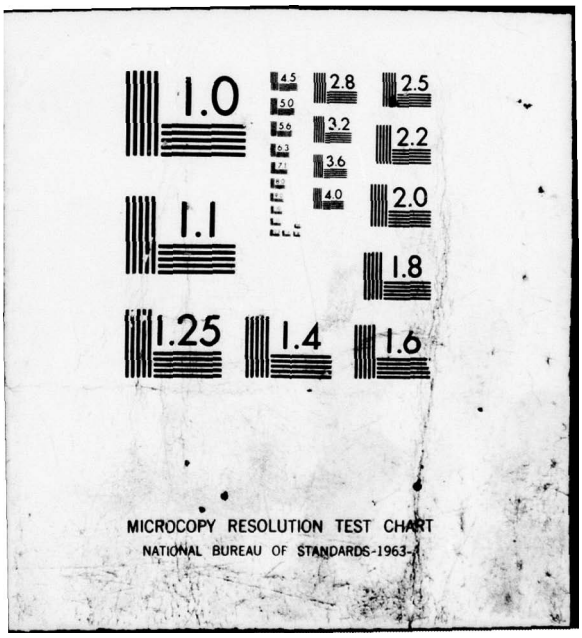
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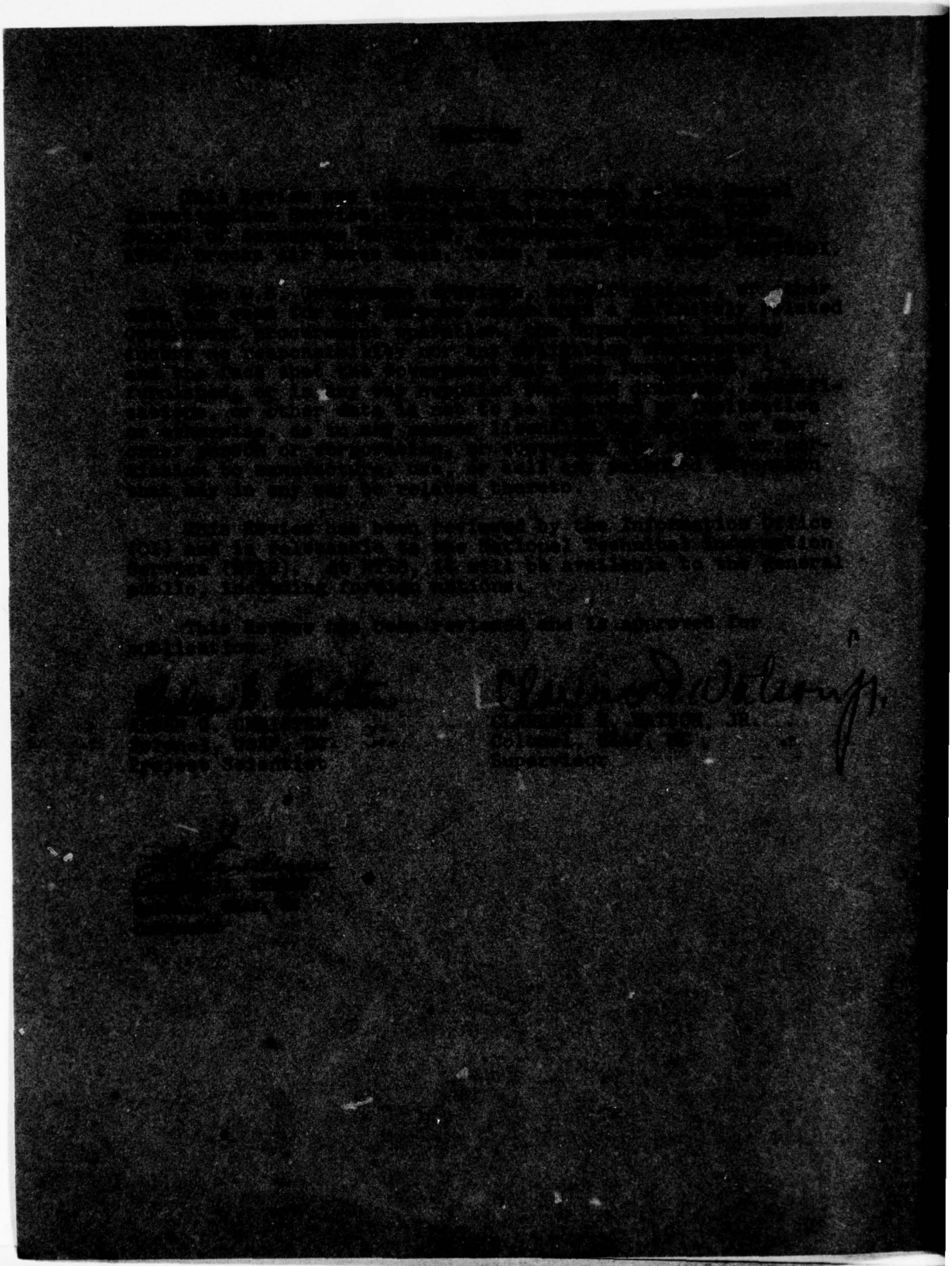


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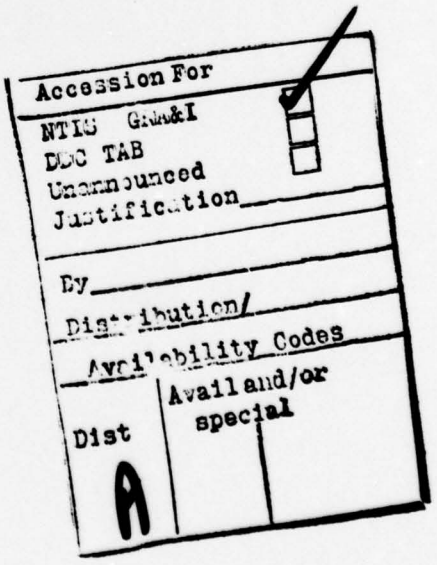
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PREFACE

The author wishes to thank Ms. Ena Borden Shaw, Medical Editor, USAF School of Aerospace Medicine, Brooks AFB, Texas, for her continuous, active help and encouragement during the past two years in producing this oral history. The perfecting of a manuscript such as this requires many drafts and involves hours of tedious, hard work. Ms. Shaw is a highly creative individual who loves a challenge. Her imaginative suggestions have added greatly to the value of the following pages.

I am especially grateful to Dr. Sumter S. Arnim, for the trust he has shown, and for giving us free access to his life and activities. During this entire process, he has been candid and open, sharing not only the events of his life, but his human responses and feelings as well.

One of my beliefs is that history has too often been depersonalized--a dry recitation of occurrences and statistics tending to replace people in the story of mankind. In the final analysis, history consists of flesh and blood. In short, this is my attempt to humanize history.



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A MODERN PIONEER IN PREVENTIVE DENTISTRY--
SUMTER S. ARNIM, DDS, PhD

Teacher, Researcher, and National Dental Consultant

An Interview [1]

INTRODUCTION

Some of the greatest contributions toward stimulating interest and growth in preventive dentistry have been made by Dr. Sumter S. Arnim (Fig. 1). In his work, Dr. Arnim rediscovered, expanded, and publicized the ideas, ideals, and practices originally set forth by Levi S. Parmly (59) in the early 1800's, [2] and by Charles C. Bass (31-36), Dean of Tulane University Medical School, [3] in this century.

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[1] *EDITOR'S NOTE: Dr. A. G. Christen has also prepared a related publication, based on his in-depth interview with another National Dental Consultant, entitled: Portrait of a National Dental Consultant. Life Story of a Prevention-Oriented Dentist: An Interview with Miles R. Markley, DDS, SAM Aeromed Rev 1-78, Oct 1978 (44).*

[2] *Levi Spear Parmly (1790-1859), called the "father of oral hygiene," understood a great deal about the causation of dental caries. He anticipated W. D. Miller by exactly 70 years. Dr. Parmly came from a family that boasted of 13 practicing dentists within a little more than a century (1812-1923). At various times, Parmly practiced in Canada, England, and France, and in larger cities along the Atlantic Seaboard. He treated President Monroe and his family. Eventually, Parmly settled in New Orleans. Because Parmly knew nothing of acid-producing bacteria, he ascribed the decay process to "erosion." He discovered that caries always starts on the surface of the enamel and that the only cause of decay was food particles which lodged around and between the teeth. In 1819, Parmly recommended thorough brushing, a dentifrice polisher (table salt), and:*

> *the waxen silken thread, which though simple, is the most important. It is to be passed through the interstices of the teeth, between their necks and the arches of the gum, to dislodge that irritating matter which no brush can remove and which is the real source of disease (59).*

Parmly was a fanatic on the subject of oral cleanliness. He was known to stop a stranger, inspect his teeth, hand him floss and a toothbrush, and explain the "correct" uses (60).

[3] *Charles C. Bass (1875-1975)--born in southern Mississippi on Jan. 29, 1875--graduated from Tulane Medical School (New Orleans, La.) in 1899. He then returned to his native Mississippi, where he practiced medicine in Columbia for 5 years. He was renowned for his studies of microorganisms that cause hookworm and malaria. He became famous for his microscopic studies and treatments of hookworm--a disease which occurred in 80% of country children in his area of practice. Later, at Johns Hopkins University, he enrolled in a course in clinical laboratory diagnosis. One of the techniques he learned was to examine blood for malaria. Working under Dr. William S. Thayer, an associate of the famous Sir William Osler, Bass learned how to make blood counts to differentiate between malaria and typhoid fever. In 1906, he was made an Instructor of Medicine at Tulane Medical School. His malaria studies continued and, in 1912, he became the first scientist to cultivate the malaria organism in the laboratory. He became Dean of the Tulane Medical School in 1922. As a physician, Dr. Bass became interested in dental disease, due to his microscopic studies of amoeba of the gingival crevice which occurred in periodontal lesions. In the course of these experiments, he observed the mouths of hundreds of patients, noting the universal nature of rampant dental diseases of soft and hard tissues. After his retirement from the Deanship at Tulane in 1940, Bass devoted all of his time to dental research. Bass patterned his techniques after the methods devised in the early 1800's by another New Orleans physician and dentist, Levi Spear Parmly. In the Rudolph Matas Medical Library, at Tulane, he discovered Parmly's writings.*

(cont'd)

Moreover, Dr. Arnim adapted many of the Bass techniques to teaching operative dentistry and oral pathology in the laboratories and clinics at the University of Texas Dental Branch in Houston. Arnim's refinement of phase contrast microscopy technique led to a better understanding of the microbiology of dental plaque, which he called "microcosm." Plaque disclosants and refined home-care methods were introduced by Arnim as adjuncts to the personal oral hygiene concepts of Parmly and Bass.

All of these ideas, concepts, and practices were important to future developments in the field of preventive dentistry. Arnim's 50-page curriculum vita (single-spaced!) indicates the extent of his commitment. From 1929 to 1973, Arnim was involved in producing 11 textbooks, 8 motion pictures, and 84 scientific articles for the medical and dental literature. During these 44 years, he also made over 500 oral presentations to civilian and military audiences throughout the world.

Dr. Arnim served as Civilian Consultant to the Dental Service, Wilford Hall USAF Hospital, Lackland AFB, Texas, from 1961 to 1974. 4/ On 17 separate occasions during this period, he taught at the Air Force Preventive Dentistry Course at Brooks AFB, Texas. 5/ He was appointed Civilian Consultant to the USAF School of Aerospace Medicine, Brooks AFB, Texas,

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3/ *(cont'd)*

Bass found himself shocked at the profusion of theories offered by dental researchers of the day concerning the causes of dental disease. He concluded that dental scientists "were simply guessing." His observations pinpointed the initial sites where periodontal disease and dental caries begin in the human mouth. Bass designed a toothbrush and dental floss for effectively cleansing these vulnerable areas having microbial masses associated with the initiation and progression of caries and periodontal lesions. He was the first to describe in detail the essential characteristics of the toothbrush and dental floss. He refused to commercialize his own brushes and floss. For various reasons (including a long-standing feud with the Public Health Service, the American Dental Association, and the rest of organized dentistry), his most important ideas and concepts seldom appeared in dental literature where they could be read by the general dentist. They are, however, still considered classics, and are the basis for much of the current theory and practice of preventive dentistry. In one of a series of famous memorandums distributed to interested dentists, Bass wrote (in January 1967): "I would be glad to know that my epitaph will read--'He designed and promoted an effective method of personal oral hygiene'." Whatever one thinks of Bass, one cannot help but be impressed by his courage in criticizing and writing on subjects involving another profession (36, 60).

4/ *Dr. Arnim was the official representative of the University of Texas Dental Branch, Houston, at the dedication ceremonies of MacKown Dental Clinic (Graduate Training Center), Wilford Hall USAF Hospital, Lackland AFB, Tex., June 26, 1965.*

5/ *Arnim lectured at the first Air Force Preventive Dentistry Course, 5OZY9800, given at Brooks AFB, Tex., 25-28 May 1964, to 14 dental officers. Since then (through May 1978), 780 Dental Officers have attended this important course and have been directly exposed to his ideas. The last lecture he delivered in this course was on May 14, 1973. Arnim's concepts are kept alive by his able successor and co-worker, Dr. Merrill Wheatcroft, from the University of Texas Dental Branch, in Houston.*



Figure 1. Dr. Sumter S. Arnim, at age 72, reminiscing about his long career in teaching and research. (Photo taken by the interviewer in San Antonio, Tex., Apr. 11, 1976.)

from 1963 to 1973 (Fig. 2). He was appointed a National Consultant in Preventive Dentistry to the USAF Surgeon General from 1968 to 1972.

I first heard Arnim speak in San Antonio at an important Preventive Dentistry Workshop on November 6, 1966, at Lackland AFB. I still have notes from this conference. In the late 1960's, Sam W. Hoskins, Jr., and Roland M. Meffert, both formerly of the periodontic staff at Wilford Hall USAF Medical Center, established at Lackland several of these weekend workshops which greatly stimulated growth in military preventive dentistry (43). Among other distinguished teachers and practitioners of preventive dentistry who participated in these workshops were: Arthur L. Alban (pedodontist who developed the modified Snyder Test); Robert F. Barkley ("Mr. Preventive Dentistry"); Gerald M. Latimer (general practice: "If you got 'em, floss 'em"); Donald H. Masters (periodontist and nutritionist); James T. ("Toothbrush") Thompson; and Merrill G. Wheatcroft (general practice and oral microbiologist

The following recorded interview with Dr. Arnim was made on February 3, 1977, at his home in Brownsville, Texas (Fig. 1). Also present was my father, Harold J. Christen, DDS, a general dentist in private practice from Lemmon, South Dakota.

CHRISTEN: Sumter, how long have you been living in retirement in Brownsville?

ARNIM: It will be 3 years, this March.

CHRISTEN: Let's keep this interview informal. Please go back to your early life, and tell us a little about your childhood days, your parents, and your background.

THE FORMATIVE YEARS (1904-1924)

ARNIM: I was born in Hallettsville, Texas, in 1904, on October 9, the son of Charles William Arnim, a saddler, who was a buggy and harness dealer there (Fig. 3).

CHRISTEN: How did you get the name "Sumter"?

ARNIM: My maternal grandfather, E. M. Smith, had a brother who was killed at Fort Sumter, Charleston, South Carolina, in the Civil War. When my grandfather had a son, he named him Fort Sumter Smith in honor of his brother. I was born on Fort Sumter Smith's birthday, so they named me Sumter Smith Arnim. My mother, Lydia Catherine Arnim, was the daughter of this same farmer (my grandfather, E. M. Smith), whose family originally came from Charleston and migrated through Arkansas to DeWitt County, near Yoakum, Texas.



Figure 2. Dr. Arnim (right) receiving the Air Force Institute of Technology Certificate of Appreciation, Jan. 23, 1968, from Colonel Arthur J. Stumpf, Jr., Chief, Dental Sciences Division, USAF School of Aerospace Medicine, Brooks AFB, Tex.



Figure 3. Charles William Arnim (father of Sumter S. Arnim) of Hallettsville, Tex., prior to 1910.

CHRISTEN: Were your parents strict disciplinarians?

ARNIM: I probably have been beaten for more things and by a greater variety of whips than any other child who ever lived to tell about it. My mother's temper had a very short fuse. We had a wood stove in the kitchen with a box beside it which was always filled with kindling made from the crates in which buggies were shipped to us from up North. These were called "one-by-threes," in the lumber yard. She could easily reach one of those, and they were her favorites. If it was something that she had time to think about and she wanted to use a little psychology, she'd send me out to the peach tree to trim off a suitable switch. She might even send me back two or three times before I got one that would suit her fancy. In fact, I got many whippings with buggy whips, leather quirts, and with this and that and the other. A young man who was apprenticed to my father as a saddle-maker lived on the second floor of our house. One day he said, "Sumter, I'll tell you how you can fix it so she won't beat you any more. Next time she whips you, don't cry." I said: "You mean if I don't cry she'll quit beating me?" He said: "Yeah, that will really work." [Laughter] So the very next time she got hold of me and tapped my bottom, I didn't make a sound. All of the sudden she noticed I wasn't crying; and she said, "Oh, so you're not going to cry?" and WHAM! I went right through the door. I still don't like that fellow. [Laughter] He really gave me the wrong advice.

Perhaps I did not resent the rough treatment I received as much as I might have, had I not deserved it so much! I began to run away to go fishing in the nearby Lavaca river--actually a creek, but deep enough to drown in--before I was 6 years old (Fig. 4). My mother would have to hitch the horse to the buggy and drive along the creek road to find me. As she drove along, she would whistle and call to my two dogs, who would run to her when they heard her call. Without their help I probably would have stayed on the creek all day. As it was, the thought of her buggy whip persuaded me to grab my pole and can of worms and run for the buggy. I remember catching only one small perch, and mother was kind enough to drive me to the town square where I displayed it proudly to all who would watch. In desperation, she locked me in my room after one long day at the creek. I was put on corn bread, molasses, and water for a week. However, I was allowed all the books I wanted to read, and I could crawl through the window on to the roof and visit with my boyfriends who gathered in the yard below. The day my prison sentence was up and I was released, I ran away to go fishing again.

Certainly, she was a sorely provoked mother. Around the age of 8-9 years, I began to steal everything that



Figure 4. The children of Lydia and Charles Arnim, Hallettsville, Tex. (about 1910). Left to right: Lula Arnim (age 20), Sumter S. Arnim (age 6), and Benjamin Franklin Arnim (age 18).

wasn't nailed down. Firecrackers, candy, gloves, money--all found their way into my pockets on the inside of the blouses little boys wore in those days. She usually caught me in the act, or shortly thereafter, as she seemed to have an in-built sense of perception when she looked directly into my eyes. These escapades ended suddenly when I stole a large brass valve which had been left near the back door of my uncle's plumbing and tinsmith shop. It was in this shop, where I had first learned to solder, I carefully beat the valve with an axe until I was sure no one would recognize it and then sold it to the junk man for 65 cents. When my uncle visited the junk man to find his valve, he was amazed to learn I was the one who had stolen, beaten, and sold it. My mother insisted that dad be the one to punish me on this occasion, so he took me to the barn, took off his belt,and said: "Now when I hit this wall with the belt, you cry." I did, lustily; but it was the knowledge I gained when I learned the valve I sold for 65¢ had cost my uncle $16.00 that ended my career as a burglar. Crime did not pay!

Perhaps the most important aspect of my childhood upbringing was the emphasis on hard work, quality, excellence, and fair treatment of others. Most boys in small towns had part-time jobs in those days. My first was as stoker for the steam boiler at the creamery, one summer during school vacation. I was paid 50 cents a week, and allowed to eat all the ice cream I wanted. Thereafter, I held a succession of jobs--grocery delivery boy, clerk in the 5-and-10-cent store, cotton picker, grocery clerk, Western Union delivery boy, sales clerk in a clothing store, and so on--even after I reached college, and dental and medical school.

My father's reputation for excellence and fair dealing in his shop, and my mother's skill and acknowledged position as the best cook in town, set me an impressive example. Cowboys rode many miles on horseback to buy his saddles, and willingly paid much more than they would have for those of inferior quality which could be purchased along the way (Fig. 5). Satisfaction was guaranteed, and money was refunded unless the customer was pleased. Perfection was the goal, at home or in the shop. With a few exceptions, I learned as much (or more) of importance from this background, and the employers for whom I worked, than from my formal education. One exception was the influence of the English teacher in my grade school, Miss Emma Searcy. She taught elocution, public speaking, debate, reading, and writing. I had read all the books in the tiny Hallettsville public school library before I reached the 8th grade.

When I was 14, my father died; and my mother and I moved to Houston where my brother, Benjamin Franklin Arnim,



Figure 5. The saddle, harness, and buggy shop of Charles W. Arnim (arrow) at Hallettsville, Tex., prior to electricity (about 1904).

was working in the rice business. Soon after we reached Houston, my mother said my breath smelled as though I had some decayed teeth. An appointment was made with the dentist. He decided to fill a cavity in a lower right bicuspid, and started to work with an electric engine which he ran at (what seemed to me) full speed and steadily until my tooth was so hot I tried to pull his hand away from my mouth. As he was bigger and stronger, he succeeded in grinding away my tooth to his satisfaction and to my extreme discomfort and resentment. Not once would he stop the drill long enough for the tooth to cool off. Local anesthetic was not in general use in those days. The end result of this experience was that I thought there must be a better way to fix decayed teeth.

I finished my high-school education in Houston and went to San Antonio to work for my cousin, W. K. Sullivan, who was the manager of the Cotton Exchange in the St. Anthony Hotel. After staying about a month in San Antonio, I lost about 10 pounds. One day, my cousin called me into his office and told me that, if he hadn't had the bookkeeper checking up on me, it would have cost him $600 to keep me there. The reason I turned out to be such a poor clerk in the cotton business was that I was writing two or three letters a day to a young lady whom I wanted to marry who lived back in Houston. Of course, not having any money, I thought if I went into the cotton business I could get rich quick and get married sooner. But my cousin finally told me he thought I'd do better if I went back to school. In other words, he fired me. I went home at the end of the month, and my mother was alarmed at my scrawny condition. She took me to the doctor and he told her that if she fed me a little bit of meat and plenty of milkshakes and things like that, I might get in good shape again.

THE COLLEGE YEARS (1922-1935)

By that time, my brother, who was 12 years older, came around and asked me what I was going to do. I told him that I didn't know. He said: "Well, you know that you can go to Rice University for free; it doesn't cost anything there. If you graduate from Rice, we will see to it that you can go anywhere in the world you want, whatever it is you want to study. Whether it be medicine or law or anything of that kind." So I started Rice in the fall of 1922. In those days, anyone who had a high-school diploma could enter Rice. I managed to get by the first year, and had a lot more difficulty with the second year. By the third year, my interest in biology became evident, because that's where I made my best grades. I was having terrible trouble with math and chemistry, but I landed a job at Rice as a Laboratory Assistant

in the Biology Department. The Chief of the Department was interested in research and asked me if I'd like to do some. (Perhaps I was unconsciously influenced by an inscription on a building cornerstone at Rice which read: "Rather would I be the discoverer of one fact than king of all the Persians.") By this time, I was beginning to think I would probably prefer to go into dentistry instead of medicine, because many of the brightest students were planning on being physicians and I didn't want that kind of competition! So I told him I had "some interest in dentistry." It was in those days that Dr. Charles C. Bass had written a book which proposed a relationship between periodontal disease and the Entamoeba gingivalis (31). My professor knew about these studies, so he suggested I study mouth amoeba also.

This was my first introduction to research. During my last year at Rice, I wrote to several dental schools to see if I could get a scholarship. I ended up with a fellowship that paid my tuition to Northwestern University (Evanston, Ill.), with the provision that I act as student assistant in the bacteriology laboratory. In those days, it was easy for anyone with a degree to enroll in dental school. Basic science studies were limited. There were textbooks in anatomy, physiology, biochemistry, dental materials, and pharmacology. G. V. Black's volumes on Operative Dentistry (38), dental anatomy, dental pathology, and books on prosthetic dentistry and oral surgery completed this list. So, once one managed to learn what was in these books, the rest was easy going, especially for a youngster who was highly trained in his daddy's saddle shop. (As a child, I had, as one of my main jobs, the sharpening of the knives which we used to cut leather.) Dentistry at that time was still being done with foot engines in many dental schools--but Northwestern was supposed to be one of the most modern schools of the day, with electric motors in the clinics and laboratories. (G. V. Black had warned that electric motors would be the downfall of dentistry because they created so much heat while removing enamel and dentin. Cutting instruments were considered to be the best and least painful for removing tooth substance at that time.)

CHRISTEN: When did Dr. G. V. Black retire at Northwestern?

ARNIM: I don't think he ever retired; and I believe he died about 1912. But I'm not certain about that. 6/

6/ *Greene Vardiman Black died at his boyhood home on a farm near Jacksonville, Ill., on Tuesday, Aug. 31, 1915, from pernicious anemia, at the age of 79.*

CHRISTEN: His son was in school with you, also?

ARNIM: Yes, his son, Arthur D. Black, was Dean when I attended dental school. [7]

CHRISTEN: What type of an individual was Arthur?

ARNIM: He was a very good administrator, and Northwestern was run on a business-like basis. The School was reputed to be the best in the world.

In those days, of course, dental students didn't really know how short of money the School was. If you forgot your key to the locker, you were fined 25 cents; and if you forgot it twice, you were fined 50 cents. That was a lot of money in those days. All books and instruments were bought from the bookstore in the Dental School at prices which were considered exorbitant by the students. One of the first things students were taught when they joined fraternities was how to turn pages in textbooks with their feet so they could cheat on examinations. [Laughter] There was a so-called "foolproof" bookkeeping system for collection of fees in the clinic. However, a year or two after I left, an investigation revealed that some of the students had been "bush-whacking" (as they called it) to the tune of many hundreds of dollars; and the system had to be changed.

I started a little change in the situation when the fraternity, in order to collect enough money to pay the rent, insisted that students from out of town live in the fraternity house. The fraternity house was so dirty and disagreeable that I told them I didn't plan to live like "poor trash." When this all came to a head, Dean Black called me into his office and said: "Instead of being that kind of a fellow, Arnim, why don't you go ahead and see if you can straighten out the fraternity house and make it better?" That sounded like sense, so I agreed; and the brothers put me on the house committee as Chairman. We moved into a new house the very next year. By the time we graduated, we had a house that had an 8-car garage, a ballroom, and a large living room. Furthermore,

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[7] Arthur Davenport Black (1870-1937), MD, DDS, Sc.D., the son of G. V. Black ("The Father of Modern Dentistry"), was Dean of Northwestern University Dental School for 20 years. Like his father, Dean Black was a noted educator, scientist, and writer, having been on the faculty of Northwestern since 1900. At the time of his death, he held a commission as Colonel in the Army Reserve Corps. He was the compiler of the Index of Periodical Dental Literature, consisting of 13 volumes, cataloging dental literature from 1839 to the date of his death; and the author of a classic text on operative dentistry in four volumes and of more than 200 scientific articles in medical and dental literature. As Dean of Northwestern, he established the first dental clinic for children, and organized the first successful department of graduate study in dentistry (4).

the house was within walking distance of the school. It was just marvelous, until Dean Black called me into his office one day. With a serious look on his face, he said that the head of the Dental Hygiene School was starting to complain about what was going on at our "wild" fraternity house. I asked: "How could that be?" He informed me that the young ladies (dental hygiene students) left school Saturday afternoons, and came back on Monday mornings wearing the same clothes. When the Director of Dental Hygiene confronted the students and asked how this happened, they said: "We've been going to the Tea Dance at the fraternity house Saturday afternoon and evening, and we haven't had a chance to change since!" [Laughter] So, we had to see to it that the girls changed their clothes before they got back to school.

CHRISTEN: Dr. Arnim, what was being taught in preventive dentistry during those days at Northwestern?

ARNIM: There was no such thing as preventive dentistry at that time. In fact, periodontics wasn't even listed as a department. Major emphasis was on what was called the point system in the clinic. Each student was required to place a given number of amalgams, inlays and gold foils, bridges, dentures, and partials in order to graduate, regardless of what grade he made on any one or all of these operations. There were a series of practical tests for your handwork, designed to train you to pass State Boards once you graduated. These tests were called "practicals," and you were graded on each one. To me, it seemed ridiculous that a student should have to do 50 inlays if he had learned how to do them well after doing only a few. [8] I learned to make excellent restorations in good time by doing 10 or 12, so I became one of the ringleaders in the student body to straighten out the point system and other problems around the school. [Laughter]

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[8] *In a thought-provoking address given to the annual meeting of the American College of Dentists, Miami Beach, Fla., Oct. 1977, Dr. Joseph A. Devine took a critical look at dental education--*

I have often said there are two things I would never want to go through again: one is puberty and the other is dental school...When we graduate from dental school we have to have a marketable skill, and we have to be able to treat people's teeth, and that is what the examiners try to find out. Basically, what we have to offer is skill, care, and judgement. One of the reasons for the difficulties that the young dental graduate has is that no one has taught him how to care. When a young man graduates, he has to have confidence in himself and in his own ability. Unfortunately, the entire system seems designed to destroy his self confidence. In my freshman year, nobody ever said a kind word to me. Every instructor criticized me. I never did anything right, always did everything wrong. I was supposed to be there to learn how to care for people, and all I heard for four years was that I had to pass this examination in order to practice. If they weren't going to examine me on a subject, we didn't need to learn it. So we didn't have much training in endodontics, and a lot of the things that I think were important. We were so concerned about passing a three-day examination that we spent four years getting ready for it (45).

I served on the Student Council each year. During one of the meetings in the first year (which was recorded in the Council "Minutes"), I suggested that the school authorities should upgrade the bacteriology course, as it was terribly out of date. When I returned from summer vacation, I learned I didn't have a job assisting in bacteriology. (I was so naïve! It took me almost a year to find out why!) Eventually I learned it didn't pay to be critical in the Student Council. When I had been at Rice, no one had to attend class unless he wanted to, as no roll was called. There was an honor system (no one would think of cheating on examinations); and students were encouraged to be critical of themselves, the administration, and the world at large.

By this time, I was upset and disappointed with my choice of a dental school. Students and faculty were attuned to the "point system," conventional testing and grading, browbeating, and the failing and passing system. If student protests had been allowed, I would probably have been leading them. Fortunately, I made friends with a young teacher, H. C. Benedict, in the Biochemistry Department, who was working for his Ph.D. on the campus at Northwestern. He needed someone to help with his research on local anesthetics. I'd made very high grades in organic chemistry, biochemistry, and histology. (Earlier, at Rice, however, after I had taken the first three exams in organic chemistry, I made 14 out of 100 on one; 12 on the second; and 9 on the third. After the third exam came back, I saw written--underneath my pledge that I'd neither given nor received aid--the professor's remark: "Evidently not!" [Laughter] It was signed by Dr. Henry D. Nicholas, who was our professor at that time.) When I took organic chemistry at the Northwestern Dental School, I really hit the studies hard. That's how I became friends with the professor there. Our research was conducted on Sundays, when one had to have a special permit to get into the building. The elevators were not running, and we had to walk up nine flights in order to get to the lab; so we would stay up there all day until we finished for the day.

I also had a wonderful teacher, G. B. Denton, who was in charge of technical composition. He was a brother-in-law of Dean Black. Many of the Black family had jobs in the school. When it came time for me to take the regular course work in technical composition, Dr. Denton told me that I could write a term paper instead of attending the regular class (where students threw erasers and chalk at him). As my term paper, I chose a library research project on various theories concerning the etiology of dental caries. I reviewed the literature that was available in the Dental School Library. It was, is still, a really excellent Library.

Dean Arthur Black was intensely interested in dental literature, and developed the first-class Library at Northwestern.

CHRISTEN: What year was this, Dr. Arnim?

ARNIM: In 1927-1928, I was in my sophomore year. I don't know what became of my paper on the etiology of dental caries, but working on it was interesting. Moreover, I began at that time to make a bibliographic file of articles that I had read. My chemistry teacher taught me how to cross-reference everything. Eventually, I had thousands of cross-referenced cards on all of the articles I read.

CHRISTEN: In these early days, how influential were the teachings of W. D. Miller? 9/

ARNIM: As far as the understanding of the etiology of dental caries was concerned, W. D. Miller knew as much as we know today. Likewise, concerning practical applications, he knew as much or more!

There were others who wrote at the same time, showing that the carious process was well understood. G. V. Black added a great deal to the knowledge of plaque. One of the men who did some of the first photomicrographs of plaque, using ground sections of teeth that were embedded in resin, was James Leon Williams (68). 10/ The sections of teeth he prepared gave us

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9/ *Willoughby D. Miller, PhD, DDS, MD (1853-1928), a brilliant teacher and researcher, attended the University of Michigan (1870-75) where he received a BA. Following study at the University of Edinburgh (1875-76) and the University of Berlin (1876), he returned to the United States in 1877 to study dentistry and received a DDS from the University of Pennsylvania in 1879. After graduation, he went back to Germany and became a Professor of Operative Dentistry at the University of Berlin. From 1882 to 1885, he did the most important studies on and proposed the main theory of caries causation which is still accepted today--the Chemico-Parasitic (Acidogenic) Theory. He incubated extracted human teeth in a mixture of bread and saliva, producing carious-like lesions (the first artificial mouth!). The suggestion that microorganisms might be the culprit responsible for tooth decay originated in Germany about 1867. However, not until Miller completed his investigation and published his findings, in 1889, was the etiology of dental caries firmly established (55). Eventually he returned to the United States as Dean of the College of Dentistry, at the University of Michigan. He died on July 27, 1928, of postoperative complications occurring after an operation to treat gangrenous appendicitis (9).*

10/ *James Leon Williams (1852-1932) was descendant of Oliver Cromwell, Roger Williams (of Providence), and William Williams (a signer of the Declaration of Independence). In 1871, at the age of 19, Leon Williams was tutored in dentistry under a local dentist, Dr. Roberts, of North Vassalboro, Maine. At age 20, he became the youngest member of the Maine Dental Society. He immediately borrowed a microscope which belonged to the Society and began a study of dental histology and pathology of enamel that was to continue for over 50 years. In 1897, at the age of 45, he published an excellent paper describing plaque, stating that acids were localized under plaque against the teeth. He understood well the adhesive nature of plaque (68), and is reputed to have coined the line: "A clean tooth will not decay." He is also remembered for his efforts to improve the aesthetic qualities of artificial teeth. In 1914, he established the selection of artificial teeth on a scientific basis by describing three typal forms of maxillary teeth common to all races (11).*

the first good look at the total microbiotope on the tooth surface that is commonly called plaque.

CHRISTEN: Did you know Williams personally?

ARNIM: No, but I read every article he had written while I was still a student at Northwestern.

In my junior and senior years I received fellowships again for the work I was doing in the laboratory of the Chemistry Department. In my senior year, I decided to sue Northwestern University for my diploma. There was no way for me to graduate without accumulating all the necessary points in the clinic. I had made straight "A's" on the practicals, and this was proof enough for me that I could do the job. But the administration, of course, couldn't let this happen. The contention was that, if you didn't practice by making large numbers of fillings over and over again, you couldn't become "perfect."

CHRISTEN: How many dental students attended Northwestern in each class?

ARNIM: I'd say more than 100 in each class. Most of them graduated sooner or later, after they put in the right number of fillings--whether their work was poor, good, or the best.

About this time, we had a freshman student from New Haven, Conn. He attended Dental School in golf knickers. This boy's father was a fraternity member also, so the lad was invited to our fraternity house. However, the boy was soon dropped from Northwestern; and his father came to see why. The reason was that one simply didn't attend Northwestern in knickers in those days. He was like a black sheep in a flock of white ones! Dental students wore spats, and some sported canes and wore derby hats. This student's father learned that I was doing research in the Chemistry Department and that, as a senior, I was going to present a paper before the International Association for Dental Research (IADR) which was meeting in Toronto, Canada, that year. He told me about fellowships at Yale University. I said I wouldn't be able to get one of those because the school wouldn't recommend me and might not even let me graduate. Moreover, it seemed I wouldn't be allowed to give a paper at the IADR Meeting because I was a student; and allowing a student to give a paper would be beneath the dignity of that research association.

Fortunately, H. C. Benedict, my mentor in the Chemistry Department, stuck up for me. He told them that I had as many degrees as he did, that I had done all the work on the project, and that if I didn't give the paper he wasn't going

to give one either! So we reached a compromise. I was to take a train to Toronto the night before the Meeting, give the paper, and quickly return by train that same afternoon to Chicago. 11/ So I went on and gave the paper in Toronto (16)--and afterward bought two quarts of McCallum Scotch (which came in curved bottles) which I taped underneath my arms. I then took the train back to Chicago as planned, and fell asleep in the Pullman expecting the Customs people to come through later to examine my luggage. But they didn't come. And there I was with all that stuff taped to my body! I thought: "They'll catch me when I get to Chicago"; but, when I arrived, no one checked my luggage. I could hardly wait to get a taxi to the fraternity house with that precious cargo because, you must remember, those were prohibition days! [Laughter] When I made it to the fraternity and untaped the Scotch, let me tell you I was a popular fellow.

CHRISTEN: How did you resolve your difficulties and eventually manage to attend Yale?

ARNIM: With the help of the boy's father in New Haven, I arranged to go to New Haven on the way to Toronto and to consult Dean Milton C. Winternitz at the Yale Medical School about fellowships. While in New Haven, I was told that I could have one if I graduated from Northwestern Dental School.

I surveyed my situation. This news left me with an appointment to Yale--and no graduation from Northwestern in sight! I had been planning to sue for my diploma, but now I had to change my thinking pretty fast. I decided I'd better not fight the system. First, I contacted all the young professors who didn't believe in the point system either. Among all the other things, I hadn't done the required number of "prophys." In those days, prophys weren't considered to be preventive in any form or fashion. They cost $1.00 apiece, and you had to have something like 50 of them in order to graduate. I lined up all the fraternity boys one after another, paid the dollars, and acquired my necessary prophy points (Fig. 6).

Well, I was also short on points in surgery, because I never did enjoy pulling teeth! I hung around the surgery department and discovered that the young instructors could give you extra points if you did a good job. They helped me get the extra points and the highest grades. I think it was

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11/ The paper by Arnim and H. C. Benedict, entitled: "A New Method for Determining the Colloid Content of Saliva by Electrophoresis," was presented at the 8th General Meeting of the IADR, Royal York Hotel, Toronto, Canada, Mar. 24, 1930 (16).



Figure 6. Sumter S. Arnim (at age 25) in 1929, the year before receiving his DDS degree from Northwestern University in Chicago. He was Vice President of his Senior Class in the Dental School.

in March when the IADR met in Toronto, so I had April and May in which to accumulate two-thirds of the year's points. By the time May 15th came around, I had 500 to 600 points over the line. [Laughter] In short, dental school was a tremendous shock and disappointment to me. I left it with a single thought in mind: "There must be a better way to teach dental students." As soon as School was out, I went home to Texas and took the State Boards. 12/

CHRISTEN: Did you set up practice in Houston?

ARNIM: Yes. After I received word from the Board that I had passed, I worked with a dentist in Houston. I practiced until time to go to New Haven and enroll at the Yale Medical School.

CHRISTEN: When you were clearing your throat a little bit, you mentioned that perhaps this problem goes back to when you were still smoking. What's the history of your smoking?

ARNIM: Well, to begin with, my mother had a nose that could detect the slightest change in the atmosphere, any kind of fragrance or smoke, or anything else of that sort. Because my father smoked around the house all the time, it was a while before she caught on to the fact that I had begun to smoke, too. I would steal some of my dad's cigarettes and get out of the house and have a puff. When she found out that I was smoking, she gathered up all the cigarette packages she could find in the house--I think there were 3 or 4 open packs. She had me sit down in the chair and smoke one after another. She kept telling me to inhale; but at that time, I hadn't learned how to inhale. She could see that I wasn't getting sick as she hoped I would, because evidently I didn't change color! When we used all the tobacco in the house without producing the desired effect, she racked her mind about what to do next and suddenly remembered that the kitchen sink was full of dishes. To this day, I wash very few dishes. [Laughter] I didn't smoke any cigarettes for a long, long time after that episode, either.

Years went by until I began to do research on amoebas for Dr. Richard P. Hall in the Biology Department at Rice. I noticed he smoked a pipe, and thought that it looked very erudite. (You know what I mean--the learned professor and his pipe.) Well, it wasn't very long before I had a pipe, too. When I got to Chicago, I found there was a popular song in those days about the man from the South with the big cigar,

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12/ *Arnim has the following licensures to practice dentistry: Texas, 1930; Connecticut, 1932; Illinois, 1939; Virginia, 1940; and Ohio, 1946.*

and that seemed to fit my image. Of course, I was the only Texan in our class, and so I began to smoke cigars, too. When I started my studies in New Haven, I didn't have time for smoking cigars or pipes; so I smoked cigarettes.

CHRISTEN: How did your studies progress at Yale?

ARNIM: From the very beginning, I became the chief technician in the pathology lab. We prepared monkey and human sections for the dental study group in the fellowship program. No one there could sharpen microtome knives well enough to cut sections thin enough to please the pathologists who were our advisors. They were accustomed to thin paraffin sections of soft tissues. Of course, bone and teeth had to be embedded in celloidin. At that time, Gottlieb and Orban were using sections 20 - 50 µm thick. Medical pathologists said you couldn't really tell a thing about sections made that way. They wouldn't even bother to look at them. As a result, faulty conclusions and misinterpretations were being made from such material. However, the people who were doing brain sections were cutting thin sections, and they used celloidin; and those doing sections of the ear used double-embedding techniques of celloidin and paraffin. So we adapted these techniques to jaw specimens from animals and humans. This method led to the largest collection of thin-cut material, in which cellular detail was distinct, that was available at that time; and the collection is probably still unique in this respect today.

CHRISTEN: Did you know Balint J. Orban?

ARNIM: Oh yes, I knew Orban and Kronfeld when I was in Yale Dental School. Our Professor of Pathology at Yale, Dr. Raymond Hussey, was a great teacher. He went to Vienna to study with Gottlieb one summer. (Hussey came back with the statement that there was no point in trying to study thick sections like those he had seen in Vienna, because detail was obscured.) Rudolf Kronfeld, Balint Orban, Bernhard Gottlieb, Harry Sicher, and Joseph P. Weinmann were all personal friends of mine. [13]

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[13] *From 1911 until 1938, the world-famous Dental Division of the Vienna Medical School was under the guidance of Bernhard Gottlieb, MD, DMD, LLD (1885-1950). He had been born in Kuty, Poland, in 1885. By 1911 he held the Degree of MD from Vienna, and Honorary Degrees of LLD (Loyola of Chicago) and DMD (from Bonn). He combined teaching with private practice, which he maintained until the Nazis moved into Vienna in 1938. At that time, he went to Palestine, where he taught and practiced for two years. In 1940, he came to the United States and was a Visiting Lecturer for one year at the University of Michigan. He then went to Dallas, in 1941, and took the position he was to hold until his death on Mar. 16, 1950: Director of the Department of Oral Pathology and Dental Research at Baylor University College of Dentistry. Orban said of Gottlieb (6):*

> *One of his major accomplishments was his tendency to write spontaneously without exhaustive investigation and draw conclusions which could be questioned, thereby encouraging those who doubted to work and prove him wrong.*

Gottlieb's disciples, who were Viennese-trained and who all ultimately migrated to the United States, were:

CHRISTEN: Tell me, how were the dental researchers and teachers who were trained in Europe regarded at that time?

ARNIM: They were kings. They brought "new" ideas to supplant the teachings of J. Leon Williams, G. V. Black, and Harold K. Box. No one else gave a better or more exciting presentation to a dental audience. They were simply the best. They also published more articles and gave more talks, one right after another, than anyone else. At that time, scientists in Berlin and Stockholm were also doing excellent work which was not in agreement with that which came from Vienna. Also, the great periodontist on this continent, Harold Box 14/ (in Toronto, Canada), who had done excellent research and had earned an international reputation as a practitioner, was generally ignored as the new ideas from Vienna received general acclamation.

These men from Europe and Scandinavia hung Box by his toenails. Anyone who is familiar with the literature would know this.

13/ *(Cont'd)*

Rudolf Kronfeld, BS, MD, DDS (1901-1940)--a brilliant lecturer, teacher, and researcher of dental histology--was born, raised, and received his medical training in Vienna. He worked with Gottlieb until 1929, then came to the Chicago College of Dental Surgery, where he received his DDS in 1933. He served there as Professor of Dental Histology and Histopathology. He died suddenly, Feb. 13, 1940, during the Midwinter Meeting of the Chicago Dental Society. His textbooks on dental histology are still recognized as distinctive and authoritative (8).

Balint J. Orban, MD, DDS (1899-1960), was a tireless clinician, investigator, and writer in periodontal histology and pathology (12). He received the MD at the University of Budapest (1922), the MD from Vienna (1930), and a DDS from Northwestern University (1938). From 1927 until his death, he taught at various schools, including: Loyola of Chicago; University of Vienna; Northwestern University (Evanston, Ill.); and The University of Illinois. Practicing in Colorado Springs, he kept his ties with Chicago and held, from 1952 until his death in 1960, the position of Professor of Periodontics at Loyola of Chicago. Orban's extensive works concerned enamel histology, early tooth development, dentinogenesis; pulpal histology; cementum resorption and repair; classification of oral mucosa and periodontal diseases; gingival changes in pregnancy and diabetes; occlusal trauma, etc. Orban was often heard to say: "Always fight issues, never fight people."

Harry Sicher, MD, Sc.D. (1889-1974), was a beloved and respected dental anatomist, Professor Emeritus of Anatomy and Histology at the School of Dentistry, Loyola University of Chicago (61). He received the MD Degree from the Vienna Medical School (1913), where he was a student of the renowned anatomist Julius Tandler. After the Nazi takeover, in Austria, he fled to the United States in 1939. He conducted a private practice in oral surgery and lectured widely. He was an accomplished violinist, both playing and directing chamber music. His butterfly collection was world famous (48).

Joseph P. Weinmann, MD (1896-1960), who received his degree from Vienna in 1923, eventually taught dental research, oral pathology, and histology at the University of Illinois, Columbia University in N.Y., and Loyola University of Chicago. His classic paper, concerned with changes in alveolar bone occurring during mesial drift, was published in 1925 with George Stein (3). Weinmann studied and wrote about bone physiology and pathology, tooth eruption, gingival inflammation, periodontosis, amelogenesis imperfecta, enamel histogenesis, and the different characteristics of skin and oral mucosa.

14/ *Harold K. Box, DDS, PhD (1890-1956), a product of the University of Toronto, received his DDS from the Royal College of Dental Surgeons of Ontario in 1914 and a PhD in 1920; in 1921, he was elected the First Fellow of the American Academy of Periodontology. He wrote a total of 70 articles, bulletins, and monographs--mostly related to the etiology, histopathology, and treatment of periodontal disease (39). His career was characterized by "academic brilliance, insatiable inquisitiveness, and the courage to be progressive (41)."*

CHRISTEN: Are you implying that the overpowering nature of these individuals retarded the development of preventive dentistry and information that was to come later?

ARNIM: You have to remember, in those days, it wasn't called preventive. It was just good dentistry.

CHRISTEN: Recently, while reviewing the literature, I read some interesting articles, such as reports from the Hygiene Conference of 1915 (62). Even in those early days, there were some significant discussions concerning preventive concepts.

ARNIM: G. V. Black, of course, developed the concept of "extension for prevention" in 1891. He did the original studies on the tooth locations at which dental caries begins and develops. These studies were overlooked by later investigators and, for many years, it was believed that none of the studies which might have led toward a practical preventive approach were possible--because diseased teeth were counted, not diseased surfaces. The significance of Black's first report on the vulnerable sites at which caries begins was not recognized. (Just because there is no rickets in Cuba, you can't say that these people will not get rickets. If they were moved to New Haven where there is far less sunshine, and were not given Vitamin D, they would get rickets. Rickets occurs at those sites where sunshine and Vitamin D are missing.) Dental caries occurs at certain sites on teeth where adherent colonies of microorganisms thrive in mouths of people with high frequent intake of modern carbohydrate foods.

The way G. V. Black prevented dental caries was to cut away those surfaces that decayed and replace them with fillings. That is the essence of extension for prevention. It is also the reason he put his fillings underneath the edge of the gum. He knew decay didn't occur down there either.

CHRISTEN: What effect did the concept of extension for prevention have on dentistry in those early days?

ARNIM: It fit in very well with the production schedule of the dentist. It became very popular, because you could even cut a hole in a tooth where there wasn't a cavity.

CHRISTEN: It justified tooth destruction?

ARNIM: It justified what you got paid for. If you don't have something the practitioner can get paid for, you are out of business! The initial result was that prevention of dental caries got off in the wrong direction. At this time, everyone went along with a currently popular Viennese idea

that caries could be prevented with a balanced diet. Those who examined children's teeth in a hospital that specialized in treating diabetics said it was the diet that was doing the job, not the fact that patients weren't allowed sugar. So the theories of Miller, Williams, and Black were discredited; and it became more difficult to understand the causation of both periodontal disease and caries.

By this time I had developed the triple embedding technique in our laboratory at Yale, trying to get sections cut thin enough so the pathologists would look at them. I embedded twice in celloidin, and once in paraffin. The first two years flew by. At that time I didn't have to attend any formal classes. One of my classmates spent his second year in Europe, without visits to the medical schools or hospitals. He came back to take preclinical exams and, to our surprise, made the highest grade in the class. All of this he accomplished after one year at Yale and the other year with his own independent study. This plan suited me to no end! I thought it was wonderful. This system was a broadening of the one used at Rice. Eventually, it came time for me to prepare for my preclinical exams, too. By this time, I had decided I did not want to become a "real" doctor. I didn't relish the idea of going around various wards where people were dying and there wasn't a damn thing you could do for them. I especially remember one little girl, about 16, who had rheumatic fever; and she was dying, too. This I just didn't go for. I did all the surgery that anyone is supposed to do to graduate from Medical School; but surgery didn't appeal to me either. To be able to cut on all these helpless, anesthetized people, I knew that I would have to learn anatomy all over again. On the other hand, everyone had dental diseases, including surgeons; but no one wanted to take care of their dental problems, as everyone was chiefly concerned with the "more important" life-saving medical practices.

CHRISTEN: Talking about anatomy, I visited a new dental school recently in which anatomy is completely taught by the use of models. What are your feelings about this practice?

ARNIM: That is the way we taught dentistry for years. If a student took a tooth with a hole in it up to the professor and asked how to make an ideal cavity preparation, the student was told he had the wrong attitude. Ideal cavities were cut in chalk teeth or dentoform teeth, and students were not supposed to ask any questions but do as they were told. The clinical facts that alter extension for prevention have no meaning when artificial models are used. After you reached the clinic and when you got out of dental school, you had to learn to modify extension for prevention in order to treat diseased teeth. Every dentist had to get this

experience on his own. In my day, if you didn't swear you were following G. V. Black's model cavity preparations, you were an outcast. Of course, there were regional differences in what was being taught. I really blew up at Northwestern when I found out, after the second year, that I couldn't transfer to a dental school in Pennsylvania or New York. I also learned that a Northwestern graduate couldn't take the State Boards in those states. I went in and told Arthur Black I had been cheated.

CHRISTEN: Why couldn't you take the State Boards?

ARNIM: Because, Northwestern wasn't considered a good enough school for accreditation in the northeastern states. The fellow who founded the University was the one who invented amalgam. The amalgam war was still being fought in the twenties, you see. Arthur Black wasn't about to admit that his father invented amalgam because gold foil wasn't a really good enough answer to the caries problem. Let's say you try to use gold foil in a tooth. If you try to put it in any of the incisor teeth, there is hardly enough dentin present to accommodate the foil. It gets too close to the pulp. [Laughter]

CHRISTEN: So the amalgam war was refought on new battlefields?

ARNIM: In those days, while you were learning to place gold foil, you couldn't use anesthetic. Local anesthetics were in their infancy and were dangerous. Students were discouraged from using them at Northwestern University Dental School.

CHRISTEN: It was dangerous?

ARNIM: Well, of course, it was dangerous! My first published paper had to do with local anesthetics (15). One had to learn to operate on unanesthetized living teeth without hurting the patient.

There was a great shortage of dental care in medical school. It seemed no one wanted to take care of the people's teeth. We ran an extraction clinic for poor folks in the neighborhood of the school. We lined them up and extracted 25-50 teeth every morning. That was the main dental service rendered in a dental clinic which was funded by the Women's Junior League; but we also made some false teeth for some of the people.

Dean Winternitz and his children, too, had dental problems. Most of the medical staff and dental fellows also had dental diseases. I enjoyed taking care of their teeth. As my Rockefeller Fellowship stipend (after tuition deductions) amounted to $1,000 annually, I was short of money. There was

still prohibition, liquor was high priced, and I loved dental work--so I got me another job at night, working for a dentist in New Haven by the name of Mullineaux. I carved and cast his inlays at night and had them ready to go for the next morning's patients. I could stop in to visit my nurse friends on the way home, too, which wasn't half bad, since I was still unmarried. [Laughter] One morning, after I had been up working pretty late, I went to the class in pathology that was taught by the Dean. He called on me to get up and describe something about the heart, and I told him I couldn't do it since I hadn't read that part yet. He said: "What do you mean that you haven't read it? We assigned that last week!" I explained that I was busy with an overload in helping out my dentist friend. In front of the whole class Dean Winternitz said: "G** D*** you, Arnim," [Laughter] "you're here on a fellowship! If you don't like what you are doing around here well enough to stick to it, there is a train that leaves here every hour on the hour going to New York City. From there you can take a boat or a train to go anywhere in the world." [Laughter] So that was the end of my working at nighttime in dental offices!

CHRISTEN: They kept close tabs on you then, I'll bet.

ARNIM: Oh, and how! Not only that, I had to help do the autopsies. One night I went to the motion pictures. The next day there was a call from Dean Winternitz' office for me to hotfoot it over there. As I walked into his office he said: "Where were you last night at 9:30?" I explained that I was at the movies. He said: "Did you leave your telephone number with the operator?" I said: "No, Sir." "What do you mean: 'No, Sir'," he retorted. "You are not in the Army!" [Laughter] He told me that I was "on call" and that I couldn' go anywhere from now on without leaving the telephone number. And boy, that meant 24 hours a day while you were on that special fellowship. You had to be there waiting for that phone to ring.

I made up my mind that I wasn't about to study anatomy over again. I had made a "C" in it in dental school, and I didn't like any part of that straight memory work. I liked to get to the books and read what had been done, and then see what I could put together to synthesize and perhaps work out a better system. Memorizing where all those complicated muscles began and ended just wasn't for me! [Laughter] I was working in the lab all of the time, while my classmates were in the anatomy classes. They didn't take roll, so it didn't make any difference to me. When it was time to take the preclinical exams, which came at the end of the second year at Yale Medical School in those days, I said I didn't want to take those exams. Well, buddy, don't you think the

Dean didn't work me over! Didn't want a degree? Didn't want to be a "real doctor?" Unthinkable. The heads of the other departments couldn't believe it. Didn't want to be a real doctor!

Well, the only place where I found some sympathy was over in the Chemistry Department. At that time they were feeding some rats extremely low salt, calcium, and phosphorus diets. These were all synthetic diets. The professor said he thought perhaps I could be transferred to the Graduate School. Much to the disgust of all the physicians, I moved to the Graduate School.

Some of the rats' teeth had carious lesions. In those days, the only way the experts could cause tooth decay in rats was to feed them a special rice diet, with a given particle size, that had been developed in Japan. Our rats were fed a diet containing no rice, and it was ground up as smooth as silk. The only place we were allowed to mention the effect of our diet on rats' teeth was at a meeting down in Cleveland before the American Academy of Science, as this situation was contrary to accepted opinion at the time. I was now overseeing the pathology laboratory for the Dental Study Unit at Yale. I think I trained something like 18 Medical Technologists while there. As soon as one became proficient, he was transferred to other labs in the Medical School. I really enjoyed the technical and research work, as it related to clinical application in dental practice.

CHRISTEN: Let's back up a bit. I didn't quite understand how you feel about teaching with models, as opposed to using actual teeth.

ARNIM: In the study of pathology, one learns that examination of the actual organs, both gross and microscopic, has no equal in providing the student with an understanding of disease. As soon as I was put in charge of Operative Dentistry at the University of Texas in Houston, I collected human teeth with holes in them and let students learn, first of all, where decay occurs. We worked with human teeth. They won't tell you I was a good teacher. I never was. I scare students before they even begin, when they first take a look at me. By the time I was working with graduate students, however, it was better; but even the graduate students were a little reluctant to come into my office.

CHRISTEN: During these days, of course, the teacher was an absolute authoritarian.

ARNIM: Yes, absolute! However, students soon discovered when they examined natural teeth with carious lesions that

these teeth were different from perfect ones or model substitutes. They soon learned that cavity preparations pictured in textbooks did not fit in the dentin between the dentino-enamel junction and the pulp, nor did the illustrations allow for the variations in the size and shape of the carious lesions.

When casein models of teeth were used, the students would take them up in front of the room, to the teacher who would say: "The preparation was too shallow--go back and cut some more." Later, the same professor would say: "You cut it too deep. Start another tooth." These model casein teeth cost money; and one soon began to ask some of the other classmates: "What gives? How can you tell whether it's too shallow or too deep?"

You have undoubtedly heard of the man who made the Wedelstaedt chisel. 15/ He wrote and asked all the experts, including Black, to make ideal cavities in human teeth and send them to his lab--where he cracked them open. He checked to see how deep the preparations were, and soon found out that dentists didn't know what they were doing. Many of the preparations were right next to the pulp. Wedelstaedt was the first to start measuring how much remaining dentin there was in cavity preparations, and he even devised a little instrument for calibrating it. He measured it from the outside in; and, of course, the enamel isn't the same thickness from the surface to the dentino-enamel junction. However, if one measures from the dentino-enamel junction toward the pulp along the horizontal plane, one finds dentin thickness equal on the four sides of the tooth at all levels; for it is laid down rhythmically during tooth formation. The amounts are remarkably constant. Wedelstaedt was at a convention in New York, telling how to measure teeth, when one dentist said: "Dr. Wedelstaedt, if I have to do that in my dental practice, I would rather chop wood for a living!" [Laughter] Even Wedelstaedt knew how to use science as a guide to protect the patient in those early days. Unfortunately, the patient suffers because often the best treatment does not harmonize with the dentist's production schedule. One can get paid for cutting and filling teeth without knowing anything about dental pathology or anatomy.

So, in direct answer to your question regarding the use of models, my answer is that teeth with carious or periodontal lesions from human mouths are far superior to models.

15/ Edward K. Wedelstaedt (1857-1931) was an innovative and creative general dentist who lived his entire life in St. Paul, Minn. He designed numerous dental instruments. In 1896, he organized the G. V. Black Dental Study Club of St. Paul, which led to the formation of many other dental study clubs in the northwest as far away as Seattle (10).

By splitting and sectioning such teeth horizontally and longitudinally, one can see exactly those areas affected by disease and plan treatment in accordance with physiologic, pathologic, and physical requirements to the benefit of all concerned (23-24). Also, if models are used to teach gross anatomy, essential details must be learned by study of real anatomic specimens later. I must admit, however, that it is much easier to use model teeth, with no pulps, caries, or periodontal lesions. Students ask fewer questions!

The study of extracted carious, periodontally diseased, or healthy human teeth follows the examples set by scientists when autopsies are performed and specimens of all kinds are examined in their natural state with dissection, low- and high-power magnification, histologic, and other types of microscopic inspection. One day a student came to me with a tooth in his hand and asked: "Dr. Arnim, does a carious lesion that has developed into a large cavity ever become filled with calculus?" I told him: "No, that is impossible." He then opened the tooth he had split at his desk and showed me the large cavity filled with calculus. After that, hardly a day passed in the laboratory without some student bringing up a similar tooth and asking the same question. (Imagine learning this important fact about the nature of the carious process and the deposition of calculus 17 years after graduation from dental school, because a student had the opportunity to look and see, unhindered by the professor's ignorance!)

It was this method, which Dr. Bass used in his laboratories, that led him to develop his toothbrush and the dental floss with his instructions for personal oral hygiene for prevention of caries and periodontal disease (33-34). He studied extracted teeth with his hands, his eyes, a hand lens, and a dissecting and a conventional light microscope. He was very careful to include the adherent materials, the microcosm or plaque, found at the site of lesions. He didn't add anything new that hadn't already been discovered by others. The truths that were taught by Parmly in New Orleans, in 1819, were known and improved by Kells, [16] who was a contemporary and colleague of Bass (7). Around 1915 or so, they worked on the role of the amoeba as an etiologic agent in periodontal disease.

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[16] *C. Edmund Kells, DDS (1856-1928), of New Orleans, was probably the first dentist in the United States to attempt the use of the x-ray machine in connection with teeth (in 1896). (William Conrad Roentgen, director of a laboratory at the Univ. of Wurtzberg, Germany, had accidentally discovered the x-ray in 1895.) Kells eventually paid for the discovery with his life. Amputation after amputation came in succession; first, three fingers; then the left hand; and, finally, the entire arm. After submitting to 49 operations, he finally committed suicide, preferring death to continued suffering.*

CHRISTEN: Do you think that ideas have to be rediscovered from time to time?

ARNIM: Yes, and they have to be spoken by an authority. When one finds a physician who says that this is the thing to do, then dentists come running from miles around, saying: "I've talked to a real doctor, Bass! It must be so." Yes, that's exactly what happened. The other thing he did was not to let others have his toothbrush and dental floss unless they personally came and studied in his laboratory for a week, or unless they were taught by someone he had taught personally.

CHRISTEN: "The master laid his hands on the student?"

ARNIM: Yes. You couldn't buy his brush or floss. Now, without these you were out of business. Bass himself admitted writing some things when he was a young man that would have been better left out of print. For example, Bass wrote a book citing amoebas as the cause of periodontal disease (31). To this day, we don't know what role they do play in the microcosm.

CHRISTEN: What did you learn about caries during your further studies at Yale?

ARNIM: By this time, our lab was turning out good histologic sections of rats' teeth. Some animals, fed diets that were not supposed to produce dental decay, unexpectedly got decay. Others, that didn't have periodontal disease, got it when we extracted some of their teeth. The studies with these animals confirmed the concepts of Williams, Miller, and Black regarding the etiology of dental caries. In addition, I had the opportunity to examine the teeth of the Indian children in the pueblos of New Mexico and Arizona, and those of a group of children who had rickets in New Haven. Moreover, we had a colony of 76 monkeys. Examination of the teeth in these groups contributed additional information, confirming the role of adherent microorganisms with acid production as an etiologic factor. Even though our thin sections did reveal much of the nature of the adherent microbial masses on the teeth, they were still far from perfect. Amoeba or trichomonads disintegrate when passed through the processes using celloidin, paraffin, or electron microscopy. I really enjoyed this work. I wrote my thesis in the Chemistry and Pathology Departments. I passed my comprehensive exams and, in the process, even made an attempt to learn German. At that time I could also read French and Spanish. The young intern they put in charge of tutoring me in scientific German had to vouch for my ability in that language. He vouched, but just between us, I didn't learn a thing about German!

I was as proud as a peacock! My name was published in the paper with the list of graduates. I was due to graduate; and, as my thesis had been accepted, with full confidence I laid a copy of it on the desk of Dean Winternitz. A couple of days later, my chief, Bert Anderson, called me in. He was a likable Swede. He said: "Now Sumter, don't get excited, but you have an urgent call from the Dean's office. Now, when you go over there, I don't want you to blow up." The Dean laid his cards on the table, saying: "Arnim, this thesis won't do at all. I'm surprised the Graduate Committee ever passed it. The thesis is simply no good. First of all, you have all the photographs in the back, and they should be interspersed throughout the text. Secondly, where's the bibliography? You have only 9 or 10 articles that you refer to."

In my defense I said: "Dr. Winternitz, the thesis is written concerning the changes in rat teeth that have never been reported in the dental literature previously. No one else has found periodontal and carious changes like these, since others didn't see the changes." "Well," the Dean said, "it doesn't really do credit to your fine work." (You have heard that before, haven't you?) By this time I could see the handwriting on the wall, and I answered: "Well, Dr. Winternitz, I'm sure your suggestions would improve it, and I would be glad to try; but I don't know what I can be living on in the meantime." The fact was, there wasn't any place for me to go, anyway. I would have liked to go back home to Texas and go into private practice, but I preferred not to do without the degree if I could avoid it. I liked practicing on my friends at the School for free, and there were always plenty of people who wanted dental work done. My dentist friends especially needed someone to care for their teeth, so what to do? The Dean finally offered to continue my stipend, and to let me work in the lab and rewrite the thesis. He extended my fellowship for a given number of months. On my way out the door, I said: "Dr. Winternitz, many of our young doctors here have serious dental problems and they need someone to take care of the mouths. If I could find an office to practice in part-time, maybe I could afford to stay in school to finish my degree." That's what we settled on.

I found an office through a fraternity brother. (It had been Dr. Edward S. Gaylord's original office in New Haven. [17]) To me it was a beautiful office, even though the paint was peeling off the walls. The dentist, Dr. Johnson, grossed

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[17] *Edward Sanford Gaylord, DDS (1840-1926), of New Haven, Conn., was President of the American Dental Association, 1910-1911. He was one of the earliest advocates of the Relief Fund for the American Dental Association (5).*

around $10,000 a year from about 30 patients. I used the office while he wasn't busy. He had two chairs and a beautiful laboratory, a front office, and a waiting room. I asked him how much I would need to pay in order to work there. He replied: "Young man, if you have any business at all, at the end of the year you can buy me a new suit of clothes." His office girl was being paid $6.00 a week to be there all day long to answer the phone and to make appointments. That's just about all she did. After we made the deal, I asked him if he would mind if I paid the office girl a little extra because she would take my phone calls also. He said, "Not at all." So, I raised her salary to $8.00. Was she happy! My instructions to her were simple. If anybody called and needed an appointment, she was instructed to tell them that I was working at the Medical School, and to give them an appointment. In case of an emergency, I was to be notified by phone. I didn't put my name on the door or in the phone book. This was in 1935.

I recalled a few years earlier, when I was a freshman dental student, I had learned that denture prosthesis was one of the things that you had better be good at if you wanted to make any money in dentistry. I asked my professor if he minded if I really worked hard to learn to set up denture teeth, and he said "No." So I decided to do 2 or 3 additional setups beyond the requirement. After I did the first one, I brought it up to him and he gave me an "A." To gain more experience, I broke it down and started over. It was only 2 weeks before the end of the school year, but I thought I had plenty of time to put it together again. Shortly thereafter, the professor put a sign on the board saying that all students who did not have their setups in by such and such a date would fail the course. I went to see him immediately, and told him that I didn't know how I could finish on time. Students were only allowed to work right there in the lab. If you took your work home you might cheat! (That's another reason that I became a rabble rouser in dental school. I couldn't see why a student couldn't take those things home and set them up.) So, working furiously, I got the second setup in to his office just before the deadline. My professor said: "That's fine, Arnim. Now the reason I wanted you to do this was because I wanted to teach you that it doesn't pay to try and do things too good. The public doesn't appreciate it anyway!" [Laughter]

Well, this statement didn't make any sense to me. I had been in my daddy's saddle shop in Hallettsville and seen cowboys ride in there from as far north as Oklahoma and as far west as New Mexico, and say: "Charlie, will you make me a saddle?" (It was a long ride to a little Texas town of only 1,300 souls.) They would hang their gun belts

up on the rack, come to the back of the store, and discuss arrangements with my father. These cowboys could have purchased 5 or 10 saddles anywhere along the road for what they paid my father for one. So I figured that if my daddy could do it then, I was also going to do the best work and charge the best fees I could now! So I continued my fellowship, and practiced dentistry on the side.

That brass bed you saw in the other room was given to me by the daughter of an industrialist from New Jersey. She came from Newark to have her teeth fixed in the office I shared with Dr. Johnson. I also treated her friend, a Harvard medical student. He came during the same time to meet her. They had this "meaningful relationship" way back in the 1930's. Kids today think they invented everything! [Laughter]

EARLY TEACHING CAREER AT FOUR DENTAL SCHOOLS (1936-1947)

After one year, I finished my thesis. I was still on the staff as a Clinical Teacher, but received no payment for my services. It was during the second year of practice there that Schour came by and visited with Bert Anderson. Schour said that the University of Illinois was looking for a teacher of operative dentistry, preferably someone who had a good background in science. Anderson told him that I was the man. (Meanwhile, the old dentist whose office I was using had died, and I had inherited his 30 patients. The practice was netting me a little over $12,000 annually.) I moved on to Illinois, and was made Chairman of the Operative Department. It was my first academic job. Right from the start, I insisted on doing away with the point system, with all the chalk teeth, and also with the casein model teeth. The students began to crack open teeth that had real cavities in them, and to plan their cavity preparations by making drawings to show where the decay was. We had them section teeth in three planes, so they would have a 3-dimensional representation of the carious process. I lasted almost two years at Illinois.

CHRISTEN: You were certainly ahead of your time. Did you have a lot of difficulty selling your new ideas to the Faculty at the University of Illinois?

ARNIM: Actually, the ideas I tried to implement at Illinois were not new. They were the same basic educational methods used at Rice and Yale, where students were recognized as capable, honest adults with a governing desire to become proficient in their professions and to enter in the life of service to mankind signified by the title "Doctor." Progress toward these goals was to be measured by achievement exercises

(practical examinations), given from time to time. Roll call, point requirements (counting number of restorations, operations, etc.), frequent examinations monitored by faculty to prevent cheating, regulations barring independent unsupervised study, etc., were all to be eliminated. Of course, we were unable to incorporate these ideas to the same level of use as at Yale or Rice; but I tried. As a result, I doubt if anyone could have had poorer relations with students and faculty at Illinois than I did by the end of the school year. Nevertheless, I thought I was doing well when I left for Yale to study the histologic sections left with the Dental Study Unit at my departure.

In the meantime, I had submitted a plan for graduate study leading to the Master's Degree in Dentistry from the Graduate School of the University of Illinois, in Champaign, Ill., with a request for funds to provide stipends for three graduate students. Seymour Kreshover, Victor Dietz, and Joseph P. Weinmann were chosen. (Kreshover later became Director of the NIDR; Dietz developed the plastic eye, ear, and other prostheses in the U.S. Army; and Weinmann, who came from the Vienna group, stayed in teaching until his death recently. [13]) When I returned from New Haven, one of my colleagues told me that some of the students did not like the changes I had made.

One of the reasons I had been hired as Acting Head of the Operative Department was the failure of numerous University of Illinois students to pass the State Board, especially in the gold-foil examination. I replaced the points required with the achievement measurement, which was not unlike the State Board exam. Students received credit for the operative requirement when they demonstrated competence in theory and practice in a special examination. This achievement measurement was quite different from the point requirement, which allowed the student to progress when he had placed a given number of restorations--of varying quality, and time of execution--with no measurement of basic science knowledge related to the operation. If the student failed to demonstrate satisfactory competence on the achievement measurement, he was allowed more time for additional study and practice. No record was made of his failure, and no penalty was given. It was impossible for me to believe that students and faculty would not welcome this system! Hence, the second year at Illinois passed rapidly and, I thought, well. Nevertheless, enough students thought otherwise to take a petition to the Dean requesting my dismissal. They wanted the old system back--charging that I was a sadist, mistreated students, and knew nothing about how to teach.

My interpretation of the autopsy material at Yale, the studies of others, and my practical experience also left me in conflict with Schour, Weinmann, and Orban--who were in agreement with Gottlieb's Theory of Epithelial Attachment. This theory led some schools to teach that cavity preparations should not be extended for prevention below the gingival margin, as such extension might damage the attachment. My argument was that a gentle puff of air blows the margin away from the tooth; hence the margin could be easily pulled away with an instrument. It would resume its initial relation when released, with no subsequent sign of damage. In addition, the basal cells of the epithelial attachment divide as do other basal cells of squamous epithelium; and mitotic figures could be seen in these cells when the specimens were prepared with my methods--resulting in thin sections. Also, our sections showed the exfoliated cells in their natural position in the sulcus. So how could the attachment be a firm one of epithelium to tooth, when the cells were dividing and moving out into the mouth as are those on the surface of the gingiva?

The response was that I was against not only Gottlieb, but also the texts of Schour and Orban, and that I was attempting to destroy their image.

Many other faculty members were against the change; some in my own Department. They did not like faculty meetings at night, and did not like to be encouraged to do research, or to read the dental literature. A few approved; and some students prepared a counter-petition in my favor, stating I was the best teacher they ever had. When copies of the petitions were found on my desk, I went to see the Dean. He had told me when I was first hired that, when he became Dean, he signed an undated resignation and gave it to the President of the University to date and type should he ever see fit. I told the Dean that I could not understand why anyone would prefer the point system to one that permits each student to progress in accordance with his ability, and to pursue electives of his choice should he complete the requirement early. I had assumed the Dean approved the changes made, but he did not come right out and say so. I told him if I hadn't been performing to his satisfaction, I would also give him a letter of resignation. He said it would not be necessary. I went home Friday, returned to school Monday, and found a letter from the President accepting my resignation on my desk. I realized that I had failed. I thanked the Dean and all others for the good treatment I had received, and resolved to try and do better should I find another place.

Certainly, I learned much more than anyone else from this experience! During my time at Illinois, and at Yale, I had been in correspondence with Dean F. C. Elliott, Texas

Dental College, Houston. I admired his views regarding dental education, and wanted to teach and work with him. He had told me of his plans for dental education. He envisioned a school where students could enter from 7:00 in the morning to 11:00 at night. Where each one would have his own key, to come and go as he pleased. Where there would be no roll calls--and students would have their own honor system. Where every student would keep his own area clean, and all the janitorial work would be done between midnight and 7:00 the next morning. Where teachers would not be needed in the laboratories all the time, etc. (not unlike Rice, and certainly like Yale--both of which, I thought, did a better job for me than I ever did for them).

It happened that Elliott was attending the ADA meeting in Milwaukee that year. When he arrived in Chicago, he stopped by to see me. I drove him to and from the ADA meeting. We stopped in every cheese place alongside the road! He bought several different cheeses, and so did I. He rode the train home with a suitcase full of cheese. His wife wouldn't let him bring it into the house on account of the smell. [Laughter] In the meantime, he told Dean Harry Bear [18] at the Medical College of Virginia (MCV), something about my plight.

I talked with Dean Bear about a job in his Dental School. He said someone was needed in the Operative Dentistry Department. When I reached Richmond the man in Operative, whom they had thought was leaving, had decided to stay. I told the Dean I would be glad to teach anywhere, any lab he wanted me to work in--wherever he thought I might be helpful--including research. It wasn't long before I talked their administration out of some more fellowships for graduate students. That's how I got Barnet M. Levy [19] and H. M. Swenson. [20] Millard Doyle was the third graduate student. (He has been in practice in Norfolk, Va., since receiving the Master's Degree in Biochemistry.) I didn't teach Operative Dentistry, but helped in Dental Anatomy and in the Clinic. The graduate study program progressed satisfactorily with studies in pathology, where more human autopsy specimens were obtained and processed. Additional studies

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[18] *Harry Bear, born (1890) in Richmond, Va., was graduated from the Medical College of Virginia (MCV) in 1913. After a period in the general practice of dentistry, postgraduate studies qualified him to limit his practice to exodontia and dental roentgenology at MCV. He rose from a part-time instructor, in metallurgy, to professor of exodontia and of dental jurisprudence, ethics, and economics, and finally served as Dean of the School of Dentistry from 1929 until his death at age 60 (July 30, 1950). He made notable contributions to the dental literature on oral surgery, on dental education, and on college administration (12).*

[19] *At present, Director of the Institute for Dental Research, University of Texas, Houston; and Editor, Journal of Dental Research.*

[20] *Now teaches periodontics at Indiana University, School of Dentistry, 1121 West Michigan Street, Indianapolis, Ind. 46202.*

were added in microbiology, chemistry, and clinically related projects on caries and dental anatomy.

With the threat of impending war, a Hospital Unit was organized. I was commissioned an Army captain. (I had been turned down for the Reserves at Northwestern University on account of a bad leg. It had been wrecked on a Baptist Sunday School hayride when I was in college. The truck turned over with all the kids on it, and I was the only one injured.) A few months after the Unit was organized, word came that war was indeed going to be declared. The number of personnel in the Unit was checked, and it was learned few faculty members would be left to teach at the Medical College. The administration called us all in, and asked what we were going to do about this. Most of the fellows said they would stay there if they were in uniform, and if they were commissioned and assigned to do the teaching. Of course, Headquarters said we must keep the schools running. Not only keep them running, but run them 12 months out of the year. The end result was that I said to the Dean and the President of the College: "If you folks and Roosevelt don't know what I should do, how should I? Make up your mind, and I will do whatever you tell me to do." They put me back into teaching. At that time I was teaching nurses in the medical school, medical students, medical technologists, dental anatomy, and operative dentistry in the clinic. I wasn't telling anybody how to run or change anything. The graduate students and I were frozen there. Salaries were frozen--also our jobs, through the war. This lasted 7 years. At the end, I think my salary had gone up to a total of $3,600. That was in 1945. They were paying public school teachers in Virginia $700 for a 9-month year of teaching the elementary grades.

When the war was ending and the restrictions on salaries and job changes were lifted, I was offered a position at Ohio State University Dental School through the influence of H. B. G. Robinson, Professor of Pathology. Robinson wanted somebody with a background such as mine for full-time teaching. They gave me a wonderful offer for that time (1945)--$6,000 a year, plus added pay for working in the summertime. I left Richmond with all sorts of commendations and a good feeling all around. When I reached Ohio State, I told Dean Wendell D. Postle I hoped I would not move again. I was supposed to be in the Operative Dentistry Department. Both the Head of the Department and his right-hand man were a lot older than I. Both were quite active. Both were well liked and respected. I ended up in the Histology Lab. I had some autopsy sections with me. The Histology Department was conducting a study on lactobacillus counting. I had conducted a state-wide program on caries and lactobacillus count in Virginia where I learned they were not valuable in terms of a practical control program for dental caries.

Prevention of dental caries had become an important part of my studies by this time. I had written my first articles about prevention in 1937 (17-18), but the first successful clinical case in my experience occurred around 1940. A 3-year-old patient was referred because of her dry mouth. It was learned she had no salivary glands. All of her teeth were badly decayed. Her mother fed her sweet foods to get her to eat, and water to keep her mouth wet. We took pictures of her teeth and showed her mother how to clean the holes with a brush and water. Then we waited and (as some critics said) we "watched them rot." Much to our surprise the remaining dentin in the holes turned brown, hard, and shiny. This child was followed at the Medical College of Virginia for several years, and additional photos were sent before the deciduous teeth were shed. The lesions were still hard and shiny and no new ones--or enlargement of the old--had taken place.

Another patient was referred while I was still in Virginia. Examination and history revealed the child was getting 10 times the daily amount of carbohydrate that he required, because the pediatrician was prescribing vitamins in syrup to stimulate his appetite. They use syrup so the children will take it without any problem. This situation was explained by the nutritionist and by myself to the mother, whom we advised simply to keep his teeth clean. His teeth stopped decaying also. The simplist procedure to stop caries is to remove tooth substance around the carious lesions so that they can be cleaned by natural and/or personal hygiene methods. Similar studies have been done, both in the Army by Colonel James T. (Toothbrush) Thompson (65), and in the Navy by William R. Shiller. The Navy chap, Shiller, set up his teaching labs in the submarine base in Groton, Conn. He soon found out (he is good with statistics and other things) that a lot of money could be saved if x-rays were taken when recruits first came in. Only those lesions were filled that needed taking care of most. The remainder were checked later on. This method was used with the supposition that, somewhere along the line, the recruits might be taught how to use floss and brush on those areas where tooth decay begins.

Bert Anderson, at Yale, demonstrated the ease with which active carious lesions on occlusal surfaces could be arrested (14). He opened the lesions on the occlusal of first molars on one side, that were large Class 1, brushed them clean, and ground the edges down so they were flat. The ones on the other side were left alone. The opened ones got hard. They stayed clean. The patient was told to eat on both sides. The unopened, uncleansed ones rotted away. How many times must this be done to convince people that clean surfaces do not decay?

Soon after I reached Ohio State (and found the Professors of Operative Dentistry to be hale and hearty), the man teaching radiography, periodontics, and oral surgery had to cut down on his time. I became Professor of Periodontics overnight! All I knew about periodontics was that I got my points by scaling teeth at Northwestern. At Ohio State, the requirement in periodontics was a total of 15 prophies in order to graduate. The didactic teaching consisted of 1 lecture a week for 2 semesters. I got 2 or 3 texts and read them. The subject was really interesting, and that's when I really came to know Box well. I read everything he had written, because I knew you couldn't cure pyorrhea with anything Gottlieb or Orban was recommending. I had heard from time to time that, if you did get those pockets clean, sometimes the gum tightened around the root for some very strange unknown reason. So here was a wonderful situation--the requirement of 15 prophies for graduation. I announced in class the first day that there would be no point requirement. Students were told to get a patient who had periodontal disease, and I would help them learn how to control the disease. The two older men were still active in Operative. In fact, they were there when I left. I filled the Dean's teeth and my wife's teeth in spare moments, studied periodontics, and continued to work in the Histology Lab. If a student requested help, I would look at his patient with him. Harry Lyons, who was a great periodontal teacher and Professor at the Medical College of Virginia, had a set of instruments and a little chart that showed where each instrument was used for scaling teeth. He didn't believe in cutting the gums. He kept teeth clean. We followed his example, used his instruments and chart, and emphasized cleanliness.

YEARS AT THE UNIVERSITY OF TEXAS (1947-1973)

When Dean Elliott persuaded the University of Texas (U.T.) to take over the Dental College in Houston, he wrote to tell me he was going to get a faculty together. I wrote back and told him who to get; but he still didn't offer me a job. I finally asked my wife: "Why doesn't he offer me a job? He knows I want to work with him." She said: "You keep telling him how to run the School, and he wants to do that himself!" [Laughter] I sat down and wrote Elliott a letter, saying I really didn't want to run the School; I just wanted to work for him. I got an offer promptly. (I hated to leave Ohio State. I got along fine with the students and faculty.) The U.T. position turned out to be a fine job, however. In the meantime, no one wanted the dental sections I had left at Yale University. They were stuck in the attic where no one looked at them. I arranged with Dr. Bert Anderson to get the sections to use in teaching, and took them to Texas with me.

At U.T., I was made Professor of Operative Dentistry and Crown and Bridge. We soon had both courses designed after the plan used at Illinois University. They were going fine; no students failed the State Board, and no changes were made in the clinic. About this time, Bob Black (not related to G. V. Black) invented the Air Dent. Dr. Elliott sent Dr. Russell Smith, Professor of Pedodontics, and me to watch Black operate with the Air Dent in his office in Corpus Christi. He placed the rubber dam beautifully on the patient, picked up the little instrument, and cut the patient's tooth with no pain, noise, or vibration. (G. V. Black would have approved of the operation and graded it with an "A.") We returned to the Dental College and told the Dean about this innovation. He instructed us to go to Michigan and take the course in the use of the Air Dent.

We went and found that for the course, which was taught in a little room, casein model teeth were used. These were held in a little tin can with a little hole in the bottom of it. The big machines were next to the can, which was connected to a vacuum hose to collect the abrasive used in cutting. One could not see what one was doing because abrasive dust flew everywhere! Bob Black came up one day to show the students how to use the instrument. He picked up the handpiece and started working outside the can where he could see what he was doing. He also adjusted the machine. The first problem with this equipment was that the machines were erratic, easily getting out of adjustment. An expert (who knew when they were working right) was needed before the student tried to use the instruments. Black held the tooth out where he could see it instead of placing it in the can. As soon as he left, Russell Smith and I did the same thing. The professor in charge told us: "You can't do that, because the place will get all dusty." [Laughter]

When we returned to Texas and reported to Elliott, he asked if we could build a lab where all the problems could be controlled. The answer was "yes"--if we could have someone who would know if the machine was in good working order. We hired Bob Black to come up on the first day of each course to check the machines, and also sent our custodian to the factory to learn how to keep the unit in working order. The lab was designed so it was dust-free; human teeth were used; and no anesthetic was used in the clinic. Adequate light, with a magnifying lens, allowed students to see what they were doing.

The course started at 8:00 in the morning, and ran until 10:00 at night. We worked in the lab during the day, and on patients at night. The first thing we did was to have each man use his regular handpiece, and any other instruments that he used in practice, to make preparations in human teeth.

Afterward, he made a Class 1 and a Class 2 in human teeth, the way he did in his own office. We then took him to the lab next door which had dissecting microscopes (the scopes that you use to look at flies, and butterflies, and things like that) under 20 to 30 times magnification. The teeth they had operated, using their own conventional methods, were split open and put under the dissecting scope so the student could really see what he had done. When one dentist looked at his sample tooth he said: "You mean to tell me that this is my tooth?" "Yes, that is the one you just finished," I replied. When students saw what they were doing with conventional instruments they were ready to listen and to give the course a try. The entire course is described in one of my articles (21).

CHRISTEN: What happened to the air abrasive system?

ARNIM: I know two dentists who still have their machines working. They tear the units down themselves and scavenge old ones for parts. On the last day of our course, the student with an interest in the machine could see how it was made and repaired. We didn't try to push the machine on anybody; we were simply trying to teach them something about the teeth they were working on, so they could do a better job with their own instruments or any kind of an instrument they elected to use. We taught it all. At the end of the week, the student made his own decision.

There are several reasons why teaching air abrasive like this didn't last very long. One was that the machine was defective. But that wasn't the main reason. Dentists do not like to bother with rubber dam. That was the biggest problem. Also, at this time, high speed came out; and this instrument fitted very well into a dentist's production schedule. It was a very long time before Operative was taught using human teeth, dissecting scopes, noise and vibration recorder, heat measurements, pulp response, and other scientific aids.

CHRISTEN: How did you decide to join the Pathology Department at U.T.?

ARNIM: Dean Elliott left the U.T. Dental School, in Houston, to become the Executive Director of the Texas Medical Center there. Russell Smith, Victor Olson, and I were recommended for the Deanship that he vacated. The end result was that Olson made Dean. (When he was first hired at U.T., I had been the fellow who met him, took him to the Dean's office, and entertained him while he was here. At the time, I told him that, if he was interested in a deanship, this was the place for him to come. He was young enough and qualified for it to work out that way. I was much too near Elliott's age to become

Dean of the Dental School.) Prior to leaving, Elliott had hired a pathologist and an operative dentistry teacher. He thought I would get mad and quit, but I wasn't about to give him that satisfaction. (I had tendered a resignation once in my life, and I wasn't going to suggest to anyone that I might resign again!) As we now had a teacher in the Operative Department, and one in the Pathology Department, I spent the next two years in research. The pathologist turned out to be an alcoholic and was fired.

A year or so after Dr. Olson became Dean, he called me in and asked me what I wanted to do. I said, "Whatever you want." He replied, "I want you to decide." He didn't tell me at the time that some influential dentists were trying to get me fired because they were not in agreement with the articles and talks we were giving at the time. The end result was that I became Professor of Pathology and Director of Graduate Studies. The phase contrast microscope became a part of our equipment, and our clinical studies were extended from caries prevention to periodontal prevention and oral health. The School had moved into the new building, and a special graduate program for the Air Force officers began. I started working with the Air Force and graduate students in their special program, as well as lecturing all over the country.

Olson supported the programs and the work wholeheartedly; but, when I retired from the Dental School to become Dean of the Graduate School of Biomedical Sciences, he told me that he wished I had continued with Operative Dentistry, because he thought that was one of the best things that he had ever seen happen in the Dental School.

CHRISTEN: What was your relationship with Dr. Miles Markley? You told me that you became a National Consultant to the Air Force as a result of his recommendation (43).

ARNIM: Well, as Dean of Postgraduate Studies of the Dental Branch, I was responsible for the short courses. My policy was to organize any short course that the department heads felt should be given. It was up to me to invite the people to give the courses. As you know, Miles Markley has conducted a practice for many years in Denver, Colorado. I didn't know anyone equal to him. I had read his writings, and knew what he was doing. I also knew how successful he was whenever he gave a course. Hence, with the collaboration of the professor teaching Operative, we invited Miles to give a course.

I had also been with him on a program in Arizona, and had attended his lectures. When Miles came to U.T. to give the course for us, he brought his wife, Winnifred, and his

assistant, Ms. Ruby Zoberst. When I arrived, Ms. Zoberst was in my office, reading some of my articles. She said: "You know, Dr. Markley does the same things you do." She had read that we don't recommend filling teeth until the mouth is cleaned and dental disease is arrested. Well, I don't think that, if you have osteomyelitis, the thing to do is to put in a splint without treating the infection first. To me, the kind of dentistry most valuable to the patient and dentist is to eliminate the cause of disease prior to restoration or surgical intervention. I think our common interest, of coupling excellent operative practice with prevention, led Markley to recommend me as a Consultant.

DEVELOPMENT OF PREVENTIVE CONCEPTS

CHRISTEN: When did you start lecturing on preventive dentistry?

ARNIM: To the best of my knowledge, the first time I stood up before a large dental audience and talked about prevention and control of dental caries was in Boston. I gave the talk (18) before the Massachusetts Dental Society on April 26, 1937.

CHRISTEN: Could we explore your relationship with Dr. Bass, and elicit a little more information about what type of a person he was?

ARNIM: First, let me explain the mutual interests which brought us together. At the Medical College of Virginia, in 1939-1940, I had a rich clinical experience behind me and had access to my sections of rat, monkey, and human teeth that had caries. Also, one of my co-workers--Bert Anderson--after graduating from Minnesota, had years of experience as a practicing dentist and as Director of the Dental Department at the Peking Medical School in China. His teaching had a great influence on my thinking. Anderson had just done his experiment on arrestment of caries (that I have described on page 42). Shortly thereafter, I arrested caries in two of my patients (as mentioned previously). Every time that someone would come up with a strange caries story, they would either bring the patient into my lab or they would come in and tell me about it.

One student came in one day and said: "Dr. Arnim, there's a boy on my farm whose teeth are rotting off. I know he doesn't get any sugar. The rest of the family have no holes in their teeth. How can that be?"

I said I didn't know, but I sure would like to see him. The boy's teeth were decayed off at the gum line. His brother, just 2 years older, had no decay; and his father was

also caries free. I started trying to find the cause. An hour went by, and I didn't find out what the kid was putting in his mouth. He was sitting in the chair and the father and brother were sitting in the hall. I said to him: "Listen, young man, you are either going to tell me what you are putting in your mouth that's causing your teeth to rot or you are going to stay here with me while I send your father and your brother home." He finally admitted: "I sucks bread. When my mother makes up a biscuit for my pocket, I reaches in there and rolls up a little bread pill. When the teacher isn't looking, I sticks the pill in my mouth." This solved the mystery! There was no sugar in that biscuit, but he kept putting bits of it in his mouth all day long. (The man who then ran a flour mill in Texas wrote me a letter saying how terrible it was that the University of Texas, with taxpayer's support, had kooks like me running around saying that flour could cause tooth decay.) [Laughter]

Another thing I was doing at this time was reviewing all of the literature for the journal entitled Dentistry: A Digest for Practice. It was one of the first digest journals, and was published by the J. B. Lippincott Co. (Philadelphia, Pa.). I edited the "Operative Section." During this review, all sorts of journals would come across my desk. I ran across a medical journal from New Orleans that had one of the articles by Bass (32) in it. I was amazed to find that a physician could know more than a dentist about how to prevent dental caries by keeping teeth clean. Look at how many people had said that before; and even though I knew it to be true, I couldn't convince many dentists. Finally, I had found a voice in the wilderness; so I decided to write to the old man and tell him how wonderful it was to learn that he was writing such articles, and that I hoped to see him someday.

CHRISTEN: Do you recall the date when you first wrote to him?

ARNIM: I was still at the Medical College of Virginia. It was 1940. In my letter I told him that he had omitted one thing in the article he had written--he didn't say how fast acid could form in plaque. I gave him a rundown on what Stephan (63) had done in my lab at Illinois. Bass wrote back saying how glad he was to get my letter with my kind words, and he hoped we would have a chance to meet some day. He told me that Stephan's work was unimportant, and that I shouldn't pay any attention to it. He explained that one simply had to use the "right kind" of toothbrush and floss in order to prevent dental caries. I continued to follow the articles he wrote. In 1947, the year I moved to Houston, I was asked to talk at the New Orleans Dental Conference. The first thing I did in New Orleans was to see Bass. You know why? Not because I thought Bass could stop tooth decay and periodontal

disease with his "right kind" of toothbrush and dental floss, but because I wanted to use his laboratory techniques to teach operative dentistry. When I got back to Texas and told Dean Elliott about this, he asked Russell Smith and me to go over to the Bass laboratory in New Orleans and stay long enough so that we could repeat his experiments here, in the Operative Technique Laboratories.

When we returned to Texas, Dean Elliott bought us dissecting microscopes for the Operative Laboratory for students to use in studying human teeth with caries and periodontal disease. Of course, Bass had made a large collection of slides on plaque that he personally dissected and photographed. He also made his own sections of teeth. We copied some of his sections and learned to prepare our own. Most students had never seen a good section of plaque in its entirety, nor had it been related to the diseased tooth by splitting and studying with the dissecting microscope.

For the first time, our students saw these holes in teeth in their entirety before sectioning. Then they operated and cut the teeth, broke them open, and studied them through the dissecting microscope. It was the dissecting microscope that I learned how to use in the Bass laboratory. Bass would take his little dissecting needles, select an extracted tooth that had been kept in a weak solution of formalin, pick a little piece of plaque off of it, and put the piece on a slide. He would never use a whole cover glass, because that was too expensive: He would drop the cover glass on top of the tiny bit of plaque and put the oil-immersion objective on it without any difficulty at all. He would rack down the oil immersion on top of the tiny part of plaque exactly where he wanted it. He was a technician par excellence. I also got a copy of his textbook on medical technology, which he wrote when he was a young fellow, as well as his book on periodontal disease (31).

CHRISTEN: Was the book on periodontal disease used in dental schools?

ARNIM: Oh, Lord no! The concept that pyorrhea was caused by amoeba was not generally popular, even though the idea was publicized considerably in 1915. Drs. Barrett and Smith (of the University of Pennsylvania) and Dr. Angelo Chiavaro (of Rome, Italy) also said and published the same thing (31, 42). Bass had some dental colleagues convinced that the amoeba was important as a causative organism in pyorrhea, and C. Edmund Kells was one of them. Kells, the first dentist to develop the dental x-ray, had even worked in Bass' office in New Orleans. (When Kells died, Bass put all of his dental instruments and memorabilia into a museum in the

Tulane Medical School. Long before Bass had ever written anything on prevention, Kells wrote 3 articles telling people how to prevent periodontal disease; but no one would listen to him, either (50). Kells said that some of his patients would go to the floor beneath his, looking for his office; and the dentist whose office was beneath his would tell them that he had never heard of Kells. This made Kells so angry that he decided to get even. When he wasn't going to be in his office, he would aim his x-ray machine at the floor, over the dental chair below, and let it run all day, thinking: "I'll burn out that bastard underneath!" [Laughter]

We didn't go so far as to use all of the Bass techniques in operative dentistry. There was little point in having the students pick off plaque and put it under a big microscope in that course, when they were going to do that in the lab in Oral Pathology. There was one problem, however--we didn't have a lab in Oral Pathology! We also didn't have any microscopes for the students to look through, except the ones that were used for anatomy; and we weren't permitted to use any of those.

One day, Russell Smith came to me and said: "Didn't you tell me about an experiment that Bert Anderson ran where he leveled off decayed first molars and told the patients to chew on them until decay stopped?" I said: "Yes." "Come look at this little girl," he said. I went to the oral surgery clinic and there was a tiny girl with tears just running out of her eyes. All four first molars had very large occlusal cavities. He wondered if we could do anything for her. I answered that I would be willing to try, if she was willing. She didn't want those teeth pulled; but the oral surgeons were going to extract all four of those teeth, right then and there. The needles and everything were ready to go. This wouldn't have been bad dentistry; because what can one do with an indigent person with teeth all broken down and toothaches in all of them? You have to do something NOW. For a moment, I considered what fellow dentists would say if I told her to go home and chew some wax? [Laughter] I didn't want her to chew any sugar gum, and no sugarless gum was available in those days. She didn't have any money, and lived with a cousin in a poor part of town. I gave her a little piece of paraffin, and told her to go home and chew on this, and then come back in one week (thinking this would be the last I would see of her). However, she came back a week later, and you could see the difference in the teeth. So I took pictures of these, just like Anderson did. We had just acquired our first color film at School, and I used a whole roll on this little girl's molars! Only one picture turned out! When she came back a week later, we took two more photos.

She was then instructed to chew paraffin on only one side. Later, you could really see the difference in the teeth on that side. Now we had three photos; and after that we made many, as the years went by. To the best of my knowledge, she still has those molars.

That's when Dave Hagerman came into the picture. (Dave had also studied with Dr. Bass.) He was a General Practitioner in Houston; and he had some patients he had treated for 25 years who, like the girl, had unrestored carious teeth that had turned hard after they were kept clean. Hagerman went to Dean Elliott and requested that he be allowed to study some of my histologic sections of human autopsy material. Elliott said, "Yes," even though Hagerman had never studied histology. I agreed that we should examine the material together. We used Wednesday afternoons for our sessions. Then we went beer drinking, and ate barbecue at one of my favorite places in Houston. Dave usually got there a little late, and we seldom finished before 5:00 p.m. This place stayed open until 9:00 p.m. Gottlieb used to go and drink beer, too; so I figured that if he could do it, so could I! Soon, we had our own personalized steins out there, and were both getting fat as hogs. [Laughter]

One day, when we were looking at sections, Dave said to me: "Dr. Arnim, where is the physiologic round-cell infiltration that I read so much about in Orban's text? I don't see it in this section." I said: "Dave, it's got to be there. Pictures are published of these cells in Kronfeld's and Orban's textbooks" (52,58). "But I can't find it," Dave said. I said: "You have been working here a long time now. I know you can find the round cells. You just don't want to stick your neck out!" (I had learned at Yale that a good teacher tries to get the student to commit himself. One learns by mistakes; but I had also learned, by that time, that people don't like to learn by making mistakes. They are afraid they will be punished. Students like to be told the right way.) The microscope eyepiece had a pointer in it; and I kept assuring Dave that he had learned to identify round cells, and could easily point one out with the pointer in the microscope eyepiece. Dave finally said: "Won't you help me, please?" I said: "Of course I will!" I looked at the section and started moving it one way and another, crossways, up and down. Finally, I had to admit there was no round-cell infiltration to be seen. I was dumbfounded. How could David and I tell anyone we found gingival tissue with no inflammatory cells? This finding would be in conflict with everything I was teaching, and more important, it would be against the teaching found in current textbooks. The section we were examining was cut in a horizontal plane through the gum and incisor teeth of a 10-month-old child.

There is no way for me to tell you how exciting was Dave's discovery. We went right to work and examined all of our sections, giving special attention to those cut in a horizontal plane. There was a total of 23,053 serial sections from 130 human autopsies. The monkey and rat sections were not counted. We thought we had found something no one had seen before. (Dave Hagerman was just a local practitioner, and Arnim was a screwball who shouldn't be teaching dentistry in the first place. Yet, here they were, looking through a microscope, thinking they knew something about operative dentistry!)

Fortunately, we kept looking. Do you know what we found? In a 1950 textbook of orthodontics, by Strang (64), the circular fibers in the marginal gingiva were described as going round and round. Strang, a great orthodontist, said the fibers were described in the Noyes text on dental histology. We looked up the Noyes text and, sure enough, the fibers were described. When the text was rewritten (57) by Schour, with Gottlieb's and Orban's influence, this material had been deleted.

Dave's discovery, and further study of all the sections, left us with a question: "If one cleaned microbial contents out of periodontal pockets, would the circular fibers grow back?" Every practicing dentist (if he would stop to think) has seen that this happens. Let me give a personal example. When I was at Ohio State, the Dental School was closed on Saturday afternoons. If there was a football game, no one was around the School. One Saturday afternoon, I worked for a while before rushing over to the football game. In came this poor girl with her hand holding up a swollen jaw. She had had a lower molar extracted the day before. She was secretary to the director of the hospital. What did I know about treating dry sockets? Not a thing. I informed her I was the only one there. She asked: "Can't you do something?" I said I could put some zinc oxide in the socket and it might quit aching. I looked in the socket and saw a hunk of calculus about a third of the way down on the second molar root. There was plaque all the way up on the crown of the tooth, but there was no blood clot in the socket. Well, I cleaned it first. Stupid me. I mean I really cleaned it off because I was taught if you are going to clean something, get it clean. Don't do it haphazardly. Then I filled the socket with zinc oxide and eugenol. It must have been about five days later when she returned saying that it hadn't hurt, but she had lost the dressing and wanted another. Who was I to argue with her? I noted that there was connective tissue growing in the bottom of the socket and it was beginning to migrate up the roots. I think I had to fill the socket with zinc oxide about six times. Eventually the tissue attached

firmly to the cleansed root all the way up to the cemento-enamel junction. There was no pocket, so there must have been complete healing with reattachment of the new periodontal membrane (19). Not only do practicing dentists know of this process by experience, but it has been shown to occur in numerous experiments in research laboratories. Hence, Hagerman and I began to take gingival biopsies prior to periodontal treatment, and subsequently during the course of treatment.

In addition to scaling, brushing, and flossing, we followed G. V. Black's recommendation and flushed microbial material from the pockets with syringes. The results of these studies led to the publication of a number of articles showing the role of the microbial masses, adjacent to the gums and in the pockets, as causative agents of periodontal disease (25-26). These publications, supplemented by many lectures before dental audiences, were the basis of a change in the attitude of many in the dental profession toward the possibility of prevention of dental disease.

Perhaps one of the most important events in all our experience was the advent of phase microscopy and cinemicrography. An anatomist from the U.T. Medical School in Galveston, Texas (who could draw with either hand, beautifully), gave a talk before the local dental society. His name was Charles M. Pomerat. He showed cinemicrographs of ameloblasts forming enamel. Now, can you imagine taking pictures of live ameloblasts while they are in the act of forming enamel? This was phase contrast cinemicrography at its best! The first time that I had ever seen it. I wondered whether one could take the living microbial matter off the tooth and photograph it. Pomerat told me that he didn't think it could be done because the organisms would be moving so fast it would require too much light. The heat from the lamp would undoubtedly kill the organisms. I requested, and was granted, permission to go to Galveston to see how his cameras worked. Sure enough, cinemicrography worked (Fig. 7). One could see the bacteria jumping around all over the place, just as if one were watching a bunch of kids dancing to rock music (29).

CHRISTEN: When was that?

ARNIM: About 1958 or 1959.

CHRISTEN: Did you show this material to Dr. Bass?

ARNIM: I showed him the cinemicrographs, and he flatly stated that they were not important. In his book on periodontal disease, he had said that it might help to flush out pockets, but that wouldn't be important--because you couldn't kill many of the organisms anyway unless you used too strong a drug. He had come to that conclusion after he found out that amoebas

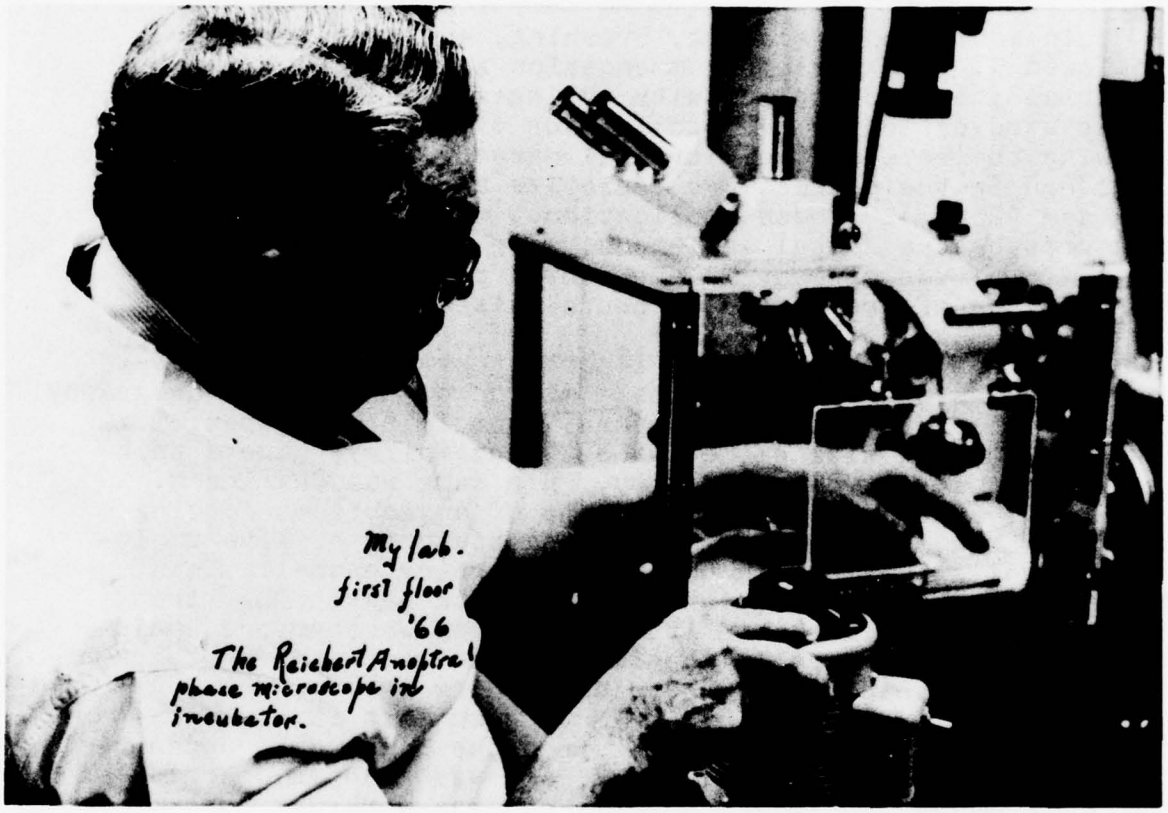


Figure 7. Dr. Sumter S. Arnim, Chairman of the Department of Pathology, University of Texas Dental Branch, Houston, using a phase contrast microscope to photograph living oral bacteria (1966).

didn't cause the disease. Previously, he had advised using emetin not only in the pockets but also injected into the patient's arm. (Patients were having lots of problems with it.) Kells worked with Bass, studying the role of amoebas in periodontal disease. He made many slides to see if amoebas disappeared in his patients' mouths following the treatment, but he found out that they came back all the time. He couldn't rid his patients of amoebas with shots of emetin or anything else.[21] It was Kells (50) who convinced Bass that he was wrong in thinking that if one could get rid of the amoeba, one could get rid of periodontal disease. Bass told me that disclosing solutions, cinemicrographs, pocket irrigation, and sedimentation studies were unnecessary and confusing. He said all you have to do is tell people to use the "right kind of brush and floss once a day, and show them how," as he did with each entering class of medical students at Tulane.

CHRISTEN: What was Bass' relationship with dentists and dentistry?

ARNIM: I referred many dentists to him.

CHRISTEN: Were you the first dentist to really visit and study with him?

ARNIM: No, because he had worked with Kells and others prior to 1915. He had also given a series of lectures at the Texas Dental School, when he found the amoeba. The Director of the Clinic in 1950 knew Bass, having arranged for him to speak to the Dental Society in 1915. He wasn't about to have anything more to do with Bass, as he remembered Bass as "that crazy guy saying amoebas caused pyorrhea." Almost everyone thought he was crazy, senile, or both. His obsession was with the "right kind" of toothbrush and "right kind" of dental floss, to be used at night, once a day; and that's all, period. Once he asked me: "Why does everyone have to modify?" He put it simply--do it the "right way." He had a big sign on his wall saying: "The 'right kind' once a day will prevent dental caries and periodontal disease." He sold the toothbrushes and

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[21] *Ipecac was originally introduced as a remedy for dysentery; but it has been replaced by its alkaloid, emetine, for that purpose; and it is now used in syrup as an emetic. Kells believed that Ipecac was a specific for amoebas. He wrote that Drs. Barrett and Smith, from Philadelphia, injected emetin into the pyorrhea pockets and their walls, whereas Dr. Bass injected it hypodermically into the patient's arm. Kells advocated and practiced the Bass method. He wrote:*

> *If the case (of pyorrhea) is a bad one, one-half grain emetin hydrochloride in 1 cc. of distilled water is injected into the left arm near the shoulder, for each of three successive days-they must be successive...If the disease is limited apparently to one or two teeth only, instead of giving the hypodermic of emetin, one bottle of 40 tablets of Ipecac that does not dissolve in the stomach is prescribed, three to be given twice daily after meals...This treatment will not bring the dead to life. The hope is that used in time it will prevent the ravages of the disease (50).*

floss only to those who had taken his courses or to the people they recommended. Dave and I went to work with him twice, staying a week each time. We made copies of all his slides. Dave used the Bass techniques in his office, and even bought himself a light microscope. This was before we had phase contrast microscopy.

CHRISTEN: What type of an individual was Dr. Bass?

ARNIM: He was undoubtedly a great scientist; but in his later years, he became obsessed with his slogans. His students would comment what a shame it was that a man who was the first to cultivate plasmodium vivax, the organism which causes malaria, had become senile and was "playing with toothbrushes and string." He had even been written up by a famous science writer as being dead; but, in fact, didn't die until a few days after he was 100 years old. In the history of medicine, he was the first to use a microscope south of the Mason-Dixon Line. His early work on the tapeworm in the South was of the best quality. As I have told you before, he was the greatest technician.

When I first came to see him in 1947 at Tulane University, we went to the cafeteria to have some coffee. While we were there, another physician joined us. Dr. Bass said: "Dr. Arnim, I want you to meet our Professor of Parasitology, Dr. Walker." The Professor asked: "Did you say your name was Arnim?" I said: "That's right." He exclaimed: "You must be the fellow who wrote Dr. Bass and advised him to read the literature." I was very embarrassed, but they both had a good laugh!

According to Bass' way of thinking, Stephan's work wasn't important (see p. 48), because acid in plaque lasted all day long; and he wouldn't accept the fact you could find plaque with no acid in it. He knew acid lasted all day long because he had tested saliva with a tube of litmus milk, and it took all night for it to make acid. (Of course, you know the reason why. You don't have mass action when you have so much milk and so few bacteria.) When Bass retired as Dean, he first spent some time in the pecan groves on his family plantation; but later he decided he would rather return to the Medical School and do dental research. He moved into a neat shuttered house on Philip Street in New Orleans' Garden District.

All of his medical patients had dental diseases which he felt were injurious to their general health. Each incoming medical student at Tulane was required to go to his office and laboratory and sit in his dental chair for a lecture and demonstrations on personal oral hygiene. We later met a former student of his in Houston who remarked

what a shame it was that such a brilliant man had become senile so early in life. Before he finished telling us his tales about Bass' eccentricities, he pointed at his mouth and asked: "Is there anything you can do about my gums?" [Laughter] He had gone through the instruction himself, but he did not profit by the experience!

Bass let me look into his mouth once. It was beautiful for a man his age (at that time, about 75). However, on the lower left side, around his last molars, he had as much periodontal disease as you would find in anybody's mouth. When I showed him the inflamed gum and pocket in the mirror, he said: "I'll take care of that all right." He got his brush out, and started working on it. Whether the lesions healed or not, I don't know. He never let me look in there again.

CHRISTEN: He taught a course at the University of Texas, Houston Branch. Did he come more than once?

ARNIM: No. In 1951, I brought him in to help teach the first course we gave there having to do with prevention of dental disease (Fig. 8).

CHRISTEN: How was that course received?

ARNIM: There were four faculty members (who had not seen or heard of Bass before), four practicing general dentists, and one periodontist who took the course. To have a Dean of a Medical School teach a dental course was really something. An amusing thing occurred when Dave Hagerman and I took Bass to eat at the Shamrock Hotel--now the Shamrock-Hilton (he was staying there). Before dinner, we were relaxing in the unscreened patio alongside the Hotel. Bass immediately noticed many flies were flitting about. As far as I'm concerned, there could have been 100 flies buzzing around and, if there is someone I am interested in talking to, I wouldn't see them. (We had flies everywhere in Hallettsville.) Dave looked at him and said: "Dr. Bass, would you prefer to eat inside, where there are no flies?" Bass replied: "Yes, I would, David. You know, I know where they come from!" In New Orleans, for several years, Bass had virtually lived at the dairies in the countryside surrounding New Orleans, to collect samples of milk. At that time, New Orleans had the highest infantile dysentery death rate of any city in the country. Bass collected the data on contamination of the milk samples. Then he sat in every City Commissioners' Meeting from that time on until they passed his recommended regulations for the dairy industry supplying milk to New Orleans. Following the enforcement of the new ordinances, the death rate from infantile dysentery fell dramatically.

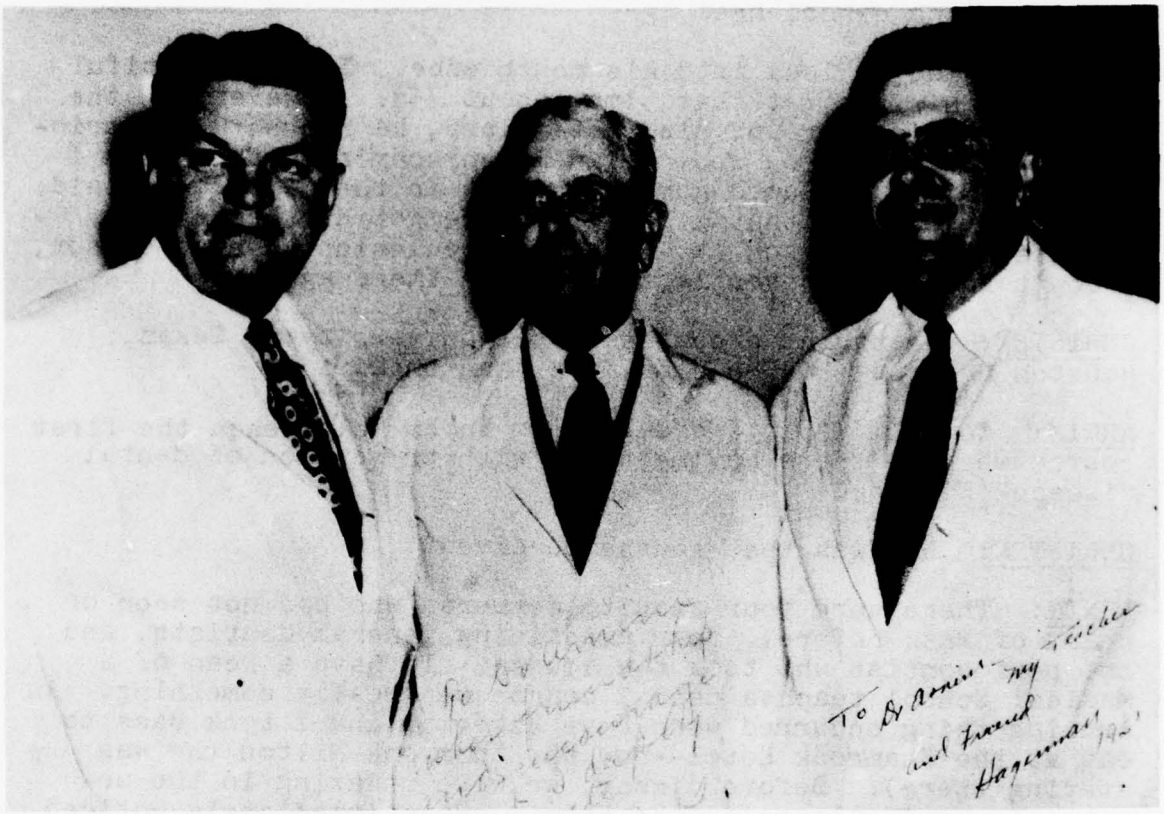


Figure 8. Faculty members of Dr. Bass' preventive dentistry course, the first of its type to be taught at the University of Texas Dental Branch, Houston, in the spring of 1951. Left to right: Drs. Sumter S. Arnim, Charles C. Bass, and David A. Hagerman.

There is just no question about Bass having been a truly great scientist. However, in my opinion, dentists would never have given him the time of day if he hadn't been a physician and a "Medical Dean." Another reason he attracted some dentists was because he required a visit to his office, or the attendance at one of his courses, before he would sell anyone the soft, rounded bristle brush and floss. Now, if a dentist had the brush and floss certified by a Medical Dean, and another fellow dentist couldn't get it...well, that was really something! I am sure many of my students and listeners in dental audiences were impressed by my frequent references to the work of a Medical Dean. So was I.

CHRISTEN: You mean he was advocating taking prevention out of the hands of the dental profession?

ARNIM: The dental profession didn't have it. The brush and floss were made to Bass' own specifications. One of his sisters, it was said, helped pay for the original cost of dies. As we were teaching Bass' personal oral hygiene techniques in the School, he furnished brush and floss to us at his cost (as he did to Tulane Medical School and to dentists who had taken his course). I don't know just how Bass' teachings with brush and floss became accepted in the dental schools and clinics. The only clinic I had was for my special research patients. Dean Olson arranged for me to have a student cubicle with dental chair where I could treat my special patients. My patients got the floss and brush because we gave it to them. Some of them liked to use it, whereas others liked to use tape or wax floss because unwaxed floss would catch and fray on their fillings. I also recommended toothpicks for my patients, but the dental school didn't teach their use. My special patients were followed year after year, and they were not billed for my services. It was for free! When a state law for sales taxes was passed, we would have had to add a sales tax on the brush and floss if we were selling these materials. That would have caused more "busy work" and required more staff.

Bass required everyone to whom he sold brush and floss to buy a certain number of spools of floss per toothbrush. It was his contention that dentists or patients who had not been taught by him or one of his designated teachers had no need for his special kind of brush and floss, as they would not understand how to use it correctly. All of this led to a search for a commercially available source of floss and brushes enough like those of Bass to take care of the growing demand. The Gudebrod Yarn Co., of Philadelphia, had a similar type of floss which was close enough for our use. We also managed to use soft bristle toothbrushes of several kinds. Several preventive dentistry societies, organized throughout the years, have also helped.

Soon several dentists, who were talented speakers and advocators of "prevention," were on the lecture and special course circuit; and new products eventually became available.

CHRISTEN: The disclosing wafer was an extremely important development in preventive dentistry. How did it come about?

ARNIM: It had its origin as a teaching aid for oral hygiene at the University of Texas Dental Branch (Houston) and in the surrounding community.

In December 1960, a school nurse, Mrs. Faye Montgomery, R.N., used basic fuchsin staining solution at Stevens Elementary School in Houston to give oral home care instructions to 1,000 children. She later wrote me a highly favorable letter which stated that the liquid form of disclosant was effective, but also messy, that it was easy to spill on clothing, and had an unpleasant taste. Her letter underscored the need for readily available disclosing tablets. In 1961, during Children's Dental Health Week in Oklahoma, a state-wide demonstration of personal oral hygiene was conducted. The Procter and Gamble Company furnished, for 80,000 eighth graders, kits that contained disclosing tablets, brush, floss, and Crest toothpaste. The American Dental Association was highly critical of my involvement with a commercial firm in this enterprise.

In fact, someone from the ADA central office contacted the Chairman of the local dental society's "ethics committee" recommending that I be investigated for conflict of interest. By July 1961, we (at the U.T. Dental Branch) had made up several sample batches for testing by about 200 dentists in general practice. Approximately 15% of these dentists gave us suggestions on how to improve the tablets. The Procter and Gamble Company provided a research grant to the University of Texas Dental School to develop what later became the "X-Pose Brand" disclosing wafer.

In the beginning, the tablets were dispensed from the Department of Pathology in the Dental School. They sold for a penny each, which was the amount that it cost us to make and distribute them. In a very short time, however, demand outgrew the Department's ability to keep up with the orders. Thereafter, we moved the distribution to my home (which soon had a pervading odor of raspberry flavor in the air). During this whole period, Dean Vic Olson supported the development of the tablets in every way possible. As word spread, the demand became so great that Dr. Bruno S. Petrulis, of the Amurol Company, agreed to manufacture the tablet in accordance with my formula which was published in the Journal of Periodontology in May 1963 (27). After this, the Amurol Company

(Naperville, Ill.), Proctor and Gamble (Cincinnati, O.), and the D. Brownlee Company (Bellaire, Tex.) took over the manufacture, advertising, and distribution of the tablets to the profession. The tablets were generally available in 1963.

CHRISTEN: Someone has recently suggested, in a journal article, that the various existing "preventive dentistry societies" have probably outlived their usefulness. What has been your relationship to these societies over the years? What is their value to dentistry?

ARNIM: Some prevention-oriented societies have asked me to become a member, but I told them we had enough societies in dentistry already. The first society I was involved with which had to do with prevention was the Society for the Preservation of Oral Health, which was ramrodded by Bob Jones, in Tulsa, Oklahoma. He began because he had heard me lecture one time when he was ready to retire from dentistry. He was bored with practice when he came down to take a short course in periodontics, at the University of Texas. The professor asked me to give a talk on hygiene. I showed what had happened to dental caries and periodontal lesions in some of my patients. This sent Bob back home with new ideas. He also learned how the phase microscope was used in the movies we had made. He quit making dentures and extracting teeth, and started teaching prevention in his office. The end result was his interest in practice was reborn, and he began to make money. This attracted considerable attention. His wife had a close girl friend in Baton Rouge, La., whose husband had had a recent heart attack. This friend asked if Bob Jones would come down to lecture in Baton Rouge and tell what he was doing in his dental practice, so that her husband could hear and change his practice accordingly.

Bob agreed, provided the wives were allowed to attend the meeting. So the dentist in Baton Rouge got a few of his dental friends together and collected enough money to pay Bob's expenses for the trip. Bob gave all his receipts, above expenses, to the Wycliff Society (which translates the Bible into primitive, native tongues). Bob lectured to the group, and told what he was doing; and the dentists who listened thought it was wonderful.

They needed a reliable source for brushes and floss. Bob Jones had gone to see Bass by this time, and recommended the dentists to him. Bass sent them brushes and floss, and they were in business. (Bob eventually quit practice and went to work selling hygiene products, including unwaxed floss and soft rounded bristle toothbrushes patterned after those Bass had designed.) Everyone became enthusiastic. Another great movement in dentistry was born.

Naturally, organization came next. The initial meeting was held in the Monteleone Hotel in New Orleans, with Bass and me in attendance. When the meeting started, the first item for discussion concerned requirements for membership in the proposed new society. The question was asked: "How long did a man have to be in practice before he could join?" Some felt that dentists could be admitted after graduation from dental school. Others objected on the grounds that, when dentists come straight from dental school, they don't need to know anything more--they should know everything about prevention already. Therefore, the society would have nothing to offer these individuals. The arguments went along this line: What were the dues to be? What about a constitution? I told them I would prefer that they not organize a society per se, but that each would volunteer a certain amount of time to the society, by keeping records on his patients to see whether personal oral hygiene was really effective in the prevention of dental disease. Then, when the records showed it could be done, these could be published and there would be convincing evidence the project was worthwhile. Bass said that it wouldn't take long to have the evidence, no question about it. (I asked Bass once if he had any long-term patients that he had followed up and that he could show me; but I never asked him that question again, because it was obvious that he had none.) Of course, my suggestions were not accepted by the group. Someone wanted to be President, and another wanted to be Treasurer, etc. [Laughter]

Initially, the name decided upon was: "The Society for the Prevention of Dental Pathology." I said, with tongue-in-cheek: "Fellows, you can't do that. What will we do with our textbooks? We can't prevent dental pathology--that's our living. With no dental pathology, where would we be? We'll have to call it something else." Bass named his whole bit: "Personal Oral Hygiene." Hence I suggested that they call it: "The Society for the Preservation of Oral Health." They liked that. The Society is larger now and, I think, still active. But, to the best of my knowledge, not a single member has collected any data showing that he has arrested tooth decay or periodontal disease in any patient at any time and published the evidence. The American Society for Preventive Dentistry (a misnomer, said Kells; for who wants to "prevent" dentistry?) came with tremendous fanfare.[22] When I was asked about becoming active in this organization, I gave them the same advice as before. However, I must admit that the two societies have, collectively, had a tremendous impact on the profession, as

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[22] The American Society for Preventive Dentistry existed from 1968 to 1977. It had its own bimonthly Journal and Annual Convention. The Chicago-based organization gained 8,000 members in its first two years, and billed itself as the "fastest growing society in the history of dentistry." It was founded in Chicago, Oct. 8, 1968, and disbanded in Denver, June 21, 1977.

evidenced by changes in the ADA and elsewhere. I don't know who deserves credit, if anyone does. I wouldn't say you could give credit to any one person, especially to me or to Bass. As far as I know, neither one of us has had any real impact. Both of us have had certain clinical and laboratory material that has made it possible for us to publish certain articles that have the basic material in them, but none of it is new (25, 26). If dentists would read articles--by Bass, myself, Hagerman, Gerald Latimer, Don Masters, and Arthur Alban--with their combined bibliographies, they would have access to the important knowledge on this subject. Certainly, it would do no harm to ask patients, when they come in, if they do want to do something about their dental disease. If they do, you could either have your assistant teach them what to do, or you could have regular appointments with them and (with very little change in office routine) do it yourself.

CHRISTEN: How much of preventive dentistry would you say has been taken over by the "hucksters"?

ARNIM: I checked the definition for huckster, and doubt if there has been any serious misrepresentation of the subject matter. There has been a lot of peddling by hucksters who had little of the necessary basic knowledge. Certainly, the sales techniques used have been dramatic and aggressive. Most of the peddlers have been motivated by the idea of personal profit. If they don't have data to prove that what they are selling actually works, I think they will lose their market--unless their product is nationally advertised. Even then, one cannot expect continued acceptance unless the public finds it pleasing, affordable, and practical. It is here that we have our real problems. Even the Air Force has no evidence that the money spent on "prevention" has brought good, or even mediocre, results. National advertising of preventive products by industry is still far from accurate or truthful, and it is often misleading. The ADA adds to the confusion; and dental schools lack the knowledge and the will to pursue the subject. With a situation such as this, even a huckster may make a useful or worthwhile contribution.

CHRISTEN: Dr. Bass certainly talked down fluoridation and topical fluoride. Why was he against it?

ARNIM: At first, I never heard Bass speak about fluorides; but, when the question arose, I asked him. His answer was that if you had fluoride you got more periodontal disease. 23/ Anyone who knows epidemiology would understand this remark. You have to have teeth to have periodontal disease. If you save the teeth, you eventually get pyorrhea. If you live long enough, you will get it for sure. [Laughter] That was the explanation that Bass gave to me. He said he had to speak out against fluoride, because a very good friend of his, who ran the Ochsner Clinic, was the one who said that smoking was bad and also said that fluoride was bad. Alton Ochsner, a distinguished New Orleans surgeon, was like Bass; he had an obsession against any kind of pollutant, and fluoride was considered one.

CHRISTEN: There seems to be a lot of confusion in preventive circles, these days. We seem to go from one school of thought to another. On one hand, plaque removal is the answer--others say proper diet and nutrition are the solution.

ARNIM: You can't suck on anything sweet all day and not get tooth decay--sugar, flour, oranges, grapes, etc. The people who had the worst tooth decay in the world, at the time W. D. Miller was writing about dental caries, were those on a grape diet for arthritis in Germany. In Beck's writings, he tells you that the ones who had no refined carbohydrates--but were orange suckers--had rampant dental caries when they consumed 18 to 20 oranges a day.

CHRISTEN: What I was talking about, specifically, are these people who say: "Just don't worry about the plaque and let's make sure the people get the right diet, and the plaque can go its merry way."

ARNIM: Of course you can have plaque and no tooth decay. You also can have plaque, and be starving, and still have no decay. Look at the people in India and Bangladesh. Certainly

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23/ Bass wrote:

The time and effort spent by dentists in uselessly applying fluoride to teeth, if it had been devoted to teaching their patients effective personal oral hygiene, could have reached, and actually prevented further caries damage in many times more people. I believe that continued ingestion of fluoride (in drinking water) actually increases the activity of the already existing periodontoclasia.

Bass also severely chided dentistry in the Armed Forces for not practicing prevention when he wrote that military personnel:

go through their period of service with active, advancing dental disease and are finally discharged, without being taught and induced to follow the only effective method of personal oral hygiene ever known. The dental officers had not learned this method before they were inducted and do not learn it afterwards. This situation is a shame and a disgrace. It is a serious reflection upon the leading authorities, in the dental profession, especially those in dental education, and also upon the highest officers in the Armed Forces (36).

the idea of a caries preventive diet that is physiologically wholesome is an excellent one. In 1964, Professor Ralph R. Steinman (of Loma Linda University, Calif.) made the Washington Post News Service with the headline: "Look ma, brushing doesn't help." In the article, he is quoted as saying: "Brushing doesn't affect the two places where most decay begins: the tiny grooves on the top of the molars that are too small to be affected, and the sides of the teeth that are in contact with other teeth." He also said: "If people would stop eating between meals, eat less sugar, and replace refined cereals with whole grain, they would completely wreck the economic status of the dental profession." Of the children using this regimen, 58% had no cavities. If Steinman or the others think this result is because of the diet consumed, someone should tell them that millions of people in this world have existed on a diet composed of principally polished rice, a refined cereal. Many of them have osteomalcia, rickets, and worse. Does this finding mean that a diet of polished rice gives 100% protection against dental caries? My suggestion would be that such people get so little rice, so seldom, that none is left in the mouth to dissolve and enter the plaque where the organisms could convert it to acids. Even sugar will not cause caries--if it is left in the sugar bowl, and not in the mouth. It would seem that those few persons who are fortunate enough to go through life with no cleansing of the teeth, and no decay, have a protective factor in their saliva. This is well documented in cancer cases, where radiation of mouth tumors destroys the salivary glands and leads to subsequent rampant caries in patients who have had no cavities and are still eating the same foods. This salivary protective factor is readily overcome by a change of eating habits leading to frequent in-between-meal snacks. For example, those who are quitting smoking frequently suck on candy mints, or snack on other sweets, to compensate; and they can suddenly develop a batch of new cavities.

CHRISTEN: Over the years, what type of support have you received for your research in the forms of grants?

ARNIM: Our research on caries and periodontal disease was aided in the early stages by small grants from the National Institute of Dental Research. Site visitors from Washington visited our laboratories and saw our clinical and phase cinemicrographic studies demonstrating that personal oral hygiene could arrest dental caries and inhibit periodontal disease (Fig. 9). Much to our amazement, we were informed that our studies were not considered "dental research" and therefore did not justify further NIDR grants! Fortunately, this lack of support from the "establishment" did little to squelch the

high degree of interest being shown by dentists and grateful patients of that time. 24/

24/ *Dental clinicians were somewhat skeptical at first of Arnim's ideas. But later, many of them came around to Arnim's way of thinking. Dr. Donald H. Masters, a periodontist in San Antonio, Texas, writes:*

In 1960, several Texas dentists including Cliff Ochsenbein, Gerald Latimer, Harry E. Mayo, Sam W. Hoskins, Jr., and myself visted the University of Texas Dental Branch in Houston specifically to "straighten out" Dr. Arnim. This visit was in reference to his article, "Thoughts Concerning Cause, Pathogenesis, Treatment and Prevention of Periodontal Disease" (22). A critical editorial and subsequent dialogue resulted in an invitation by Arnim to his critics to "come and see for yourselves." After two days of reviewing the clinical, histologic and microscopic results and methods of his research in oral ecology, witnessing personal demonstrations and studying case histories, the critics came away somewhat chagrined. In fact, we were filled with curiosity and a determination to explore further the clinical implications of a controlled oral eco system, which Arnim had introduced. In addition, we were charmed by the warmth of Dr. Arnim's southern style hospitality.

During the return trip from Houston, the group planned a protocol in order to be convinced and to be more convincing to others relative to those things which we had seen. We were particularly interested in exploring and documenting the clinical instances that demonstrated the influence and role of the micro-biota on the periodontal structures. Other items under consideration would be: 1. The longitudinal effectiveness of personal oral hygiene. 2. The value of disclosing agents. 3. The value of dental irrigation. 4. The equipment and armamentarium necessary for a practical oral hygiene program in the average dental office. Over the years, each man in his own way added to the data base that Arnim had already started, others also took up the challenge and it wasn't long before Arnim was a hot property on the lecture circuit; and the effect of oral hygiene on dental disease was a new interest of at least a significant segment of the responsible practitioners.

Sam Hoskins and I were particularly privileged to return time after time to the oral pathology lab and spend many hours with Sumter poring over histologic sections, case reports, and learning how to use the phase contrast microscope. We shared with him the interesting things that were developing as an outgrowth of his teachings and influence on us. This was particularly centered around the concept of the personal dental care training program, which later became known as the "control program" popularized by Robert F. Barkley. We pondered about the fact that, regardless of what one knows about the whole eco system, unless it can be placed in the hands of a responsible individual, the patient, the knowledge is only of academic importance. We did complain about the fact that there was a relatively low compliance rate and a strong economic consideration regarding introducing such a program to people who were used to traditional dentistry, but were not particularly enamored with its effects. Sumter heartily agreed that he had noticed the same attitudes which existed both in the minds of patients and the dentist who was trying to inaugurate these programs. To paraphrase him, "It's not difficult to control dental disease by oral hygiene procedures; the difficulty lies in convincing people that it's a worthwhile undertaking." We also found that we were handicapped in that the shift from the authoritative, technically trained practitioner to one of a more humanistic model was a difficulty that had to be overcome if we were to be successful. In other words, the influence on the patient had to produce a responsible, active participant rather than a submissive dental patient, quite the contrary from our traditional thinking and training.

It was quite opportune that, in 1965, Robert F. Barkley came visiting. He had been enamored of Armin's work and was already into the behavioral change business, but he needed more technical information from Sumter and me. We certainly shared a lot of experiences. For example, early in my clinical trials, I had found that, both from a research and personal insight standpoint, it was necessary to perform the personal training before therapy and then evaluate for professional treatment. Bob had reached the same conclusion and apparently he was far more adept at getting compliance than I had been. This sharing of the humanistic aspect of his program was of great value to Sumter and to me.

Over the years, each of the original group has maintained an individual relationship with Sumter. Perhaps the one that Sam Hoskins and I have shared with him has been the most meaningful. In my opinion, the historians will label Arnim's work as having one of the great impacts of the century on the dental profession and, subsequently, those that we serve. Alas, like most great prophets, neither he nor his work was given adequate support during his active years. However, the American Society of Periodontists presented him with their first gold medal award in 1967 for the man who had made an outstanding contribution to the understanding and treatment of periodontal disease. He summarized much of his research work on periodontal disease in a classic movie entitled, "Oral Hygiene: Oral Health," which he presented at the gold medal ceremonies. Later, the American Society for Preventive Dentistry also presented him with their annual preventive dentistry award. Both of these awards, I know, he still cherishes.

S. S. Arnim, pioneer dental researcher, patient, humanistic, but challenging. Teacher, master lecturer and author--I am privileged to have been influenced by such a man.



Figure 9. Dr. Arnim photographing stained oral plaque in 1968 (29).

At the suggestion of Dr. Joseph C. Muhler, from Indiana University (Consultant in Preventive Dentistry to Procter and Gamble, and developer of the first fluoride dentifrice), we had been visited by Drs. Arthur W. Radike and John J. Ennever from Procter and Gamble (Cincinnati, O.). They were impressed with our studies and asked if the School would accept a grant from their Company to further the studies underway in the Pathology Department. Dean Olson approved the request, and an annual grant was sent to the School each year thereafter for our work. The funds were especially useful in the development and perfection of the cinemicrographic studies we made utilizing phase microscopy. The motion pictures made with this equipment and techniques provide a tremendous insight into the characteristics of the living microcosms associated with periodontal disease and dental caries. For several years, the only sources for loan of these films, at no cost, was Procter and Gamble and the University of Texas Dental School at Houston. The films are now available, on loan, from the American Dental Association Library.

CHRISTEN: Who took over your work at Texas when you retired?

ARNIM: I made a real contribution when I hired Merrill Wheatcroft to come into the Pathology Department (Fig. 10). He has a nice gentle touch and likes to practice dentistry the way I do, and can do it much better than I could. He's a good exodontist, and even fills root canals. He is just a wonderful person. I had high hopes he could do better with "prevention" than I did. He is now in private practice, part time. He still goes to the Dental School, I think, about half time; but he might quit that before long. He lectured for a while, but I think that the average dentist who now attends a dental society meeting doesn't go to hear something on preventive dentistry.

CHRISTEN: Do you think we are going to go into a cyclical thing with preventive dentistry?

ARNIM: Of course, all things are cyclical. History repeats itself. The references in the articles I have written illustrate this fact so well. What a pleasure it has been to read what these dentists of years gone by have had to tell us of their attempts not only to preserve the oral and general health of their patients but also to prevent the discomfort, expense, and ravages of dental disease. Perhaps the discovery needed is one even better than water fluoridation--possibly a chemical that can be incorporated into foodstuff (even in sugar), and that will upset the ecology of the microcosm in such a way it will no longer produce the substances which cause caries and periodontal disease. Then

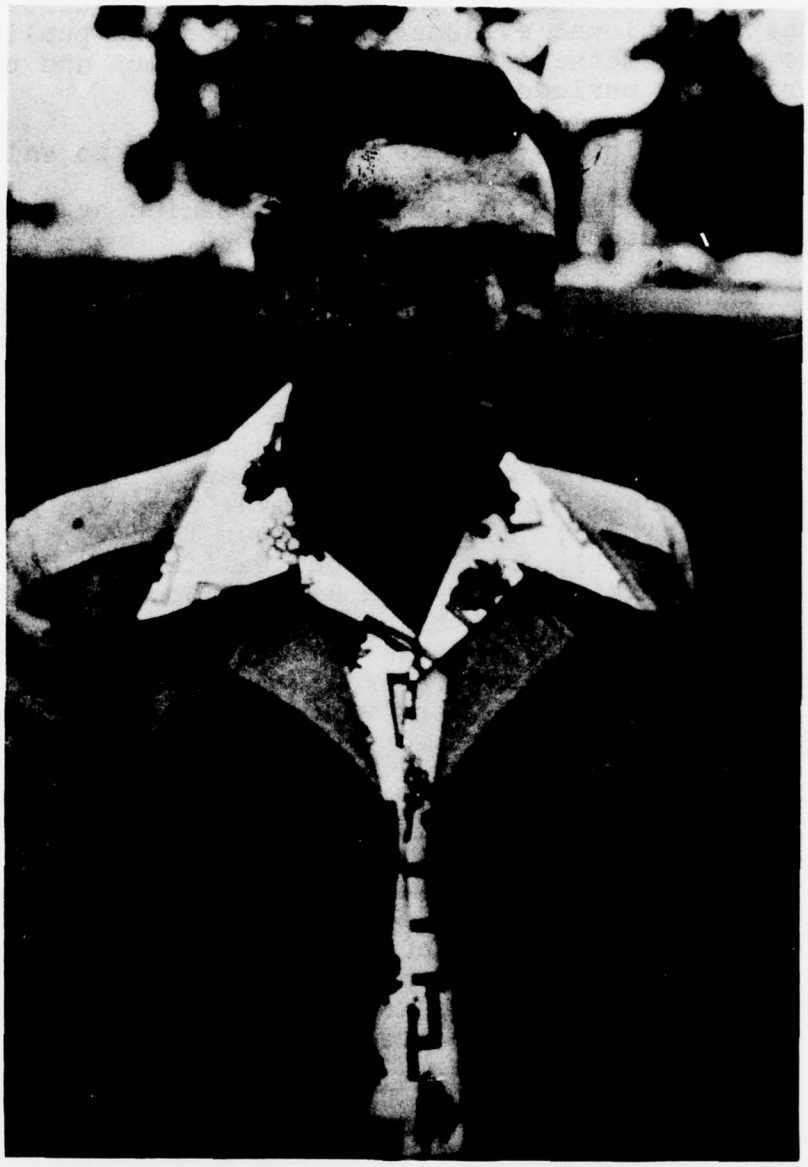


Figure 10. Dr. Merrill G. Wheatcroft, Senior Consultant in Oral Pathology, University of Texas Dental Branch, Houston, and guest lecturer to the U.S. Air Force Dental Service. (Photo taken during the Air Force Preventive Dentistry Course at the USAF School of Aerospace Medicine, Brooks AFB, Tex., May 11, 1976.)

there would be no need to brush the teeth and tongue except to prevent mouth malodors. I gather we will have to leave this discovery to others; in the meantime, it is certainly needful that additional evidence be gathered and published widely, so that something can be done to prevent and control dental caries and periodontal disease.

CHRISTEN: You feel that what we must do now is to validate?

ARNIM: Yes, but validation must be accompanied by publication. Knowledge is not useful unless it is shared. Orban and Gottlieb knew this well! It had been our hope that many of those practicing dentists, who helped us with the formulation and testing of the disclosing tablets in the early 1960's, might develop office procedures for teaching patients more about prevention of dental disease and keep clinical records revealing their results. To the best of my knowledge, few have done so. There were three, however, whom I know personally who have made recorded contributions. Dr. Quinton E. Williams of Corpus Christi, Texas, made a motion picture in his office entitled, "How to Clean Your Teeth." Dr. Arthur Alban (Fig. 11), from Lakewood, California, developed an effective preventive program in his pedodontic practice and published the results in the Journal of Dental Research. Dr. Gerald Latimer (Austin, Texas) also kept careful records over many years of clinical practice, and published the results he obtained in his preventive-oriented practice in the Texas Dental Journal (53).

Of course, any practical preventive technique, program, or system must be one that works to the advantage of the people and, hopefully, to the advantage of the profession. By this statement, I do not mean that dentists must look forward to an unending life of placing large numbers of amalgams to make a living. Vaccination, immunization, physician helpers, prescribing nurses--none have hurt physicians' incomes or social standings. The new effective methods for prevention and control will augment the dentist's usefulness as a member of the medical team whose overall goal is health-directed and treatment-oriented. In our society, the servant is still worthy of his hire. Excellence, quality, and perfection are still valued commodities. As knowledge increases, dental services will become less and less restoratively centered, because people will keep their teeth without caries for a longer period of time. Who can forecast the possibilities in the near future?



Figure 11. Lifetime friends: Dr. Arnim (left) and Dr. Arthur L. Alban (a pedodontist from Lakewood, Calif.)--guest lecturers at the 15th World Dental Congress of the Federation Dentaire Internationale, Mexico City, Mexico, Oct. 1972.

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[25] *EDITOR'S NOTE: In 1936, Dental Cosmos was discontinued; and, in 1953, publication of Dental Items of Interest was suspended.*

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[26/] *EDITOR'S NOTE: Because the entire Review honors Dr. Sumter S. Arnim, his name is not listed in this "Index." (To locate photographs of Dr. Arnim, however, the reader is referred to the list of "Figures," on p. 3.)*

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