapies, he also delved more deeply into understanding how pathogenic bacteria, such as *S. mutans*, assemble plaque biofilms.

Using advanced imaging technology that allows him to reconstruct a three-dimensional picture of a biofilm, Dr. Koo has found that the bacteria are able to cluster tightly together because they are enmeshed in a matrix comprised of glue-like polymer molecules and other extracellular materials.
“Biofilms are highly organized microbial communities, forming a structure almost like a tissue,” says Dr. Koo. “We show how the ‘scaffolding’ of the matrix creates a highly compartmentalized architecture, while making the biofilms very sticky on the surface.”

In 2012, Dr. Koo and colleagues published a paper in *PLoS Pathogens* demonstrating that not only does the matrix provide a scaffold and make the biofilm gooey and sticky, but it also helps to create acidic microenvironments. By devising a novel three-dimensional pH-mapping technique, Dr. Koo showed highly localized, matrix delineated acidic compartments throughout the biofilm. These niches of low pH affects everything from the balance of microorganisms that can thrive inside of them, to the behavior of *S. mutans,* to the severity of damage to tooth enamel that results in cavities.

“Our data offer new avenues for further elucidation of how cell-matrix interactions govern the formation of pathogenic biofilms, while introducing new tools and methods for biofilm research,” Dr. Koo says.

Dr. Koo’s probing of the matrix structure and biofilm microenvironment has led to new ways of thinking about how to prevent or treat plaque build-up on the teeth. Instead of solely targeting the bacteria themselves, Dr. Koo and his team are looking for ways to degrade or stop matrix production. This strategy has the added benefit of avoiding treatment with antibiotics, which some bacteria can eventually learn to evade.

**DEVELOPING NOVEL THERAPIES**

Much like his previous explorations in the Amazon and other ecosystems, Dr. Koo has continued to look in some unlikely places for new anti-biofilm compounds to target the matrix. His investigations have revealed potentially useful compounds in cranberries and in the waste product from the wine-making industry—the leftover grape skin, pulp and seeds called pomace. Dr. Koo’s research has shown that molecules found in cranberries called proanthocyanidins can reduce the synthesis of polysaccharides in the matrix.

In parallel, Dr. Koo has methodically examined the bioactivity of each of the food-derived compounds discovered in his lab to help design an effective therapy against cariogenic biofilms. He has looked at how combinations of various molecules could synergize, enhancing the overall therapeutic effect.

In one line of research, Dr. Koo and colleagues examined the possibility of pairing the proven standby, fluoride, with newly discovered anti-biofilm agents. The rationale was simple yet promising: Fluoride helps to prevent mineral loss and rebuild tooth mineral during acid attack, but has limited effects against bacteria and biofilm formation.

“We thought that including agents that impair acid production, a terpenoid, and biofilm matrix build-up, a flavonoid, could complement and enhance the effectiveness of fluoride,” Dr. Koo says.

He discovered that the therapeutic effect of this combination therapy was superior to that of the potent antimicrobial chlorhexidine as well as fluoride, effectively reducing the development of caries disease in an animal model. Recently, Dr. Koo and colleagues published a paper in *Antimicrobial Agents and Chemotherapy* revealing the mechanisms by which these food-derived compounds, together with fluoride, disrupt the assembly of the biofilm matrix, and enhance the overall anti-caries activity.

“If you understand the principles of how biofilms assemble and cause diseases, we can learn how to prevent or disassemble them effectively,” Dr. Koo says.

Studying these microbial communities ensnared in a polymeric matrix could pave the way for relevant findings beyond the mouth—ranging from barnacles on a ship hull to plaque on heart valves and medical devices—as biofilms are often associated with many diseases in humans as well as industrial and naval issues.

“We always have the idea in mind of how our research in the oral cavity might have broader applicability,” Dr. Koo says.
UNRAVELING

DISCOVERING A CROSS-KINGDOM PARTNERSHIP

This knowledge of biofilm architecture and assembly extends to an important public health concern. Dr. Koo has a special interest in a disease that affects children early in life, called early childhood caries. It involves a highly destructive and painful form of tooth decay that affects toddlers, particularly those from backgrounds of poverty.

“It’s a costly and terrible disease and very psychologically damaging to kids because they can’t even smile,” he says. “The tooth decay can become so severe that treatment often requires surgery in the operating room.”

Some of Dr. Koo’s latest work, to be published in the May issue of Infection and Immunity, aims to identify the factors that make these infections so virulent in children, with an eye toward preventing or treating the disease.

“Our data offer new avenues for elucidation of how cell-matrix interactions govern the formation of pathogenic biofilms, while introducing new tools for biofilm research.”

—DR. MICHEL KOO

Though researchers had long known S. mutans was a primary culprit in the disease, Dr. Koo and collaborators, as well as other scientists, probed dental plaque from children with the disease and almost always found the fungus Candida albicans together with high levels of S. mutans. The discovery piqued Dr. Koo’s interest, because although C. albicans sticks to the cheek and tongue, it was not believed to be a common resident in dental plaque formed on teeth.

“We were puzzled,” Dr. Koo says. “Candida usually does not associate with S. mutans, nor does it colonize teeth very effectively.”

The investigators discovered that an enzyme secreted by S. mutans, which the bacterium uses to produce extracellular polysaccharides from sugar, also binds to and enables Candida to produce a glue-like polymer in the presence of sugar. Candida then uses this same polymer to adhere to teeth and to bind S. mutans, two abilities it otherwise lacks.

“The combination of the two organisms led to a greatly enhanced production of the biofilm matrix,” Dr. Koo says, “drastically boosting the ability of the bacterium and the fungus to colonize the teeth, increasing the bulk of the biofilms and the density of the infection.”

And because of the biofilm’s compartments of low pH, this accumulation led to greater levels of acid next to the teeth that can dissolve enamel, leading to cavity formation. The investigators showed that infection by S. mutans and C. albicans together doubled the number of cavities and boosted their severity several fold in rats.

“It is an intriguing interaction where a fungus is converted into a fierce stimulator of cariogenic biofilm formation,” says Dr. Koo.

“Our data will certainly open the way to test agents to prevent this disease,” Dr. Koo says, “and, even more intriguing, the possibility of preventing children from acquiring this infection.”

NEW HORIZONS

The novelty and merit of Dr. Koo’s work has been recognized through several awards, including the IADR Distinguished Scientist Award and IADR/GSK Innovation in Oral Care Award, as well as funding from the National Institutes of Health, the U.S. Department of Agriculture, and industry. Having just come aboard Penn Dental Medicine’s faculty last September, he says he is honored to be part of what he sees as “a world-class winning team for research,” with ample opportunities for cross-disciplinary collaboration within the School and across the campus to make new discoveries and to bring them into clinical use. For example, Dr. Koo is starting to collaborate with Dr. Henry Daniell, Professor, Departments of Biochemistry and Pathology, on a project to investigate the potential of using his antimicrobial peptides to control cariogenic biofilms.

Dr. Koo’s recent sabbatical leave in Dr. Ken Yamada’s lab (a leading scientist in cell/matrix biology) at NIDCR/NIH brought new ideas to study biofilms. He’s particularly interested in taking advantage of the nanotechnology and engineering expertise at Penn, perhaps utilizing the new Singh Center for Nanotechnology, located just at the other end of Penn’s campus from Penn Dental Medicine. He plans to build on previous work, in which he has explored strategies for drug delivery using nanoparticles.

“One of the major challenges of topically-delivered compounds is rapid clearance of the agents in the mouth before they have time to exert their full therapeutic effect,” he notes.

By engineering low-cost and high adhesive nano-carriers, the therapeutics can be retained for longer periods of time, increasing drug efficacy. He hopes these technologies will lead to development of more-effective therapies against biofilm-associated oral diseases.

At Penn Dental Medicine, Dr. Koo sees himself able to fully realize the potential of these and other clinically relevant technologies.

“There are so many ways different disciplines can help us, from biomedical sciences to nanotechnology to engineering approaches and Penn’s philosophy is centered in promoting the integration of knowledge,” he says. “I’m in the right environment with all the necessary support to further advance our mission of conducting innovative research and developing new therapies to make a difference.”

—By Katherine Unger Baillie
TOP: Members of the Koo Lab, left to right: Jinzhi He, Dr. Yuan Liu, Dr. Michel Koo, Yong Li, Dr. Lizeng Gao, Dr. Geelsu Hwang, Dr. Dongyeop Kim.

ABOVE: The 3D architecture of a fungal-bacterial biofilm.

RIGHT: This close-up image of the biofilm illustrates the spatial relationship between Candida albicans cells and a Streptococcus mutans microcolony. Yeast (red) and hyphal forms of C. albicans (blue) are found associated in the periphery of the microcolony structure (green); specific areas where fungal cells are associated with the microcolony are highlighted in orange.
Endodontics vs. Implants: A Modern Clinical Dilemma

DENTAL IMPLANTS are the most important advancement in dentistry in the 21st century. However, with an increase in the popularity of implants, endodontically treated teeth have been debated by some as inferior to implants in regard to long-term stability and retention. Furthermore, there has been a tendency to take the simplified approach of ‘extraction and implant;’ but this does not always prove to be as simple or ethical as some would like to believe. We should not forget that the ultimate goal of our profession is keeping one’s dentition in function throughout a lifetime.

Modern endodontics is fundamentally different from the past. Modern techniques, some developed within our own Endodontics Department, utilize the surgical operating microscope for better visualization and identifi- cation of canals, electrometric length measure- ment devices for accurate and objective canal length determination, rotary nickel-titanium (NiTi) instruments to prepare canals with ease and better negotiate curved canals, Piezo- ultrasonic instruments for root end preparation, improved disinfection protocols, and cone beam computer tomography for better and accurate diagnosis and treatment planning.1

Endodontic therapy performed by a properly trained endodontist following all these advanced techniques guarantees over 90% positive long-term outcomes.1 Furthermore, failed endodontic cases can be predictably and successfully treated by using a new microsurgical approach of apical surgery, which is fundamentally different from the “apicoectomy” practiced and taught in the last century. We now call it “endodontic microsurgery.” The outcome of endodontic microsurgery of failed endodontic teeth with a persistent periapical lesion but minimum periodontic defects is well over 90% for long-term follow-ups.2

How about Implants?
The survival rate of implants performed in many clinical centers supported by industries is extremely high, over 90%.5 However, this high survival rate does not reflect the everyday practice environment. First, in center studies, if the initial implant fails before loading, that case would not be counted as a failure. Survival is counted only after loading. Second, inclusion and exclusion criteria are so strict that results of such studies do not reflect the average population. If volunteers are smokers, have diabetes, or inferior bone quality, they are not included in a center study. Thus, actual success or survival of implants in the general population would not be 95-96%, but significantly lower, below 80%.6 If 95% or so is the true survival rate of implants, why do we see so many implant failures?

And while the loss of an implant would be downright failure, how about the significant loss of bone covering an implant or persistent peri-implantitis? Regardless, the implant is not a panacea.

How do the two compare?
Many studies show the comparison between endodontically treated teeth and implants. No statistically significant difference was found between dental implants and endodontically treated teeth over a period of six years.4 The same statement is reported in more recently published meta-analysis of the survival of single-tooth-restored dental implants versus restored endodontically treated teeth.5

In addition, at the University of Minnesota, all specialists—oral surgeons, periodontists, and endodontists—compared the long-term outcome of a matched pair of endodontically treated teeth and single-tooth implants.3 Seven- to nine-year recalls showed a positive outcome of 74% in implants and 84% in endodontics. This type of matched pair, long-term study performed at a university without the support of industries provides more objective and non-biased results.

Both implant and endodontic therapy show great outcome rates if the treatments are appropriately chosen and rendered by well trained specialists. Both treatment options should be seen as complementing each other, not as a competition, and serve the overall goal in dentistry—providing care that supports the long-term health and benefit of the patient, being least invasive, and incorporating function, comfort, and esthetics. To achieve these goals, it is important for clinicians to be fully aware of the truth on the long-term outcome of both implants and endodontic therapy with an intention of maintaining natural teeth as long as possible.

Recent articles published in JADA raised an important issue.6 The results of the in-depth systematic review show “…implant survival rates do not exceed those of compromised but (continued on page 28)
Scholarly Activity

Following is a snapshot by the numbers of the scholarly activity within the School's faculty over the past five years (January 2009–December 2013). Listed are the top 20 by their h index* (see definition below) and the number of research articles published.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Dr. George Hajishengallis, Dept. of Microbiology</td>
<td>54</td>
<td>18</td>
</tr>
<tr>
<td>Dr. Henry Daniell, Depts. of Pathology &amp; Biochemistry</td>
<td>41</td>
<td>16</td>
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<td>Dr. Dana Graves, Dept. of Periodontics</td>
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<td>Dr. Anh Le, Dept. of Oral &amp; Maxillofacial Surgery/ Pharmacology</td>
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<tr>
<td>Dr. Denis Kinane, Depts. of Periodontics &amp; Pathology</td>
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<tr>
<td>Dr. Gary Cohen, Dept. of Microbiology</td>
<td>26</td>
<td>13</td>
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<tr>
<td>Dr. Elisabeth Barton, Dept. of Anatomy &amp; Cell Biology</td>
<td>31</td>
<td>12</td>
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<tr>
<td>Dr. Hyun (Michel) Koo, Dept. of Orthodontics</td>
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<td>11</td>
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<tr>
<td>Dr. Markus Blatz, Dept. of Preventive &amp; Restorative Sciences</td>
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<td>7</td>
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<td>Dr. Sunday O. Akintoye, Dept. of Oral Medicine</td>
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<tr>
<td>Dr. Hydar Ali, Dept. of Pathology</td>
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<tr>
<td>Dr. Carolyn Gibson, Dept. of Anatomy &amp; Cell Biology</td>
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<td>Dr. Frank Setzer, Dept. of Endodontics</td>
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<td>6</td>
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<tr>
<td>Dr. Claire Mitchell, Dept. of Anatomy &amp; Cell Biology</td>
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<tr>
<td>Dr. Yan Yuan, Dept. of Microbiology</td>
<td>13</td>
<td>6</td>
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<tr>
<td>Dr. Faizan Alawi, Dept. of Pathology</td>
<td>22</td>
<td>5</td>
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<tr>
<td>Dr. Kathleen Boesze-Battaglia, Dept. of Biochemistry</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>Dr. Kelly Jordan-Sciutto, Dept. of Pathology</td>
<td>12</td>
<td>5</td>
</tr>
<tr>
<td>Dr. Bekir Karabucak, Dept. of Endodontics</td>
<td>11</td>
<td>5</td>
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<tr>
<td>Dr. Marjorie K. Jeffcoat, Dept. of Periodontics</td>
<td>9</td>
<td>5</td>
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</table>

* The h index was developed by J.E. Hirsch, Department of Physics, UCSD, and it attempts to measure the impact of an individual or department’s scientific research output. The calculation is based on a list of publications ranked in descending order by the “times cited” count. As an example, an h index of 20 means there are 20 items that have 20 citations or more each. Hirsch’s full article on the h index can be found in PNAS 102 (46): 16569-16572 November 15 2005.

These lists were generated using the Scopus database, and the Author IDs found within that system. Articles published in journals that are not indexed in Scopus, are not included in the calculation. The articles that were included were published between January 2009 and December 2013. It should be noted that publication and citation practices differ among disciplines and specialties.

ABOVE: From a recent study of leukocyte adhesion deficiency patients looking at inflammatory bone loss; published in Science Translational Medicine, by Dr. George Hajishengallis, Professor, Department of Microbiology (copyright Niki Moutsopoulos and George Hajishengallis, 2014).
## High Impact Basic Science Articles

Among the original research articles published within the Penn Dental Medicine basic science departments over the past year, following are the articles that appeared in journals with the five highest impact factors.*

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>ARTICLES</th>
<th>JOURNAL</th>
<th>JOURNAL IMPACT FACTOR*</th>
<th>DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kwon, K.-C., Nityanandam, R., New, J.S., Daniell, H.</td>
<td>Oral delivery of bioencapsulated exendin-4 expressed in chloroplasts lowers blood glucose level in mice and stimulates insulin secretion in beta-TC6 cells</td>
<td><em>Plant Biotechnology Journal</em></td>
<td>6.3</td>
<td>Biochemistry/Pathology</td>
</tr>
<tr>
<td>Aranasu, D., Cairns, T.M., Whitbeck, J.C., Saw, W.T., Rao, S., Eisenberg, R.J., Cohen, G.H.</td>
<td>Regulation of herpes simplex virus gB-induced cell-cell fusion by mutant forms of gH/gL in the absence of gD and cellular receptors</td>
<td><em>mBio</em></td>
<td>5.6</td>
<td>Microbiology</td>
</tr>
<tr>
<td>Nuth, M., Guan, H., Zhukovskaya, N., Saw, Y.L., Ricciardi, R.P.</td>
<td>Design of potent poxvirus inhibitors of the heterodimeric processivity factor required for viral replication</td>
<td><em>Journal of Medicinal Chemistry</em></td>
<td>5.6</td>
<td>Microbiology</td>
</tr>
</tbody>
</table>

*The Impact Factor identifies the frequency with which an average article from a journal is cited in a particular year. This number can be used to evaluate or compare a journal’s relative importance to others in the same field. Journal impact factors are reported in Thomson Reuters Journal Citation Reports®.* The JCR Science Edition, 2012, was used for these figures.
## High Impact Clinical Science Articles

Among the original research articles published within the Penn Dental Medicine clinical science departments over the past year, following are the articles that appeared in journals with the five highest impact factors.*

<table>
<thead>
<tr>
<th>AUTHORS</th>
<th>ARTICLES</th>
<th>JOURNAL</th>
<th>JOURNAL IMPACT FACTOR*</th>
<th>DEPARTMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ponugoti, B., Xu, F., Zhang, C., Tian, C., Pacios, S., Graves, D.T.</td>
<td>FOXO1 promotes wound healing through the up-regulation of TGF-B1 and prevention of oxidative stress</td>
<td><em>Journal of Cell Biology</em></td>
<td>10.8</td>
<td>Periodontics</td>
</tr>
<tr>
<td>Shi, S., Zhang, Q., Atsuta, I., Liu, S., Chen, C., Shi, S., Le, A.D.</td>
<td>IL-17-mediated M1/M2 macrophage alteration contributes to pathogenesis of bisphosphonate-related osteonecrosis of the jaws</td>
<td><em>Clinical Cancer Research</em></td>
<td>7.8</td>
<td>OMFS &amp; Pharmacology</td>
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</table>

## High Impact Review Articles

Among the review articles published by Penn Dental Medicine faculty over the past year, following are the articles that appeared in journals with the five highest impact factors.*

<table>
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<tr>
<th>AUTHORS</th>
<th>ARTICLES</th>
<th>JOURNAL</th>
<th>JOURNAL IMPACT FACTOR*</th>
<th>DEPARTMENT</th>
</tr>
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<tbody>
<tr>
<td>Hajishengallis, G., Mantovani, A., Moretta, A., Lambris, J.D.</td>
<td>Aegean reflections on innate immunity</td>
<td><em>Nature Immunology</em></td>
<td>26.2</td>
<td>Microbiology</td>
</tr>
<tr>
<td>Kwon, K.-C., Verma, D., Singh, N.D., Herzog, R., Daniell, H.</td>
<td>Oral delivery of human biopharmaceuticals, autoantigens and vaccine antigens bioencapsulated in plant cells</td>
<td><em>Advanced Drug Delivery Reviews</em></td>
<td>12.9</td>
<td>Biochemistry</td>
</tr>
<tr>
<td>Hajishengallis, G., Chavakis, T.</td>
<td>Endogenous modulators of inflammatory cell recruitment</td>
<td><em>Trends in Immunology</em></td>
<td>9.5</td>
<td>Microbiology</td>
</tr>
<tr>
<td>Stoopler, E.T., Kuperstein, A.S.</td>
<td>Glossitis secondary to vitamin B12 deficiency anemia</td>
<td><em>CMAJ: Canadian Medical Association Journal</em></td>
<td>6.5</td>
<td>Oral Medicine</td>
</tr>
<tr>
<td>Stoopler, E.T., Sollecito, T.P.</td>
<td>Temporomandibular disorders</td>
<td><em>CMAJ: Canadian Medical Association Journal</em></td>
<td>6.5</td>
<td>Oral Medicine</td>
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</table>
What results were most surprising or of particular clinical relevance?
When FOXO1 was deleted in keratinocytes normal wound healing was significantly delayed. We found that this was largely due to FOXO1 regulation of two very important aspects of wound healing. The first was that FOXO1 was needed for keratinocytes to migrate. The second was that FOXO1 protected the cells during wound healing from oxidative stress. When FOXO1 was deleted, keratinocytes did not migrate as well and suffered damage from oxidative stress.

What conclusions or other applications could the findings lead to?
The simple answer would be that increasing FOXO1 should help wound healing based on our result that FOXO1 is needed for normal healing to occur. However, it is more complicated than this since high levels of FOXO1 are just as detrimental as not having enough FOXO1.

What were the key objectives of this study?
The events in wound healing are carefully orchestrated. The concept that we investigated was that a transcription factor would coordinate the regulation of events that are needed in order for wound healing to occur properly. Based on our previous work, we focused on the transcription factor FOXO1. Transcription factors are important in wound healing because they control the expression of other genes, which are needed for healing to occur.

What were some of the important techniques used in the study?
The most important aspect of the study from a technical standpoint was the deletion of FOXO1 in a single type of cell in vivo. These studies used a genetically modified mouse in which the FOXO1 transcription factor was deleted only in keratinocytes, an epithelial cell type that lines mucosal and skin surfaces. All of the other cell types were normal, allowing us to focus on the impact of deleting FOXO1 only in keratinocytes.

What were some of the important techniques used in the study?
In this study, we developed a BRONJ-disease model in multiple myeloma (MM)-burdened mice. The important techniques include therapeutic approaches using adoptive transfer of ex vivo expanded M2 macrophages, or pharmacological blockage of IL-17 activity to treat BRONJ.

What conclusions or other applications could the findings lead to?
The study concludes that IL-17-mediated M1/M2 macrophage alteration induced by zoledronate may be beneficial for cancer therapy, but might have contributed to an increased susceptibility to BRONJ development.
LOCALLY DELIVERED SALICYLIC ACID FROM A POLY(ANHYDRIDE-ESTER): IMpACT ON DIABETIC BONE REGENERATION

Journal of Controlled Release (7.6 Impact Factor)
Wada, K., Yu, W., Elazizi, M., Barakat, S., Ouimet, M.A., Rosario-Meléndez, R., Fiorellini, J.P., Graves, D.T., Uhrich, K.E.

What were the key objectives of this study?
Diabetes mellitus (DM) involves metabolic changes that can impair bone repair, including a prolonged inflammatory response. A salicylic acid-based poly(anhydride-ester) (SA-PAE) provides controlled and sustained release of salicylic acid (SA) that locally resolves inflammation. This study investigates the effect of polymer-controlled SA release on bone regeneration in diabetic rats where enhanced inflammation is expected.

What were some of the important techniques used in the study?
This study is the first time that an SA-PAE has been applied to diabetic animals for bone regeneration purposes. The difficult part in this project was the surgical procedure and postoperative management. Because of the diabetic animals, the grafting procedure needed to be minimally invasive and postoperative monitoring has a significant impact on wound healing process.

What results were most surprising or of particular clinical relevance?
We found that treatment with SA-PAE enhances bone regeneration in diabetic rats. Plus, it can accelerate bone regeneration in normoglycemic (non-diabetic) animals. It could be possible for this polymer to combine with a bone graft in order to achieve more predictable bone formation for oral and maxillofacial reconstruction purposes.

What conclusions or other applications could the findings lead to?
The advantages of localized, controlled, and sustained SA release, our polymer system enables the incorporation of other bioactives (such as insulin) to further improve bone regeneration.

ORAL DELIVERY OF BIOENCAPSULATED PROTEINS ACROSS BLOOD-BRAIN AND BLOOD-RETINAL BARRiERS

Molecular Therapy (7.0 Impact Factor)

What were the key objectives of this study?
The goal of this study is to develop a low cost, orally deliverable drug for long-term treatment of Alzheimer’s patients at home.

What were some of the important techniques used in the study?
The most important concept is bio-encapsulation of therapeutic proteins. Plant cells protect protein drugs from acids and enzymes in the digestive system. However, when plant cells carrying therapeutic proteins reach the gut intact, they are broken down by microbes colonizing the gut, thereby releasing the drugs in the gut for rapid absorption into the blood circulatory system.

What results were most surprising or of particular clinical relevance?
The most surprising observation is our ability to deliver therapeutic proteins across the blood-brain barrier, which tightly regulates the transport of molecules to the brain, blocking bio-therapeutics from reaching their site of action. Alzheimer’s disease results in accumulation of the Beta amyloid plaques in the brain. Myelin basic protein (MBP) inhibits amyloid fibril formation through binding and degradation of amyloid by intrinsic protease activity. Oral delivery of MBP fused to a transmucosal carrier (CTB) that facilitates delivery of proteins to the circulatory system from the gut degraded amyloid plaques in post-mortem human Alzheimer’s disease brains and in Alzheimer’s mouse model. Another surprising finding was the observation of amyloid plaques in the retina and their clearance after oral delivery of CTB-MBP. This raises an interesting question—whether dementia and decrease in vision could both contribute to early symptoms of Alzheimer’s disease (especially the inability to recognize close relatives).

ABOVE: Compared to controls, Dr. Daniell’s strategy (lower right) reduced plaques in the brain tissue of Alzheimer’s patients.
Students with the interest, motivation, and required academic achievement can earn their DMD degree with honors. The competitive honors program is designed to enable students develop the skills to leverage their leadership potential in the areas of research, clinical dentistry, community health, and dentistry for the medically complex (oral medicine).
MOST WEDNESDAY afternoons, Kari Hexem (D’15) takes the subway from Penn Dental Medicine’s West Philadelphia campus to 13th and Locust streets, where she spends the next four hours helping to provide dental care to HIV/AIDS patients. Katharine Woehling (D’14) has had the opportunity to work on advanced clinical cases this year, while the research Jae Yeon Jang (D’14) did on a bacterium associated with periodontitis was published in a professional journal.

These three students have gained valuable experiences in patient care and research through Penn Dental Medicine’s honors program. Since it was established in October 2010 with options in community health, clinical, and research honors, about 200 students demonstrating interest, motivation, and academic achievement have participated in the program.

“At Penn Dental Medicine, we pride ourselves not only on providing an excellent education, but on providing opportunities for students to pursue their passions.”
— DR. KATHLEEN BOESZE-BATTAGLIA

“The honors program is important for several reasons,” says Dr. Boesze-Battaglia. “At Penn Dental Medicine, we pride ourselves not only on providing an excellent education, but on providing opportunities for students to pursue their passions. This program enhances the student experience by providing them a strong foundation for future specialties, as well as providing us an excellent opportunity to recruit a diverse student body as it relates to healthcare goals.”

For instance, she notes that more than half the students in the research honors program have published research papers, and many have won travel awards and presented posters to the International and American Associations for Dental Research. Students in community health honors, with Director of Community Oral Health and Associate Dean for Academic Policies Joan Gluch as director, spend 120 hours in a variety of community health settings and also can propose a site of their choosing. Fourth-year students in clinical honors work on advanced procedures in the William W.M. Cheung Advanced Dental Care Clinic.

The new program in oral medicine, dentistry for the medically complex, gives students the opportunity to work with medically complex patients—those impacted by a range of diseases and required medications—and participate in the professional dialogue and collaboration with all healthcare providers to better care for these patients, says Dr. Thomas Sollecito, Chair and Professor of Oral Medicine.

Roma Ghandi (D’14) one of the first students in oral medicine honors, says it “allows me to be exposed to very ill patients and, as a result, train to monitor and evaluate changes in patients’ health and medications. By working closely with faculty and residents, I am able to develop specific treatment plans to fit the needs of patients based on their medical histories.”
FOR KARI HEXEM (D’15), applying to the honors program in community health last year was a natural fit. She had been volunteering with Philadelphia FIGHT, the city’s largest provider of comprehensive care for people with HIV/AIDS, as an intern with Penn’s Bridging the Gaps program, which focuses on community healthcare. Hexem wanted to continue to work with the agency and hoped the honors program would provide an institutional framework and support for her to do so.

This year, under the auspices of the community health honors program, Hexem and two other honors students, fellow third-year Jonathan Vo and fourth-year Tyler Smith, have helped initiate a new dental care program at Philadelphia FIGHT, where they see up to seven patients on a typical Wednesday afternoon. Hexem helped write a grant proposal that provided the organization with portable dental equipment and supplies to support their work.

“We do screenings, look inside their mouths, talk about any complaints, provide information, rate their dental anxiety,” Hexem explains. “If they need care, we try to connect them with the appropriate clinic” at Penn Dental Medicine.

For Hexem, the motivation is clear: helping to provide dental care to a population that is underserved and at risk of serious complications because of their compromised immune systems. But the benefit to her is equally clear: “Dental school is very overwhelming,” she says. “Having these four hours set aside every week has been an incredible blessing. It provides a counterbalance to more didactic learning and allows me to focus on something I feel really committed to.”

Philadelphia FIGHT is one of several organizations served by community honors students; others include healthcare clinics at Homeless Health Initiative, Puentes de Salud clinic in South Philadelphia, and Sayre Health Center in West Philadelphia.

At FIGHT, the Penn Dental Medicine honors students often deal with a wide range of issues that impact their patients. “We’re learning how to appropriately interact with and triage a patient population with complex needs,” says Hexem, who plans to work in community health dental care.

The honors program provides “a tremendous opportunity to give students more support in learning about community health endeavors,” she says. “Now, when I think about community health dentistry, I have a clear vision of what this could look like, both the frustrations and the rewards.”
KATHARINE WOEHLING (D’14) applied to the clinical honors program for her senior year because she wanted “to expand my clinical knowledge and be introduced to more challenging dental procedures.”

And challenge is what she got, working with faculty on such procedures as restoring implants and other complex treatments. “I’ve been introduced to new techniques, new equipment, and dental materials that I otherwise may not have been exposed to in dental school, and for this I’m very grateful,” Woehling says. “I learned new techniques for sculpting and staining composite resin restorations to enhance my restorative dentistry skills.” She also learned to use the Lava intraoral scanner to fabricate impressions digitally.

In addition to gaining experience working on tough cases and with new materials and tools, Woehling applied to the honors program because she “wanted to be exposed to the teaching styles of many clinical faculty members to learn how to treatment plan from different perspectives.”

Woehling says her honors experience has been a valuable bridge between dental school and private practice, helping her develop the skills to formulate more comprehensive treatment plans and observe how faculty members interact with patients to explain procedures and treatment plans. “Communicating with patients is one of the most important parts of dentistry, and I know I will incorporate the skills I learned in honors clinic into my future practice,” she says.

The honors program has provided Woehling with other benefits as well. “I’ve learned to be a more organized and efficient dental professional,” she explains. “The program has helped me to become more independent, while being guided by talented faculty. The collaborative environment educates students through a team approach, and because of this I have learned so much from my peers.”
AS A RESEARCH HONORS STUDENT, JAE YEON JANG (D’14) collaborated with Penn Dental Medicine faculty on a study of a protein, cytolethal distending toxin (CDT), which is produced by a bacterium associated with some forms of periodontitis.

“I was involved in creating various mutations on CDT toxins in an attempt to identify structural and functional motifs,” Jang says. “I was also localizing various subunits of CDT during its intoxication process using fluorescence tags and observing them under the confocal microscope.”

The findings were published May 2012 in the journal Infection and Immunity of the American Society for Microbiology. For the research honors program, Jang worked under the tutelage of Dr. Joseph DiRienzo, Professor, Department of Microbiology, who was a co-author of the study along with several other Penn Dental Medicine faculty members.

Jang said his work on the project was not just about learning what CDT does, but also about putting scientific concepts into practice. “You really gain a lot of experience in vast areas of research techniques that are commonly used,” he says. “And these experiences will be very useful if I decide to participate in further research during my specialty training.”

Jang was interested in participating in the research honors program because he “believes strongly that research is what connects basic science to real life.” As an undergraduate at the University of Wisconsin-Madison, he worked on research projects for three years and was pleased to be able to continue to do so at Penn Dental Medicine.

“We learn so many basic science concepts through lectures and reading textbooks,” Jang says. “But we have limited opportunities to use what we learn in basic science classes in real life. The research honors program gave me that opportunity. I was actually at the frontier of the specific subject that I researched.”

Although he plans to go into practice after graduation, he is not ruling out the possibility of doing research in the future. Meanwhile, he’s pleased to have had the experience to immerse himself in a research project with Penn Dental Medicine faculty. “I believe offering this type of research opportunity for students is what distinguishes Penn from other dental schools,” Jang says.

—By Debbie Goldberg
ANATOMY & CELL BIOLOGY

RETIREE

Dr. Carolyn Gibson, Professor, Dept. of Anatomy & Cell Biology, retired effective December 31, 2013 after 27 years of service to the School. Her teaching and accomplished research has contributed greatly to the School and to the field of dental medicine as a whole. In 2003, she was named the Distinguished Scientist in Oral Biology by the International Association for Dental Research for her extensive work on the molecular and genetic bases of tooth enamel formation. She was also recognized in 2002 with the American Association for Dental Research William Gies Award for the best paper in the Journal of Dental Research, and again in 2008 with a second William Gies Award in the area of biological research. She continues to be active in research at the School. For the past two years, Dr. Gibson has also served as Interim Chair of the Department; Dr. Elisabeth Barton, Associate Professor, assumed this leadership role effective January 1, 2014.

SELECTED PUBLICATIONS

Recently published work by department researchers (indicated in bold).


Endodontics

AWARDS & ACHIEVEMENTS

Dr. Martin Trope, Clinical Professor of Endodontics, has been awarded the Jens Ove Andreassen Lifetime Achievement Award, by the International Association for Dental Traumatology (IADT). This award is given in recognition of exceptional contributions to the field of dental traumatology in research, teaching, and engagement and hard work for the IADT.
(continued from page 16) 

adequately treated and maintained teeth.” This study supports “the notion that the decision to extract a tooth and place a dental implant should be made cautiously.” The study further argues that a tooth can be extracted and replaced at any time; however, extraction is a definitive and irreversible treatment.

It is clear that implant-industry-supported studies have been steering our clinical dentistry down a dangerous and risky path. Saving teeth is becoming a dirty word in implant dentistry, although a majority of patients want to save their teeth. It is about time we reexamine what we are doing judiciously and ethically.

REFERENCES


**RECENT GRANT AWARDS**

NIDCR/NIH/DHHS grant to determine the mechanisms whereby P. gingivalis manipulates the host response to stabilize dysbiotic microbial communities leading to inflammation and periodontitis. Principal Investigator: Dr. George Hajishengallis, Professor

**AWARDS & ACHIEVEMENTS**

Dr. Thomas Sollecito, Professor and Chair of Oral Medicine, recipient of the Thomas Evans Achievement Award, presented by the Penn Dental Medicine Alumni Society, May 2014. See story page 34.

Dr. Eric Stoopler, Associate Professor of Oral Medicine, was inducted as a Fellow of the International College of Dentists, October 2013; he was also Fellow of the International College of Dentists, October 2013; he was also Fellow of the International College of Dentists.

**SELECTED PUBLICATIONS**

Recently published work by department researchers (indicated in bold).


Idahas C, Berardi TR, Shkolnikov R, Stoopler ET. Thrombocytopenia absent radius (TAR) syndrome: A case report and review for oral health care providers. Special Care in Dentistry, 2013


Stoopler ET, Kuperstein AS. Glossitis secondary to vitamin B12 deficiency anemia. JAMA, 2013;185(12)


**STUDENT TRAINING**

Predoctoral students with an interest in oral surgery now have new opportunities to explore the field through the Oral & Maxillofacial Surgery Foundation’s (OMSF) Student Research Training Award. This is the first time that the Department has applied for and received support through this program, which will fund five research projects. “We want to provide students who are interested in oral and maxillofacial surgery a mechanism to get involved in research specific to the field,” says Dr. Helen Giannakopoulos, Associate Professor and principal investigator of the grant. “We already have had multiple inquiries from students about participating.” Students will work on research projects with Dr. Giannakopoulos and Dr. Joli Chou, Assistant Professor of Oral & Maxillofacial Surgery/Pharmacology.


Recent published work by department researchers (indicated in bold).


**ORTHODONTICS**

**AWARDS & ACHIEVEMENTS**

**Dr. Chun-Hsiung Chung**, Chauncey M. F. Egel Endowed Chair, Dept. of Orthodontics, was appointed by the Commission on Dental Accreditation (CODA) as a Commission Consultant for the year 2014/2015, starting October 2014.

**SELECTED PUBLICATIONS**

Recently published work by department researchers (indicated in bold).

This year’s annual meeting of alumni and friends of the Department of Orthodontics will feature a CE symposium on the “Accelerated Osteogenic Orthodontics™” (AOO) Procedure, discussing the clinical procedure and physiologic benefits, including increased range of movement and long-term stability. Featured speakers will be Drs. William Wilcko and M. Thomas Wilcko; the 6-CE credit program will be held at the Union League of Philadelphia on Oct. 10, 2014. For more information and to register, visit www.dental.upenn.edu/pennortho2014.
**Pathology**

**Selected Publications**

Recently published work by department researchers (indicated in bold).


Also see H Daniell under Biochemistry and DF Kinane under Periodontics, who both have joint appointments in the Dept. of Pathology.

**Recent Grant Awards**

National Institute of Allergy & Infectious Diseases/NIH/NIHHS grant using humanized mice to determine the role of MrgX2 expressed in human mast cells on IgE-mediated anaphylaxis and asthma.

Principal Investigator: Dr. Hydar Ali, Professor

NIDCR/NIH/NIHHS grant to study the molecular biology of virulence in periodontal disease, testing the hypothesis that a bacterial protein toxin (LtxA) of this organism undergoes structural reorganization as the molecule transitions from an aqueous to the membrane environment to kill human immune cells.

Principal Investigator: Dr. Edward Lally, Professor

**Periodontics**

**AWARDS & ACHIEVEMENTS**

Dr. Arnold Weisgold (GD’65), Adjunct Professor, Dept. of Periodontics, received the Achievement Medal Award from Alpha Omega International Dental Fraternity.

**SELECTED PUBLICATIONS**

Recently published work by department researchers (indicated in bold).


PREVENTIVE & RESTORATIVE SCIENCES

APPOINTMENTS
Dr. Jeffrey Ingber (GD’72), Clinical Professor of Restorative Dentistry, has been named Director of the Honors Program in Clinical Dentistry. He will continue to expand the honors program as a platform for innovative and creative clinical education. Dr. Ingber is one of only 100 international dentists elected to membership in the esteemed American Academy of Esthetic Dentistry.

PUBLICATIONS
Recently published work by department researchers (indicated in bold).


AWARDS & ACHIEVEMENTS
Dr. Fusun Ozer, Instructor, Div. of Restorative Dentistry, is the recipient of the 2013-14 Rabinowitz Award for Excellence in Research. This Penn Dental Medicine award, endowed by Josephine and Joseph Rabinowitz, is designed to help Penn Dental Medicine faculty undertake pilot projects that will enable them to successfully apply for extramural sources of funding. This year’s applications focused on new projects that also involve new collaborations between Penn Dental Medicine faculty and other investigators within the School or the Penn community. Dr. Ozer’s project is “Influence of PVM/MA copolymer on bacterial adherence to dentin and resin composite surfaces” and will involve a new collaboration with Dr. Joseph DiRienzo, Dept. of Microbiology, who will perform the microbiological analyses. Drs. Francis Mante and Markus Blatz, Dept. of Preventive & Restorative Sciences, will also collaborate on the project. PVM/MA is a copolymer of methylvinyl ether and maleic acid, which has antibacterial properties. The hypothesis of the project is that incorporation of PVM/MA into adhesive bonding agents will reduce bacterial adherence to dentin.
Philby Magazine’s Top Dentists

Penn Dental Medicine alumni were once again present in impressive numbers in Philadelphia Magazine’s annual Top Dentists issue, making up 49% of the 212 area dentists recognized in the 2014 Top Dentists listing. Here is a breakdown of the number of alumni included in each specialty:

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Alumni Included</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>General Dentistry</td>
<td>7 of 29 (24%)</td>
<td></td>
</tr>
<tr>
<td>Cosmetic Dentistry</td>
<td>12 of 26 (46%)</td>
<td></td>
</tr>
<tr>
<td>Orthodontics</td>
<td>17 of 28 (61%)</td>
<td></td>
</tr>
<tr>
<td>Pediatrics</td>
<td>9 of 23 (39%)</td>
<td></td>
</tr>
<tr>
<td>Periodontics</td>
<td>14 of 27 (52%)</td>
<td></td>
</tr>
<tr>
<td>Endodontics</td>
<td>14 of 28 (50%)</td>
<td></td>
</tr>
<tr>
<td>Prosthodontics</td>
<td>16 of 24 (67%)</td>
<td></td>
</tr>
<tr>
<td>Oral Surgery</td>
<td>11 of 22 (50%)</td>
<td></td>
</tr>
<tr>
<td>Oral Medicine</td>
<td>3 of 5 (60%)</td>
<td></td>
</tr>
</tbody>
</table>

Philadelphia Magazine arrives at its Top Dentists listing by sending letters to the address on record for every dentist in Philadelphia and the surrounding seven-county area, inviting them to nominate up to three peers for Top Dentists in each dental specialty via an online survey. Six hundred and fourteen dentists took the survey for 2014, amounting to more than 5,000 votes. The resulting list of 20 Top Dentists in each specialty (including all those who were tied) was reviewed by an advisory board made up of 11 dentists, chosen for their credentials and the high number of votes they received.

49% of dentists in Philadelphia Magazine’s 2014 Top Dentists issue were Penn Dental Medicine alumni

Major Gifts Officer Joins Development, Alumni Team

Penn Dental Medicine’s Office of Development and Alumni Relations has added a new member to its team, welcoming Kevin A. Brown in March as a Major Gifts Officer.

Brown brings more than 14 years of experience in alumni relations and development to this new role, most recently working with Arcadia University. A graduate of Hampshire College, Brown worked as an actor in Boston and New York City for 15 years before being asked to head up the Alumni Relations Department at his alma mater. He has also worked in support of development at World Learning Institute (School for International Training) and Trinity College.

“I’m looking forward to getting on the road and meeting Penn Dental Medicine alumni and friends,” says Brown. He can be reached at brokevin@dental.upenn.edu.
THOMAS EVANS ACHIEVEMENT AWARD

DR. THOMAS SOLLECITO (D’89, GD’91) RECEIVES THE PENN DENTAL MEDICINE ALUMNI SOCIETY’S HIGHEST RECOGNITION AWARD—THE 7TH RECIPIENT SINCE THE AWARD’S INCEPTION.

AS DR. THOMAS SOLLECITO (D’89, GD’91) marks his 25th class reunion at this year’s Alumni Weekend, the Penn Dental Medicine Alumni Society is also paying special tribute to his 25-year career in dental medicine with the presentation of the Thomas Evans Achievement Award. The Evans Award is the Society’s highest recognition award, honoring alumni who have shown innovation, excellence, and leadership in the profession of oral healthcare; Dr. Sollecito is only the seventh recipient since the award’s establishment in 1993.

“I’m honored and at a loss for words to receive this award,” he says, “I know four of the previous winners, three of whom were my teachers, and I look at them as true giants in dental medicine. To be included in this group… I am incredibly humbled.”

After earning his DMD and completing general practice and oral medicine residencies at Penn Dental Medicine, Dr. Sollecito joined the School’s faculty, rising through the ranks to Professor and then Chair of the Department of Oral Medicine in 2009. Through a diversity of leadership roles, Dr. Sollecito’s impact within the School’s Department of Oral Medicine and the field overall has been far-reaching. Prior to serving as department chair, Dr. Sollecito directed both the residency program in oral medicine and the oral medicine clinic at Penn Dental Medicine.

“It is an honor to work with students, residents, and colleagues who are of such a high caliber and who are always academically or intellectually challenging me,” he says. “It forces you to be a better teacher, investigator, and clinician. It’s also exciting when someone wants to pursue a similar career as you; you realize how much you can learn from someone who has just as much interest in the discipline as you do.”

After 25 years in oral medicine, Dr. Sollecito still is excited about his work. “I very much enjoy what I am doing. I look

“We can ameliorate many complications from cancer therapy and make early diagnoses when we see cancer patients regularly before, during, and after therapies.”

— DR. THOMAS SOLLECITO, D’89, GD’91
forward to coming to work, enjoy taking care of patients, teaching students and residents, and being involved in research that will have an impact on patients in the future,” he says.

Dr. Sollecito has a particular interest in cancer research and has worked in numerous collaborative roles and on various studies to discover how oral health impacts cancer patients. His most recent research study, which reveals oral medicine-related outcomes of cancer patients receiving high-dose radiation to the head and neck, is a first-of-its-kind, clinical study leading to better understanding of oral and dental complications experienced by patients after radiation therapy. “This study will give us a better understanding regarding damage to tissue that affects a patient’s quality of life, identify risk factors for disease, and improve the ability to deliver the best dental care for these patients,” he says.

In addition, in collaboration with Abramson Cancer Center, Penn Dental Medicine provides diagnostic dental care to patients with cancer, and over his time with the School, Dr. Sollecito has continued to strengthen that partnership, leveraging their collaborative research and clinical care to improve the quality of life for many cancer patients suffering from oral problems caused by cancer metastasis.

“Cancer and cancer therapy often have profound oral implications. Chemotherapy and radiation therapy can have devastating effects on oral health, and that’s why a team approach at Abramson is so important,” says Dr. Sollecito. “We can ameliorate many complications from cancer therapy and make early diagnoses when we see cancer patients regularly before, during, and after therapies.”

Along with his responsibilities at Penn Dental Medicine, where he also served as interim dean from 2008 to 2009, Dr. Sollecito is Professor of Oral Medicine in otolaryngology, head and neck surgery at Penn’s Perelman School of Medicine; Attending in Oral Medicine at the Hospital of the University of Pennsylvania; and a University Associate at the Children’s Hospital of Philadelphia and the Abramson Cancer Center. He also consults with the National Naval Dental Center and is a reviewer for The Journal of the American Dental Association.

While his workload often makes others wonder how he achieves as much as he does, Dr. Sollecito maintains that collaborative efforts with colleagues across disciplines make the load not only manageable but inspiring. “I love to think about a clinical problem that we can immediately translate into a solution for our patients,” he says.

His solution-oriented approach has been influenced by colleagues and mentors alike. “I am particularly fortunate to have had Martin Greenberg, our former Chair, as an invaluable mentor,” he says.

Aside from the Thomas Evans Achievement Award, Dr. Sollecito is particularly proud of winning the 2005-2006 Christian R. and Mary F. Lindback Award for Distinguished Teaching at the University of Pennsylvania. “Teaching is a passion, and one of the highlights of my career is seeing students open up and express their own ideas.”

He also received the Penn Medicine Award of Excellence in 2006 and has been recognized in Philadelphia Magazine’s Top Dentists.
Alumni-Student Networking Event >

On November 6, students networked with alumni, faculty, members of the Board of Overseers, and each other at the 2013 Penn Dental Alumni-Student Networking Event held at the HUB Commerce Square.
Penn Dental Medicine Tennis Events

This winter, Penn Dental Medicine alumni, students, and faculty came together for two separate round-robin tennis matches at the Levy Tennis Pavilion. Organized by Dr. Lee Durst (D’83), Alumni Society President, nearly 30 participants including Dean Denis F. Kinane participated in each event!

Penn Dental Medicine Tailgate & Basketball Game

On February 8, Penn Dental Medicine alumni and students gathered to cheer the Penn Quakers to victory at The Palestra as the men’s basketball team took on the Columbia Lions.
The students in Dr. Margrit Maggio’s Operative Dentistry class have seen the future, and it’s called haptic technology.

Interfacing with users through their sense of touch, haptic technology is the force behind the Simodont advanced simulation units that Dr. Maggio (D’87), Assistant Professor of Clinical Restorative Dentistry and Director of Operative Dentistry and the Advanced Simulation Laboratory, introduced to her first-year students last fall as part of a year-long study comparing haptic technology to traditional advanced simulation systems. Her research results will be published later this year.

Through this year-long pilot, which used two Simodont units, every first-year student was trained on these cutting-edge dental training units, which deliver an incredibly realistic virtual reality simulation of dental procedures.

Although Simodont units are being used at schools in Europe and Asia, Penn Dental Medicine is the first dental school in North or South America to integrate the technology into its curriculum. As the number of units increases, says Dr. Maggio, Penn Dental Medicine will become “a showcase for other schools” across the country.

“Penn Dental Medicine has been at the forefront of virtual reality in preclinical training for the past 13 years,” she says. “With the use of the Simodont, we are moving into a new phase: we’re matching virtual reality with sensitivity to touch.”

Dr. Markus Blatz, Chair and Professor of Restorative Dentistry, is excited about the many ways in which this advanced-simulation technology will benefit Penn Dental Medicine students. “Through the sheer endless possibilities of these units, we can simulate the clinical situation and varying conditions much more realistically, while objectively assessing and supporting the individual capabilities and needs of each student,” he says. “These virtual reality tools are extremely beneficial in preparing our students for our ultimate goal: highest-quality patient care.”

**Feeling The Difference**

Ask anyone who has tried both traditional advanced-simulation technology, which uses replaceable plastic teeth that fit into plastic model heads, and the advanced haptic simulation experience provided by a Simodont unit, to compare the two, and the answer will most likely be that the difference is in the feel. Manufactured by The Netherlands-based Moog, which for years has created highly realistic flight simulators for pilots and astronauts in training, haptic technology allows the user to “feel” the difference between different layers of a tooth. “Plastic feels like plastic. But with the Simodont, enamel feels like enamel, dentin feels like dentin, pulp feels like pulp, and a root feels like a root,” explains Dr. Maggio.

The result is a much more realistic training experience that allows students to see (using 3-D glasses for depth perception) and work on a virtual tooth, with different colors representing its layers (dentin is yellow and pulp is red, for example), and to “feel” what makes each layer unique using virtual dental instruments. Most users begin their training by practicing cutting out different shapes with the virtual drill, choosing a level of difficulty, and selecting the proper bur.
HAPTIC TECHNOLOGY

When they have mastered the various levels of drilling skills, they graduate to working on a virtual tooth, which they select through a virtual case study, complete with patient photo, background, patient history, and treatment plan. They are tasked with selecting the proper virtual tools to drill or scoop out decayed tooth sections and fill the cavity. In addition, says Dr. Maggio, “By pressing a button, students can see a filling in the tooth that’s been overfilled, and, by choosing the correct hand piece or hand instrument, they can refine the filling back to the anatomy of the tooth.”

In addition, “The Simodont simulation requires students to learn to use the mirror at an earlier stage” than they would otherwise, says Dr. Maggio, and in a more accurate way. With traditional simulations, she explains, it is possible to “cheat” when learning indirect vision procedures on the maxillary arch by repositioning the model or the student’s own body in ways that would not be possible in real life, but with a Simodont, students are required to learn to hold and use the mirror the correct way, and to use it properly each time. She also admires the way that a Simodont unit can adapt, at the click of a button, to a right- or left-handed student. “With our old units, we had a separate unit for left-handed students that sat idle otherwise,” she says. “That’s not necessary now.”

All of these capabilities mark the advent of a new era in virtual reality teaching, she says: “The Simodont is particularly effective in developing psychomotor skills through the ease of repeating a lesson. And through the way the lessons are structured, it teaches students to think and practice at the same time.”

A COLLABORATIVE AGREEMENT

Dr. Maggio, who counts advanced simulation among her ongoing research interests, has been following the development of the Simodont with great interest over the past several years. She has been in regular contact with Moog, its manufacturer, to check on its progress, waiting for the right moment to introduce the new technology to her students. Through an agreement with Moog, she will be continuing to work with the company to establish requirements for new software for the North American market, evaluate the educational benefits of adding Simodont to the curriculum, and developing a cost-of-ownership model to help other schools understand the costs versus benefits of the new technology. In addition, Dr. Maggio has agreed to work closely with Moog to explore the development of new curriculum for the units, noting the potential for applications like suturing, periodontic scaling, and lessons in endodontics: “There are so many possibilities!”

Penn Dental Medicine’s fully outfitted advanced simulation lab will feature 12 units—ten new units as well as updates to its two existing units. At press time, it was anticipated that all 12 units would be in place by this year’s Alumni Weekend, May 16-18, so that graduates of all ages will have the impressive and eye-opening experience of trying haptic technology—and comparing the state-of-the-art simulation to the reality of practice.

REALISTIC, COST-EFFECTIVE, AND WELL DESIGNED

While this year’s class of first-year students have had a relatively short introduction to this advanced simulation, Dr. Maggio plans to begin next year’s Operative Dentistry class with complete immersion in the technology, using a summer session offered to college students considering the field of dental medicine as a chance to refine the classroom experience. Gradually, she may also bring second-year students into the lab to use the Simodont units to train for more complicated procedures, such as crowns.

Despite their limited time on the Simodont units, members of the inaugural class formed immediate impressions of the technology. “You can tell the difference between enamel and dentin,” says John Shue, (D ’16). “That’s not something we were ever able to do before.”

The beauty of the Simodont unit, he adds, is that unlike the old technology using replaceable plastic teeth, the virtual digital teeth cannot be destroyed. In fact, a new tooth is only a click away.

“There’s a reset button,” says Shue, “so there’s a lot less stress about messing up.” With this newfound freedom, he says, “you can press the boundaries rather than having to be conservative,” leading to stronger skills overall.

Poolak Bhatt, (D ’16), agrees. “Being able to reset saves time, and we don’t have to worry about wasting materials.” Although he watched a YouTube video on the Simodont before he tried it, he was still unprepared for the intensity of the experience. “It was a lot more realistic than I expected,” he says.

“You can actually feel two [virtual] instruments clicking together,” and it feels just like two metal instruments would actually feel, he adds.
The Simodont is not only highly realistic, cost-effective, and convenient, it’s also well designed and fun to use, says Taylor Hagler, (D ‘16), an avid video gamer. “The screen is very cool,” he explains. “The controls are intuitive and they make sense.”

Dr. Maggio looks forward to a day in the near future, when, with all the Simodont units in place, students can receive additional practice at night or during their free time, simply by coming to the lab and swiping a card. “Our old technology was too fragile for me to allow students to use it unsupervised,” she says, but the new units will provide students with as much practice as they need, at no additional cost, in and out of class.

SHAPING THE FUTURE

The new Simodont technology is among the first steps in plans for a major transformation of facilities within the historic Evans Building. This renaissance of this landmark structure will not only include a new space for the Simodont advanced simulation lab, but will also create a new Preclinical Lab and CE Training Center, a new primary care clinic, a new library, and new student spaces and administrative offices. The result will be a state-of-the-art, technologically advanced dental learning environment that will rival any nationwide.

“A Simodont will never replace an instructor,” says Dr. Maggio, whose Simodont teaching screen will allow her to monitor the simulation work of all 12 student users simultaneously, “but it can help students to practice the same skill over and over” until it’s perfect. Haptic technology is cost-effective and convenient, but most importantly, it greatly increases opportunities for more realistic practice, which she believes will ultimately result in improved skills and better patient care.

—By Juliana Delany
Mark B. Desrosiers (D’84) is currently serving as the President of the Connecticut State Dental Association. He recently became a Diplomate of the American Board of Endodontics and was inducted into the American and International Colleges of Dentists.

Wayne S. Atebara (D’86) was honored for his service as President of the American Board of Oral and Maxillofacial Surgery on October 12, 2013; he continues to serve on the Board as Immediate Past President.

James P. Murphy (D’88) had the pleasure of performing his craft of dentistry on Tory Island, Donegal Ireland this past November. In the day that he spent there, he treated eight patients who had not seen a dentist on over two years.

1960’s

Arnold S. Weisgold (GD’65) received the 2013 Achievement Medal from the Alpha Omega Dental Fraternity.

1970s

Louis F. Rose (GD’70) received the 2013 American Academy of Periodontology (AAP) Gold Medal Award, which is the highest honor bestowed by the AAP.

Joseph E. Gian-Grasso (C’67, D’71) has been appointed as President of the Academy of Osseointegration.

Jeffrey S. Ingber (GD’72) was appointed Director of the Honors Program in Clinical Dentistry in the Department of Preventive and Restorative Sciences at Penn Dental Medicine.

Jay M. Rossell (D’73) was a United States Air Force dentist for 24 years before retiring in 1997. Following his service, he was a contract dentist from 1997-2008 before retiring from patient care in 2008 due to glaucoma.

After 30 years of general practice in Southern California, John Burk (D’74) retired in 2006 and now writes articles for a local newspaper, does wood working, and manages a cattle ranch.

Ellen Eisenberg (D’74) received the first Distinguished Faculty Award from the University of Connecticut School of Dental Medicine Alumni Board on November 2, 2013.

Barry P. Setzer (GD’77) was honored with the 2013 Humanitarian Award from Florida Dental Association’s Florida Dental Health Foundation for 35 years of service to the Jacksonville Cleft Palate Clinic. Dr. Setzer was also inducted into the International College of Dentists in 2012 and was recently elected to the Board of Trustees of the Florida Dental Association in 2014.

1980s

Stuart E. Lieblich (D’81) was promoted to Clinical Professor at the University of Connecticut School of Dental Medicine, Department of Oral and Maxillofacial Surgery. In addition to his faculty responsibilities, Dr. Lieblich is in private practice in Avon, Conn., and has published over 40 articles and 20 textbook chapters in his field.

Mark B. Desrosiers (D’84) is currently serving as the President of the Connecticut State Dental Association. He recently became a Diplomate of the American Board of Endodontics and was inducted into the American and International Colleges of Dentists.

Wayne S. Atebara (D’86) was honored for his service as President of the American Board of Oral and Maxillofacial Surgery on October 12, 2013; he continues to serve on the Board as Immediate Past President.

James P. Murphy (D’88) had the pleasure of performing his craft of dentistry on Tory Island, Donegal Ireland this past November. In the day that he spent there, he treated eight patients who had not seen a dentist on over two years.

1990s

On the cover of the 2014 ADEA Official Guide to Dental Schools are Olivia Sheridan (D’90, GD’92), Matthew Ryskalczyk (D’13), and Marni Glick (D’12), featured in a photo at Penn Dental Medicine when Matthew and Marni were still students at the school.

EDITORIAL CORRECTION
In the fall issue of the Penn Dental Medicine Journal, the winner of the Charlotte J. Sullivan Award was incorrectly reported. Our apologies and congratulations to Ann E. Eshenaur Spolarich (DH’82, GED’99), who received the Charlotte J. Sullivan Award given by the Penn Dental Hygiene Alumni Association for her significant contributions to advancing the profession.

CORRECTION OF FY13 HONOR ROLL
In the FY13 Honor Roll listing of supporters of Penn Dental Medicine, which appeared in the Fall 2013 issue of the Penn Dental Medicine Journal, the donor category of Olivia Sheridan, D’90, GD’92, was incorrectly noted. In FY13, Dr. Sheridan generously supported Penn Dental Medicine at the Benjamin Franklin Society Associate level ($2,500-$4,999).
2000s

Vrishali Gujar (D’09) and husband Gautam Govitrikar (D’07) welcomed their first daughter, Ela, to the world on August 27.

2010s

Some of the newest alumni—Dean’s Scholars from the Class of 2014—got together as a group before heading off to the next stage of their dental careers. Margaret Buell is pursuing a GPR; Fred Chen, pediatrics; Milda Chmielew skaite, oral medicine; Neeti Desai, GPR; Maryam Hajialiakbari, public health; Latisha Henderson, orthodontics; Lammarr Holland, GPR; Isaac Kuyunov, GPR; Everett Lin, orthodontics; Christine Martin, orthodontics; Marla Martinez, private practice; Ronak Mody, orthodontics; Nicholas Mueller, oral surgery; Kruti Patel, GPR; Neel Patel, OMFS; Ernesto Perez, GPR; Alexandra Rada, oral surgery; Scott Sakowitz, orthodontics; Haim Tawil, orthodontics; Carlton Taylor, oral surgery; Daniela Turcinov, GPR; Katharine Woehling, pediatrics; Justin Zimmer, oral surgery; and Matthew Zimmer, pediatrics.

Share Your News

We want to hear from you. Share your news on personal and professional accomplishments with your fellow Penn Dental Medicine alumni through the Class Notes section of the Penn Dental Medicine Journal. We have made it easy for you to make a submission—simply go to www.dental.upenn.edu/classnotes where you can quickly send us your information—we welcome photos as well.

Or, you can send your submissions to:
Robert Schattner Center
University of Pennsylvania
School of Dental Medicine
Office of Development and Alumni Relations
240 South 40th Street
Philadelphia, PA 19104-6030
215-898-8951 (p)
alumnifeedback@dental.upenn.edu

Save the Date for Alumni Weekend 2015!

Return to Penn Dental Medicine for Alumni Weekend 2015, May 15-17, and join friends and classmates in celebrating reunions for classes ending in “0” and “5”! Stay up to date at www.dental.upenn.edu/AW2015 starting this summer.

GET INVOLVED!

If you are interested in volunteering for your class reunion, please contact us at 215-898-8951 or alumnifeedback@dental.upenn.edu
IN MEMORIAM

REMEMBERING MEMBERS OF THE PENN DENTAL MEDICINE COMMUNITY

The Penn Dental Medicine community warmly remembers four highly respected faculty members—Dr. Ellis Eckstein Golub, Professor, Department of Biochemistry, who passed away on January 22, Dr. Richard P. Dakin (D’59), Clinical Assistant Professor of Restorative Dentistry, who passed December 29, Dr. Adrian Donaghue, Clinical Associate, Department of Preventive & Restorative Sciences, who passed March 12, and Dr. Alice Morse Amsterdam (D’78, GD’81), who passed on December 22. Drs. Golub, Dakin, and Donaghue were all active faculty members at the time of their deaths.

Dr. Golub first joined the School’s faculty in 1977, rising through the ranks to full Professor in 1990. He held the leadership post of Chairman of the Department of Biochemistry from 1996-2003 and later served again as Interim Chair from 2009-2013.

Dr. Golub’s research primarily focused on two key areas: calcification of hard tissues and computer applications in biochemistry and molecular biology. He had been involved in the development of computer programs for prediction and graphical display of protein secondary structure from sequence. In the calcification area, he focused on the cellular mechanisms necessary for initiating hard tissue mineral formation. His teaching activities included biochemistry courses for first-year dental students and lectures to postdoctoral dental students.

Dr. Dakin was a passionate clinical instructor, who also maintained a private practice from 1961-2000. He joined the Penn Dental Medicine faculty in 1963, serving as an Associate Professor of Fixed Prosthodontics till 1974. In 2000, he returned to the faculty as a Clinical Associate, Department of Preventive & Restorative Sciences, and in 2003, he was appointed Clinical Assistant Professor of Restorative Dentistry.

Dr. Donaghue was a member of the Penn Dental Medicine faculty since 1997 in various roles, remembered by colleagues and students for his great spirit and dedication to teaching. He also maintained a cosmetic dentistry practice in Media, Pa.

Dr. Amsterdam, who served as a group leader of clinical instruction during her time on the Penn Dental Medicine faculty in the 1980s, was an inspiration to many. She forged a path for women in dentistry as the first female graduate of Penn Dental Medicine’s combined Periodontic/Orthodontic postdoctoral program in 1981, and practiced in Havertown for 20 years. She was the wife of Penn Dental Medicine alumnus Dr. John Amsterdam (D’71, WG’72), and the daughter-in-law of Dr. Morton Amsterdam (C’43, D’45), Professor Emeritus, Department of Periodontics.

B. Rakusin Ableman, (DH’31)
Silver Spring, MD; September 13, 2013

Barnet M. Levy (C’38, D’42)
Englewood, NJ; March 3, 2014

William A. Sheehan (D’39)
Albany, NY; December 31, 2013

Samuel Hahn (C’40, D’42)
Palm Harbor, FL; January 20, 2014

Arnold M. Geiger (D’41)
White Plains, NY; January 2014

James R. Warner, Jr. (C’42, D’43)
Bellport, NY; January 17, 2014

Herbert Paskow (C’43, D’45)
Sarasota, FL; November 13, 2013

Marilyn Johnson Mannion (DH’45)
Falls Village, CT; November 1, 2013

Mortimer L. Weisenfeld (D’47)
Roslyn Heights, NY; September 2013

Joseph E. McKeone (D’47)
Rockford, IL; December 20, 2013

Mary Ohs Craig (DH’48)
Camp Hill, PA; November 16, 2013

Kenneth E. Lebaron (D’48)
Sudbury, MA; August 12, 2013

Maj. Gen. Arthur J. Sachsel (D’50)
Riverside, CA; September 19, 2013

Leon A. Weiss (GD’50)
Swampscott, MA; September 2013

Chester W. Taylor (D’51)
Winchester, VA; December 17, 2013

Daniel M. Burns (D’51)
East Berne, NY; September 28, 2013

J. Herbert Arnold (D’51)
Charleston, SC; January 31, 2014

John W. Burgess (D’52)
Central Square, NY; December 10, 2013

Jack Wister Thrash (D’52)
Dunedin, FL; March 1, 2014

Edward F. Johannemann (D’52)
South Orleans, MA; March 16, 2014

Edward R. Knoll (D’53)
Fisherville, VA; September 16, 2013

Charles H. Wolfe (D’54)
Lancaster, PA; February 23, 2014

William A. Margolis (C’54, D’57)
Trappe, PA; March 13, 2014

Adrian P. Hulsebosch (D’55)
Elmira, NY; October 25, 2013

Robert D. Schweitzer (D’55)
Westhampton Beach, NY; January 2014

Daniel A. Bomberger (D’55)
Litz, PA; November 23, 2013

Leon Kussick (D’56)
Redmond, WA; January 29, 2013

Richard J. Zeigler (D’56)
Osterville, MA; September 28, 2013

John Bruce Dunlop (D’57)
Stroudsburg, PA; September 20, 2013

Col. Charles L. Hughes (D’57)
Sierra Vista, AZ; November 5, 2013

Paul S. Kaufman (D’57)
Floral Park, NY; July 16, 2013

James D. Sheen (D’59)
Gettysburg, PA; September 21, 2013

Richard P. Dakin (D’59)
Philadelphia, PA; December 29, 2013

Howard S. Glaser (GD’60)
Roxbury, CT; May 12, 2013

Everett P. Borgesani (D’60, GD’64)
Berwyn, PA; August 30, 2013

Carl A. Mohr (D’60)
West Chester, PA; September 30, 2013

Stephen R. Matteson (D’62)
San Antonio, TX; January 6, 2014

Robert L. Massucco (D’63)
Mount Desert, ME; January 21, 2014

Stanley E. Ross (D’63, GD’65)
Wellington, FL; February 12, 2013

Irving O. Thomas, Jr. (D’64)
Naples, FL; August 30, 2013

Manuel H. Marks (GD’65)
Tucson, AZ; December 14, 2013

Ronald Feldberg (D’75)
 Voorhees, NJ; October 15, 2013

Alice M. Amsterdam (D’78, GD’81)
Bala Cynwyd, PA; December 22, 2013

Adrian J. Donaghue (D’81)
Media, PA; March 12, 2014

David P. Schleimer (D’83)
Alamo, CA; January 11, 2014

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