Winter 2020

LLUSD Articulator - Volume 30, Number 2

Loma Linda University School of Dentistry

LLUSD ARTICULATOR

The melding of compassion and competence in dental education

LOMA LINDA UNIVERSITY
School of Dentistry

PNAM celebrates tenth anniversary

From street life to restoration

Applications of 3D printing in dentistry

Riverside's fifth long night

Volume 30, Number 2

Winter / Spring 2020

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How will you leave your **LEGACY**?

Drs. Edmond and Ella Haddad are leaving their legacy by giving the gift of opportunity. Both educators at Loma Linda University Health, they decided to make a gift through real estate. Proceeds from its sale established the Ella and Edmond Haddad International Student Scholarship in the Loma Linda University School of Public Health and added to The Labeeb Haddad Memorial Scholarship in Loma Linda University School of Dentistry.

"Qualified students from all over the world should have the opportunity to receive a higher education. We believe everyone has something that they want to promote and for us that is love, peace and hope."

– Drs. Edmond and Ella Haddad

To learn how you can give from your IRA account or about establishing a Planned Gift, visit **llulegacy.org** or call **909-558-4553**.

MANY STRENGTHS. ONE MISSION.

LOMA LINDA UNIVERSITY HEALTH

LLUSD
ARTICULATOR
The melding of competence and compassion in dental education.

Volume 30, Number II Winter/Spring 2020

Articulator (formerly ***Dentistry***) celebrates with alumni and friends the School of Dentistry's efforts to combine compassion and competence in the education of oral healthcare professionals. LLUSD alumni represent the strength of that amalgam. The journal is published twice each year by the Loma Linda University School of Dentistry Office of Marketing.

LLUSD Mission

Loma Linda University School of Dentistry seeks to further the healing and teaching ministry of Jesus Christ by providing an environment wherein:

Students learn to provide high quality oral healthcare based on sound scientific principles

Patients receive competent care, which is preventive in purpose, comprehensive in scope, and provided with compassion and respect

Faculty, students, and staff value the patient relationship, respect diversity, and share responsibility by working together toward academic, professional, spiritual, and personal growth

Scholarly activity and research provide a foundation for evidence-based learning and enhance whole person care

The workplace environment attracts and retains a superior and diverse faculty and staff who motivate, educate, and serve

Our communities (local, global, and professional) benefit from our service, stewardship, and commitment to life-long learning.

LLUH Centennial Complex fourth floor provided the venue for the 10-year reunion celebration of young patients whose cleft lips/palates have been repaired by the LLUSD Advanced Dental Education Program in Pediatric Dentistry and the LLUH craniofacial surgery team using the uniquely effective, minimally traumatizing Presurgical Nasal Alveolar Molding (PNAM) *(see page 11).*

Editor's note:

If you like the *Articulator* cover shot, you can enjoy it and eleven other LLUSD photo contest winners assembled in the Loma Linda University School of Dentistry 2020 calendar of striking outdoor photography available for purchase at:.

https://tinyurl.com/wqyywrn

This first annual LLUSD photo contest attracted 43 submissions. The twelve photos that appear in the calendar were taken by five different members of the LLUSD family comprised of faculty, students, and staff.

Wishing you a most meaningful 2020,

Doug Hackleman, MA
Editor

Cover: A winner of the 2019 LLUSD photography challenge, Nicholas Warounthorn, D2, took the cover photo of Half Dome from Glacier Point during the 2019 break between the summer and fall quarters, "with the Nikon D7200 issued to us and my Sigma 17-50mm f/2.8 lens at f/5.6 1/80 sec and ISO 140." The view represents Nicholas' "first sight of Yosemite made possible," he says by three classmates.

CONTENTS

Direct advertising inquiries and correspondence to:

Publications Director
LLU School of Dentistry
11245 Anderson Street, Ste 120
Loma Linda, CA 92354

Phone: 909-558-4984
Fax: 909-558-0992

To reach School of Dentistry Alumni Affairs, contact:

Jeri Fowler, assistant director
LLUSD Alumni Affairs
11245 Anderson Street, Ste 120
Loma Linda, CA 92354

Phone: 909-558-4399
Fax: 909-558-4858

For admissions information contact:

School of Dentistry
Office of Admissions
11092 Anderson Street
Loma Linda, CA 92350

Admissions.sd@llu.edu
Phone: 909-558-4621

DEAN'S MESSAGE

The pursuit of progress

Dear Alumni and Friends,

A School of Dentistry highlight reel for 2019 would be well worth watching and even cheering.

Academic and clinical transformations currently under way, or slated for rollout, are exciting, stimulating, challenging, and at times a little daunting. It is not a journey for the faint of heart, and the team that leads your alma mater has stepped forward boldly, even courageously.

Our students, residents, staff, faculty, and administration have all put their shoulders to the plow and are working diligently, as we continue to be blessed with the opportunity to impact significantly and positively the individuals and communities we serve.

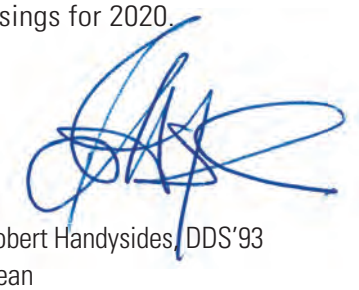
It is encouraging to be able to enumerate a few of the School's accomplishments over the past year. We have

- launched a new curriculum that is refocusing our teaching on current approaches to learning and andragogy.
- created a new clinic where multiple disciplines today, and interprofessional education tomorrow, work collaboratively within a whole-person model to diagnose and treatment plan for each individual's oral health.
- sponsored ten international service learning trips while domestically supporting 172 students to CDA Cares and another 20 to the Senior and Family Health Fair; meanwhile seven or eight students run the New Hope Clinic every Tuesday, and that is not to mention our students' regular services to the Baldy View, Victoria, and Lugonia elementary schools and the Victorville prison.
- moved toward greater integration with the LLU Health systems.
- reimagined some of our organizational structures including faculty promotions and compensation, leadership, and our dental education business model.
- created new local and global partnerships.
- found new ways to engage and connect with our alumni through monthly meetings with geographical clusters of alumni and through a video contest (see page 39).

Dean Robert Handysides

As an industry renowned for its resistance to change, we are breaking the mold. We are committed to an extraordinary shift in the way we educate our students, and are moving forward deliberately and decisively with bold determination. Our goal of making this academic year better than last year is in action. God continues to bless as we strive to follow His leading.

Thank you for your prayers, investments, and joining us in our pursuit of excellence. I wish you God's richest blessings for 2020.



Robert Handysides, DDS'93
Dean

WHERE ARE THEY NOW?

Brief updates on the noteworthy professional and personal activities of LLUSD alumni

Ms. Loralee Craig-Miller

Loralee Craig-Miller

Two years after dental hygiene graduation, **Loralee Craig**, BS'70, responded to an ad seeking American hygienists to join dental teams in Switzerland for a two-year work experience. Expecting to savor the European scene for a couple of years, she went through the hoops: brushing up on high school French, getting permits to work, drive, rent an apartment, secure health insurance. She remained for 20 years.

Then on a stateside visit Lore met a high school friend; yes, he proposed. It was two years later, as a Swiss citizen, that Lore returned to the United States and married Victor Miller. During the next 20 years, she earned a master's degree, practiced dental hygiene, and served on LLUSD's dental hygiene faculty.

Seeking a solution for ergonomic shoulder and neck pain, Lore found in Pilates not only relief but eventually a new career path. In the six years since dental hygiene retirement, Lore, who has completed two Pilates certifications, one in rehab and one in classical pilates, loves teaching others the huge benefits of Joe Pilates' exercise system. Agile and trim, Lore, who is at home in Loma Linda, is modest about her accomplishments, saying, "I know what it's like to be aging and in pain, and I'm thrilled to help people learn how to reconnect to their bodies to return to healthy movement and age gracefully."

Polly Nichols

Dr. Polly Nichols

Polly Sprague Nichols, DDS '96, practices dentistry with her father, Howard Sprague, DDS'62, and two other LLUSD alumni (Per Houmann, DDS'83, and his daughter Martina Howe, DDS'16), in Topsham, Maine, 3,000 miles from their alma mater. Her brother Greg, DDS'05, MS'17, another alumnus, is two miles away for endodontic referrals.

The Topsham area has always been a favorite coastal destination for boating, visiting friends, and enjoying historic sites. Henry Wadsworth Longfellow and Nathaniel Hawthorne went to school at nearby Bowdoin College (1822-25) when the school had five faculty; twenty years later Ellen White lived in Topsham.

It's where, with the assistance of her mother Rosemary, BSN (who home schooled Polly), and her husband Tim, MBA and CPA, who is CFO of the practice, Polly home schools four children.

Adept at piano and violin, Dr. Nichols has organized Topsham Strings, a multi-generational string group that presents primarily sacred concerts. Her children all play violin and piano.

Looking to the future, Dr. Nichols is seeking an additional dentist so that she can have flexibility to participate in dental mission trips with her children. Interested LLUSD alumni may apply to pollynichols120@gmail.com.

Dr. Terry Schmunk

Terry Schmunk

Col. **Terry Schmunk**, DDS'73, received a bronze star for meritorious service after commanding the 307th medical company overseeing 54 dentists in southern Iraq and spending two years on assignment in Vietnam. He is also member of the Order of Military Merit for his "sustained contributions to the betterment of army medicine."

He admits, "Two years in Vietnam caught up with me," citing health issues prompting closure of his Santa Cruz dental practice in 2017. He continues his long-time commitment as president of Volunteer Health Professionals, Inc., a non-profit corporation that develops and supports 21 medical and preventive health dental care systems in developing countries on four continents and the South Pacific.

Currently Dr. Schmunk is recruiting volunteers and raising money for a removable prosthetic dental laboratory in Fiji. He explains the project's economy: "We treat 50 to 100 people in a village instead of their making expensive individual trips to a dental clinic." His Fiji project—dental building, solar and septic systems—prompted Dr. Schmunk to return to school. He is studying water management to improve Fiji's water system. "Some of my grandchildren are older than my current classmates," he says, but his passion propels his projects.

Clifford Tym

Dr. Clifford Tym

Fifty-one years into his full-time Innisfail, Alberta, practice, **Clifford Tym**, DDS'68, still treats a patient from his first week of practice—and another from the third week. Adjacent to his home (near Red Deer) he can view a church and church school built on the eight acres of land he donated for the project. Today there are 51 students enrolled in the school that he supported as building committee chair.

In the community, Dr. Tym's two-year effort to put smoke-free legislation on the ballot resulted in Innisfail 's becoming the first town in Alberta to preserve smoke-free environments. In another project, he served for 28 years on the Alberta Dental Association mediation committee, sorting out dentist/patient disputes.

Dr. Tym regularly volunteers at DOoR (Dental Outreach of Red Deer), providing dental care for under privileged children. He also participates in a work experience program for high school students, becoming the inspiration for several students to pursue careers in dental care.

"I'm into third and fourth generations now," he says of his patients. In his free moments he's likely to be on his HAM radio. He says his trumpet playing is rusty, but he stays abreast of dental practices, helping people get their smiles back.

Dean's Circle members assemble at ESRI

A recent banquet for the LLU School of Dentistry's Dean's Circle members was held Thursday evening, September 26, 2019, at the salubrious ESRI Cafe on the Environmental Systems Research Institute headquarters' campus in Redlands, California, the Loma Linda neighbor's largest employer.

Dean Robert Handysides, DDS'93, led out during the evening repast attended by approximately three dozen particularly engaged and (primarily) alumni supporters of LLUSD.

Dean Handysides elaborated candidly for a few minutes on the challenges, changes, and conquests LLUSD recently has faced, embraced, and celebrated.

In regard to the reinvigorated Department of Dental Hygiene, Dean Handysides mentioned recent successes of the School's "Bridge Pathway" by which some would-be dental students take dental hygiene to demonstrate their ability to participate in the DDS program. This year (2019) six dental hygiene graduates matriculated to the dentistry program.

The dean stated that the School is investing heavily in digital dentistry—which means significant expenditures on digital (especially intraoral) scanners and an industrial strength (Ivoclar Vivadent PM7, 3D) mill which was featured in the Summer/ Autumn 2018 *Articulator*.

Under what he termed "four big buckets," Dean Handysides discussed "tremendous changes in LLUSD's curriculum" pertaining to 1) dental fundamentals, 2) biomedical sciences and oral ecosystems, 3) patient centered care, and 4) clinical professionalism

Some very basic changes, he said, are finding first-year dental students on the clinic floor paired with upper-class students—an arrangement that will create opportunities to practice four-handed dentistry and collaborative learning. The dean stressed the importance of student clinic work being evaluated over time by the same clinical faculty.

In a reordering of the curriculum, Dean Handysides explained that senior dental students will be taking some basic science course work which should prepare them for those kinds of questions on the Integrated National Board Dental Exam (INBDE).

Discussing the incoming DDS class, Dean Handysides reported the admission of 134 new students in August 2019, a number that included 32 international students. Mixing what were formerly International Dentistry Program students with predoctoral students is designed to create additional opportunities for growth producing, peer-to-peer learning, especially because the international students come with dental degrees and often times considerable practice experience.

The attendance of Duane Wacker, DDS'64, NASDAD president during the School's 50th anniversary in 2003, and his wife Charlene, BS (RN), at the recent Dean's Circle led to some memories shared with the *Articulator* that included Dr. Wacker's role in the Dean's Circle inception. During the 1989 CDA annual meetings in Anaheim, Dr. Wacker visited with a colleague from University of the Pacific Arthur A. Dugoni School of Dentistry (UOP) in the adjacent booth. He mentioned his desire to find a way to raise money for LLUSD, especially from among its alumni. His colleague it turned out was involved in a Dean's Circle for UOP and was all too pleased to tell Dr. Wacker about it, showing him the printed materials used in their mailings to alumni and all the details of the program, including the pins that were presented to members

Dean Handysides shares a moment with Dr. and Mrs. Wacker.

at Dean's Circle occasions. Dr. Wacker was thrilled, but wary about copyright issues that might preclude imitating what the UOP operative was doing. He need not have been concerned. His colleague from the other school reassured him that the idea was not copyrighted or trademarked and gave him copies of all printed materials related to the UOP program.

Back at Prince Hall, Dr. Wacker was delighted to share with Dean Judson Klooster what he'd acquired and the concept behind it. Dr. Klooster was on board immediately, says Dr. Wacker, and Barbara Bostwick, the School's first director of development, soon implemented the concept of a Dean's Circle for alumni who would make an annual gift of $1,500 to the project, program, or endowment of their preference—quite the commitment, given what a dollar was worth 35 years ago.

Dean Robert Handysides heartily welcomes the continuing support of LLUSD friends who promote the growth of this School-enhancing, Dean's Circle philanthropic fraternity.

RDAEF Expanded Duties Program

This comprehensive Board-approved RDAEF program provides 410 hours of instruction for RDAs and 318 hours of instruction for existing RDAEFs. It combines didactic, hands-on laboratory and live patient clinical experiences that satisfy the California Dental Board's requirements for new and existing RDAEFs who wish to expand their licensure in preparation for earning certification in the new extended functions.

This RDAEF Expanded Course is taught as a series of three individual courses (modules) that must be successfully completed in a designated sequence within an established time frame before taking the new State Board Examination. Modules can be paid individually and sessions will be offered on Sundays and evenings to better accommodate working professionals.

To successfully complete the program and be eligible to sit for the new State Board Examination, participants are required to pass all three modules with a minimum 75% pass rate.

Financial Aid: Loma Linda University Continuing Dental Education is now offering funding available to qualified individuals through the ***"Sallie Mae Smart Option Student Loan"*** program. These are low interest student loans that offer choices between 3 repayment options. Apply online and it only takes approximately 15 minutes to get a credit result. Please visit the Sallie Mae website for more information.

Module 1

Fee: $4,700 | CDE Credits: 104
July 7, 2020 - Sept. 27, 2020 (19 class sessions)
July 7, 9, 12, 19, 21, 23 / Aug. 2, 4, 6, 16, 18, 20, 30 / Sept. 1, 3, 13, 15, 17, 27, 2020

Module 2

Fee: $6,300 | CDE Credits: 128
Sept. 29, 2020 - Dec. 20, 2020 (24 class sessions)
Sept. 29 / Oct. 1, 11, 13, 15, 25, 27, 29 / Nov. 8, 10, 12, 15, 17, 19, 22, 24 / Dec. 1, 3, 6, 8, 10, 13, 15, 20, 2020

Module 3

Fee for Licensed RDAEFs: $6,000 | CDE Credits: 104
Fee for RDAs: $7,000 | CDE Credits: 180
Jan. 5, 2021 - May 16, 2021 (30 class sessions)
Jan. 5, 7, 10, 17, 19, 21, 31 / Feb. 2, 4, 14, 16, 18, 28 / March 2, 4, 14, 16, 18, 28, 30 / April 1, 4, 13, 15, 18, 20, 22 / May 4, 6, 16, 2021

All three modules can be paid with payments, with balance due 10 days before the end of each module.

To register call: LLUSD Continuing Education Ph: 909-558-4685 | F: 909-558-0835 or go to **dentistry.llu.edu/rdaef**

TRANSITIONS

Dr. Brian Chu

Brian Chu

Brian Chu, DDS'14, was appointed full-time assistant professor for the Koppel Special Care Dentistry Center, effective July 1, 2019. He graduated from the LLUSD Advanced Dental Education Program in Anesthesiology in 2019.

Rachel Dason

Rachel Dason, DDS'16, was appointed full-time assistant professor for the Koppel Special Care Dentistry Center, effective July 1, 2019. She graduated from the LLUSD Advanced Dental Education Program in Anesthesiology in 2019.

Dr. Rachel Dason

Dr. Akinlolu Jegede

Akinlolu Jegede

Akinlolu Jegede, DDS'19 (IDP), has joined the LLUSD clinical faculty as assistant professor, Division of General Dentistry effective July 1, 2019.

Before his graduation from LLUSD in May, Dr. Jegede earned a Bachelor of Dental Surgery (BChD) from Obafemi Awolowo University, Nigeria, in 2011. There he worked four years as a general dentist for the government.

Martin Martz

Martin Martz, DDS'75B, MS'83, was appointed assistant professor and clinic director, Department of Orthodontics and Dentofacial Orthopedics, effective September 16, 2019.

Dr. Martz has 22 years of orthodontic private practice experience and holds several patents in the orthodontic field.

Dr. Martz was named Faculty of the Year four times while serving as a part-time lecturer at the UCLA School of Dentistry, Section of Orthodontics, from 2010 to 2019.

Dr. Martin Martz

Dr. Jeffrey Paxman

Jeffrey Paxman

Jeffrey Paxman, DDS'15, joined the LLUSD Department of Oral and Maxillofacial Surgery as assistant professor, effective July 1, 2019.

Margaret Soh

Margaret Soh, DDS'09, has joined LLUSD's Division of General Dentistry as an assistant professor, effective July 15, 2019.

Dr. Margaret Soh

Dr. Casey Vidovich

Casey Vidovich

Casey Vidovich, DMD, was appointed full-time assistant professor for the Koppel Special Care Dentistry Center, effective effective July 1, 2019. He graduated from the LLUSD Advanced Dental Education Program in Anesthesiology in 2019.

Chi Viet

Chi Viet, DDS, PhD, MD, joined LLUSD as assistant professor, Department of Oral and Maxillofacial Surgery, effective August 19, 2019.

Dr. Viet earned her DDS and PhD from the University of California, San Francisco, and her MD from New York University, where she completed her Oral and Maxillofacial Surgery residency followed by a fellowship in Head and Neck Oncology and Microvascular Reconstructive Surgery at Providence Medical Center, Portland, Oregon.

Dr. Chi Viet

Dr. Ke-Chung Wu

Ke-Chung Wu

Ke-Chung Wu, DDS, MSD'19, joined the Department of Pediatric Dentistry as an assistant professor, effective August 21, 2019.

Amy Wong

Amy Wong, DDS, earned a certificate in dental anesthesiology from LLUSD in 2009. She was appointed assistant professor at the Koppel Special Care Dentistry Center, effective September 4, 2019.

Dr. Amy Wong

Join a tradition of giving!

Dean's Circle

The purpose of the Dean's Circle is to support students and enhance their educational experience. Our Dean's Circle members are important partners in our mission to provide the finest in oral healthcare education. Your gift makes this possible by funding scholarships, updating facilities, supporting service opportunities, and much more.

Gifts of $1,500 or more to any School of Dentistry fund qualify you for Dean's Circle membership and benefits.*

More information regarding the Dean's Circle and other School of Dentistry giving opportunities can be found at dentistry.llu.edu/about/giving-opportunities.

LOMA LINDA UNIVERSITY
School of Dentistry

Office of Development
11175 Mountain View Ave., Suite A
Loma Linda, CA 92354
909-558-4754
sdgiving@llu.edu

**Gifts of $1,500 or more must be donated within the same calendar year and received by December 31st to qualify for Dean's Circle membership.*

PNAM alumni gather to celebrate decade of health

With the use of a presurgical nasal aveolar molding appliance, infants born with cleft lip/palate receive functional and remarkably cosmetic corrections through a single surgery.

Nearly forty young LLUSD Department of Pediatric Dentistry cleft lip/palate patients, ranging in age from infant to ten years old, attended with parents or guardians a PNAM 10-Year Anniversary Celebration.

Along with their loved ones and care providers from the LLUSD Advanced Dental Education Program in Pediatric Dentistry and the LLUCH craniofacial surgery team, the PNAM patient alumni

LLUH Centennial Complex fourth floor provided the venue.

gathered on the Centennial Complex fourth floor Sunday, October 27, 2019, to celebrate the cosmetically successful correction of their congenital cleft lips/palates.

The Presurgical Nasal Alveolar Molding (PNAM) alumni share the distinction of having their cleft lips/cleft palates repaired through the uniquely effective, minimally traumatizing PNAM treatment provided by the pediatric dentists and residents at the School of Dentistry's Advanced Dental Education Program in Pediatric Dentistry directed by PNAM specialist Jung-Wei Chen, DDS, MS, MS, PhD. The School of Dentistry's PNAM program is unique in the Inland Empire of Southern California as an entity where children born with cleft lip/palate, supported by DentiCal, are able to obtain the best possible corrective care for one of the more common (and disfiguring) birth defects.

PNAM alumni celebrants and their care providers were treated to a three-hour fair with games and activities—Double Shot Basketball, Toothbrush Ring Toss, Skee Ball, face painting, balloon artistry, coloring stations—and more food than they could eat.

LLUSD Dean Robert Handysides, DDS'93, was "delighted to welcome such a diverse young crowd of success stories" to such a happy occasion. He particularly was pleased "to be able to see first-hand, up close and personal, what the LLU School of Dentistry's Department of Pediatric Dentistry, the craniofacial team at the Children's Hospital, and our community sponsors have been able to accomplish with these precious young lives."

There also were words of welcome and appreciation from LLUH President Richard Hart, MD, DrPH, who expressed gratefulness particularly to the founders of Shawnee's Smile, parents of a daughter born with a cleft palate who received amazing care at Loma Linda University Children's Hospital and created the charity for others affected with craniofacial issues. Appreciation was also expressed for a donation to the Eric M. Olsen Cleft Lip & Palate Fund that improves children's opportunities to go through life looking so approachable, and to the California Society of Pediatric Dentistry Foundation which raises funds to support the improvement of education in pediatric dentistry in California at every level.

Dr. Hart was gratified by how PNAM patients represent an emphasis on "'One Loma Linda'—this collaboration of clinicians, schools, and departments that have brought healing to these little ones."

Dr. Chen recounted stories of patients and their families' courage and grit as they struggled, with the help of the LLU pediatric dentists and craniofacial team, to surmount the considerable challenges that a cleft lip/palate baby can present. Dr. Chen also moderated heartfelt remarks by a number of grateful parents.

Pre-surgical Nasal Alveolar Molding (PNAM), a pre-surgical orthopedic treatment of the cleft lip and palate, has become the treatment of choice for a growing number of craniofacial teams that have seen the benefits of utilizing a nasal alveolar molding appliance prior to surgical lip repair.

When in three to five months the PNAM appliance has done its work, it requires only one surgical procedure to complete a cosmetically optimal correction of the baby's cleft lip/palate.

LLUH is proud to provide this PNAM treatment that demonstrates the spirit of One Loma Linda through the collaboration of an interschool, interprofessional team that adds so significantly to the lives of these young patients.

Dean Handysides looks on as Dr. Hart congratulates Dr. Chen on the success of the PNAM program.

ALUMNI STUDEN homeco

Thursday, March 5, 2020

All burned out and nowhere to go? Adapting and inspiring change in your life

Registration: 7:30 am
Lecture: 8:00 am - 4:30 pm

Synopsis

Occupational burnout is now a widely recognized and prevalent syndrome "linked to long-term, unresolved, work-related stress." (WHO, May 2019) This interprofessional program examines causes and manifestations of professional burnout and discusses how this affects interprofessional communication and teamwork. Professional boundaries and social connectivity are two of the most common factors associated with this syndrome. Interdisciplinary panels and small group discussions will elucidate professional ramifications of healthy and unhealthy boundaries and social connectivity followed by stress regulation techniques using the Community Resiliency Model (CRM).©TM

Objectives

- Describe what burnout is, what causes it, and identify how it affects our personal and professional life.
- Illustrate how burnout within professions affects interprofessional communication and teamwork.
- Develop sustainable adaptations and solutions to managing burnout such as boundaries and social connectivity.
- Develop immediate adaptations and solutions to managing burnout with the Community Resiliency Model (CRM).©TM

Please join us for this highly interactive all-day continuing education course. The morning session will take place within Centennial Complex and highlight various perspectives on professional burnout. For the afternoon session, attendees of the program will transition to the Drayson Center field tent for lunch and subsequent small group discussions.

For additional program details, please visit llu.edu/homecoming.

The New Wellness Approach: A realistic way for dentistry and medicine to collaborate

Registration: 8:30 am
Lecture: 9:00 am - 4:30 pm

Synopsis

Dentistry is no longer simply about fillings, the loss of teeth or whether patients floss or not. It is about wellness. There is now undeniable evidence that the local inflammatory response to initiating periodontal bio-film spills into the circulatory system and contributes to the level of systemic inflammation. There is also evidence that successful periodontal intervention can result in meaningful reductions of systemic inflammation. Clearly, it is time for dental and medical providers to work together to better control the systemic diseases that are affected by systemic inflammation.

Every report detailing the link between oral and overall health concludes with a recommendation that medicine and dentistry should work together to achieve better outcomes for the patients they share. However, no one ever outlines what form that collaboration should take...until now. This presentation outlines a realistic protocol which dental and medical providers can utilize to effortlessly screen and refer patients for better management of the risk factors their patients have in common.

A cardiologist who understands the role oral health can play in systemic disease will teach dental attendees what they need to know to manage their patients with cardiovascular disease. A periodontist who understands the challenges of cardiovascular disease management will teach medical attendees what they need to know to minimize any oral contribution to their patient's systemic inflammatory burden.

This course will be team taught to finally develop a realistic protocol for dentistry and medicine to collaborate for better patient outcomes.

- The latest on periodontal and systemic inflammation-- what we can say for sure
- A priority patient approach to dental care. Which patients should be treated differently
- A protocol for dental providers to screen and refer patients to medicine
- A protocol for medical providers to screen and refer patients to dentistry. Co-management of cardiovascular disease, obesity, diabetes, pregnancy, breast cancer, sleep apnea, dementia, rheumatoid arthritis, etc
- Emerging concepts in cardiovascular disease management.
- Practice management materials that attendees can use starting tomorrow

IT CONVENTION

ming

Friday, March 6, 2020

Awaken Your Knowledge of Sleep Disorders in the Pediatric Population: Airway management for the entire healthcare team

Registration: 8:30 am
Lecture: 9:00 am - 4:30 pm

Synopsis

This program is designed for the entire health provider team, including physicians, dentists, nurses, physical therapists, speech pathologists, myo-functional and behavioral health specialists. Screening protocol is emphasized, with useful resolutions provided.

Sleep consumes about one-third of our life and has a spectrum of abnormalities which can hinder our daily living. It has received little attention in our medical education system. Unfortunately, most health professionals have not been trained to deal with these common problems.

Sleep disorders in children and adolescents are common; even infants may have sleep disorders. Studies have shown that poor sleep quality and/or quantity in children are associated with a host of problems, including academic, behavioral, developmental and social difficulties, weight abnormalities, and other health maladies. Pediatric sleep problems affect children's health, and impact family dynamics and parental or sibling sleep. Children suffer from problems falling or staying asleep and not waking up rested having daytime sleepiness. Physiological problems such as obstructive sleep apnea show abnormal or disruptive behaviors during sleep such as sleepwalking or other parasomnias, restless legs syndrome, and daytime symptoms such as excessive sleepiness, cataplexy and more. While adults may suffer from the same problems, the etiology, presentation, and associated findings in children are different than those seen in adults.

Children with these problems are typically under-diagnosed in medical and dental practices. Breathing trumps all other physiologic body functions. Our brain and facial/nasopharyngeal structural development are unfavorably influenced and affected when imbalances with disorders of sleep or breathing are evident. Physicians, dentists, nurses, behavioral health specialists, parents, teachers, coaches and others in the lives of children can observe and screen for disorders to discover the unfavorable effects on their daily lives.

In children, breathing and sleep problems also affect cognitive performance and physical development. This presentation will emphasize the relationships between the physiological, clinical and treatment aspects for children with respiratory, airway and sleep disorders problems.

Prevention and earlier intervention are the most powerful therapies for sleep disorders!

LEARNING OBJECTIVES

At the end of this lecture participants will:

- Identify end-stage problems that alert us to make every clinical effort to prevent or intercept these sleep-related co-morbidities in youth and infants.
- Recognize and communicate pediatric sleep disorders with medical, dental, and allied health professionals.
- Integrate allied therapies with knowledgeable colleagues.
- Describe the coordinated-care model between physicians, dentists, and allied colleagues–the team approach with co-management strategies for effectively managing patients with sleep-disordered breathing problems.
- Describe the medical and dental assessment of compromised airway, sleep bruxism, and TMD.
- Identify limitations related to oral appliance therapy, teach facial orthopedics and airway focused therapies.
- Describe the social issues associated with diagnosis and treatment of sleep disorder co-factors, including approaches for managing such patients in the airway focused medical/dental practices.

Loma Linda University School of Dentistry Continuing Education programs are open to all oral health professionals.

For more information on registration please contact Loma Linda University School of Dentistry Continuing Dental Education office at **909-558-4685** or visit us online at **https://ce.llu.edu/homecoming-2020/hc-asc-dental-reg-site**

ALUMNI STUDENT CONVENTION homecoming

Friday, March 6, 2020

Mission Emphasis Breakfast
Gary Krause
Director, General Conference, Office of Adventist Mission
7:00 am - 9:00 am

State of the School presented by Dean Handysides
3:30 pm - 4:00 pm

Alumni Reception and Practice Opportunities
4:00 pm - 6:00 pm

Spiritual Activities - Sabbath, March 7, 2020

Homecoming Registration
7:00 am

Sabbath School/Parade of Flags
9:30 am

Church Service
11:15 am

Homecoming Haystacks
12:15 pm

Mission Vespers - Loma Linda University Church
4:00 pm – 6:00 pm

Hands-On Courses

Online Registration only

Guided Surgery for Single Implant Site and Immediate Provisionalization Workshop
Friday, March 6, 2020.....$120//DDS//AUX

Digital Dentistry: Intraoral scanning and designing of single crowns
Friday, March 6, 2020.....$120//DDS//AUX

Updates for the Dental Hygienists: Advanced periodontal instrumentation and local anesthesia
Friday, March 6, 2020.....$100//DDS//AUX

Surgical Techniques in Periodontics
Friday, March 6, 2020.....$120//DDS//AUX

Digital Implant Planning from A-Z
Friday, March 6, 2020.....$120//DDS//AUX

Endodontic Instrumentation
Friday, March 6, 2020.....$120//DDS//AUX

From Smile Analysis to Occlusion: Creating harmony between anterior guidance and esthetics (How the front end and the back end of the mouth work together)
Sunday, March 8, 2020.....$195 DDS//$145 AUX

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From street life to restoration

Twenty-nine-year-old Patrick Neitzel, the younger of Steve and Mary Neitzel's two sons, has received extensive restorative dental treatment at LLU School of Dentistry.

Patrick Neitzel

Diagnosed in high school with OCD and schizophrenia, Patrick had been living on the street homeless for three years, his whereabouts unknown to his parents. His rescue was at the hands of Bridgett and Erin, two deputies of the Riverside Police Department's homeless unit, who had gained his confidence and steered him toward badly needed assistance.

While living on the street, Patrick had fallen heavily into the use of methamphetamine which is destructive to the mouth and its dentition.

The condition of Patrick's teeth upon arrival at LLUSD.

Back in his parents' home, Patrick was referred to LLUSD by Theresa Cutler, DDS, Escondido dentist to his parents and a teaching alumnus of the School of Dentistry.

When Patrick finally received badly needed dental attention, his intake screening at the LLUSD clinic was by Balsam Jekki, BDS, associate professor, Division of General Dentistry, who saw a very nervous and anxious patient. She referred him to the School's Advanced Dental Education Program in Prosthodontics where he came under the care of then third-year graduate student, Hatem Alqarni, BDS.

With his gentle touch and reassuring manner, Dr. Alqarni was able to thoroughly assess the condition of Patrick's dentition and the bony structures of his jaw with advanced imaging techniques before referring him to the School's Advanced Dental Specialty Education Program in Oral and Maxillofacial Surgery to begin the preparation for dental implants that the young man would require.

Patrick receives reassurance from his mother.

With his restoration nearly compete, Patrick poses with Dr. Hatem Alqarni.

Senior oral surgery resident Luiza Portnoff, DDS'14, initially removed a severely abscessed wisdom tooth (#32) that was causing Patrick a lot of pain. And in subsequent visits, her oral surgery resident successors removed all of his thoroughly compromised teeth before sending him to Dr. Alqarni, who prepared the patient for the implants that the oral surgeons placed in his lower jaw.

Six months later, Dr. Alqarni affixed a complete, lower, fixed denture to the implants of an increasingly relaxed Patrick, and fitted a prosthetic, removable partial to his upper jaw.

Rami Jekki, DDS, assistant professor and associate program director, Advanced Dental Education Program in Prosthodontics, has provided clinical oversight and coordination throughout Patrick's restoration and takes considerable pleasure in the clinical skills of the graduate students and residents who provided the professional services that returned to the patient a pain-free, functional, and esthetically pleasing mouth.

What little was left of Patrick's dentition was removed.

Patrick's restored dentition: full arch implants below, removable prosthesis above.

On April 10, 2019, just having received the upper removable and lower fixed complete dentures from Dr. Alqarni, Patrick held up a mirror and admired his new smile.

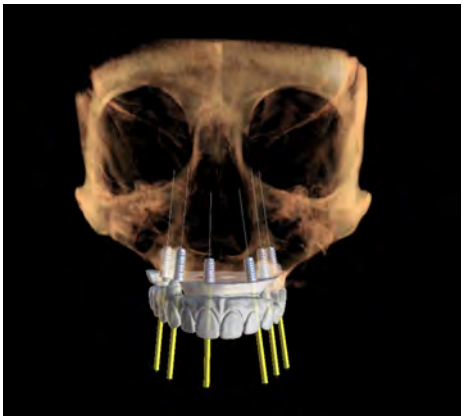
L-R: Dr. Hakem Alqarni, Patrick Neitzel, Patrick's parents, and Dr. Rami Jekki

"They did a great job. I'm really impressed," he enthused. "They saved my life. I'm thankful for all the help." He smiled, "I can now eat theater popcorn again."

LOMA LINDA UNIVERSITY
School of Dentistry

2020 LLU Implant Dentistry Continuum

A CLINICAL PROGRAM AT LOMA LINDA UNIVERSITY SCHOOL OF DENTISTRY



For more than 30 years the Advanced Dental Education Program in Implant Dentistry, through its Division of Continuing Dental Education, has provided didactic and clinical training in implant dentistry to general practitioners and specialists.

The 2020 LLU Implant Dentistry Continuum (formerly LLU Maxicourse) offers **300+ hours** of lectures, hands-on workshop sessions, live surgical demonstrations, online lectures, and clinical experiences assisting and performing dental implant surgeries by course participants. These hours can be applied toward the credentialing requirements of several professional organizations.

The lectures and workshops feature the expertise of widely regarded instructors and clinicians from Loma Linda University and around the world, including material for beginning, intermediate, and advanced clinicians in implant dentistry who wish to expand their competence in this field.

The program is designed to systematically educate participants, starting with basic concepts and graduating to diagnosis, treatment planning, dental implant surgery, and implant prosthodontics. Attendees will develop sequential treatment plans on their own patients and perform surgeries with the assistance of experienced faculty members and residents of the Advanced Dental Education Program in Implant Dentistry.

Attendees will also participate in hands-on workshops involving procedures such as cone-beam imaging analysis, simulated patient-based dental implant surgery on simulation manikans, and guided bone regeneration procedures on cadavers and pig jaws that will complete their understanding of basic and advanced dental surgical procedures.

HANDS-ON SESSIONS

- Zimmer Institute Workshop – Simulation laboratory in implant placement and prosthodontics
- Cadaver Surgery – Bone grafting techniques and head anatomy dissections
- MIS Workshop – Implant placement and prosthodontic techniques
- NobelBiocare Workshop – Immediate implant and provisionalization with tissue grafts, pig jaw GBR surgery – Vertical and horizontal bone augmentation procedures and DTX Studio Implant
- Dentium Workshop – Implant placement and maxillary sinus grafting techniques
- Straumann Workshop – Implant placement and prosthodontic techniques
- PRF Workshop for autogenous membrane and graft preparations
- Computer-guided template design and fabrication
- Phlebotomy Workshop

LECTURE TOPICS

- Dental Photography
- Basic Concepts in Dental Implant Surgery
- Diagnosis and Treatment Planning in Implant Dentistry
- Legal Considerations in Implant Dentistry
- Pharmacology and Clinical Application
- Biology of Platelet-Rich Fibrin (PRF) and its Applications in Implant Dentistry
- Implant Dentistry Restorative Space Requirements
- Full Arch Prosthesis – Design Considerations
- Principles of Ridge Preservation Techniques
- Implant-supported Restorations
- Current Concepts of Osseointegration and Bone Physiology
- Maxillary Arch Implant Rehabilitation: A Restorative Perspective
- Dental Implant Maintenance, Etiology of Complications, Diagnosis, and Treatment
- Clinical Updates of Maxillary Sinus Graft Procedures
- Complications Associated with Cemented Implant-supported Restorations: Their Prevention and Management
- Applications of CBCT in Implant Dentistry
- Applications of Digital Dentures in Implant Dentistry
- Management of Prosthodontic Complications
- Anterior Implant Esthetics
- Basic Principles of Guided Bone Regeneration
- Understanding the All-on-4® Concept
- Evidence-based Peri-implant Considerations
- Basic Concepts in Implant Prosthodontics and Biomechanics
- Single Implant Provisional Restorations in the Aesthetic Zone
- Anatomy and Diagnosis of the Maxillary Sinus
- Titanium Mesh Ridge Augmentation
- Principles of Moderate Sedation and Stress Reduction Protocols

Every participant will have the opportunity to assist in surgical procedures.

2020 SCHEDULE

Course dates:

- March 12 – 13
- April 2 – 3
- May 7 – 8 (offsite course)
- June 3 – 5
- July 8 – 10
- August 6 – 7 (offsite course)
- September 2 – 4
- October 8 – 9
- November 5 – 6
- December 3 – 4

Tuition: $18,000

Half due upon registration, remainder due March 8, 2020.

CE Credit: 300 Hours
*Cancellations received prior to February 28, 2020, will qualify for a refund minus a $200.00 non-refundable charge.

REGISTRATION INFORMATION

To register for LLU Implant Dentistry Continuum contact Loma Linda University School of Dentistry Continuing Dental Education office at **909-558-4685** or visit us online at **dentistry.llu.edu/implant-dentistry-continuum**

**Faculty, topics, and schedule subject to change*

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Applications of 3D printing in dentistry

Roberto Savignano, MSc, PhD

Abstract

In the last decade, the usefulness of 3D printing technology has extended to the medical and dental professions. This new manufacturing process based on computer aided design (CAD) technology facilitates the production of customized devices that were not even conceivable with traditional manufacturing methods. The widespread distribution of low-cost, desktop 3D printers makes it possible even for solo dental practitioners to utilize their own manufacturing devices. However, to select the optimal 3D printer, it is important to understand how additive manufacturing works and to be aware of the several available technologies and the advantages and limitations of each. The ideal 3D printer is the one that best applies to particular applications, required accuracy, specific materials, production size, and budget. The objective of this article is to explain the main features of the most commonly available 3D printing technologies and to explain briefly the workflow required to print a digital model.

Introduction

3D printing—or additive manufacturing—is a process for producing solid 3D objects from a digital file, commonly in STL format (surface tessellation language file or standard triangulation language file) by joining, bonding, sintering, or polymerizing small volume elements.[1] 3D printing offers several advantages over other common manufacturing methods, such as subtractive or casting. It enables the creation of customized 3D anatomical models with a level of complexity impossible to obtain with subtractive manufacturing or computer numerical control (CNC) manufacturing. [2,3]

Traditional casting manufacturing is certainly the least expensive technology when it comes to mass production; but because the mold creation requires a high initial investment, this method is not suited to customized, one-off production.[4]

Additive manufacturing is not a recently developed technology, as it was introduced almost forty years ago.

In 1980, Dr. Hideo Kodama was the first to file for a patent about rapid prototyping that utilized laser beam resin curing,[5] and in 1984 Charles Hull developed the world's first working 3D printer based on stereolithography (SL).[6] However, within 20 years, at the introduction of more affordable imaging and CAD modelling technologies, the technology became very popular in the dental profession.

In 1999, Align Technology® introduced dental design software that enabled digital orthodontic setups. The process begins with a dental impression and an optical scanner used to create a three-dimensional digital dental model, on which a virtual treatment is planned.

Approximately ten years later, the first intraoral scanners, composed of a handheld camera, a workstation, and software, were introduced. Intraoral scanners make it possible to digitize with precision the three-dimensional geometry of a full dental arch, without taking a physical impression.[7]

The intraoral scanner, and its combination with Cone Beam Computed Tomography (CBCT), which was introduced for dental use in the late 1980s, signaled a milestone toward digital dentistry, providing the efficiency and precision of 3D digital anatomical models. Digital workflow provides higher accuracy and more design control compared to manual methods. For this reason, the 3D printer's dental market is growing rapidly and many common laboratory applications are progressively being substituted by digital applications.

Digital dentistry workflow

3D printing represents the final step of the computer-aided design/computer-aided manufacturing (CAD/CAM) process that is comprised of multiple steps shown in Figure 1. The digitization of an object, or of biological tissue, usually represents the first step in the process. This operation can be carried on by multiple technologies depending on the specific target. The most common 3D imaging methods in the dental field are optical scan, CBCT, and Magnetic Resonance Imaging (MRI).

The digital dataset usually goes through a postprocess phase, in which digital manipulation can be performed on the anatomical models. For example, segmentation is a common process applied to the digital anatomical model; as a result, the initial digital model is divided into multiple objects based on specific variables. In the dental field, for example, a CBCT segmentation can obtain separate digital models for each tooth and for the bone from which each tooth erupts. An optical scan can be used to segment teeth, crowns, and gums. This operation makes it possible to manipulate each model independently in the subsequent design and printing phases.

Then, a registration phase can be used to combine reliably accurate volumes obtained by different imaging acquisitions. During this process, the digital volumes are roto-translated, usually with rigid transformation, to bring them into the same coordinate space. Through Boolean operations, the different models can be merged to obtain a single digital object. For example, it is possible to obtain a full arch model combining roots acquired by CBCT and crowns and soft tissues from the optical scan. Hence, the high resolution of the optical scan and the ability to reconstruct internal structures of the CBCT are combined.

With the targeted tissue scanned and modeled using CAD software, specific devices (implant, crown, tray, etc.) can be designed to match or fit. The digitally designed device can be modelled according to the anatomical data retrieved through the imaging process to obtain a customized appliance for the specific patient. Before sending the models to the 3D printer, the digital file needs to be prepared. Therefore, the geometry is "cleaned" to remove possible non-manifold geometries, and the models are sliced. Usually the operator can decide some of the printer settings in this phase. When the digital files are ready, they are transferred to the 3D printer to realize the physical object. Depending on the 3D printing technology used to produce an object, support materials might be necessary during the printing phase, as explained in the following section. After 3D printing an object it will be necessary to remove the support material that can be made by different materials, requiring different removal procedures. Sometimes the 3D printed sample is not the final product, but rather can be used as a mold to produce the final object. For instance, orthodontic clear aligners are created by thermoforming a thermoplastic disk onto a 3D printed dentate model.

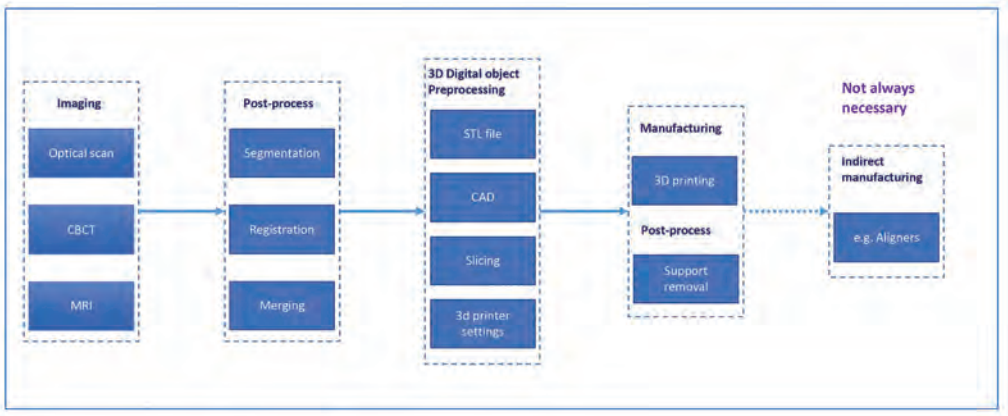

Figure 1. Digital workflow from 3D imaging to manufacturing

Available technologies

Since development of the first 3D printer in 1984, several 3D printing technologies have been developed and are commercially available. The common feature that relates all 3D printing technologies is the layer-by-layer manufacturing process. However, each technology uses different materials, solidification sources, and procedures that result in different costs, accuracy, and mechanical properties for the 3D printed object. Therefore, each technology has advantages and limitations that should be carefully considered and properly weighed, depending on the specific application and desired outcomes. Some of the main technologies are summarized in Table 1 and described in the following paragraphs.

Laser-based Stereolithography (SLA)

The first 3D printing technology invented by Hull in 1984 was laser-based stereolithography (SLA). The printing process is based on the solidification of a liquid resin by photopolymerization (see Figure 2). A laser is focused to a specific depth in a vat of resin, causing localized polymerization and solidification. After the process is applied to the entire layer, the building platform moves to the following layer, and the process is repeated for each layer until a solid object is produced.[8] In SLA printing, the energy transmitted by the laser is important and depends on the light source power, the scanning speed, the exposure time, and the amount of polymer and photoinitiator.[9] The main advantage of SLA printing is its accuracy, which can be approximately ± 0.05 mm.[8] Accuracy is limited only by the width of the focused laser.[10] Supports generated to resist the wiping action and the effects of gravity must later be removed from the final product. Postprocessing involves removal of excess resin and a hardening (or curing) process in a UV oven. SLA is costly when used for large objects, but this technology is commonly used for the industrial production of 3D printed implant drill guides.

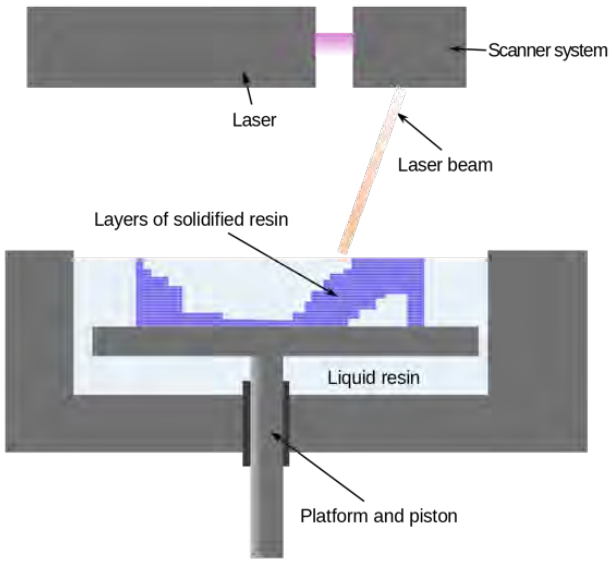

Figure 2. Schematic drawing of an SLA printer. The platform and piston move down after a layer is solidified and a new layer of liquid resin becomes available for the laser to polymerize. (©User: Materialgeeza / Wikimedia Commons / CC-BY-SA-3.0)

Digital Light processing SLA (DLP)

Digital Light Processing (DLP) is based on the same principles as the previously described SLA. The polimerization power source constitutes the main difference between them. DLP uses a lighted screen instead of a punctual laser. The heart of the DLP projector is a digital micromirror device, a chip developed by Texas Instruments. It contains hundreds of thousands of tiny mirrors that are able to move in two directions, on and off, thousands of times per second. Therefore, the single locations of each slice can be polimerized in the same moment, making this method faster than classic SLA. Since a DLP printer builds a model in voxels rather than layers, there are no visible steps, making the finished quality the best of all 3D printing technologies. Many materials are available for DLP printers, from ABS plastic to materials designed for burnout casting.[11] The accuracy, which depends on the projector, can be comparable to SLA technology.

Fused Deposition Modeling (FDM)

Fused deposition modeling (FDM) is one of the earliest 3D printing technologies and is commonly found in low-cost, home/desktop 3D printers. It adequately prints simple anatomical models without too much complexity.[8] It is based on the use of thermoplastic filaments that are extruded through a heated nozzle and deposited onto a build platform in a sequence of layers.[12] During extrusion, the heated nozzle melts the polymer into a semi-liquid state.

Support structures are usually necessary depending on the 3D geometry. They may be formed either from the same material, or from a different material which, for example, can be water soluble.

Manufacturing accuracy will depend on the speed of travel of the extruder and on layer height. More expensive and accurate FDM printers are available, and have application in anatomical study model-making, but little else in the dental and medical fields. The main limit of FDM technologies is that it works only for thermoplastic materials and the accuracy (± 0.5 mm) is lower than that of the other technologies.

Photopolymer Jetting (PPJ)

Photopolymer jetting (PPJ) uses light-cured resin materials and print heads like those found in a common inkjet printer to lay down layers of photopolymer which are light cured with each pass of the print head. A support structure is necessary, but it can be removed with water. A variety of materials may be printed including resins and waxes for casting, as well as some silicone-like rubber materials. Complex geometry and very fine detail is possible,[13] with a minimum

layer height of 16 µm. The disadvantage of PPJ technology is related to the high cost of equipment and materials. It is useful for printing dental or anatomical study models; but they are expensive when produced in this way, whereas implant drill guides may be quickly and cheaply produced with this technology. An advantage of PPJ is that by using multiple print heads it can simultaneously print different materials, graduated mixtures of materials, and thereby vary the mechanical properties of the printed object which may have both flexible and rigid parts—for the production of indirect bonding trays, for example. The approximate accuracy is ± 0.05 mm.

Selective Laser Sintering (SLS)

Selective laser sintering (SLS) technology is based on a scanning laser that fuses a fine material powder to build up structures layer by layer. After one layer is completed, a new powder bed drops down and a new fine layer of material is evenly spread over the surface.[14] A high level of resolution (60 µm) may be obtained; and it is not necessary to print a support structure, because the surrounding powder supports the 3D printed object. Polymers used in this process have high melting points (above autoclave sterilization temperature) and excellent material properties, making objects manufactured in this way useful as anatomical study models,[13] as cutting and drilling guides, and as dental models. However, some of the materials are difficult to prepare and drill, and the technology is costly to purchase, maintain, and run. The materials are intrinsically dusty and come with health and safety requirements. Materials available include nylon, which is perhaps the most versatile, flexible elastomeric materials, and metal-containing nylon mixtures. An interesting possibility for medical implants is the use of polyether ether ketone (PEEK);[15] however it requires high temperatures and complex control – and generates a great deal of waste. The approximate accuracy is ± 0.3 mm.

Direct metal laser sintering (DMLS)[16]

Direct metal laser sintering (DMLS) differs from the other 3D printing technologies in its ability to fully melt the metal powder, rather than heating it to a specific point at which the powder grains can fuse together. This feature makes it possible to control the material porosity and create a homogeneous part. Therefore, DMLS can produce stronger parts because of reduced porosity and greater control over crystal structure. However, DMLS is only feasible when using a single metal powder. DMLS produces strong, durable metal parts that work well as both functional prototypes or end-use production parts. The ability to 3D print in metals is incredibly exciting for dental applications. There are a broad range of metals and metal alloys available including titanium, titanium alloys, cobalt chrome alloys, and stainless steel. 3D printed partial dentures and prosthesis frameworks are already being made in this way, and for implant bridge frameworks this technology may be combined with milling processes to provide high precision connections.

The 3D printing process is not more complex than other technologies, but the post-processing is much more demanding and the fine metal powders and nanoparticle waste require careful management due to health and safety risks.

The DMLS machine uses a high-powered 200-watt Yb-fiber optic laser. Inside the build chamber area there is a material-dispensing platform and a build platform along with a recoater blade used to dispense new powder over the build platform (Figure 3). The technology fuses metal powder into a solid part by melting it locally using the focused laser beam. Parts are built up additively layer by layer, typically using layers 20 mm thick. This produces an overall accuracy of 0.1 mm. The current disadvantage of this technology is the $300,000 price of a DMLS printer.

Applications

The dental industry has embraced 3D printing, and the range of applications is increasing continuously. Some of them are described below.

Anatomical models

One of the earliest applications of 3D printing to the medical professions is the production of anatomical study models, facilitated by 3D imaging technologies (such as CBCT)[17] that have transformed diagnosis and treatment in implant dentistry[18] and in endodontics.[19]

3D physical models (Figure 4) allow the dentist to carefully analyze complex anatomy before surgery.[20] This has led to the development of new, less invasive procedures and more reliable surgical outcomes.[21] Moreover, multicolor anatomical models can be useful in teaching environments. A wide variety of 3D printers and 3D printing materials are available to manufacture multicolor medical models that aid discrimination among structures.

Prosthetics and oral maxillofacial implants

The ability to 3D print metals or high-performing, implantable polymers (PEEK)[15] makes it possible to create maxillofacial implants.[22] 3D printing can produce complex geometries, and can be used to print the implanted structure directly, or as a tool for indirect manufacture using a conventional mold and pressing process.

In 2012 a team of researchers from Belgium and the Netherlands replaced a patient's lower jaw with a 3D printed model. The design,

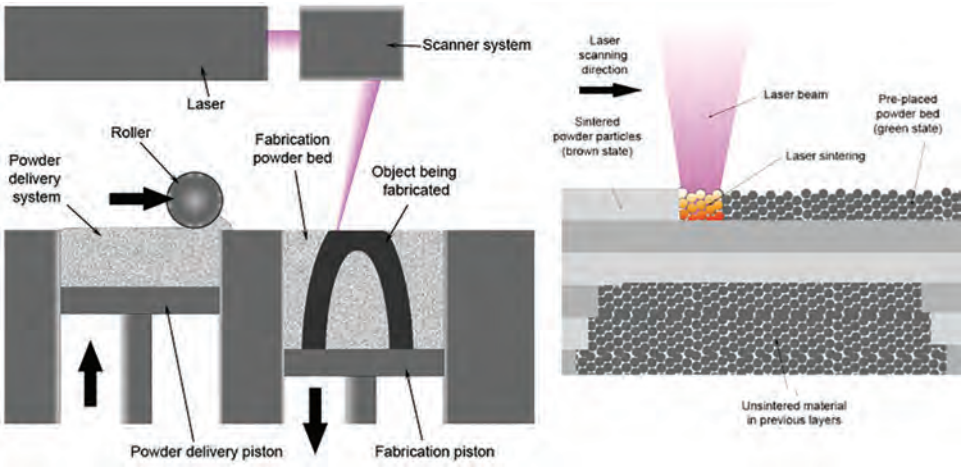

Figure 3. The DMLS scheme is also representative of SLS technology, differing only in the material used. Unique to these technologies are two distinct pistons (platforms), illlustrated above, performing unique tasks. The right portion of the figure is a detailed view of a piston (platform) supported by unsintered metal powder. (©User: Gringer/ Wikimedia Commons / CC-BY-SA-3.0)

processing and production of the implant were all accomplished digitally. The patient was spared a long surgery and the temporo-mandibular joint could be restored at the same time.

3D printing technology may be used to create one-off dental implants. There is also the opportunity to create implants of complex geometry, although ultimately inserting a dental implant using a screw type form appears to be a well proven approach.[23]

Given their capability to produce complex geometry and to be customized without the extensive manual pre- or post-processing steps, DMLS and SLS could be used to produce dental prostheses (Figure 5). [24,25]

Surgical guide (drilling and cutting)

The use of drill guides (Figure 6) and cutting guides allows a virtual 3D plan, created on-screen with software to be transferred to the operative site.[26,27]

Precise 3D printers and high-resolution printing materials must be utilized for implant drill guides, and the imaging must be very precise.

3D printing can be used to manufacture cutting guides such as a genioplasty template system.[28] With the support of digital technology, surgeons can simulate the entire orthognathic surgery and test various surgical plans before performing the actual surgery. 3D printed drill guides have been used to transfer the computerized surgical plan to the patient at the time of the surgery and to guide the surgeon in a precise peformance of the planned surgery.

Clear aligners

Since 1999 Align Technology has been using CAD/CAM technology to produce orthodontic clear aligners (Figure 7). Clear aligners are a profound example of how 3D printing changed a specific dental market. Clear aligners have existed since 1946, but they were made manually by separating teeth in a plaster cast and thermoforming each step of the treatment after moving the teeth to the expected position. Digital dental software and 3D printing provide a quick and more accurate digital design for each treatment step.

The patient's digital dental model is created by an optical scan of the impressions typically made recently from an intraoral scan.

Technology	Approximate accuracy	Cost	Materials
Fused Deposition Modeling (FDM)	± 0.5 mm	Desktop $2k Industrial $20k	Thermoplastic filament
Laser-based Stereo-Lithography (SLA)	± 0.05 mm	Desktop $3.5k Industrial $80k	Photopolymer resin
Digital Light Processing SLA (DLP)	± 0.1 mm	Desktop $3.5k Industrial $80k	Photopolymer resin
Photopolymer Jetting (PPJ)	± 0.05 mm	$20k - $100k	Photopolymer resin
Selective Laser Sintering (SLS)	± 0.3 mm	Desktop $3.5k Industrial $80k-$100k	Thermoplastic powder
Direct Metal Laser Sintering (DMLS)	± 0.1 mm	$300k	Metal Powder

Table 1. Main features of 3D printing technologies

The model goes through a segmentation process that digitally separates teeth and soft tissues so as to freely orient each tooth in planning orthodontic treatment.

A resin model for each step is 3D printed and used to thermoform the aligner.[29]

The main challenge for 3D printing related to clear aligners is the possibility of 3D printing the aligners directly. This would mean several advantages in terms of cost and treatment effectiveness.

This would make possible the most customized aligners, in which thickness and mechanical properties can be controlled. Even more important, this would overcome the cost of the resin model for each treatment step.

Indirect orthodontic brackets bonding

Figure 4. 3D printed anatomical model

Bracket-placing when starting an orthodontic treatment requires time and can be imprecise.

Precise bracket positioning expresses the full potential of the straight-wire orthodontic appliance and leads to better treatment results and shorter treatment times. CAD technology could provide the precision. Through indirect bonding it is now possible to place the brackets on a digital model (obtained from the patient impressions or from an intraoral scan), with the support of the computer for ease and

Figure 5. 3D printed removable denture

precision. Through CAD operations, the digital tray can be created and sent to the 3D printer.[30]

Once the trays have been produced and delivered, the brackets can be precisely bonded to the teeth.

Bioprinting

A separate category of 3D printing applications is represented by 3D bioprinting, which is the three-dimensional printing of biological tissue and organs through the layering of living cells.

This represents a rather new technology, but some applications are already worth mentioning.

Bioprinting can be used to create scaffolding for bone and cartilage regeneration.[31] Moreover, it has recently been used for periodontal tissues regeneration. These scaffolds are referred to as multiphasic constructs, as they possess various compartments that recapitulate the native structure of the periodontal complex.[32]

Recent developments have been made also in the field of whole-tooth regeneration.[33,34] Early prototypes replicating the anatomy of the tooth and using composite inks of poly-ε-caprolactone and hydroxyapatite have already been tested in vitro and in vivo.[35, 36]

These are only some of the possible application of bioprinting in dentistry, but the opportunity to create artificial tridimensional structures of biological tissues most probably will open the way for several applications in the near future.

Discussion and conclusion

The most common 3D printing technologies were introduced to highlight benefits and limits of each. Some of the most popular applications of 3D printing for digital dentistry were described to illustrate the current potential of the technology.

Figure 6. Implant drilling guide (©User: Zypcu / Wikimedia Commons / CC-BY-SA-3.0)

3D printing is used currently in many dental specialties, with additional applications on the horizon. Much of the manual work done by technicians in the past already has been replaced by digital workflow. Furthermore, new applications have been developed that were unthinkable before digital dentistry. For example, researchers from the University of Groningen in the Netherlands have developed monomers containing an antimicrobial that soon will make possible the creation of antimicrobial dental prosthetic devices.[37]

All this means that dentists and dental technicians are becoming well acquainted with and adept at working with large volumes of digital data. 3D printing offers the possibility to create and manufacture intricate components and objects in a variety of different materials, and it facilitates the quick creation of customized devices for each patient.

Following an initial phase in which the technology was prohibitively expensive and required highly specialized technicians, lower costs and the more user-friendly software interfaces have made it possible for dental offices to maintain their own scanner, CBCT, and 3D printer, which translates to timely patient service.

Figure 7. Clear aligner

It is possible now to consider using 3D printing whenever there is a need for a customized patient-specific device.

It is important to understand the limits of 3D printing and recognize that it is still being perfected and doesn't yet enable the production of all dental appliances and prostheses accurately and inexpensively.

When planning the use of 3D printing technology, it is essential to recognize the unique aspects of each specific application. In particular, the technology choice should be based on budget, final application, necessary accuracy, material, and the number of items that will be printed. Combining these considerations will help to ensure the best technology selection for each application. It should be kept in mind that 3D printing is not always better than traditional manufacturing processes (which still show advantages for some applications), but it certainly promises new possibilities.

Future developments will probably bring lower costs for both equipment and materials and, most importantly, the development of new materials. Without doubt, the technology will continue to improve and, as a consequence, so will the mechanical properties of the manufactured objects. 3D printing soon will most likely be used for applications that today are better suited for traditional manufacturing methods. In addition, it may be expected that technological enhancements will open paths for new projects and applications that do not exist today for any of the manufacturing processes.

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Roberto Savignano, MSc, PhD, assistant professor, Dental Education Services, Loma Linda University School of Dentistry
Email: rsavignano@llu.edu

Applications of 3D printing in Dentistry—the quiz

Circle the letters of the correct answers.

1. Which 3D printing technology is the most common among home based desktop printers and why?
   a. cheapest (Fused Deposition Modeling)
   b. most affordable (Photopolymer Jetting)
   c. most accurate (Selective Laser Sintering)
   d. newest (Laser-based Stereolithography)

2. Which 3D printing technology is currently the least accurate?
   a. Laser-based Stereolithography
   b. Selective Laser Sintering and Direct Metal Laser Sintering
   c. Fused Deposition Modeling
   d. Photopolymer Jetting

3. Which 3D printing technology is the oldest?
   a. Digital Light Processing SLA
   b. Fused Deposition Modeling
   c. Laser-based Stereolithography
   d. Photopolymer Jetting

4. Why is it useful to merge optical scan and CBCT data?
   a. The volume reconstruction will be quicker.
   b. It produces higher accuracy on visible parts.
   c. It exposes the patient to less radiation.
   d. The combination is easier to handle with CAD software.

5. What are the advantages of 3D printing compared to casting?
   a. It is cheaper for large numbers of items.
   b. It is more accurate.
   c. Output has better material properties.
   d. It is cheaper for customized output.

6. Which technology can print multimaterial models?
   a. Photopolymer Jetting
   b. Selective Laser Sintering
   c. Fused Deposition Modeling
   d. A & C

7. Choose the correct words to complete the phrase: 3D printing enables the creation of_____3D anatomical models with a level of complexity impossible to obtain with_____manufacturing.
   a. Accurate, additive
   b. Cheap, casting
   c. Customized, subtractive
   d. Rigid, subtractive

8. Are 3D printed dental implants common?
   a. No, because it is not possible to print dental implants with existing technology.
   b. Yes, because customized dental implants have better mechanical properties.
   c. Yes, because they are less expensive than those created with other manufacturing processes.
   d. No, because the cost and time of 3D printing is not recovered by better performance than classic screw shaped implants.

9. Why is Photopolymer Jetting a poor choice for printing anatomical models?
   a. It takes too long to print.
   b. It is more expensive than other technologies.
   c. The printed model will be too weak and brittle.
   d. The printing accuracy is inadequate.

10. Which of the following statements is true?
    a. Support material is necessary only for Fused Deposition Modeling technology.
    b. Support material is never necessary if the CAD model is designed properly.
    c. Support material is often necessary for many technologies and depends on the manufactured geometry.
    d. Support material is always necessary but can be easily removed with water.

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LLUSD research publications accumulate

The following seventy-eight articles published in peer reviewed journals during the first ten months of 2019 included at least one LLUSD author.

Abi-Aad HL, Daher FI, Baba NZ, Cordioli G, Majzoub ZAK (2019). Insertion torque of variable-thread tapered implants in the posterior maxilla: A clinical study. J Prosthodont, 28(2), e788-e794. doi:10.1111/jopr.12965

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LOMA LINDA UNIVERSITY
School of Dentistry

Dental Unit Waterline Testing and Sterilization Assurance Service

Dental Unit Waterlines Testing Service (DUWLs) has been in operation since 2000. We evaluate microbial contamination of DUWLs and are actively involved in research on DUWLs biofilm removal and treatment methods. Numerous dental offices, universities, veterans hospitals, medical/dental centers, and over 43 states, and Canada use this service for monitoring the quality of their DUWLs.

What are the advantages of using LLU School of Dentistry's DUWLs service?

- The Standard Method 9215D (membrane filter method) of the American Public Health Association (APHA) is used to examine microbial contamination in DUWLs.
- Multiple dilutions to detect heterotrophic plate count (HPC) bacteria counts up to 20,000 CFU/mL
- 19 years' experience
- Free consultations by experienced staff
- All-inclusive test kit containing sterile sample vials, ice packs, and detailed instructions in insulated test packages
- Test reports sent after the seven-day incubation
- Local customers may deliver samples directly to our research laboratory.

Sterilization Assurance Service (SAS) was established in 1998. SAS provides biological monitoring of sterilizers for over a thousand dental clinics, community colleges, and medical/dental centers, and other institutions nationwide.

What are some of the advantages of using LLU School of Dentistry's SAS?

- 20 years of experience
- Choice of Basic, BasicPlus, and Intensive spore testing services to help you meet infection control requirements within your budget
- Return envelopes or prepaid envelopes are included based on your choice.
- Option of weekly or monthly reports with available Certificate of Participation
- Failure notification by phone or e-mail on same business day
- Class V integrators for steam sterilizer are available to order. The combined use of spore tests, and STEAMPlus Integrators provide early detection by visually confirming the performance of your sterilizers.

LOMA LINDA UNIVERSITY
School of Dentistry

Dental Unit Waterline Testing and Sterilization Assurance Service Order Form

Date _____

Dr. Name (Last) _____ (First) _____

Name office _____(Contact Person)_____

Address _____ City _____ State _____ Zip _____

Phone ( ) _____ Fax ( ) _____ E-mail _____

Sterilization Assurance Service

Customer ID# (for current customers) _____

Sterilizer Type/Model/Serial #_____

(Supplies for each sterilizer must be kept separate for identification purposes)

☐ Steam_____ ☐ Chemical Vapor_____ ☐ Dry Heat_____

Basic (1) One test strip and one control strip per test (2) Return envelopes (3) Monthly report (4) Failure notification via phone

Price	Quantity	Total
$89/12 tests	_____	$_____
$119/24 tests	_____	$_____
$169/52 tests	_____	$_____
Optional: Certificate of participation $12/ea		$_____
Add $15 shipping & handling for each package		$_____

Basic Plus (1) One test strip and one control strip per test (2) Return envelopes (3) Weekly report (4) Failure notification via phone

Price	Quantity	Total
$229/52 tests	_____	$_____

Intensive (1) Two test strips and one control strip per test (2) Prepaid return envelopes (3) Certificate of Participation (4) Report on each test (5) Failure notification via phone

Price	Quantity	Total
$128/12 tests	_____	$_____
$298/52 tests	_____	$_____

Class V Integrator for Steam Sterilizer (New)

Price	Quantity	Total
$32/100 tests	_____	$_____
$220/1000 tests	_____	$_____

Dental Unit Waterline Testing

Customer ID# (for current customers) _____

Tests	Price/Each	# of Tests	Total
3	$30	_____	$_____
4-8	$27	_____	$_____
9-12	$25	_____	$_____
13-25	$23	_____	$_____
>26	$22	_____	$_____
	Optional: Certificate $12/each		$ _____

- A foam box, ice packs, sample vials, and instructions are included.
- Use APHA Standard Methods 9215D to test DUWLs samples.
- Full dilutions provide accurate Heterotrophic bacteria counts.

Shipping & handling

Priority Mail - starting $15.00/box
FedEx 2-day - $36/3-12 tests; $45/13-40 tests

Check enclosed $_____ (made payable to SAS-LLU)

Charge: Total $_____ ☐ VISA ☐ MasterCard

Name on card _____

Card number _____

Exp. Date _____/_____ CCV# _____ Invoice# _____

Mail to:
Dental Waterline Testing & Sterilization Assurance Service
Chan Shun Pavilion, Suite A-1005
11175 Campus Street, Loma Linda, CA 92350

Tel: 909-558-8176, 909-558-8069

Fax: 909-558-0307

E-mail: sas@llu.edu

dentistry.llu.edu/sas

version 4.3

LLUSD NEWS

LLUSD faculty contribute to 3rd Global Conference on Health & Lifestyle

Eight members of the LLU School of Dentistry faculty, and an LLUH administrator colleague, provided 10.5 hours of continuing education (see list below) during the General Conference of SDA-sponsored Third Global Conference on Health and Lifestyle hosted by Loma Linda University Health July 9 through 13, 2019, at the LLUH Centennial Complex under the general heading "Your Brain, Your Body."

Dentists from ten countries—Bangladesh, Botswana, Bulgaria, Congo, Costa Rica, Democratic Republic of the Congo, Hungary, Latvia, Malawi, and the Philippines—attended eight oral healthcare breakout sessions for continuing education credit. These dentists joined about 850 attendees from around the world to the 3rd Global Conference on Health & Lifestyle.

Dentists attended from throughout the global village.

Dr. Dwight Rice lectures on modern dental imaging.

Geriatrics – Steven Powell, DDS'87, assistant professor, Division of General Dentistry
"Responding to the Dental Needs of the Elderly"

Guidelines for Special Care Dentistry – Wesley Okumura DDS'94, assistant professor, Department of Pediatric Dentistry
"Caring for Special Patients"

Sedation and General Anesthesia – John Leyman, DDS, associate professor, Dental Anesthesiology
"Dentistry for Special Needs Patients"

Spiritual Care: A dental imperative – Doyle Nick, DDS'78, MS'09, associate professor, Division of General Dentistry
"Spiritual Care in Dentistry: A Dentist's Imperative?"

Whole Person Care: Understanding our patients – Jana Boyd, PhD, MS, MA, LMFT, director, Loma Linda University Health Employee & Student Assistance Program
"Understanding the Effects of Early Trauma on Patient Functioning and Implications for Working with Problematic Patients"

Avoiding Burnout – Natalie Hohensee, DDS'08, assistant professor, Division of General Dentistry, and Anupama Grandhi, DDS, assistant professor, Oral and Maxillofacial Surgery
"A Whole Person Approach to Wellbeing for Dental Professionals"

Modern Dental Imaging – Dwight Rice, DDS'96, professor, Department of Radiology and Imaging Sciences
"Modern Dental Imaging: Digital Radiology, 3D Imaging, Soft Tissue Imaging, Responsibility, Liability"

Technology of Today and Tomorrow – Brian Goodacre, DDS'13, MSD'17, Division of General Dentistry
"Technology of Today and Tomorrow: Scanning, Milling, and Printing"

Participation by LLUSD faculty in this 3rd Global Conference on Health and Lifestyle was arranged and organized by Doyle Nick, DDS'78, MS'09, Director of International Dental Affairs.

LLUSD participates in Riverside's fifth Long Night of Arts & Innovation

LLU School of Dentistry was represented at Riverside's fifth Long Night of Arts & Innovation, October 10, 2019, with a table at which young people were introduced to the marvels of intraoral scanners demonstrated by Pooya Soltanzadeh, DDS, MS'18 (prosthodontics), assistant professor, DGD, and class of 2020 dental student Katherine Koliadko.

To demonstrate the technologies' capabilities to young attendees, Dr. Soltanzadeh displayed Star Wars characters he had scanned and reproduced with a 3D printer.

The table and support materials were set up and maintained by the LLUSD Office of Marketing team, Krista Weymar, MBA, director; Leigh Ann Evans, web content editor, Sam Sadanala, visual designer, and Doug Hackleman, MA, director of Publications. Marlise Perry, assistant director, Office of Admissions and Recruitment (accompanied by her husband), assisted at the School's location speaking with attendees who might show interest in taking dentistry or dental hygiene.

Traffic to the School's demonstration was augmented by a neighboring team from LLU's biology graduate program that presented an alarming array of snakes, lizards, scorpions, spiders, and tarantulas.

The Long Night of Arts and Innovation plays a role in the development of future artists and scientists by encouraging school children to seek challenging careers in the arts and sciences. Students who attend the Long Night can interact with presenters, ask questions, and be inspired by the real-life stories of local people who have enjoyed great success in the students' chosen fields of study.

Riverside is home to four colleges and universities and The Long Night of Arts & Innovation is a great way to encourage school children to seek innovative careers in the arts and sciences by connecting them to professors, artists, professionals and performers from these institutions.

Dr. Soltanzadeh assists as a youngster scans the hand of her friend.

Ms. Koliadko, D4, mentors a potential dentist.

Ironman Silvestrin competes in Hawaii

Tory Silvestrin, DDS, MSHPE, MSD'16, chair, Department of Endodontics, program director, Advanced Dental Education Program in Endodontics, competed in the Vega IRONMAN World Championship in Kailua Kona, Hawaii, on October 12, 2019.

The arduous IRONMAN race consists of a 2.4-mile rough water swim, a 112-mile bike ride, and a 26.2-mile run. Dr. Silvestrin completed the race in 11:45:46.

Silvestrin's participation in long distance events began in late 2011 with a run in the Portland Marathon, his first, on October 9, 2011.

He subsequently has participated in a number of marathons—including every Boston Marathon beginning in 2014—and a number of ironman races. He completed the Tempe, Arizona, Ironman in November 2015, in 9:39

Dr. Silvestrin's long-distance running began during the summer between his junior and senior year of dental school as a way of relieving stress after taking the National Boards Part II.

Dr. Silvestrin heads from the swim to the bike.

Nojan Jahedmanesh in the spotlight

Nojan Jahedmanesh, dentistry class of 2020, was featured in *CDA News*' "September Student Spotlight."

"It confirms I'm in the right profession," he says, "every time I see my patients genuinely smile after I give them the mirror."

Nozhan finds "meeting new people is one of the most rewarding parts at every CDA event," and says, "I'm proud that we as a group of students and doctors can rely on each other for mental and moral support."

Nojan Jahedmanesh

LLUSD NEWS

LLUSD faculty awarded at 97th IADR annual session

Twelve LLU School of Dentistry faculty and alumni shared their research with poster presentations at the 97th General Session and Exhibition of the International Association for Dental Research (IADR) June 19-22 in Vancouver.

Two members of the LLUSD contingent received awards.The John W. Stanford New Investigator Award for Standards-related Research Paper was presented to Claudie Pascal, DDS'19, based on her research project: "A Laboratory Model to Evaluate Tooth Bleaching Efficacy in Stained vs Non-Stained Human Teeth." Dr. Pascal's co-investigators included Prarthit Mehta, BDS (IDP class of 2021), Jeffery Pascal, DDS'16, first-year OMFS resident, and Udochukwu Oyoyo, MLIS, MPH, assistant professor, Dental Education Services. The project was mentored by So Ran Kwon, DDS, MS, PhD, MS, associate professor and program director, Student Research.

Meanwhile, the American Dental Association Standards Committee on Dental Products (ADA SCDP) presented its 2018 SCDP Volunteer Award to Yiming Li, DDS, MSD, PhD, associate dean, Research, for his "significant contribution, dedication, and commitment to the voluntary standards program for dental products."

Left: Dr. Claudie Pascal (right) and Satish Alapati, DDS, MS, PhD, associate professor (endodontics), University of Illinois, College of Dentistry | Right: Dr. Yiming Li (right) and David Preble, DDS, JD, senior vice president, ADA Practice Institute

Poster presentations by eleven LLUSD researchers are listed below.

Dentin/Pulp Responses to a Hydrophobic Oxirane/Acrylate IPN Resin Composite, Montry Suprono, DDS'07, MSD'11, director, Center for Dental Research

Mutagenicity Evaluation of a Hydrophobic Oxirane/Acrylate IPN Resin Composite, Wu Zhang, MD, professor, Dental Education Services

Oral-Health-Knowledge and Oral-Health-Related Quality of Life Among Adults Aged 65 Years and Above, So Ran Kwon, DDS, MS, PhD, MS, director, Student Research

CBCT and MRI Render Similar Pharyngeal Airway Measurements, Victoria Geren, DDS'15 (IDP), final year graduate student, Advanced Dental Education Program in Orthodontics and Dentofacial Orthopedics

Subgingival Microbiota and Hypertension in African Americans, Ahmed Khocht, DDS, MSD, professor, Department of Periodontics

Measurement of Erosion Depth using Microcomputed Tomography and Light Microscopy, Gina Roque-Torres, DDS, MsC, PhD, postdoctoral fellow and research associate, Center for Dental Research

Hypersensitivity/Oral Mucosa Irritation Potential of a Hydrophobic Oxirane/Acrylate IPN Composite, Abu Shufian Ishitiaq Ahmed, MS, PhD, Research Associate, Center for Dental Research

Potential Penetration of Functional Gold Nanorods into Tooth Enamel, Yiming Li, DDS, MSD, PhD, associate dean, Research

CBCT and MRI Yield Similar Maxillary Sinus Measurements, Cara Hodgson, DDS'17, final year graduate student, Advanced Dental Education Program in Orthodontics and Dentofacial Orthopedics

Comparison of Two Methods for Evaluating Efficacy of DUWL Disinfectants, Omaima Mohamed, lab assistant, Center for Dental Research

Evaluating Bonding Agent's Effect in Microleakage of a Bioactive Restorative Material, Jung-Wei Chen, DDS, MS, MS, PhD, program director, Advanced Dental Education Program in Pediatric Dentistry

LLUSD clinicians inducted to International College of Dentists

Nominated by Ronald Fritz, DDS'72, three LLUSD alumni were inducted as fellows to the International College of Dentists at the ICD convocation ceremony during the California Dental Association's annual meetings (September 4 - 8) in San Francisco:

- Jung Wei (Anna) Chen, DDS, MS, MS, PhD, clinical director, Advanced Dental Education Program in Pediatric Dentistry,
- Heidi Kohltfarber, DDS'03, MS, PhD, owner, Dental Radiology Diagnostics and Dentsply Sirona 3D trainer,
- Paul Yoo, DDS'08, adjunct assistant professor, Dental Education Services and owner, Kauai Dental Studio.

At the same convocation, the ICS presented Dr. Fritz with a presidential citation "In recognition" for his contributions "as a volunteer speaker for imparting invaluable information and inspiring others to serve."

Dr. Jung-Wei Chen

Dr. Heidi Kohltfarber

Dr. Paul Yoo

Dr. T. Bob Davis *Dr. Ronald E. Fritz* *Dr. Richard A. Williamson*

OMFS clinicians receive Healing Hands appreciation

During the last couple of months in 2019, three LLUSD dentists were honored with Healing Hands silver pins awarded to LLU Health care providers whose patients have formally and tangibly acknowledged their appreciation for compassionate care.

The receiving trio was comprised of Alan Herford, DDS'94, MD, chair, OMFS, and program director, Advanced Dental Education in OMFS; Matthew Streelman, DDS'11, chief resident, Department of Oral & Maxillofacial Surgery; and Carlos Moretta, DDS'01, assistant professor, OMFS.

Dr. Streelman's patient thanked him "for being kind, caring, and for helping me get through my oral surgery."

"I thank God for Dr. Moretta," said his 89-year-old patient. "He treated me like I was young enough to have anything done."

Dr. Herford's grateful patient's mother appreciated the care given by his team in "allowing me as the caregiver to be the advocate for my daughter. They listened and invited my participation for the care process which really eased the fear and created a smooth, trusting, and safe environment for us."

Dr. Matthew Streelman

Dr. Carlos Moretta

Dr. Alan Herford

Peripatetic Chen does China

Jung Wei Chen, DDS, MS, MS, PhD, program director, Advanced Dental Education Program in Pediatric Dentistry, presented four lectures in the People's Republic of China (July 23-26) and four more in the Republic of China (Taiwan) July 28 through August 1.

In the adjacent photo, Dr. Chen and Chinese colleagues, Dr. Zhi Hong Chen (left) and Dr. Yao Chen (right), in the Zhejiang University dental clinic bracket Dr. Jung-Wei Chen during her zirconia crown hands-on training course.

Estey and Sahl represent LLUSD at Sir Run Run Shaw's 14th International Academic Week

Dr. Sahl (4th from left) and Dr. Estey (to his right) are bracketed immediately by Dr. Andy Lieping Sheng (left), SRRS dental clinic director, and by Dr. Larry Liqun Wu (right), former clinic director, and by six other dentists from the dental clinic staff.

Mark Estey, DDS'98, assistant dean, Academic Affairs, and Eric Sahl, DDS'06, MSD'11, program director, Advanced Dental Education Program in Periodontics, represented the LLU School of Dentistry, at Sir Run Run Shaw Hospital in Hangzhou, China, on October 22, 2019, during its 14th International Academic Week.

Holli Riter earns Project Management certificate

Dr. Holli Riter

Holli Riter, DDS'98, associate professor, director, Clinical Quality Assurance, recently earned a Project Management Certificate (8/30/2019) from the University of California, Los Angeles Extension.

Dr. Riter says she "became interested in learning about project management . . . to increase my underastanding of quality, and learn how to use project management to create systems that promote quality. I was inspired by working with Dr. Joe Caruso and his extensive knowledge in this area."

LLUSD graduates/faculty become ADI fellows

From left, Schubert Sapian, DDS'97; Dr. Steve Chang, Dr. Oariona Lowe, Dr. Heidi Kohltfarber, Ronald Fritz, DDS'72, MPH, Past VP of ADI; and Jaikrishnan Kakanar, DDS'95 (IDP), vice chair, USA Section of ADI.

The Academy of Dentistry International inducted new fellows Wednesday, Sept 4, 2019, during its annual meetings in San Francisco. Among the newly designated fellows were three LLUSD-related dentists: Steve Chang, DDS'91; Heidi Kohltfarber, DDS'03; and Oariona Lowe, DDS, MPH; assistant clinical professor, Department of Pediatric Dentistry.

ADI is an honor society for dentists dedicated to sharing knowledge through continuing education in order to elevate the standard of dental care, better serve the dental health needs, and improve the quality of life throughout the world. Fellowship in the Academy is bestowed on dentists who have distinguished themselves in their profession and are nominated for the award by a fellow of the Academy.

LLUSD graduates/faculty become ADI fellows

Three, recent graduates of the LLUSD Advanced Dental Education Program in Prosthodontics—Jefferson Clark, DDS'13, MS'16; Pooya Soltanzadeh, DDS, MS'18; assistant professor, DGD; and Raj Swamidass, DDS'13, MSD'17, assistant clinical professor, Advanced Dental Education Program in Implant Dentistry—were awarded the status of Diplomate, American Board of Prosthodontics, at the ABP meeting in Miami, November 1, 2019.

L-R: Drs. Jefferson Clark, Pooyah Soltanzadeh, Raj Swamidass, and Mathew Kattadiyil, DDS, MDS, MS, program director, Advanced Dental Education Program in Prosthodontics

PROFILING

Lee Ingersoll, DDS'70, MS'74

His mild manner of speaking belies Lee Ingersoll's vigor at 5 am. That's when he begins to run a 4.4-mile course he's pursued for over 40 years. Then spot him in the gym. He joins his basketball team known as the Salvation Road Show—mostly LLU faculty—who engage in a raucous welcome to Pastor Randy Roberts, their "power forward," when he enters the gym. They're chanting, "Larry, Larry, Larry," their nickname for Pastor Roberts whose shooting style resembles that of Larry Bird, the Boston Celtics basketball legend.

Dr. Lee Ingersoll

During his year in eighth grade, Dr. Ingersoll remembers taking two-hour recesses in rare balmy weather to complete a baseball game. And basketball prevailed during the long winters. "What else do you do in rural Wisconsin?" he asks. With sports looming large in his life, by the age of 13 his ambitions centered on becoming a Milwaukee Brave. Failing that, he entered LLUSD's class of 1970, having taken a good look at his father's and grandfather's lives as "country" doctors. They were making house calls and absent long hours from home. He favored a more balanced pursuit. In his subsequent 45 years of practice, the drive and teamwork required in sports have become Dr. Ingersoll's hallmark in dentistry as well.

After a year of dental internship, and a year of teaching with Dr. Lloyd Baum, he pursued the School's then new endodontics graduate program. Endodontics had been accepted by the American Dental Association as a specialty just seven years earlier; LLUSD was the second West coast dental school to offer an endodontics program. The department was pioneered by Dr. Ronald Buell, who had been the first dentist in Orange County to limit his practice to endodontics. Dr. Ingersoll liked the focus of the practice. "You're helping people get rid of pain,' he says. "You're using refined skills." Invited by Dr. Buell to join his endo practice in Santa Ana, Dr. Ingersoll welcomed the intense pace of the practice. "We scheduled no patients after 3 pm. The four us—Drs. Buell, Merrill Schmidt, Merle Hickock and I—would have 12-15 emergencies every day. That's when we took care of the emergencies that were always present to fill out our day." As he reminisces about "the busy times," he adds, "Hopefully, we represented God well. Not too many patients asked questions, but they knew they were well treated."

Joining LLUSD's endodontics faculty, Dr. Ingersoll began making the one-hour drive every other week to meet students in another segment of his career. One of his assignments, working with the International Dentist Program students, was notably rewarding because of their diverse skills. "We needed to help them be successful in the clinic," he says. "The competition to get in was intense. They were very supportive of each other, very eager to learn, eager to come in for Sunday labs. This was elective; but most came."

Today Dr. Ingersoll does not talk of slowing down. "I like being productive," he says. He cites his colleagues as examples. "Dr. Buell practiced until he was 74—a real trooper. Dr. Schmidt practiced until he was 78. We had long-standing employees—an office manager for 26 years, and front office help who were there 22 and 28 years. The people you work with make a lot of difference. Long-standing employees helped with cohesiveness."

Conversations with Dr. Ingersoll often return to sports. And there is a lilt in his voice when he admits, he's a diehard Packers fan—a franchise he praises for permitting its fans to buy stock in the team.

Yes, he's an owner!

School of Dentistry Alumni Video Contest

Your LLUSD alma mater would like to showcase your videography and storytelling skills.

We encourage you to submit an entry to the School of Dentistry alumni video contest! Whether or not you'll be able to attend Homecoming 2020, we would love to showcase your videos that include, but are not limited to, stories about enhancing the community you serve, patients describing how you changed their lives, mission trip adventures, how you chose your profession, why you chose LLUSD, how you learned you'd been accepted into the dentistry or dental hygiene program, or favorite memories of your years at LLU School of Dentistry.

Submission Information:

Video creators do not have to attend the March 2020 homecoming reception to win. Long-distance submissions are encouraged.

- A link to your public YouTube or Vimeo video must be emailed to SDmarketing@llu.edu by 5:00 pm on Friday, February 21, 2020, to be considered for the contest. Submissions must include the name and class year of submitting alumni, the video title, and a contact phone number.
- All video creators and any individuals featured in their videos must complete LLUH Authorization and Consent forms. When a video link is received, the Authorization and Consent form PDF will be emailed to the video's creator with instructions on how to complete the form correctly.

Contest Rules:

- Videos must be between one and three minutes in length. Videos over three minutes will not qualify.
- Content must be original. Commercial (copyrighted or trademarked) content will disqualify the submission.
- Videos may be produced by as many as four people, so long as all producers are LLUSD alumni. Prizes will be awarded per video, not per team member; and each producer (or production team) may submit only one video.
- Once submitted, the video becomes joint property between the video producer(s) and Loma Linda University. Winning videos will be posted on the School's website, social media channels, and may be used at public events.
- Video must be in English OR include English subtitles (or both).
- Finalists will be judged by a faculty/staff/student panel on the following attributes:
  - Originality, creativity, and quality
  - Suitability for distribution by LLU School of Dentistry and the extent to which it reflects LLUSD's mission—To make man whole and motto—Service is our calling.
  - Video submission genre or style may be dramatic, documentary, comedy, testimonial, animation, etc., so long as the content and language appropriately reflect the ethos of the School of Dentistry and LLUH.

Winners:

Winners will be announced at the School of Dentistry Homecoming reception on Friday, March 6, 2020, and the first-place video will be shown to attendees at that time. It will also be shown on May 15 at the LLU School of Dentistry alumni reception during the "CDA Presents"
Anaheim conference.

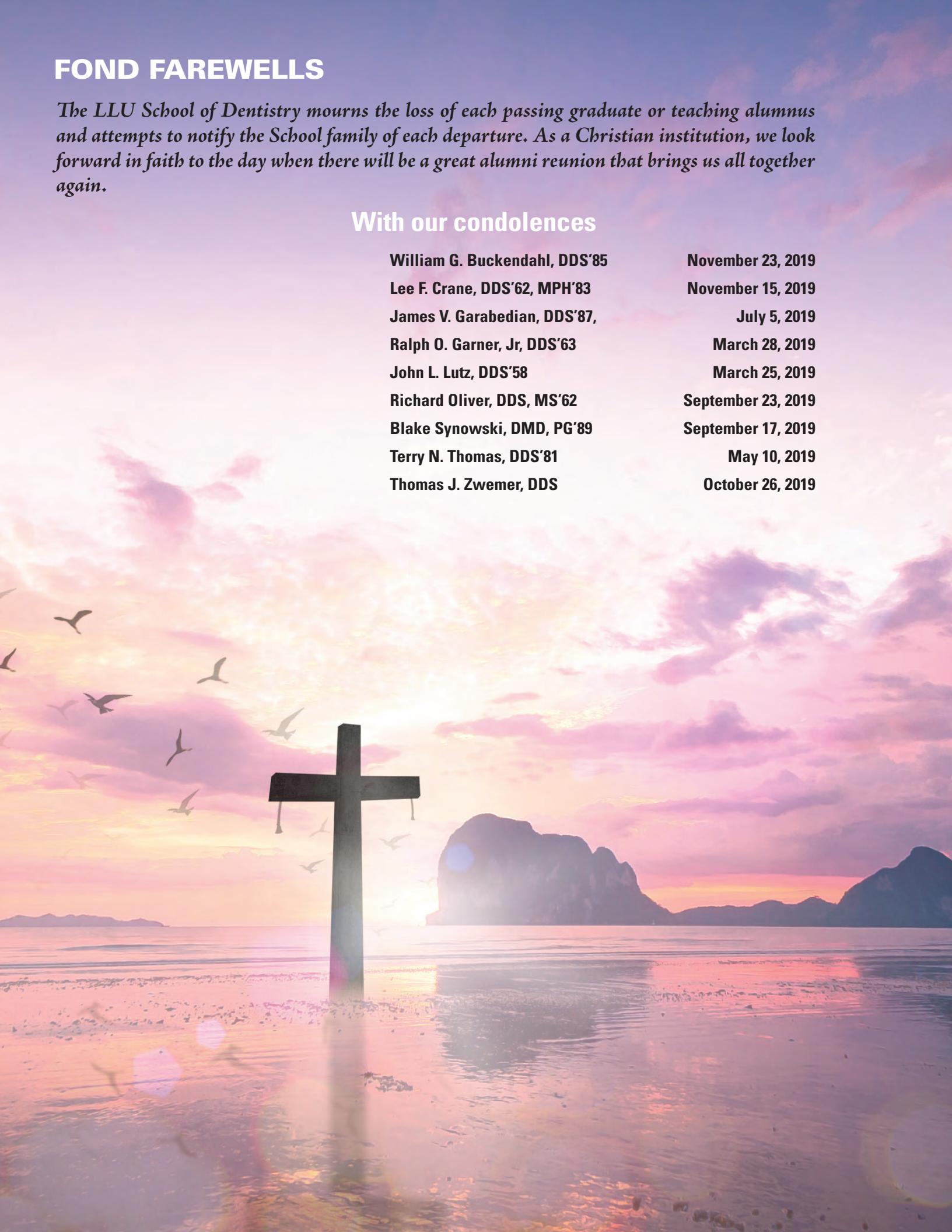
If you have any questions or concerns please contact Krista Weymar at kweymar@llu.edu or 909-651-5563.

FOND FAREWELLS

The LLU School of Dentistry mourns the loss of each passing graduate or teaching alumnus and attempts to notify the School family of each departure. As a Christian institution, we look forward in faith to the day when there will be a great alumni reunion that brings us all together again.

With our condolences

William G. Buckendahl, DDS'85	November 23, 2019
Lee F. Crane, DDS'62, MPH'83	November 15, 2019
James V. Garabedian, DDS'87,	July 5, 2019
Ralph O. Garner, Jr, DDS'63	March 28, 2019
John L. Lutz, DDS'58	March 25, 2019
Richard Oliver, DDS, MS'62	September 23, 2019
Blake Synowski, DMD, PG'89	September 17, 2019
Terry N. Thomas, DDS'81	May 10, 2019
Thomas J. Zwemer, DDS	October 26, 2019



LOMA LINDA UNIVERSITY
School of Dentistry

Upcoming CE Courses

The New Wellness Approach: A realistic way for dentistry and medicine to collaborate
Thursday, March 5, 2020

All Burned Out and Nowhere To Go? Adapting and inspiring change in your life
Thursday, March 5, 2020

Awaken Your Knowledge of Sleep Disorders in the Pediatric Population: Airway management for the entire healthcare team
Friday, March 6, 2020

From Smile Analysis to Occlusion: Creating harmony between anterior guidance and esthetics (How the front end and the back end of the mouth work together)
Sunday, March 8, 2020

2020 LLU Implant Dentistry Continuum
Thursday, March 12, 2020

Medical Emergencies in the Dental Office: A simple approach
Sunday, March 15, 2020

The Jacked-Up Dentition: Demystifying full mouth rehabilitation & I've Got A Few Tricks Up My Sleeve! Tips To Make Everyday Procedures A Little Easier
Sunday, March 29, 2020

Are Your Patient's Getting Comfortably Numb? An update and review of local anesthesia techniques and pharmacology
Sunday, April 5, 2020

Hot Topics in Infection Control and California Dental Practice Act
Sunday, April 19, 2020

Functional Considerations in Esthetic Dentistry
Sunday, May 31, 2020

RDAEF Expanded Duties Program
Tuesday, July 7, 2020

Can Your Dental Team Help Defend You in a Malpractice Suit?
Sunday, October 11, 2020

For more information or to register, contact LLUSD Continuing Education
11245 Anderson Street, Suite 120, Loma Linda, CA 92354
Ph: 909-558-4685 | Fax: 909-558-0835 | dentistry.llu.edu

LOMA LINDA UNIVERSITY
School of Dentistry

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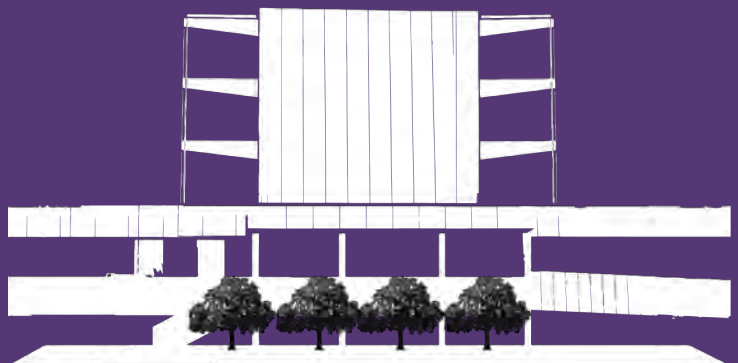
Loma Linda, CA 92354

homecoming



LLUSD

ALUMNI STUDENT CONVENTION

THURSDAY, MARCH 5 – SUNDAY, MARCH 8, 2020

Loma Linda University School of Dentistry Continuing Education programs are open to all oral health professionals.

For more information on registration please contact Loma Linda University School of Dentistry Continuing Dental Education office at **909-558-4685** or visit us online at **https://ce.llu.edu/homecoming-2020/hc-asc-dental-reg-site**