american academy of gold foil operators

# Gold Leaf

July 2022

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## In This Issue



Closeup of class two foils by Dr Dick Tucker

## President's Message

The days are getting longer and summer is just around the corner. Now is the time to make plans to attend our next Annual meeting of the American Academy of Gold Foil Operators. After missing two years due to the COVID pandemic, we are very excited to get everyone back together in Indianapolis Indiana. This academy is like one big family, and it will be very fun to catch up with all our friends. Dr. Tim Carlson has been working on the local arrangements and has secured clinic space for our operations at the university. Dr. Al LaPorta is the scientific session committee chairman, and promises to have some great lectures for us.

This Academy is all about Direct Gold Restorations, and there is no doubt that direct gold can provide lifelong service from the day it is placed. In addition there are many other benefits that may be less obvious or appreciated. When I see a direct gold restoration in a patient's mouth, I can't help but ask them what dentist placed it there. The patient may not know who did an amalgam, composite, or even crown, but they always know who took the time to place that special restoration, and they regard it with pride. Often, the dentist may have passed away, but the gold restoration is still working fine, giving that dentist a little bit of immortality. On a typical day we complete many types of treatment for our patients, ranging from composite, amalgam, crowns, inlays, and implants, but when I have the chance to do a gold foil in the office, I reflect at the end of the day that I have done something exceptional, and experience that warm glow.

Through the experience of placing direct gold restorations, every gold foil operator has developed keen skills and technical ability that lifts the quality of all of his or her treatments of their patients. There is no better teaching material, and there is no material more biocompatible for restoring teeth. I can't wait to do my next gold foil restoration.

I am looking forward to seeing you all in Indianapolis !

It WILL be fun.

Dick Tucker

| American Academy of Gold Foil Operators<br>Executive Council and Committees 2020-2021 | | |
|---|---|---|
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# Editor's Message

Hello to everyone and welcome to the 2022 edition of the Gold Leaf.

Now that things are starting to get back to some semblance of normality, with possibly the exceptions of the cost of gas, and inflation if we are not at the end of trying times, to quote Churchill at least "the end of the beginning."

This edition of the Gold Leaf will include some uplifting topics I think we could all use!

I have included a section on hobbies and passion of our membership along with the latest information about activities of the AAGFO. This will include the new Executive Council makeup! We owe a special thank You to Dr Robbie Bridgemen for serving three terms as President of the Academy! He steered our ship through those trying times I spoke about earlier! Thank You Robbie for a job well done! The information about our upcoming meetings at IU in 2022 and Germany in 2023 is included. Also, a very interesting paper entitled Dental Caries Research Observations from Ralph Steinman and John Leonora.

Dr Steinman is one of the three founding faculty members of Loma Linda University School of Dentistry in 1950. The article was authored by Dr. Clyde Roggenkamp and originally published in the LLUSD Articulator in the summer/autumn edition 2016. With the help of Dr Clyde Roggenkamp, I have arranged for permission from the editors of the Articulator to republish the article here. I think you will find it interesting and insightful and should change how you look at the development and progress of dental caries!

As usual there are lots of great photos for everyone to enjoy. After all, as dentist, we are visual people with exceptional hand-eye coordination! So please enjoy this edition and if you have ideas for future editions, please contact me at golddoc46@gmail.com.

Dan Henry DDS , Editor

# From the Secretary/Treasurer

Greetings, Academy Members:

I am writing to let you know that while met with new challenges, the Academy is alive and well. As we are not immune to the heavy impact that these "unprecedented times" have thrust on society, Covid-19 protocols and travel restrictions caused the cancelation of the 2020 and 2021 annual meetings. Since our last in-person meeting in 2019, the Executive Council members willingly stayed the course of their roles, meeting virtually, and will continue to preside as elected through the 2022 Indianapolis meeting. During that meeting, when we joyfully gather in person once again, we will resume the progression of the leadership team through the ranks while welcoming new councilors.

Plans are well underway for the annual meeting in Indianapolis scheduled on October 19th through the 23rd at the JW Marriott. Please mark your calendars and we will notify everyone as soon as registration is open.

We look forward to seeing you there!

Sincerely,

Eric K. Morrison, D.D.S., M.A.G.D.
Secretary/Treasurer AAGFO

# Annual Meeting — 2022

AAGFO in Indianapolis

The AAGFO invites you to Indianapolis, "The Crossroads of America" October 19-22, 2022. We will have a clinical session at the Indiana University School of Dentistry in one of the newest dental school clinics in the US, and hotel arrangements have been made with the JW Marriott, a large, new hotel tower in the center of downtown Indianapolis.

After the board meeting on Wednesday afternoon, there will be a welcome hors d'oeuvre reception at the JW Marriott to get reacquainted with old friends and make new ones.

Beginning Thursday morning, speakers include Jeff Platt, IU chair of Biomaterials; David McKinzie PhD on how new medications are developed at Eli Lilly Pharmaceuticals; Clyde Roggenkamp on amalgam; Eric Morrison on direct gold; Georg Meyer Dean of the dental school in Greifswald, Germany; and a roundtable review of everything AAGFO by Indiana's AAGFO venerable Mel Lund (100 years old), Ron Harris and Mike Cochran. You won't want to miss these informative and fun presentations!

Our Thursday afternoon group tour will be of impressive Columbus, Indiana, described as an "architectural mecca," boasting 94 architecturally significant buildings by Saarinen, IM Pei, Meier and many others. We'll follow that up with a distillery tour and supper at the Hard Truth distillery and restaurant in the rolling hills of Nashville, Indiana.

Friday evening will be a dine around in downtown Indianapolis where most restaurants are within walking distance of the JW Marriott.

Saturday afternoon is free time for all, and spouses and guests have additional free time to take in what Time Magazine has listed as one of the "Worlds Greatest Places 2021."
Some suggested places to visit include the famous Indy 500 race track and museum, the largest Children's Museum in the world, Eiteljorg Museum of American Indians and Western Art, downtown White River State Park and Canal Walk with gondola rides and paddle boats, Indianapolis Museum of Art, Indiana State Museum, Indianapolis Zoo, indoor karting next to the speedway, next to the Dallara IndyCar factory, the Indiana State Capitol, a downtown shopping mall and the most war memorials outside of Washington DC. Many of these attractions are within walking distance of our downtown hotel.

Our Saturday evening banquet will be at the Indiana State Museum, just a block away from our hotel where we will celebrate another successful meeting and install our new officers.

# Registration

## Register on the AAGFO Website

AAGFO Annual Meeting

### Hotel Reservations

Considered the crown jewel of Marriott Place, the JW Marriott Indianapolis Downtown is a landmark amid five Marriott hotels connected to the Indiana Convention Center. Our downtown hotel in Indianapolis soars above the city and boasts large meeting, banquet and exhibit space as well as two full-service restaurants. Adjacent to the convention center, just steps from White River State Park, the Indianapolis Zoo, and many museums, its location is unparalleled. The hotel is in the heart of world-class shopping and dining, near the State Capitol, Lucas Oil Stadium and Bankers Life Fieldhouse, and a little over a mile from the IU School of Dentistry. Guest rooms at the JW in Indianapolis feature Marriott's signature REVIVE bedding, 40" LCD high-definition TVs, marble vanities, plush towels and breathtaking views of a gorgeous art-filled plaza. Come relax and unwind at the JW Marriott Indianapolis.

## Register directly with the JW Marriott in Indianapolis using this direct link:

https://book.passkey.com/go/AmericanAcademyofGoldFoil

The AAGFO has a convention rate of $229 per night with reduced price for parking for our group. You can select from rooms with 1 King or 2 Queen beds. The meeting begins with the board meeting and reception on Wednesday October 19, and continues through the banquet on Saturday October 22. Rates are guaranteed between October 16-26 for those who would like to arrive early or depart later than the meeting.

## Occlusal Foil
## by Dr. Robbie Bridgeman

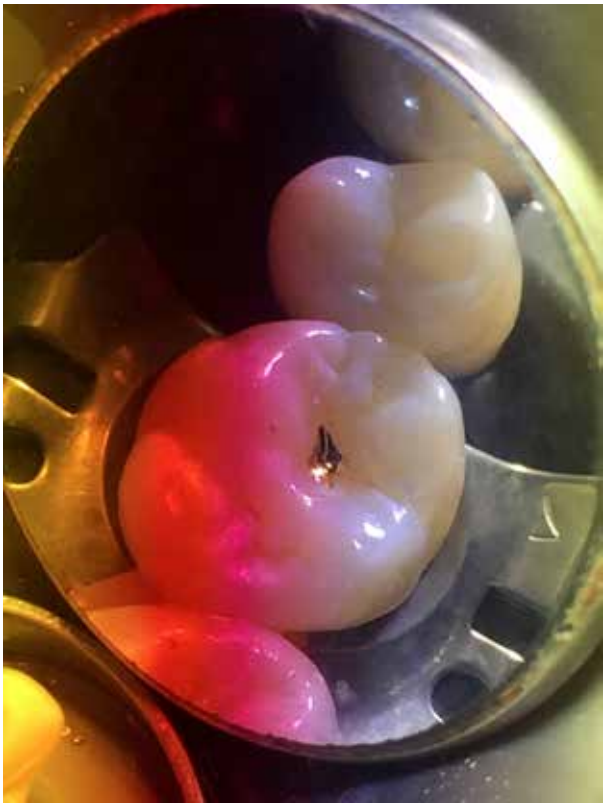
# Call for Operators


Dear Academy members, the 2022 Annual Meeting of the AAGFO is scheduled for October 19-23, 2022 in Indianapolis, Indiana. The clinical session will be held on Friday morning, Oct 21/22. Due to the work of Dr. Tim Carlson, our clinical session will be considered to be a dental continuing education course sponsored by the University of Indiana.

Attendees who wish to operate will be able to do so under the umbrella of the Continuing Education Department. The patients can be provided by the school or you could bring your own patient with you if you wish.

If you are planning or thinking of attending this year's meeting and wish to add the experience of operating at the clinical session, please contact me for more information.
Dr. David Thorburn, Chair of Clinical Operations
drdavidthorburn@gmail.com


The American Academy
of Gold Foil Operators
Invites you to the Annual Meeting
Indianapolis, Indiana
October 19-23, 2022
Indiana University
School of Dentistry
JW Marriott, Indianapolis



Gold foil sealant!
Dan B. Henry DDS

# Hobbies and Passions

The following is a synopsis of some of the hobbies and passions of members of the American Academy of Gold Foil Operators.
As you can see from the entries, being a talented dentist leads to interest and expertise far outside our professional endeavors. They not only reflect a desire for excellence in all things but gifted individuals who choose balance within their personal life and outside of their chosen profession.
It is well to note, that the qualities leading one to pursue dentistry, at the highest level, are not confined to one field of endeavor but translate to expertise in many areas of interest. In addition, the practice of dentistry at a high level of excellence and integrity enables these hobbies and passions to be fulfilled with the same dedication to excellence their participant gives to their professional endeavors.
One can liken it to a “Jeffersonian influence” in the natural expansion into many areas of interest for the pleasure of doing and learning. This impacts not only the person’s own experiences but those they interact with within this beautiful thing we call life!
Now, look with me at a sampling of the varied interests and talents found within our small community.
Dan Henry DDS

# TRAVEL

## AAGFO Royal Clipper Cruise
## Athens to Istanbul 2018

The Royal Clipper

Dr. Rick Nash and Ann with Rick Brinker  Dinner under a bridge across the Bosphorus, Istanbul Turkey

Dan and Neeny Henry; dinner
In Istanbul with the Foil group

Athens Greece

# Hiking and Mountain climbing

Dr Richard Tucker

## Rock Climbing on a sailing trip

## Ice Climbing in Colorado

## Dick Tucker

## Dr. David Thorburn Snow Skiing at Whistler

Load of logs delivered for milling into lumber

# Building furniture from the log to the finished piece

Exotic hardwood out of Brazil

Finished cedar chest

Rosewood and Purple Heart Cabinet

# Building reproduction muzzleloading rifles

Building reproduction muzzleloading rifles. The first is a Tennessee percussion long rifle in 45 cal. and the second is Hawken mountain rifle with two barrels in 37 and 47 cal. This is much like making an inlay in reverse, where you have the final parts to inlet into the wood and you are challenged to cut the prep to perfectly fit the inlay. A wonderful marriage of form and function.

Fred Eichmiller

Tennessee Percussion rifle

Finished rifle

Hawken mountain rifle with two barrels in 37 and 47 cal.

# OFFSHORE FISHING
# DAN HENRY DDS

100lb Yellow fin tuna

40lb Bull Dolphin

Offshore in Costa Rica

Tag and release a nice Pacific Sail

# Flying experimental class airplanes
# Dr Wendell Foltz

I fly an RV8, experimental class, home built, tandem 2 seat aircraft. I did not build it which usually takes about 2400 hours over 2 or more years to build. I bought it in 2007 brand new from a builder who had it set up exactly as I wanted. Able to perform safely at 6g's positive and 3g's negative and with inverted oil and fuel systems so it will fly in any aerobatic orientation without loosing power. RVs are made from kits produced here in Oregon and several types are offered. Go to vansaircraft.com if you want to learn all about the several types of kits. Soon after buying I joined the International Aerobatic Club and a local formation flying group called the West Coast Ravens. This was the culmination of years of delayed gratification caused by dentistry. I have been flying since 1974 but the RV8 brought me, at last, into high performance flying. I really wanted a P51 (which I have flown) but I never earned the extra millions of $ needed to buy and maintain one. The RV8 is the next best thing and affordable. The airplane is good for more than just sport flying. I have been from Oregon, where I live, to the Atlantic and many other USA destinations. Many RVs are regularly flown to Alaska, Central America and the Caribbean and a few have gone around the world. I have participated in IAC contest but mostly I like flying with the Raven group doing formation flying and aerobatics too. The Ravens often do "missing man" and Memorial Day tribute flights and sometimes combine with other formation groups for training or large formation tributes.

I also enjoy giving rides to willing passengers which always produces the famous "RV Grin". If flying made me better at my GF skills it would be because they both demand discipline, practice, concentration, determination, hand-eye coordination and a vision of the desired product.

Wendell

# Flying

## Dr. Clyde Roggenkamp

Attached are photos of my first, second and third airplanes, respectively.
The first aircraft was a Cessna Skyhawk purchased in North Carolina when halfway through my pilot certification training. The next was a Cessna Cardinal a year later, so I had 2 planes, and rented out the Skyhawk at the airport to other pilots and students. About a year after that I sold those 2 planes for $10K more than I paid for them and purchased the 6-passenger Cessna Centurion, which was piloted across the Atlantic Ocean on Air Force follow-on assignment orders to Laken heath, England. The third picture shows this plane cruising along the southern shoreline of Iceland, returning from England in 1996.
Having these planes made it easier to commute to the University of North Carolina dental school to teach as a part-time adjunct clinic instructor for several years while stationed at Seymour Johnson AFB, in Goldsboro, NC. UNC had its own airport in Chapel Hill and provided free shuttle service between there and the dental school. Occasionally it was desirable to commute to some mid-winter dental meetings in Chicago as well as to American Board of Operative certification clinical testing sites, such as Ames, Iowa, where I served as an examining officer. In 2004 I flew the Centurion to Ketchikan, Alaska, to visit the president of my dental school graduating class, who was practicing there at that time. While living at the present location in Loma Linda, California, where I've been associate professor at the LLU dental school since 1997, the ability to fly on a moment's notice also made it possible to maintain a house in San Antonio, Texas, that had been rented out following Air Force retirement. Rather than go through the process of selling it, in 2009 the Centurion became a tax-deductible welcomed donation to Andrews University for their high-performance-aircraft pilot training program. It was a wonderful, useful hobby, and altogether I was able to log approximately 1000 hours of flying time.

Clyde Roggenkamp DDS

# Jewelry making using the lost wax technique and finishing it into the final finish of a custom piece

## Dr Tim Carlson

Finished piece

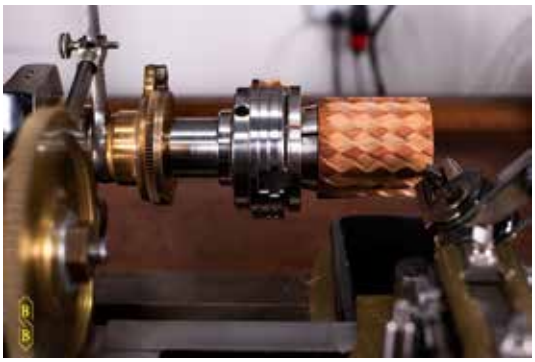
Cuff links


Multiple pieces of cast gold jewelry

# Ornamental turning Scott Barrett

I have been a woodworker for 50 years and took up ornamental turning 10 years ago. I started OT with a homemade machine but quickly graduated to a Lindow Rose Engine. I purchased a Holtzapffel Ornamental Lathe built in 1870. It took 5 months to arrive from Sheffield, England. Two weeks ago, I brought it home and reassembled it in my studio. The patterns that can be created with this machine are legendary. **This machine, Holtzapffel No. 2245 was originally built for and purchased by Winston Churchill's uncle. I am the 7th custodian/owner in its 151-year history. A lifetime of learning is on the horizon.**

Scott



Ornamental turning

Finished turning

# Sailing on the Line Angle

Sailing with the Tuckers!

# Sailing on the Sugarfoot

{Lagoon 42}
Dan Henry DDS


We bought our sailboat last Fall. 'Griffin' is a 49' Beneteau. We have enjoyed sailing all through the Gulf Islands this Winter and Spring.

We joined the Royal Vancouver Yacht Club a few years ago and enjoy staying at their outstations. There are 7 outstations in the Gulf Islands and up the coast to Desolation Sound. The Yacht Club has organized "Cruises" which have been a lot of fun and expanded our social circles.

We have been the support boat for a number of sailing races that our son Brian has participated in on 'Phoenix' an XP 44. We house some of the crew members prior to the races and take out the spouses to watch the starts. We were recently in Victoria for the start of the Vic-Maui and have enjoyed watching the Race Tracker and their progress across the Pacific.

Our two daughters are returning to live in Vancouver. I would like to think they wanted to be near us but I am suspicious that the lure of sailing is bringing them home.

Margaret Webb

49' Beneteau named "Griffin"

# Renaissance art hand cut marble art

## Dr Alfred LaPorta

Mentorship exists at all levels!  My Italian renaissance art mentor is in Rome.

I have studied there several times to learn the process and translate that into artform by hand cutting small marble stones with a hammer and chisel the same way they did it 2000 years ago.

I have only made 3 pieces, 2 of which are attached

Al

breaking marble

Finished artwork

Cupid

# Collecting the Gun Makers Art

## Dan Henry

Use of 24K gold inlay in the engraver's art placed like a gold foil then carved

24 K gold used to highlight engraving

**Secretary-Treasurer's Report**

**AAGFO Executive Council**

**Hybrid Virtual/Chicago Meeting**
**Zoom/Astor Room**

**February 23, 2022**

## Membership Overview

74 active academy members.
57 members have paid current dues.
17 members have not paid for 2022, of which 6 of those have not paid for 2021 either.
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12 members have requested that their duplicate Journal payment be refunded.
16 members have requested paper copies of the Journal.
Funds have been sent to the AOD totaling $5,700 for the Journal portion of the dues collected.

## Finances

Checking account closing balance as of January 2022: detailed P&L statement being compiled. Minimum transactions this year: monthly Zoom account fee, the Oregon non-profit organization filing fee, credit card processing fees (off-set by processing fee added to credit card/paypal payments), and deposits of dues payments.

## Student Awards Program

Invitations have been sent to the same list of participating schools as in previous years. Nominees are rolling in and awards will be mailed out in April for the awardees' commencement ceremonies.

1. UCLA School of Dentistry
2. Meharry Medical College – School of Dentistry
3. University of Washington School of Dentistry
4. Rutgers School of Dental Medicine
5. University of Minnesota
6. UNMC College of Dentistry
7. UMKC School of Dentistry
8. Penn Dental Medicine
9. Indiana University School of Dentistry
10. University of British Columbia

## New Members

Welcome letters have been sent to Dr. Sophia Sawires from Orange, California and Dr. Anita May Sung from Rockville, Maryland with invitations to attend the Indianapolis meeting and indication that their requests to join will be acted upon at that time.

One student awardee from last year, Dr. Andrew Wilson, accepted the offer for a free 2-year subscription to the Journal and he will be contacted regarding free tuition to our next meeting.

# AAGFO Executive Council Meeting

## February 23, 2022

## The Drake, Chicago IL

## Agenda

### (2:00pm CST – Virtual/Astor Room)

**Call to Order:** Dr. Robert Bridgeman (President)

**Minutes of previous Executive Council Meeting:** Dr. Eric Morrison (Secretary)
As the last four planned and emergency council meetings have been virtual, the traditional agendas and meeting minutes have not been maintained. Traditional recording and approval of meeting minutes will now resume.

**President's Report:** Dr. Robert Bridgeman

**Secretary/Treasurer's Report:** Dr. Eric Morrison

**Meeting Planner:** none

**Annual Meetings:**

- 2022 ARVTSC: Tokyo
- 2022 AAGFO: Indianapolis
    - Review updated program
    - October 19-23 @ the JW Marriott
    - Notification – a Save the Date email was sent to general membership on November 10th. The flyer has been updated and will be shared for continual promotion.
- 2023 AAGFO: Germany
- 2023 ARVTSC: California
    - Possibly a joint meeting. Proposal needed to ARVTSC if desired.
- 2024 AAGFO: LA or Baltimore
- 2024 ARVTSC: not planned yet

**Journal of Operative Dentistry Report:** Dr. Jeff Platt, Editor; Dr. Tim Carlson

**Committee Reports:**

1- **Nominating Committee:** Drs. Suzanne Grennell, Bruce Small, Alfred LaPorta


The photo is from UBC School of Dentistry Dr. Mary MacDougall, Dean and Professor of UBC Faculty of Dentistry, with their AAGFO Student Awardee for the Gold Foil Award given to the student with the highest GPA and ability in placing Gold Foil Restorations, Dr. Jae Won.

Class two case 20 years in function
Dr Dick Tucker

## The 90th Annual Meeting of the Associated Ferrier Study Clubs Vancouver BC

The Associated Ferrier Study Club (AFSC) was formed and held their first meeting in 1930. They were and are an association of gold foil study clubs which originally were mentored by Dr. W.I. Ferrier or the members of his first study club, the Seattle Dental Study Club, formed in 1922.

This association of dentists striving to improve their skills in the use of gold foil (which helps all restorative skills), probably played a part in influencing the general dental culture towards excellence. This in turn fueled the reputation the Pacific Northwest gained in the 20th century for fine restorative dentistry.

The previous meeting had been held in Seattle in May 2019. The May 2020 meeting was cancelled in the crush of the first wave of the pandemic and the 2021 meeting was cancelled as well. In those years a lot of our colleagues on the edge of retirement did retire. Some of our clubs have moved from active operating clubs to social clubs who get together for occasional dinners and visiting.

This year's meeting was held on Friday May 13, 2022, with a clinical session held in the offices of two of the members who work in the same building. The total attendance was a little small (15) in comparison to the previous meetings but we feel we will see greater attendance next year.

The two long standing Vancouver Clubs provided the operations.

1) The Vancouver Ferrier Gold Foil Study Club (formed 1936), which recently joined the Academy of RV Tucker Study Clubs a decade ago provided most of the operations:
Dr. Margaret Webb #34 B CLV foil
Dr. Janice Brennan #46 B pit foil
Dr. Jason Duan #44 7/8 gold crown (prep imp)
Dr. Pearl Chow #14 MOD inlay (prep imp)
Dr. Jordan Galpin #26 MOL onlay cementation
They are mentored by Dr. Richard D Tucker

2) The Walter K Sproule Gold Foil Study Club (formed 1947) provided the rest of the operations:
Dr. John Christensen #34 B CLV foil
Dr. David Thorburn #34 B CLV foil
Dr. Nishant Goswami #46 B pit foil
They are mentored by Dr. David Thorburn
(All tooth numbers in international numbering system)

In attendance as observers were Dr. Ed Kardong, the AFSC immediate past president and Dr. John Sechena, also a past president from Seattle. They are members of the George Ellsperman Gold Foil Seminar (formed 1957). Dr. Richard D Tucker took the clinical photographs. Dr. Caroline Jiang of the Vancouver Ferrier Club also observed.

Two recent graduates and members of the Vancouver and District Crown and Bridge Study Club (#5 Club Academy of RV Tucker Study Clubs) attended as guests. They have both done gold foils in their study club and will be joining the WK Sproule Club in the fall.

All the operations were completed before noon and everyone retired to The Royal Vancouver Yacht Club for a lovely luncheon. It was a great couple of hours of rekindling friendships, conversation, and meeting new acquaintances. Everyone departed talking about future study club meetings and next year's Associated Ferrier Study Clubs meeting on the second Friday in May, which is always sunny in the Pacific Northwest.

Reported by,

Dr. David Thorburn, now immediate past president of the AFSC

Class Five Foil

Dr. David Thorburn

Dr Margaret Webb

Class Five Foil

## Dr. Scott Barrett Outstanding Clinician Award

## Dr. David Bridgeman Distinguished Member Award

## Introducing "Dental Caries Research Observations ..."

The following paper is a great read and shines a light on observations made over the years relating to dental caries occurrence, but could not be explained. I was not aware of the Dental Fluid Transport {DFT} system nor the interactions of the hypothalamus with the parotid gland to generate a positive fluid pressure system through the dentin /enamel system within teeth!

This paper makes sense of what was suspected; that there was something else going on other than the level of Streptococcus Mutans. and oral hygiene as the root cause of why would one sibling with little or no caries but showed the same level of Strep M. as his sister who had good oral hygiene yet new carious lesions at every recall visit?

In addition, I suspect that this could also be related to post-radiation patients who had their parotid glands irradiated. Thus destroying the DFT system and eliminating a system for helping to prevent dental caries.
Dan Henry DDS

# Dental Caries Research Observations from Ralph Steinman and John Leonora: A Historical Perspective

**Clyde Roggenkamp, DDS, MSD, MPH**

Ralph Steinman, DDS (1910-2007), was one of the three founding faculty members of Loma Linda University School of Dentistry (LLUSD) in the early 1950s. A strong academic foundation gained from his education at Emory University School of Dentistry, and significant clinical experience from several years of private practice, led him to question whether W. D. Miller's commonly held bacterial theory[1] was sufficient to explain the problem of dental caries. He was influenced by the writings of Ellen White on health and wholeness.[2,3] Also in his library was a book by Weston Price, *Nutrition and Physical Degeneration*, a comparison of primitive and modern diets and their effects[4] that had become popular in promoting basic dietary lifestyles.

The problem of dental caries, in Dr. Steinman's view, could not be adequately explained by the presence of bacteria on teeth; there were missing pieces that needed to be explored. His position as the primary dental researcher at the new dental school at Loma Linda University permitted him to pursue this interest for several decades.

Dr. Steinman's opportunity to collaborate with endocrinologist Dr. John Leonora, PhD (1928-2006), at Loma Linda University School of Medicine led to a productive team effort for many years. Dr. Leonora contributed expertise in hormone physiology, and their combined research efforts accelerated in the 1960s. Their partnership facilitated a search for potential systemic, hormonal roles in dental caries disease beyond the confines of the oral cavity.

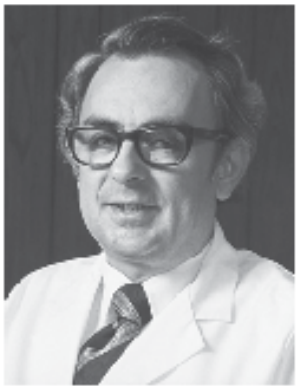
Given the current understanding of dental disease, it is interesting to revisit the hypotheses that Drs. Steinman and Leonora, along with other investigators, proposed.

The complex nature of their collaboration joined dentistry not only with medicine but also with many of the basic sciences including biochemistry, histology, microbiology, nutrition, pharmacology, physiology, and public health, as well as the concept of wholeness that has been an important part of Seventh-day Adventist lifestyle. Their research resulted in nearly 100 publications; but because of the less than orthodox view of dental disease, their literature did not receive widespread acceptance in the scientific community.

This article represents a historical perspective on the scientific research of dental caries by Steinman and Leonora.

*The author wishes to express gratitude to his wife, Kirsten, a career schoolteacher, for providing the continuing education questions for this article.*

Dr. Ralph Steinman



Dr. John Leonora

A review of their publications illustrates the complex nature of basic science research and the importance of accumulative and collective efforts to understand the mechanisms of dental caries and the challenge of designing effective measures for combating dental disease.

## Elusive, key hormone-diet-caries connection

Not all of the various mechanisms of dental caries susceptibility and resistance have yet been discovered or totally understood. It is a nearly universally held belief that acid of bacterial origin is the prime cause of caries. But Steinman began noticing in the mid-1950s that the concentration of acid present on the surfaces of teeth was not the sole determinant of whether caries ultimately would develop.[5,6,7,8,9] Teeth appeared to exhibit a native capacity for resisting the penetration of acids and other harmful solutes. This capacity existed except under conditions of high sucrose ingestion, regardless of whether the sugar contacted the teeth or not.[10] The search for a deeper answer to caries resistance vs. susceptibility led him and his co-workers to suspect a hormonal connection.[11] In 1980 Tièche, Leonora, and Steinman[12] isolated and identified a parotid hormone (PH), purified from porcine parotid glands. Leonora, Tièche, and Celestin[13] subsequently found that experimental pigs exhibited significantly higher concentrations of a parotid hormone releasing factor (PHRF) within minutes of chewing and swallowing food. PHRF appeared to signal the parotid gland to secrete PH.[14]

PH was shown to activate pulpal odontoblastic cells to induce extracellular dentinal fluid through the profuse

microscopic radiating system of dentinal tubules that extend from the centrally-located pulp to the outer enamel surrounding the tooth. Pressure from the odontoblastic cells caused this fluid to press outward through the enamel's tighter interprismatic pore structure and ultimately onto the tooth's outer surface. Visible evidence for this came from various systemically introduced dye tracers.[15,16,17,18]

This hypothalamic-parotid-endocrine-axis mediated outward flow of dentinal fluid was indicated as a normal process of vital teeth. The apparent protective mechanism of this theoretical model was proposed for caries resistance by continually providing a counterflow to the entrance of external acids and other potentially harmful solutes (see Fig. 1).[15,16,17,18]

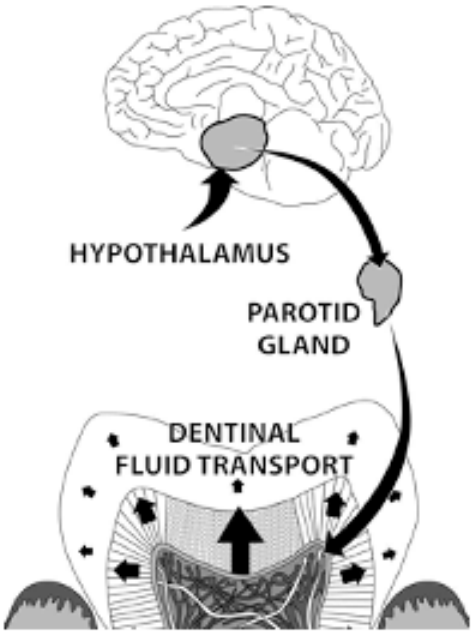



**Figure 1.** Diagram representing the human Hypothalamus-Parotid gland Endocrine Axis (HPEA)[19]

This natural nutritive-maintenance process, however, was shown to be impeded or completely reversed by the ingestion of excess sugar. Increased sugar consumption was correlated with decreased dentinal fluid transport (DFT) inferred from intradentinal dye penetration (IDDP) studies.[9,10,14,19] Sugar demonstrated a direct, antagonistic effect on the hypothalamus gland in animal experiments that exhibited inhibition or reversal of IDDP, which in turn was associated with an increased caries rate.[15,17]

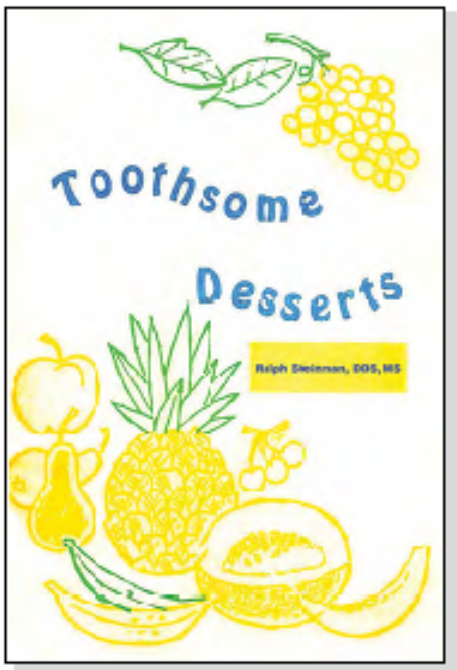
It was assumed that a similar hypothalamus-parotid endocrine axis (HPEA) mechanism involving IDDP or DFT[15,16] existed in human teeth as well (Fig. 1). This assumption was proposed to explain the hidden detrimental role of excess dietary sugar. In adult dentition, the unseen metabolic gatekeeper was considered to be the key to caries-resistance until a disturbance occurred.[5] Beyond providing nutrients for acid-producing bacteria as is commonly believed, excess sucrose may thus profoundly disturb this natural (HPEA) defense mechanism. Steinman showed that when sucrose constituted at least 60% of the diet, it caused a reduction of up to 50% of the DFT rate compared with a control group.[3] This finding by Steinman, Leonora, and Tieche at Loma Linda University remains unique in peer-reviewed literature.

The Figure 1 schematic of a human molar illustrates that tooth morphology is designed to maintain fluid flow through its structure. Dentin is composed of microscopic tubules (canaliculi) that radiate from the dentin-pulp interface to the dentin-enamel interface. At the base of the dentin is a layer of odontoblasts responsible for the secretion of dentin matrix and, because dentin is a living tissue, the maintenance of dentin vitality. Dentin, as a living tissue, requires nutrition; but, as the diagram illustrates, the blood supply terminates in the pulp chamber. To compensate for the lack of vascularity, teeth possess a dentinal-fluid-flow transport (DFT) mechanism that perfuses the dentin with essential nutrients derived from the blood. Capillaries in the pulp are fenestrated (have windows), allowing nutrients to perfuse into the pulp chamber in a lymph-like fluid. Steinman and Leonora suspected that odontoblasts play an active role in the transport of this fluid from the pulp chamber out through the dentinal tubules and enamel fibrils.

The arrow from the hypothalamus to the parotid gland indicates the parotid hormone releasing factor (PHRF). This messenger activates the parotid gland to express parotid hormone (PH) into the circulating blood, where it is believed to be picked up by the odontoblasts and effect greater flow of dentinal fluid outward through the channels and microporosities of the tooth. The arrow from the parotid gland to the pulp of the tooth is intended to show this occurring indirectly via the blood stream and not directly through the outer structure of the tooth as it may appear from this diagram. An ultimate cause of dental decay strongly suggested by Drs. Steinman and Leonora was that high blood sugar levels dramatically interfere with this process to the extent that an actual reversal of dentinal fluid occurs. Instead of the normal outward flow preventing the ingress of detrimental products including acid, these substances are drawn into the enamel porosities, and dentinal tubules and dental caries can result. Therefore, sugar ordinarily considered as a direct cause of decay by providing nutrients for harmful bacteria in dental plaque, can also be the enemy within by interfering with normal internal physiological resistance mechanisms of teeth.

As indicated by Dr. Leonora in his foreword to the book, *Dentinal Fluid Transport*,[20] the uptake of nutrients appeared to be parotid-hormone dependent.[11,21] The hormone may alter the permeability of the pulpal capillary walls, enabling the membranes to transfer nutrient-containing fluid into the surrounding tissue and hard-structure spaces. Intrinsic osmotic pressure gradients might serve as mobilizing influences. The physiological movement of dentinal fluid would be to the periphery. Fluid droplets potentially

fluoride to the dietary regimen enhanced remineralization of the affected areas.[23] An in vitro study conducted by Steinman in 1965 determined that fluoride-treated enamel underwent significantly reduced calcium release under experimental demineralizing conditions.[28]




**Trace elements needed for enzymes, hormones**

Trace elements added to a cariogenic diet not already containing these elements produced a definite cariostatic effect. Chromium deficiency may affect glucose homeostasis, thereby impairing glucose tolerance. Zinc may be involved with the normal production and action of insulin, and a zinc deficiency would impair blood glucose homeostasis.[29] In order to make a more wholesome laboratory animal-feed formula beyond the standard items already contained, Steinman added mineral supplements of phosphorus, iodine, fluoride, pyridoxine, zinc, molybdenum, and chromium.[30]

It is well to note that altering the supply of carbohydrate, fat, protein, vitamins A and B, trace elements, and minerals has been found to influence the incidence of post-eruptive dental caries.[8] In general, Steinman found that the poorer a diet was in vitamins, minerals, and trace elements, the more frequently that diet seemed to be repeated. Caries potential would be multiplied by between-meal snacking. In this connection also it was shown that commercial removal of nutrients from food was associated with an increased rate of dental caries.[30]

**Importance of electrolytes**

Sodium and chloride are the major electrolytes of the extracellular fluid, controlling osmotic pressure and water balance. In a group of laboratory rats given only 0.9% saline as their sole source of fluid, the caries score was 10.44 compared to 6.72 for the control group on regular water. Steinman and Leonora employed the diuretic effects of Diuril and Percorten and concluded that electrolyte imbalance could be a systemic factor in caries susceptibility ($p=0.001$).[31] Higher Na and Cl concentrations within the pulp and the tooth could potentially affect caries resistance in more than one way. By altering osmosis and water transport, these electrolytes could influence the nutritive state of the developing tooth, affecting final maturation and resistance to decay.

Any change in osmotic balance could also alter its relationship to the external environment. Under certain circumstances, normal osmotic pressure may tend to repel noxious bacterial agents, whereas under conditions induced by abnormal osmotic pressure it could actually encourage ingress of harmful solutes into the tooth.[32]

In addition to Na and Cl, deficiencies in certain other metabolites or associated factors—such as phosphate, pyridoxine, pantothenic acid, or protein—can also conceivably alter the cells' normal selective permeability.[33]

Thus, the electrolyte balance of the tooth may play a vital role in susceptibility or resistance to the disease. The physiological state of hydration also may be of greater significance to dental health than commonly recognized.[32]

**Anticariogenic formula, enhanced by eggshell meal and trace elements**

The metabolic pathway of the hypothalamic-parotid endocrine axis Steinman and Leonora proposed was associated with the ornithine cycle. They tested certain compounds related to this cycle and discovered a marked enhancement of DFT in teeth.[2] After an elaborate trial with laboratory animals, the most profoundly effective agent of those tested was carbamyl phosphate. Because of its highly significant anticariogenic effects, well beyond that seen with fluoride treatments alone, carbamyl phosphate was potentially considered as a therapeutic dietary additive for caries-prone human patients. An effective adult human dose was extrapolated to 150 mg daily without adverse effects. Eggshell meal was found to contain a substance that weakly stimulates fluid movement as well. Its potentiating effect allowed the possibility of reducing the effective anticariogenic dose levels of carbamyl phosphate. The addition of the trace minerals zinc, chromium, and molybdenum even further enhanced the caries resistance effect. The total combination of all these ingredients in the diet of experimental rats resulted in caries-free teeth.[3]

**Dental benefits from whole grain foods**

Primitive peoples subsisting upon natural foods usually remain quite caries-free, whereas similar racial stocks eating more "civilized" foods have significant decay. Perhaps this is a reflection of over-refinement of our commercially available foods. It may be well for civilized countries to give greater importance to whole grain cereals daily.[4] To show this comparison, Steinman fed one group of experimental rats a menu of corn flakes, unenriched white flour, potatoes, spaghetti, ice cream, cherry pie, and soft drink. The same diet was also fed to another group

Drs. Steinman and Leonora share a collegial moment in the lab.

occurred on the surface of the enamel, especially where micro-cracks or craze lines occurred. Because the hydrostatic pressure within the tooth would be greater than the external oral pressure, diffusion of harmful outside bacterial products into the tooth structure would be prevented and thus teeth would remain caries-free. It is after the DFT mechanism had been compromised to the point of reversed flow direction, from the outside inward, that cariogenesis could readily occur.

Dr. Steinman summarized his findings in a paper published in 1987:

> This poorly appreciated complexity of caries susceptibility can help explain why decay does not correlate well with [merely] the acidogenic potential of foods or with the solubility of enamel in acid. Sucrose and other cariogenic foods cause decay not only because of the unfavorable external environment they produce in the mouth. Such foods may also disturb the physiological resistance of teeth to decay, including the normal outward flow of fluid through the teeth.[21]



**Histochemical effects of caries on tooth structures**

Before discovering a possible hormonal basis for the connection to dental caries, Steinman tried to learn as much as possible about the physiology and histochemistry of the caries process in order to identify some dietary or other means of controlling it. At the time of his studies the average diet consumed by Americans was determined to be 18-20% sucrose (table sugar) and was recognized as a significant contributor to the high US caries rate.[22]

Using a variety of techniques, Steinman learned that teeth on a cariogenic high sucrose diet (HSD) first underwent a metabolic change in the dentin before actual breakdown occurred.[23] He reported that this was not a one-way mechanism, however, because he found that the caries process could be reversed by eliminating the sugar consumption of the experimental subject if the caries had not progressed much beyond the dentinoenamel junction (DEJ).[8,10,19,23,24]

**Studies on the effect of sugar on developing teeth**

The findings and recommendations of Steinman on the one hand are historic but on the other hand provide a unique example of seeking answers to questions that require additional research. His basic assumption was that sucrose had cariogenic effects, particularly on developing teeth. His research pursued the questions of how and why.

In one of his earlier studies Steinman found that increased ingestion of sugar was associated with reduced phosphorus levels in the blood, thought to be due to an accompanying greater phosphorus demand from increased metabolic glucose phosphorylation.[5,25] As a consequence, pre-weaned rats showed a 10% decrease in total phosphate content in their developing molar buds, which subsequently correlated with reduced post-eruptive dental caries resistance.[25]

For infants, not all sugars were found equally cariogenic. In fact, lactose was consistently found to be the least caries-producing. This is partly due to its brief time in the mouth compared to extended periods of bottle sucking, especially if there is a slight dribble from the artificial nipple into the mouth as the child sleeps. Unfortunately, several commercial infant milk formulas at that time added significant amounts of sucrose to their formulas. Steinman insightfully recommended avoidance of these brands in favor of those with less sucrose.[25]

**Value of vitamins and minerals in dental health**

Availability of nutrients and their proper assimilation can also control dental caries susceptibility. Vitamins A, C, D, as well as minerals calcium and phosporous, are essential for the formation and calcification of enamel.[24] Vitamin C has been shown essential to the calcification of the teeth.[26] Phosphate and magnesium are an integral part of dental structures and are associated with various metabolic processes. Mg is an activator of many glycolytic system enzymes upon which the health, integrity and function of dental structures depend.[27] When the earliest evidence of caries occurs at the DEJ, the addition of

with the exception of replacing unenriched white flour with the whole wheat type. The caries scores (Chi square, $p = 0.01$) for the two groups after five weeks were 11.14 for the unenriched compared to 4.14 for the whole grain group, which indicated a marked increase in caries potential with refined grain products.[34]

In another study, a questionnaire was distributed regarding the eating habits of 278 children ages 4-20. Children with greater prevalence of dental decay were found to consume white bread and packaged cold cereals more than those having no decay. Refined cereals were considered to be a factor in this caries difference. So much major attention had been given to sugar content that perhaps too little mention was made regarding refined cereal products consumed.[35] Due to research insights from this and similar reports by other investigators regarding the empty calories of white flour and especially cold cereals in the mid-1900s, food producers began fortifying these products with added vitamins and minerals.

Dr. Steinman and his wife each had numerous dental restorations in their own teeth, but their children at ages 22, 26, and 28 had only one surface with incipient caries. His daughter now recalls that something was done by the dentist but that there was no restoration noted afterwards. Their children's dietary regimen had consistently been (1) no between-meals snacks, (2) reduced sucrose consumption to only 12-15 lbs/person/year, and (3) only whole grain cereals and breads . Essentially their meals were devoid of refined foods, which was considered by their parents to provide them with an important caries-preventive advantage.[36]

**General dietary advice**

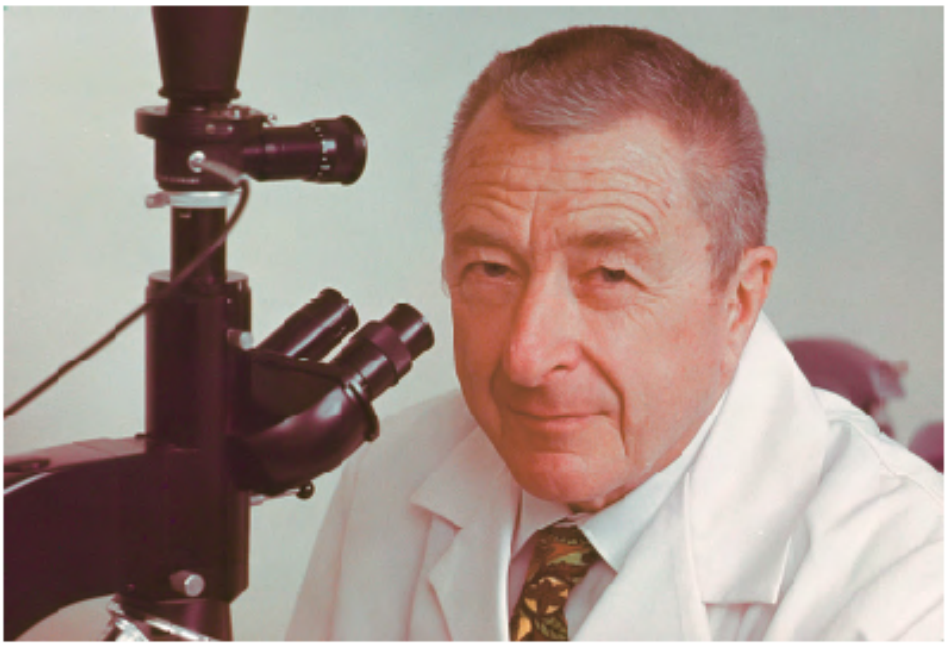
When the increased sugar content of synthetic diets was replaced by a polysaccharide such as starch, there was an accompanying marked decrease in caries. It appeared that rapidly absorbed sugar was what interfered with the HPEA system and prevented its ability to protect teeth from caries. From this it would seem advisable to include more slowly absorbed sugars in the diet. Since carbohydrates are needed as a source of energy, the bulk of carbohydrates should be obtained from starch, which is found in abundance in whole grains and vegetables.[13] Steinman consistently encouraged less sucrose in the diet, more whole grain products and more fresh fruits and vegetables.[37]

In its 1977 publication, "Dietary Goals for the United States," the Senate Select Committee on Nutrition and Human Needs recommended a 40% reduction of added sucrose in the diet (compared to Steinman's suggestion of 80%), an increased use of fruit and vegetables, and the replacement of refined cereal products with corresponding whole grain products. Steinman and Leonora believed that the basis of dental resistance to caries is to allow the teeth full function of their normal defense mechanisms.[37]

It has been recognized that high sugar foods provide the nutrients for plaque organisms to produce acid, causing demineralization of enamel and dentin. Steinman proposed that this would tend to occur at times of lower hormonally-mediated defense.[38] Caries reduction is favored by eliminating between-meal snacks and replacing rich desserts with fruits and vegetables.[25] Sugary snacks between meals would inhibit the release of parotid hormone that normally stimulates a defense mechanism in the teeth, and interfere with what Steinman and Leonora considered to be nature's way of defending the teeth against caries.

The most prevalent characteristics seen among caries-prone patients were as follows.

1. Eating foods with low nutritive value; such as frequent sugary between-meal snacks, which are almost totally deprived of vitamins, minerals, and trace elements.



Dr. Steinman with a researcher's friend.

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Clyde Roggenkamp, DDS, MSD, MPH, associate professor, Division of General Dentistry and interim director, Biomaterials Research Laboratory



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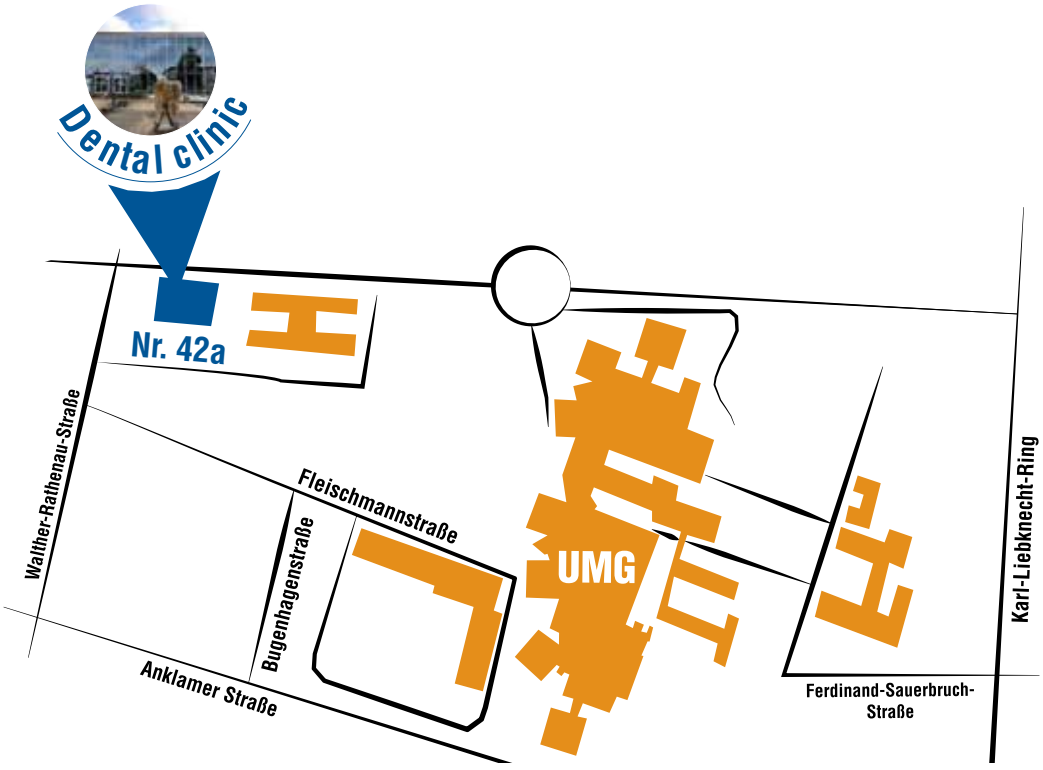
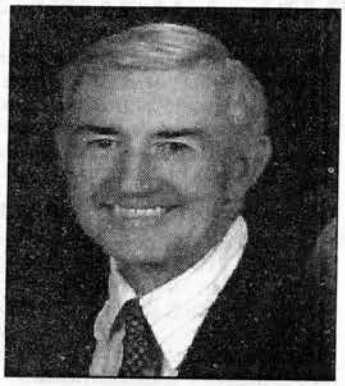


# OBITUARIES

## William T. Pike



NEW LONDON, NH — William T. Pike, D.M.D., 89, of Sutton Road, died at his home on April 23, 2022 surrounded by his family.

He was born in St. Johnsbury, VT on April 14, 1933 the son of Louis T. and Gladys (Person) Pike.

Bill graduated from Haverhill Academy, New Hampton Academy, received his B.A. degree from UNH in 1956 and his D.M.D. from Tufts University Dental School in 1960. From 1960-1962 he served in the US Air Force.

He moved to New London in 1962 and owned and operated his dental practice from 1962-1997. His late wife, Marilyn (Fletcher) Pike who died in 2018, joined him in the practice to help the office run smoothly, with a friendly atmosphere.

Bill was a member of The First Baptist Church of New London and served on various boards and committees including being a deacon and singing in the church choir. The family spent time on Lake Sunapee for many years and moved to Newbury in 1984. In 2006 they moved to Wilmot, then Bill returned to New London in 2018. Active in the community, he had been a member of the New London Outing Club and the Lion's Club. Loving the outdoors, Bill enjoyed tennis, sail racing, skiing, golf, travel, cross country skiing and hunting. His most recent interest was playing cribbage and listening to music. Of course, Bill always enjoyed time spent with his family and cherished meals and outings with the kids, grandkids and extended family.

He is survived by three children, William Pike, Jr. of The Philippines, Peter and his wife, Tina Pike of Eliot, ME and Kristen and her husband, Dag Lidbeck of Wilmot, NH; seven grandchildren, Thomas, James, Charles, Sophia, Mia, Madison and Skyla; a sister, Marina Brock of New London, NH; niece, Jayne Stacy; nephew, Ernest "Chip" Fletcher III and his brother-in-law, Ernest Fletcher, Jr. of Winchendon, MA and dear friend, Betty Blackey of Bow, NH.

Friends may call at the Chadwick Funeral Home, 235 Main Street, New London, NH on Friday, April 29, 2022 from 5:00-7:00 P.M. A funeral service will be held at The First Baptist Church, 461 Main Street, New London on Saturday, April 30, 2022 at 2:00 P.M. Burial will follow in West Part Cemetery, New London.

Memorial contributions may be made to Lake Sunapee Region Visiting Nurse Association and Hospice, P.O. Box 2209, New London, NH 03257 or to The First Baptist Church, P.O. Box 336, New London, NH 03257.

Here is a copy of the obituary from our local paper as a FYI on the lost of a great soldier for oral health and excellence in restorative dentistry, Bob

# DAN B. HENRY DDS

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850-477-1120
golddoc46@gmail.com


To LECOM class of 2021,

I would like to take this opportunity to acknowledge your accomplishments and a job well done this past year! It has been a pleasure and an honor to be a small part of your growth this year.

Through your efforts and perseverance, you have an opportunity and you have earned the rare privilege to impact the lives of your patients and the communities where you will live and practice. You can have a positive impact or a negative one, based on the decisions you make. You have the information and the talent to make wise decisions. However, the decisions are yours to make.

If you practice a needs-based practice, the needs of your patients will be at the center of your decision process. On the other hand, if you practice a "wants" based practice, profit and duplicity will tend to drive your decisions.

As you start your dental carriers, always remember that the beginning of a new thing is a very delicate time that requires thoughtful decisions. Small misjudgments or cavalier actions can lead to career-ending events. A thoughtful decision process based on examples, which I hope you have observed in all your instructors here at LECOM, should serve you well.

However, it is good to understand that "success is not final; failure is not fatal. It is the will to continue that counts." {Winston Churchill}. All of you have demonstrated this concept through your determination to get to this point in your professional journey. I am proud to call you, my colleagues.

I have tried to instill in you a sense of how to think strategically about treating your patients. As a reminder, there are three parts to this; {1} What are you doing? {2} Why are you doing it? And most important, {3} What are the long-term consequences of your decisions? By answering these three questions honestly, you will have direction in your choices both in your practices and in life.

To paraphrase Dr. Seuss: "You have brains in your head you have shoes on your feet; you know what you know, so you are the guy who will decide where you go!

Always remember, that you are part of a larger professional community. Within that community, there are those who care about you and this profession. Unfortunately, there are those who do not! Therefore, select your relationships wisely, based on integrity and respect.

Good luck to each one of you and may God bless you with health, prosperity, and joy throughout your journey.

You will always be a blessing to me!

Sincerely,

Dan B. Henry DDS, FACD, FICD