

## THE PAST—PRESENT—FUTURE OF ENDODONTICS

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*To Dan & Marion  
With my best regard  
for the many years of  
friendship in joy and in  
sorrow. JB*

"The Past, Present and Future of Endodontics" is my assigned topic by Dr. Kim. This topic is a personal challenge to me since I have lived the history of endodontics and it was my good fortune to have been a part of this endodontic adventure in dentistry. Being the oldest living functional endodontist, it is indeed gratifying for me to have been one of the participants in the development of the speciality of endodontics, and one who helped to move the status of endodontics from the "outhouse" to the "penthouse." Thus, I have much to relate historically, how yesterday's present became the past and how the present becomes tomorrow's past, and the plans of the present becomes the future. Let me restate this statement with more clinical relevancy.. "The clinical practice of yesterday's endodontics becomes the heresy of today and today's endodontic practice becomes the heresy of tomorrow. So don't be so rigid in your technics or beliefs.

Having said that, let me define my concept of the topic "past, present, future," in the hyphenated form. The past, present, future are not three separate entities. Philosophically, politically, economically, scientifically and endodontically, the three blend together as one functional unit. None of the three function independently. For example, the Constitution written by our forefathers in 1776 has not been discarded after more than 200 years. We are all aware that this old document has been the mainstay of preserving the political freedom

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of our society. Supreme Court decisions and legal matters are based on opinions made in the past which affect the present and future laws. Furthermore, whenever scientific or clinical papers are written, the past and present is invariably referenced in the introduction; the future is projected in the conclusion.

The same prevails with "Principles of Endodontics" as set forth by our endodontic forefathers: Clyde Davis, Louis I. Grossman (the initial I stands for Irwin), Daryl Ostrander, Harry B. Johnston and Ed Coolidge, to name a few. Incidentally, the term endodontology was introduced by the same Harry B. Johnston of Atlanta, Georgia. Let me mention another historical fact, as an aside, about Dr. Johnston. He was at one time the only dental practitioner in the world who limited his practice to endodontics. As long as we are mentioning firsts let me add the one who limited his practice first in the endodontic Mecca, Philadelphia. It was Sam Seltzer, around the year 1948 when he returned from Army service.

Although the foregoing endodontic forefathers wrote no endodontic constitution, they gave us the "Basic Principles of Endodontic Practice." With these as our guidelines or standards of care, consistent successful results are achieved irrespective of any privileged technic that is used, provided the principles are not violated. The beneficial results are not due to the use of any specific drug. There are two basic principles that are observed in endodontics: one, remove the critical concentration of the irritant, be it bacterial, chemical or mechanical; two, seal the canals hermetically. All else is commentary.

Much endodontic history and the manner of formation of the American Association of Endodontists already has been recorded. I should like to relate my experiences with root canal therapy which began in 1927 as a sophomore dental student at the University of Pennsylvania,

with its restrictive dogmas and teaching philosophy. Much of history is biography so I am going to discuss the personalities of the various leaders and scholars of endodontic intellect; the political and the economic conditions of the times under which endodontic development was both retarded and flourished.

The clinical phase of instruction at that time was overdosed with anecdotal dogma. What couldn't be explained had to be believed. Statements or opinions that were offered were devoid of fact or evidence. Besides, literature search was limited. In the 1920's the dental literature consisted of the following: The Journal of the American Dental Association, Dental Cosmos, Journal of Dental Research (started in 1919), Dental Items of Interest, Dental Digest, and Oral Hygiene, a throw away journal. Internationally there was also the British Dental Journal. There was one specialty journal—Orthodontics. There certainly was no need for computer Medline search. The Journal of Dental Education first appeared in 1936. Most of the lectures were hypnotic in nature, imbued with the certainty of being right. Supportive or opposite points of view were seldom expressed.

Clinical root canal therapy was taught in the restorative department by instructors who were recent graduates with limited experience, characterized by "see one, do one, teach one." The essence of philosophy of teaching was dogma. A method of teaching by authority rather than the provocative method of teaching by inquiry. This prevailed from the assistant instructor to the professor. As students, we soon learned from other students not to ask questions, especially of the young instructors who acted out their aggression on the inquiring student. This type of instruction prevailed in most all dental schools even beyond the 1960's. In graduate teaching, also, you dared not challenge accepted teaching. I would like to cite one

example, the results of a research project which was found unacceptable by the department head. The findings showed that the drug which was used for root canal sterilization as recommended by the chairman, was more toxic to tissue than the other tested drugs. The graduate student was told that the results were flawed and he should repeat the experiment. This was done and when similar results of the repeated study were presented to the sponsor of the project, he threw the paper on the floor. He couldn't bring himself around to believe that the drug, paramonochlorphenol, used for sterilization of the root canal was found to be toxic to tissues.

Most all drugs that were used to cleanse, sterilize and enlarge root canals were highly toxic, during my student days, and even for the next 20 years. Putrescent pulps with offensive foul odors were treated with explosive drugs and I do mean explosive. The drug, nascent sodium-potassium alloy was introduced into the root canal by means of an iridioplatinum nerve broach. This broach is not corroded by the sodium-potassium alloy. The broach is thrust through a paraffin stopper at the end of a glass tube, picks-up a small amount of the alloy on its surface and was carefully carried into the root canal of the tooth isolated under the rubber dam. Upon introduction into the putrescent root canal numerous minute explosions with sparks of fire occurred with manifestation of a hissing sound and development of heat. The reaction produced a saponification, forming a soluble soap. The offensive foul odor of putrescence was immediately removed and was replaced with a scented soap-like smell. Great care was exercised when the alloy was carried to the patient's tooth by covering the side of the patient's face with the operator's hand. Sparks of fire often occurred in mid-air when there was high humidity in the air.

Concentrated sulfuric, nitric and hydrochloric acids were routinely used for enlarging canals. The concentrations of the acids were in the range of 20-50%. To neutralize these acids, sodium dioxide was used. Further pharmacologic benefits were claimed because the chemical reactions would give-off nascent chlorine to exercise germicidal action. Another drug for root canal sterilization that was used, was ammoniacal silver nitrate; introduced by Percy Howe, director of the Forsyth Clinic in Boston. The use originally was advocated for deciduous teeth. Some practitioners used the drug on permanent anteriors. The black discoloration as a result of the silver precipitation within the root canal left a dark bluish tattoo mark on the mucosa. Many schools used their own pet drugs.

Most of the root canal courses presented at the various regional and state meetings even as late as the early 1970's, stressed that the beneficial results that were obtained, was due to the particular germicide. The question among practitioners at these meetings was mainly, what drug do you use? Thus, there was a rotation of drug use from meeting to meeting.

Vital pulpectomies were not performed under local infiltration or block anesthesia. Treatment was performed by sealing an arsenical paste directly over the exposed pulp for three to four days in mature teeth; in the young immature tooth, four to eight hours. Leakage of the paste and the fact that it is odorless and tasteless created numerous complications of arsenical necrosis of the soft tissues and bone.

Local anesthesia with the use of procaine solution was by means of contact anesthesia. This method involved the introduction of a procaine tablet, dissolved in sterile water, heated in a small porcelain container by an alcohol burner. This made a 5-10 percent solution. Strands of cotton soaked with this solution was placed into the cavity over the exposure. This was then

covered with a large pledget of cotton, and a small piece of unvulcanized rubber filling the cavity completely was placed over the cotton. Pressure with a suitable instrument was brought to bear on the unvulcanized rubber which in turn forced the procaine solution into the pulp. The anesthesia was more vocal than local. Screams of pain were not uncommon. These methods are the genesis of associating pain with endodontics by the general public which still prevails after 70 years. However, after the application of pain control methods and by eliminating the propagandists of endodontic pain through the attrition of mortality, the pain problem has been markedly reduced. As a result of pain control, endodontics has become much more acceptable by the public.

There was no coordinated teaching objective. The various departments taught their topics independent of each other. No attempt was made by the dental or medical faculty to correlate the basic sciences taught in the first two years. The instruction had no clinical relevancy. The medical faculty were disdainful of the dental students, calling them "tooth carpenters." The philosophy of dental teaching or stress was to train technicians with little effort to train clinicians with clinical judgement.

Most of the medical instructors were not physicians. They were Ph.D. candidates pursuing specific research interests. The instruction in the medical school was not structured to fulfill the needs of the dental student. For example, the topic of enzymes. Rather than discuss salivary enzymes, with obvious dental relevancy, they discussed hepatic or gastric enzymes. This condition was finally resolved when Dean Burket of our school (the University of Pennsylvania) created a separate basic science faculty under the aegis of the dental school. Many other dental schools followed or similar corrections were made to fulfill the needs of

dental education.

During the period of 1930-1950 no meaningful research came forth from dental schools. Some of the investigations that were reported could be categorized by, "add water and shake gently experiments." In endodontics, research consisted of bacteriology reports, comparing how many sittings it took to obtain a negative culture between the use of two or three different germicides. No controls or statistical analysis were included. The display of science naiveté was amusing when the investigator concluded, "since a negative culture was obtained within an overall average of 3.2 days using drug A, it was better than drug B, since the latter took 3.4 days to obtain a negative culture."

The literature was replete with successful anecdotal cases of bone repair following a particular pet drug or technic. Failures were seldom if ever reported. Everyone reported, orally, a success rate of 97-100 percent; some still report, to this day, 100 percent success rates. When a failure occurred, it was always something that you didn't do right. Most often it was because the canal was filled under nonsterile conditions. In other words, no bacteriologic culture control was used, therefore, the pain or failure of bone healing. I remember one time asking the program chairman of the AAE, why not have a program on failures, at one of our annual AAE meeting sessions; to which he smilingly answered, "who has failures?" That smile implied, failures were not admitted.

During the latter part of my senior year I didn't feel qualified to go into practice upon graduation. To further my education I took a general dental residency for one year at the Jewish Hospital in Philadelphia, which subsequently became known as Albert Einstein Medical Center. That indeed was a broadening experience. Not only in dental instruction, but also the

experience of the inter-relationships with house and visiting staff physicians working as a team for the benefit of the patient, who is considered as the most important individual in the hospital. In retrospect I feel the dental schools would be better served if they would adopt the philosophy that the most important individual in a school is the student. Schools are built for students, not for deans, professors or instructors. It's nigh time this concept be considered for a better student-teacher relationship and a more caring responsive alumnae. It is this latter group that is the financial backbone of schools. This is necessary in order to recruit teachers of merit or other needs, to train quality students as clinicians for the future.

Some of you present today may have read or even written concerning the past history of endodontics. I should like to add another dimension to the "past" of endodontics. Rather than reiterate how the practice of yesterday became the heresy of today's practice, I should like to discuss also the socio-economics of the times and the medical concepts that retarded the growth and development of endodontics; the personalities of the dental political leaders, the scholars and the snake-oil-salesman who were responsible in developing our respected specialty.

Let me define the term snake-oil-salesman. Around the 1920's there were "medicine men," these were not men of medicine. The former were purveyors of snake oil, claiming it was extracted from the rattlesnake with claims of medicinal cures, from fallen arches to baldness, including aches, pains and gonadal problems of both sexes. They stood on a wooden box at a busy street extolling the medicinal benefits contained in a bottled urine color solution offered at 50 cents a bottle. He mesmerized the audiences with his convincing presentation and jokes.



To promote and revive endodontic practice we had to resort for help from everyone because root canal therapy from the mid-1920's to the 1950's inclusive, was under the scourge of the focal infection theory. Then we had many more "George Meinigs" than today. The George Meinig of today reminds me of Washington Irving's, "Rip Van Winkle, the Legend of Sleepy Hollow." The difference between George Meinig and Rip Van Winkle was Meinig slept 45 years longer before he awakened..

At that time, all pulpal involved teeth even those with mechanical exposures were extracted. The generalist and the oral surgeon, who in those days was called an exodontist, had a field day extracting teeth. Almost every medical complaint was blamed supposedly on infection in teeth. The story is told about a patient who visits a physician complaining of a certain ailment. After the examination the physician informs the patient he needs to have his teeth removed, upon which the patient removes his upper and lower dentures.

A number of dental schools ceased to teach molar endodontics. Around the year 1936, a little jingle concerning focal infection went as follows: "When in doubt take it out," when you couldn't decide whether infection was present. When an upper central was to be retained, apical surgery was performed after root canal therapy even though no radiographic area of rarefaction was present.

All apical surgery was performed by the oral surgeon, hardly any generalist did apical surgery. When patients were referred to an oral surgeon, the apex was resected but the root canal was not filled. They were illiterate in the basic principles of endodontics. The generalist weren't trained to do apical surgery. Even Dr. Grossman didn't do apical surgery. He started to do anterior apical surgery in the early 1940's after watching Dr. Ivy, a prominent oral

surgeon, perform. Dr. Grossman learned his surgery the way we all did, see one, do one. He carried it a step further, he taught one. That's the way things were done during the pioneering days. Besides, we were shown only the successful cases of anterior apical surgery. No one did posterior apical surgery. Posterior teeth invariably were extracted.

Dr. Harold Maxmen of Detroit whose interest was endodontics, was the kingpin of anterior apical surgery. His waiting room was filled with failures of others. He also was an early AAE member. Another generalist who performed anterior apical surgery in the early 1940's was Dr. Ralph Sommers of the University of Michigan. He carried his apical surgery a little too far. He advocated retrograde apical surgery on juveniles in cases of incomplete root maturation. The apex was filled in a retrograde fashion with amalgam and the postoperative x-ray often revealed splattering of amalgam all over the region. This procedure was never adopted; it was too cruel for the child. Preoperative preparation and effective pain control did not exist and no one heard of the word apexogenesis or apexification with the use of calcium hydroxide. Dr. Al Frank in 1966 suggested its use in apexogenesis.

Besides the stigma of pain that was associated by the general public, which prompted them to be reluctant to have endodontics done, the political and economic climate of the time also inhibited the growth and development of endodontics for public acceptance. I opened my office for general practice (1931) in the depths of the worst economic depression in the history of our country. In 1932, 15 million people were unemployed. Physicians, dentists, attorneys and others were selling apples on street corners for economic survival; cities were bankrupt. They resorted to issuing script as legal tender, to pay the city workers who in turn used the script to make purchases within the city limits. The store owners in turn used the script to pay

their city taxes.

Under these circumstances when patients presented themselves with a toothache they usually opted for extraction rather than root canal therapy. The former cost one dollar with local anesthesia; without anesthesia, 50 cents. Whereas, root canal therapy on anterior teeth cost 10 dollars, a molar cost 25 dollars.

Most offices did not work by appointment. Patients came to have their teeth extracted and by age 50 most of the population were edentulous. Extractions were performed under general anesthesia, such as, nitrous oxide, called laughing gas. Instruction in nitrous oxide anesthesia was limited. This was received mainly from detail men selling the gas machines. In about a one-half hour demonstration the dentist was taught the various stages of anesthesia and the proper percentages of mixing nitrous oxide and oxygen. There was no instruction in medical history taking or whether the patient was medically compromised. Often the patient would come to the office after lunch. This would invariably produce a vomiting episode with complications of a foul odor and a floor mess. In those days the dentist was medically illiterate and it was not uncommon for anesthetic deaths to occur in dental offices. Besides, he often worked alone without an assistant. He administered the general anesthesia and performed the extraction or pulp extirpation simultaneously.

Knowledge of mandibular block anesthesia was limited as late as 1925, even though procaine was discovered by Einhorn of Vienna in 1905. The technic was not easy to teach. Administration was more complicated than spinal anesthesia. Most of the block anesthesia instruction were given at regional meetings or special courses on cadavers. This type of instruction and the poor steel quality of the needle created numerous cases of broken needles

in the pterygoid region and dysesthesia as a result of nerve injury.

Incidentally, molar endodontics was not a common practice. I remember being invited by the Maimonides Dental Society of Washington, D.C. in the late 30's to give a talk on root canal therapy, the term endodontics was unknown at that time. The discussor of my presentation marveled at the fact that molars were shown as illustrations. Demonstrations of molar endodontics with periapical regions of rarefactions at state and national meetings in the early 40's were uncommon.

I was invited to another meeting in the early 40's by Dr. Ernest Granger, the designer of the Granger Anatomic Articulator, who was president of the exclusive American Academy of Restorative Dentistry. I state exclusive because the membership was limited to 100 outstanding prosthodontists in the United States. The number was fixed. To join this academy a candidate who wished to join had to wait until the demise of one of the members. Their annual meetings were held during the Chicago mid-winter meeting in February. At the meeting I demonstrated how posterior teeth with areas of rarefaction due to trauma of crown preparations can be salvaged by root canal therapy. The members were particularly impressed because the cases that were shown were from Dr. Granger's practice.

Many members of this exclusive club were influential in dental politics in their regions. They gave credence to root canal therapy by demanding this type of therapy from dentists in their regions. In areas where no root canal therapy was practiced, patients were referred to me from distant areas, such as Texas, California and other far away states. Endodontic therapy to the prosthodontist is and has become very essential. It means success or failure of an expensive treatment plan, and a stake in their reputation. It was the prosthodontist who helped promote

endodontics. We, as endodontists are aware that most of the endodontics performed today is to salvage or prevent future prosthodontic complications and not due to carious exposure as it was in the 20's and 30's.

The practice of "today" is to reevaluate the past as to whether the concepts or certain procedures need to be modified or eliminated. For that you need people who dare to dream the future for good or for evil. It is people who make history in all fields of endeavor. For good, among the people of the past who had an impact on western civilization were: Moses, Jesus Christ, Sir Isaac Newton, Albert Einstein, Johann Sebastian Bach, to name a few. On the other side of the equation for evil we have: the Pharaohs of Egypt, Attila the Hun, the Czars of Russia and Hitler of Germany. Moreover, history is written by the victorious or those in power during their "today" or their "present"; quite often not objectively. The future corrects the bigotry or non-objectivity. The same holds true for endodontics.

The endodontic endeavor had their own visionaries to dream the formation of the AAE with annual sessions that became our "think tanks" and subsequently the formation of the ABE and Endowment and Research Foundation. Let me relate to you under what conditions the dreamers of endodontics met in Chicago in 1943. At this point, allow me to make an historical correction concerning the first meeting as recorded by our historian Vince Milas. He admits in his introduction, "*A History 1943-1968*," he may have overlooked events and persons and to excuse his oversight. I'll excuse his oversight posthumously. At the first founders meeting for the purpose of organizing a society for the study of root canal therapy he forgot to include two names: Drs. Louis I. Grossman and I. B. Bender. I mention this for historical correctness and self-satisfaction to have an identification with a great event in endodontic history. The

correct number was 21 dentists not 19, as founder members. It should be pointed out that not all charter members were founders but all founder members are charter members. Having made that correction, let me continue with this great adventure.

Let me relate to you the circumstances under which these 21 undaunted dentists met on a very cold day in Chicago in February 1943. The country was in the midst of the second world war. It was difficult to secure train reservations. Air travel was impossible because of priorities. Hotel reservations in Chicago were next to impossible to obtain. The biggest hotel, "Stevens," was taken over by the military to train the recruits in the big ballrooms. Every thing was rationed. Besides, medicine and dentistry were in the throes of the "focal infection" concept; 50 percent of our population over 50 years wore dentures. The greatest cause of rejection for military service was the dental condition of our young men.

Going home from the organizing meeting, many thoughts crossed my mind about the attendees. Are they rational to hold a meeting in the midst of a devastating war to think about teeth? What I gained from the meeting mainly was that I was able to put a face on the names of Drs. Ed Coolidge, Harry Johnston and Clyde Davis of whom I heard. With the others, there was an exchange of ideas different from what was taught and believed in my part of the country, hearing the same anecdotal evidence rigidly mummified over time.

After the consummation of the organization, the annual sessions were exciting. It attracted dentists from all of the United States and Canada who had a strong interest in endodontics. Now the name endodontics was officially adopted. The membership numbers grew rapidly with a high zeal of interest to save teeth and to belie focal infection. More importantly, the members who attended manifested a wonderful "esprit de corps," a common interest to

defeat the enemy of truth in regards to endodontics. The counter-attack manifests itself when we examine the first official annual sessions program of the AAE in February 1944. Most of the program was concerned with bacteriologic and histopathologic evidence of repair following root canal therapy.

After that, the annual sessions programs became less exciting but the comraderie among the members became stronger. We didn't care what kind of programs were presented, we came to recharge our batteries of friendship with our colleagues who manifested a collective hunger for endodontic knowledge. The more enjoyable aspects of the meeting was the dinner arrangements after the Saturday program sessions. At that time we didn't have the gala Saturday night affairs that we have today. We had to find restaurants that could accommodate groups of 20 or 30 people on demand. It was noisy with enthusiasm. You couldn't hear yourself talk to the person sitting next to you. The din was so great you couldn't enjoy the meal. Most of us didn't bring our wives. Besides what is there to do in Chicago on a freezing, blistering, snowy day? There were no established programs for the wives, that came many years later. In those years there was a great gender gap in all professions, particularly in endodontics. My guesstimate or conjecture of the number of women members in our organization was maybe two or three. They attended the meetings sporadically.

The best and most enjoyable part of the early meetings were the "bull sessions" that we held in our private rooms at the hotel after dinner. These sessions would last to one or two o'clock in the morning. It was at these room sessions we discussed the essays that were presented at the formal meeting. Usually the discussors at the formal meetings were very civil and polite to the essayists. Seldom were the attendees critical of the issue presented or the

method and procedures that were used. Invariably the presentation came to an acceptable conclusion.

At our room meetings we did not concern ourselves with the personalities of the essayists. We were mainly concerned with the essay as to its structure and validity of the conclusions. The discussions were far from orderly and the language used is not fit to print. Notwithstanding the bestial critical analysis of the formal papers, there was a justification for the rejection by this group who did not follow the hierarchy, the self appointed authorities of endodontics. Most of the so-called investigations that were presented were anecdotal in nature, based on personal opinions held in the past without reevaluation at the present.

The "bull session" also gave vent to question the validity of our own technics and concepts. These annual sessions became our endodontic "think tanks" where we could explore our own bigotry or illiteracy in endodontics. It was like finding a lost family member who speaks your language with a similar accent. It was this annual experience that caused us to reevaluate our thinking and technics which we idolized in the past, when we returned home from Chicago. We soon learned by reevaluating the concept of the past, that when the canal is thoroughly cleansed and filled hermetically, the results were the same, irrespective of the technics used or what is taught in different schools. This basic concept or law still prevails today. We also learned by reevaluating the past teachings and practices that there were no differences in results whether the bacteriologic culture method was used or not.

The reevaluation of the past at our then "present" was to call into question the use of the bacteriologic technic prior to filling the root canal. This technic was taught in all the temples of endodontic learning. The word temple is used advisedly, to give it a religious dimension in



which beliefs are accepted but seldom challenged, and religions range from idolatry to monotheism. Many of us were raised on the idolatry of a bacteriologic culture concept and we became strong believers in the bacteriologic culture fad. Explanations for endodontic failures or pain following filling procedures were invariably ascribed to bacterial contamination; had you used bacteriologic culture control, the failure or pain would not have occurred. This was the prevailing explanation that was held by the bigots of science clothed in the robes of authority. A large majority of the profession did not subscribe to the bacteriologic culture procedure in their practice, notwithstanding the fact it was not an invasive procedure. The justifiable objection: it required at least one or more extra visits. Besides, all the supposedly clinical pain complications and swelling did not occur as forecast and as was taught (*see article, Cognitive Dissonance, Oral Surg 1965;20:505*). Both the pros and cons of the bacteriologic culture procedures presented no scientific evidence, it was an emotional foundry heated by anecdotal proof.

Scientific proof that a negative bacteriologic culture, prior to filling the root canal, did not enhance the endodontic success, was subsequently demonstrated by a serendipitous occurrence and by the element of time. A need of a clinical study using the bacteriologic culture started in my office around 1960. Allow me to give you an historical account of this study since it did have a great impact on present clinical practice and subsequent teachings.

Having been a strong advocate of the bacteriologic culture technic myself, I had a homemade incubator in my office. One day I noted that all my cultures for the last couple of weeks were negative for growth. This result differed from previous observations in which some positive cultures would be present. When I examined the incubator, I found the electric bulb

which supplied the heat was burned-out and the thermometer registered the room temperature. Furthermore, the patient's clinical complaints did not differ. This clinical result was in accord with the anecdotal results of many clinicians who did not support the culture concept.

Under the circumstances, a decision was made to reevaluate the bacteriologic culture technic. To begin with, the entire procedure as practiced was flawed especially in the cases in which antibiotics were used for root canal sterilization. We were able to demonstrate that failure to use antibiotic inhibitors in the culture media produced false negative cultures. In another study we demonstrated that a negative culture sample obtained one week became positive in 16.6% the following week prior to filling the canal. We therefore decided to take bacteriologic cultures just prior to filling the canal. Under the methods used in taking the routine cultures, it was assumed that when a culture was negative it remained negative until the time of filling. This assumption was proven wrong. These observations were discussed with Dr. Seltzer; a decision was made for an extensive study.

Since large numbers of cases were necessary to prove statistical significance, we pooled our office cases together (Seltzer, Bender and Turkenhopf). We did not want to use student cases. They proved to be unreliable, since many of the students added a few drops of phenol to the culture broth to assure a negative culture result, so that the required number of cases could be achieved before graduation. The results of our study were expressed in an editorial (JADA 1963;67:651) "*The First Fifty Years*," states, "the original articles reach into the past, examine old problems and offer new solutions. For example..... Another study meticulously done and classic in design, will change the thinking of many practitioners on the relative importance of some of the rules of acceptable endodontic treatment. Almost all dentists will

be startled by the following statement which appears in their article by Seltzer, Bender and Turkenkopf. The results of our study indicate definitely that a negative culture of the root canal is not necessary for repair..... This statement would have been branded as heresy even a few months ago, but the authors data bear it out....The investigators also show that overfilling of the root canal is much more conducive to failure than under filling or flush filling. These new concepts surely will have an impact on the practice of dentistry." Indeed it did.

The result of this study also had a great psychologic relief on the clinical endodontist. He was relieved of the guilt feeling because he was not using the culture technic that had been established by the endodontic hierarchy as a standard of care. Besides, we only tested for the presence of aerobes.

Time has proven us wrong. Certainly the work of Sundquist, Baumgartner and others have shown that the anaerobes are the dominant bacteria present in the root canal. Furthermore, all the initial claims of a high incidence of success because of aerobic bacteriologic culture control usage has proven to be unfounded over time. Bacteriologic culture testing was done only on aerobes. Although the presence of anaerobes in root canal cultures had been reported by Morse and Yates, the prevailing opinion, at that time, disregarded their findings; because it was felt that the anaerobes occur so infrequently.

The foregoing studies illustrate that one of the functions of the present is to constantly reevaluate the past and the present, and plan for the future. It is the future that gives direction for better instruction, more sophisticated tools and materials for our endodontic practice.

A reevaluation also was made on the site and date of our annual meeting which was held always in Chicago in February during the Chicago mid-winter meeting. Traveling to Chicago

in mid-winter was no easy task, especially for the members living on the eastern seaboard. They invariably arranged for two travel reservations: plane and train. Taking the train was no sure thing to arrive on time either. One year I arrived 18 hours late; the pipes on the train froze. I was on the program and I missed my presentation.

After a number of tempestuous business meetings, a Site Selection Committee was appointed which selected Miami Beach, Florida for the 1962 annual meeting. Since then we have been meeting in different cities which can accommodate our large membership. The date of the annual meeting was changed also to eliminate the hazards of winter travel.

At the same time a small sophisticated group of the membership began to challenge the quality of our annual scientific program. The programs were highly "inbred" consisting of AAE members whose concepts and technics were well known by the membership. Speakers outside the AAE membership were seldom invited since that would entail an expenditure for travel and honoraria. An AAE rule forbade compensation including travel expense to any member participating in the annual scientific programs. One can imagine how limited the qualities of the scientific programs were. Program chairmen for the entire annual sessions were allocated the penurious amounts of 150-300 dollars which also included printing the programs.

To meet the financial needs for a more sophisticated scientific program, a small group of AAE members with Dr. Samuel Seltzer as chairman, introduced an educational program one day before our annual meeting in 1961. The topic was, "Biology of the Dental Pulp." Papers were presented on the cells, fibers and the ground substance of the pulp by Drs. Avery, Stanley, Krekas, Provenza, Ingle and Bender. The event raised \$3000 and became the genesis of our one day education programs, held one day prior to our annual sessions.

The present, extensive research section of our annual sessions was a result of reevaluating the scientific program. The addition of the research section to our annual meeting was initiated by Dr. Samuel Seltzer and me in 1962 at the Fountainbleau Hotel. The first meeting of this founders group which included Drs. Samuel Seltzer, Mel Goldman, Richard Moodnik, Sam Turkenkopf, Julie Fox, Cal Torneck, Irv Naidorf, Walter Soltanoff and I. B. Bender, met one day before the annual session at the Shoreham Hotel, Washington, D.C. in 1964. Within two or three years this research group had 150 members of the AAE organization who attended the unofficial research meeting one day before the official meeting. Some members just attended the one day research meeting which proved to be more interesting and exciting than the regular program.

Numerous proposals for inclusion of the research program into the official program were made to the parent organization's executive committee. These requests were denied due to time constraints. Finally, when they realized that a large number of members arrived one to two days before the regular meeting to attend the research session, the committee adopted the research aspect of the program by adding two extra days to our annual session.

Another progressive development of our AAE organization was the Research and Education Foundation, formerly known as the Endowment and Memorial Foundation. This was created by Dr. Jake Freedland, a pioneer member, whose driving force has helped also to establish the American Board of Endodontics.

As to my thoughts concerning the future, the greatest challenge is education of our students. They are the breeding ground of the future. What is needed are better trained teachers, more with Ph.D. training. In today's competitive global society there is the

realization that the scientist and the clinician are interdependent. No longer is the basic scientist ensconced in the "ivory tower." Today, he takes the clinical problem into the laboratory to get answers from mice and monkeys.

What also is needed is a better structured curriculum with understanding of the pathogenesis of disease. This widens the path of technologic break-through for better clinical treatments and for a better comprehension of disease mechanisms.

I would like to cite an example to illustrate the importance and the result of correlating basic science and clinical practice. The brilliant discovery of DNA by Watson and Crick has moved swiftly from the test tube in the laboratory, to the industrial giant of genetic engineering; ultimately into the battlefield of clinical application.

It is the advanced trained individual of today who will give us the tools for better endodontics tomorrow. We can see this realization from the contributions that have had an impact on endodontics today, by people such as Van Hassel, Kim, Stashenko, Pashley, Trowbridge, Hargreaves, Baumgartner and Byers. I want to personally pay tribute to their provocative contributions, and my gratitude to those who are participating in this present conference. At the present, the endodontic microscope is having an impact on today's endodontic practice similar to what the x-ray had in the 1920's. Then too, the cost was the prime objection.

The future of endodontics in the next 7-10 years will be in surgical microscopy and sophisticated computer gadgetry, such as digital imaging; whereby 80 percent less x-ray radiation is needed to assess periapical lesions, and without the need of developing solutions. Endodontics will need students trained in computerology and biophysical sciences.

The implementation of extended research and teaching is a means by which endodontics will be able to meet the future demands for its service. Service itself in a specialty cannot make progress.

I realize to direct these advanced scholars towards endodontics, financial inducements will have to be made in the form of Master's or Ph.D. scholarships. These can be aided by the Research and Endowment Fund, dental corporates and by what is being done at the University of Pennsylvania School of Dental Medicine, The I. B. Bender Research Laboratory. Corporations can help establish chairs in endodontics or other contributions to support the development of endodontic education.

Other developments in our discipline will come from people who can touch tomorrow.