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- Stimulating more thorough and comprehensive research in dental history, thereby extending the boundaries of dental knowledge, giving substantial support to growing professional culture.
- Increasing interest among dentists in dental history.
- Encouraging both the development of historical collections on dentistry, and the offering of adequate instruction in dental history.
- Stimulating professional discussion of the facts of dental history as an aid in solving problems in dental education and practice.
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Prevalence of Dental Caries and Tooth Wear in a Byzantine Pediatric Population

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Dental caries and wear are important conditions to record in archaeological collections, as they can provide invaluable information regarding a culture and its people. The aim of this investigation was to determine the frequency and distribution of dental caries and dental wear in a medieval Byzantine pediatric population in Yenikapi, Constantinople, Istanbul. The research was carried out on the skeletal remains of one infant and 28 children with a total of 180 teeth. Based on the findings of low dental wear and low dental caries, there is reason to characterize the site as a fishing community.

Dental caries is caused by the demineralization of dental tissues by organic acids released during the breakdown of carbohydrates by bacteria under genetic control. Caries frequency is affected by cultural factors such as dietary habits, nutrients and food production techniques. Ollson and Sagne\(^1\) and Hillson\(^2\) recently stated that “the frequency and distribution of dental caries in ancient populations enables us to follow their economic, social, and cultural progress through different historic eras.” Therefore, the diagnosis and evaluation of archaeological dental tissue, along with other evidence regarding past lifestyles, would enable us to determine what they consumed and how they lived.\(^3\)

Yenikapi is a Byzantine architectural archaeological complex that was found during the Istanbul Marmaray metro project, which began in
2004. Yenikapi is located on the southern shores of the Marmara Sea, inside the historical peninsula, and corresponds with the largest harbor of the Byzantine capital Constantinople. The Yenikapi precinct, the former harbor of the Byzantine capital known as the harbor of Eleutherius or Theodosius was determined to be one of the transfer points for two different lines of the Marmaray and the Metro subway construction projects. In this way, the largest archaeological project in the history of Istanbul started in an area of 59,000 m² that comprises a partial section of the largest harbor of the Byzantine capital.

Excavations, according to Turkish legislation, were supposed to be conducted under the authority of the local archaeological museum, the Istanbul Archaeological Museums. The skeletal remains, which were found from the Istanbul Yenikapi Metro and Marmaray excavation in March 2004, were recently brought to Istanbul University, Forensic Medicine Institute. In the Institute the skeletal remains were matched and were anatomically reconstructed, after which the age, sex, stature and skeletal pathology of skeletal remains were determined.

The Yenikapi site was established between 5000-6000 BC. The present site holds the major port of Byzantine Empire, Port Theodosius, which connected Constantinople with the rest of empire. According to Magdalino, the area was established by Theodosius I (379–395 BC) and later revived from the fifth century to the eleventh century AD. Located on the southern shore of Constantinople facing the Sea of Marmara, where the harbor of Julian was situated, the area had been a desirable precinct for aristocratic houses. In the early period, the district was relatively less populated than the northwestern side of the city by monastic/religious complexes and mercantile installations, which were reserved for the sea trade long after the displacement of the limeburners. Yenikapi consisted of a major forum, the mint, the harbor of Theodosius, 11 streets, 363 houses, 3 great porticoes, 5 private baths, 5 private bakeries, small shops, mitata (special lodging houses for merchants), warehouses and fora.

Many skeletal remains; Byzantine buildings, including Theodosius Harbor and a church complex; over 30 shipwrecks; and thousands of archeological artifacts have been excavated in Yenikapi. The skeletal remains identified also include an important pediatric population dating to the 7th-10th century AD. In the literature, there is limited data regarding the dental health of ancient Byzantine populations. To our knowledge, there have been no recent studies regarding dentistry referring only to ancient pediatric populations. The aim of the present investigation is to determine the frequency and distribution of dental caries and dental wear in a medieval Byzantine pediatric population in Yenikapi.

Method of Study

The present study was carried out on the skeletal remains of one infant and 27 children excavated at 2004 from the archaeological site in downtown Yenikapi, Istanbul. The samples were stored and preserved in ISTYAM, Yıldız University, Istanbul. All available skulls were analysed, regardless of the level of damage. The state of preservation varied from completely preserved skulls with complete mandibles, to cases where only small fragments of the mandible were preserved.

Age classification was carried out according to the criteria of Watt et al. Samples were classified into following groups: 0-6 months (infant edentulous), 0.5-5 years (primary dentition), 6-12 years (mixed dentition). Tooth loss was classified as ante- or postmortem. Teeth were considered lost postmortem if there was clear evidence of an alveolar socket. Teeth were examined macroscopically under a bright light and carious lesions were determined with the help of a dental probe.

Evaluation of dental caries

Evaluation of dental caries was detected using the method of Caglar et al. A lesion was considered a carious if there was a clear defect in tooth tissue. Color changes of the enamel were not considered carious unless there was concomitant
cavitation. The number of carious lesions, as well as their location (fissure, occlusal, mesial, distal, buccal, and lingual) was noted. Caries frequencies and the frequencies of carious lesions on the various tooth surfaces were calculated, however the skeletal root index was not calculated.

**Evaluation of dental wear**

Dental wear was graded according to the Brabant index because it is straightforward and was used previously in a recent Byzantine archeological study.

**Results**

The analysed sample consisted of the skeletal remains of 28 children that had a total of 180 teeth (113 primary, 67 permanent teeth). The total frequency of antemortem tooth loss for the sample was 1%. Incisors were the teeth most frequently lost postmortem, while primary and permanent molars had the highest rate of preservation. Nearly 10% of the analysed children had one carious lesion. From 5 children in the 0.5-5 years age group, all were detected to be caries-free. In the 6-12 years age group, two individuals were observed to have 4 carious teeth (2 primary and 2 permanent molars).

Regarding primary dentition, primary incisors and canines were caries free (0%), while 7.1% of first primary molars, and 6.2% of second primary molars had caries. Analysis of permanent tooth type showed that central incisors, lateral incisors, canines, 1st premolars, 2nd premolars had no caries, while 1st molars had an 4.3% incidence of caries, and 2nd molars were as high as 50%. The total frequency of carious lesions in the sample was 2.2%.

There were only two mesial and two distal carious lesions in adjacent teeth. No fissure lingual, or buccal lesions were noted.

While none of permanent teeth had dental wear, only 6.6% of primary teeth exhibited dental wear. Only a few maxillary and mandibular primary molars exhibited the presence of dentin clusters or most dentin still covered appearances. Analysis by tooth type showed that central incisors, lateral incisors, canines, 1st premolars, 2nd premolars, 1st molars and 2nd molars had no dental wear.

**Discussion**

According to Vodanovic, “skeletal remains of the dental system are a source of information on food, illnesses, tools, social stratification within the community, rituals, as well as age at the time of death.” Literature indicates that the data obtained by the study of pathological changes in the dental systems of medieval populations serve as important resources for evaluating life conditions of archelogical polulations.

The pediatric population in Yenikapı were excavated from a church graveyard. It should be noted that living nearly 1200 years ago, in world’s most important capital, these children were the luckiest to survive, with the richest food and health supplies. However it is evident that pediatrics in that Byzantine era was not well organized. Byzantine physicians have recognized the main otolaryngological problems of childhood, comprising of acute otitis, acute tonsillitis, asthma and parotitis. There also is evidence of herbal, veterinary and chemical substances used in various forms for respiratory problems of childhood in the Byzantine medical treatises, from the 4th to the 15th c. AD. Archaeological, literary, and documentary evidence all attest to the high rate of infant and child mortality in Byzantium, which may have approached fifty percent by age five. At that time the average life expectancy in Byzantium was about thirty-five years. Although the almost universal practice of breast-feeding must have provided children with a relatively safe supply of milk and built up their antibodies and immunities, they were still prone to malnutrition and anemia, and many no doubt died from diarrheal diseases and infections.

Regarding dental health, there is limited information from Byzantine times. Brushing was probably not practiced during the 7th to 10th centuries. The present condition highlights the importance of diet. Solidity of food in the diet affected the localization of caries. In populations whose nutrition is based on solid food, which
extensively abrades teeth, higher frequencies of interproximal caries are recorded. Due to abrasion, the occlusal surface is worn out and smoothed and is no longer a predilection spot for caries development. Voda novi et al.\textsuperscript{12} considered that there is reduced contribution of interproximal caries in the total frequency of caries in modern populations.

Increase in the number of caries is related to an increase in carbohydrate consumption and changes in the cooking and preparation of food. Also, caries frequency depends on the economy of the society.\textsuperscript{25} Low caries frequencies are found in fishing, hunting and gathering communities (0.0—5.3%), while high caries frequencies are recorded in agricultural communities (2.3—26.5%). Intermediate frequencies (0.44—10.3%) are recorded in mixed communities that lived from hunting as well as agriculture. The present finding of 2.2% caries frequency in our pediatric population supports the hypothesis of the fishing society. Regarding the latter statement, the reader should focus on the diet in Byzantium, particularly in a marine society near a harbor. Kislinger noted that cooking was expensive in Byzantium because of the price of wood. The public never consumed hot food at home, finding it cheaper to eat prepared food in taverns where hot meals were served. The recent literature\textsuperscript{4,26-27} notes that the fertile lowlands and river valleys of western Asia Minor and coasts of the Marmara sea may have made it possible for Byzantine people to consume a greater variety of foods than many other societies in these times.\textsuperscript{4} Additionally in Yenikapi, malt drinks and wine in amphoras, and cherries in baskets, were found in a ship wreck coded “YK12” from the 9th century AD.\textsuperscript{28} Fruits and wine were vital for Byzantine children, as fresh water was limited.\textsuperscript{4} It was also documented that today the region’s food is simple, with good quality wine and a variety of fresh fish.\textsuperscript{11}

Recently there have been European populations from the late middle ages analyzed by many investigators, such as Bijelo Brdo,\textsuperscript{12} Stenjevec,\textsuperscript{21} Dakavo,\textsuperscript{21} Delekovci,\textsuperscript{21} Scitarjevo,\textsuperscript{21} Vinkovci\textsuperscript{21} from Croatia, Clopton\textsuperscript{29} from England, La-Selvicciola\textsuperscript{30} from Italy, Aberdeen,\textsuperscript{22} Linlithgow,\textsuperscript{31} Kirkhill\textsuperscript{23} and Whithorn\textsuperscript{6} from Scotland, and Eski Cezaevi\textsuperscript{32} and Iznik\textsuperscript{33} from Turkey. However these populations generally consisted of adult skeletons, and it is difficult to compare present data on the populations of children with these data.

Tooth wear was not prominent in our samples. Low wear in the present archeological population can be attributed to the lack of age-related effects of attrition, and the non-abrasive diet of a fishing society.

According to Caglar et al.\textsuperscript{4}, it is suitable to use the term “dental wear” instead of erosion or attrition. To evaluate erosion and attrition, live biological information and clinical examination of the teeth are necessary. In an archaeological population, a key element, evaluation of the diet, is missing. In the present study, whereas the sample is a pediatric one, it is yet more complex. Generally, erosion can be distinguished from wedge-shaped defects that are located at or apical to the enamel-cementum junction. The coronal part of wedge-shaped defects ideally have a sharp margin and cuts at right angles into the enamel surface, whereas the apical part bottoms out to the root surface. The depth of the defect clearly exceeds its width. Further progression of occlusal erosion leads to a rounding of the cusps, grooves on the cusps and incisal edges, and restorations rising above the level of the adjacent tooth surfaces. Much more difficult is the distinction between occlusal erosion and abrasion/demastication, which sometimes are of similar shape. Significant occlusal tooth wear from mastication can occur either in the presence of high amounts of abrasives in the food bolus, or in the case of acid-softening of enamel and dentin.

A recent archaeological study\textsuperscript{4} examined four 13th-century Byzantine children of 6-12 years with dental wear of 100%; the archaeological population studied here, of same age cohort, shows no dental wear. This might be due to the different nature of the society, including consumption of a soft diet. To our knowledge, the present study is the first to evaluate both dental caries and dental wear in a medieval pediatric population.
References


The history of fluoridation in the United States provides a convenient case study of the intersection of scientific authority and its social and political counterparts. Between 1952 and 1970, proposals to fluoridate community water supplies were a magnet to social scientists, whose attraction to conflict analysis meant a focus on investigating the issues involving referenda. Waves of investigations attempted to link demographic findings to behavioral and social theories. In doing so, US researchers largely ignored the negative aspects of the history of fluoride, the phenomenon of fluoride acceptance and post-World War II North American concerns about chemicals in food. However, social scientists provided aggregate data on the social characteristics of those who voted for and against fluoridation and enunciated a critical influence on decision-outcome: centralized authority.
Introduction

By 1970, adjusting fluoride concentrations in public water supplies (hereafter fluoridation) was a broadly endorsed but widely under-utilized public health measure. In the United States (US), a nation of comparatively widespread adoption, fluoridation proposals were often controversial. Given the enduring presence and cost of the caries epidemic and the widespread consumption of near-optimally fluoridated groundwater, reluctance to implement fluoridation was a curious phenomenon that attracted US-based social and political scientists’ attention throughout the 1950s and 1960s. This review analyses their multidisciplinary and poorly-integrated findings in relation to influences on public opinion and decision-outcome.

Background

In 1951, during the transnational Hearings of the US House of Representatives Select Committee to Investigate the Use of Chemicals in Foods and Cosmetics (hereafter the Delaney Hearings), emerging evidence from field trials at Grand Rapids, Michigan, allowed the United States Public Health Service (USPHS) to endorse fluoridation.1 While USPHS-backed researchers Trendley Dean and Francis McClure understood the differences between fluoride therapy and toxicity, mostly negative experiences with this halide were widely recorded. The US mottling experience, extensive Scandinavian research, and other international reports about fluoride entering the food chain meant that scientific views about fluoride and fluoridation had polarized opinion and carried political consequences.

Community exchanges regarding the implementation of fluoridation were extensive and attracted academic interest after 1950. While health authorities generally saw fluoridation as the harmless adjustment of an omnipresent halide to an optimal concentration in drinking water, social and political scientists adopted a different perspective. They not only scrutinized human behavior and public opinion but also expanded the horizons of investigation to include social order and the exercise of power. These were the contemporaneous scientific and socio-political backdrops to community debates in North America.

General Features of the Sociological Analyses

The pre-1970 behavioral investigations are amenable to generalizations. One striking feature is their intermittency. Streams of inquiry came in waves. North American social scientists, psychologists and anthropologists dominated the pre-1970 epoch: “almost an historical era for social scientists.”2 Researchers from Harvard University led these investigations and their diverse analyses generally appeared in journals of social research. These examinations emerged in overlapping streams, which involved individual and community demographic profiles, social movements and community decision-making. Analyses of community structure and the exercise of power continued well into the 1970s.3,4 However, by the end of that decade, sociologists’ interest in the fluoride controversy had waned.5

Another notable attribute of the literature is the absence of health professionals among investigators. Studies were mostly independent of dentists, focused on referenda regarding fluoridation and used attitudinal surveys to gather data. Many such inquiries exposed local variables and findings that researchers could not authoritatively extrapolate to other municipalities. By 1969, several studies had evolved into multidisciplinary team efforts with an institutional approach that considered the role of centralized municipal authority and cases that did not come to referenda. Moreover, comparatively few researchers analyzed the political interactions between local, state and federal authorities. This state of affairs reflected not only the inexperience of behavioral and social scientists in fluoride research but also the practical difficulties for political scientists in exploring fluoride politics across three tiers of government.
Research Problems

Problems in research methodology soon emerged. While highlighting the demographic composition of the community and the nature of the decision, investigators did not take into account either the interference with water as a variable in the outcome of a proposal to fluoridate, or any negative legacy from the US mottling experience. Furthermore, some social scientists accepted the official endorsements of fluoridation without analyzing the scientific evidence. While assumptions underpin their research, it should be emphasized that this was an era when, with regard to fluoridation, questioning complex scientific evidence was not the social scientists’ role.

Sociologists’ attraction to social controversy, together with their penchant to use fluoridation as a case study to analyze conflict, meant that their investigations had inherent shortfalls. The social norms, customs and communication that polarize public opinion have a complex and variable interface. For example, controversy is a late development in the evolution of public opinion. Social scientists’ focus on campaigns, controversy and referenda raised further questions. What effect did the calling of a referendum and campaigning have on public opinion? Which came first, the controversy or the referendum? In a non-campaign situation, fluoride advocates had an advantage in that initial personal perceptions regarding fluoridation were generally favorable. However, public opinion can change during a campaign. Because controversy and referenda influence public opinion, longitudinal studies would have been more beneficial to evaluate general trends, but few were conducted. Hence, when it came to fluoridation, social scientists did not study the formative stage of public opinion and initial individual responses but concentrated on the later controversial phase. In this sense, the social scientists arrived too late (during controversy) and left too early (immediately after controversy).

Social and behavioral scientists’ focus on referenda downplayed the significance of considerable evidence suggesting that many citizens either tolerated the decision to fluoridate or wanted fluoridation. For example, in a study of ninety-eight fluoridated communities, decisions were almost invariably made by executive action and community consultation with only “2 per cent of cases” needing to submit the decision to a referendum. This report dismisses opposition and stresses the tactical importance of dentists and other health professionals in implementing fluoridation proposals. Other reports confirm and even extend this strategic role to include public health officers and nurses. In a 1952 campaign that involved a legal challenge, fluoride advocates claimed to have educated the Baltimore community into accepting fluoridation. Before 1968, 2,893 US communities, including 57 with 100,000 or more people, adopted fluoridation by administrative action that did not involve a referendum. Likewise, natural fluoridation at or just below the optimal concentration was not a community concern. The failure of researchers to study the dissipation of controversy after implementation is another research shortfall. Hence, studies into either acceptance or tolerance of fluoridation were few.

Passive public acceptance of fluoridation generally declined after 1951. Key fluoride advocates cited the 1950 Stevens Point referendum as the genesis of US political opposition to fluoridation. The emergence of organized widespread opposition coincided with the end of the Delaney Hearings, which not only formalized opposition to fluoridation but also remained another poorly-researched variable in assessments of early 1950s community attitudes to fluoridation.

Geographical issues complicated investigations into campaigns and referenda. The USPHS-funded sociologists Robert Crain, Eli Katz and Donald Rosenthal perceived a distorted focus involving the controversy associated with the non-acceptance of fluoridation in the states of the Northeast and West rather than the acceptance in the Midwest. They acknowledged serious confounding variables like regional subcultural characteristics and the nature and role of administrative action and the political circumstances that produced the call for a referendum. Crain et al. also asserted that the demographic-focused stream of research ignored
both the decision-maker and the community power structure. Hence, when US behavioral and political scientists belatedly arrived to analyze fluoridation proposals from the early 1950s, they faced a plethora of interrelated variables involving demographic factors, controversy and the exercise of political power.

**Phase I: Observations and the Demographic Approaches**

The earliest accounts of community conflict involving fluoridation quickly drew a response. Sociological investigations began in 1953 with two observational papers, which describe similar traits among antifluoridationists. Cluett Professor of Religion at Williams College, John Hutchinson, published observations of a “Small-Town Fluoridation Fight” in *The Scientific Monthly*. Challengers expanded the fluoride-related arguments to include the role of science in a democracy, the exercise of power and the significance of the report from the Delaney Hearings. Hence, one collective inadequacy of the early demographic studies was a narrow focus involving the relationship of few variables on small cohorts.

Investigators adopted new horizons and expanded their scrutiny from individuals to the immediate community and then to multiple municipalities. Some researchers evaluated the first, while others examined the last two with Crain *et al.* also including community power analyses. These generally retrospective studies involved both subset or community cross-sectional observations and attitudinal surveys and, excluding inquiries involving Crain *et al.*, involved small sample sizes. Investigators again attempted to correlate variables such as age or level of education with attitude to or voting behaviour on proposals to fluoridate. However, the emerging relationships between demographic profile and fluoride-related attitude and behaviour lacked consensus.

The first widely cited report using demographic analysis was a survey of 397 potential voters in Massachusetts. The authors not only identified higher education and younger age as relevant to a predisposition to support for fluoridation but also acknowledged an unquantified well-educated group that was opposed to it. A second study came to a different conclusion: college education and that of less than eighth-grade were linked to strong support for fluoridation. Further studies confirmed, at best, complex associations between higher education, socio-economic status and fluoride predisposition. This lack of consensus meant that researchers soon looked to other factors.

Social scientists increased understanding of variables and the poor association between indices and outcomes meant a reassessment of the relevance of demographic lines of inquiry. For example, voting behavior on fluoridation appeared to be related to social class and political attitude but the latter influence was unclear. In more complex analyses, variables such as age, income and population growth were found to be linked to attitude to fluoridation. The many confounding factors and inconsistent findings led to increased questioning of the demographic inquiries. Hence, a solid relationship between demographic factors, attitudes to fluoridation and proposal outcome was not forthcoming.

The focus on referenda meant that campaign organization and strategies were seen as major determinants of outcomes. But again, confounding variables emerged and accord was absent. Some saw educational campaigns for fluoridation run under the banner of “the ‘true facts’ speak for themselves” as “self-defeating.” Others saw a natural advantage that generally rested with the side that did “not carry the burden of proof.” Another problem with the tactical emphasis was its failure to explain why politicians relied on community consultation or referendum. These differing interpretations triggered interest in expanded community analysis with comparative surveys of many municipalities. Two subsequent groups of investigations involved hundreds of communities. With respect to
proposal outcome, Peter Rossi, a sociologist at the University of Chicago, recognized that the generation of controversy is an exercise of power. He proposed a “conceptual scheme of political power structures” where the characteristics of communities influenced their power structure and decision-making. This reasoning was the precursor to the community structure analyses.

In summary, the demographic analyses had many limitations. Indices were few and fragile in terms of standardization, validity and reliability. While many variables and confounding factors emerged, findings established few of the anticipated correlations. There was little consensus regarding the relationship between demographic characteristics and attitudes towards fluoridation, so these investigations contributed little as to why communities implemented or rejected fluoridation. However, demography provided initial aggregate data on the social characteristics of those who voted for and against fluoridation. This evolved into another line of research.

**Phase II: Linkage with Behavioral and Political Concepts**

The contraction of demographic investigations ushered in a more complicated form of scrutiny, which arose from and gradually displaced its predecessor. Because this bracket of investigations, namely those linking behavior and beliefs to political concepts, focused on the “no” vote in referenda, it suffered from the aforementioned analytical problems associated with controversy. Nonetheless, it evolved into a diverse stream of inquiries that appear under many names: conceptual, psychological, social psychosocial, psychosomatic, psychosocial or social. Loosely speaking, these studies attempted to link behavioral or political theory to both attitudes on fluoridation and outcomes of proposals to fluoridate. Five themes emerged: naturalism; alienation; confusion; diffusion; and ideology. The first, which contributes to a powerful tactical argument, also permeated other arguments regarding fluoridation.

**The Naturalist Argument**

Since the early encounters, “fluoride is a poison” has been the catchphrase of those opposed to fluoridation. The survival of this slogan demonstrates not only its success as a tactic but also an emotional interpretation of the North American history and potential toxicity of fluoride. Antifluoridationists’ emphasis on the poison theme allowed them to ignore complex analyses of bioavailability, dosage and homeostasis. In contrast, fluoride advocates focused on these complex scientific issues and highlighted observations of the occurrence of fluoride in nature. These differences in emphasis manifest themselves even today in two lines of argument that involve the nature of fluoridation and the scientific explanations for it. This explains the enduring rhetoric over fluoride being either natural or poisonous.

The first sociological analysis of the natural or unnatural status of fluoride appeared in 1959, when Assistant Professor of Political Science at the University of Wisconsin, Morris Davis, proposed “a naturalist syndrome,” which contributed to opposition to fluoridation. According to Davis, naturalism was an ambivalent term with a descriptive form (natural meaning not artificial) and a normative form (natural meaning not perverse). Concerns about poison and purity and attempts to differentiate between the natural, the unnatural and the artificial were manifestations of this syndrome. These anxieties extended to conspiratorial explanation and fears about government and corporate authority. Davis cited a right-wing publication *The American Rally* as his primary resource. Among other improbable scenarios, this publication claimed that Washington poisoned the people with DDT sprays, chemical fertilizers and inoculations. As will be seen below, *The American Rally* contained elements of naturalist argument and evidence of alienation, which distinction Davis failed to acknowledge. Hence, Davis’ definition of naturalism was vague.

Another Harvard-based study linked ideology and antifluoride predisposition, particularly the relationship between naturalism
and the "poison argument." The author tightened definitions and argued that descriptive naturalism (natural meaning not artificial) lent itself to a symbolic expressive utterance, specifically “fluoride is a poison.” For some antifluoridationists, this claim was a tactic and not a core belief: “some individuals who employ the poison argument in public have only a cautious and qualified commitment to it in private.” While ill-defined and poorly-investigated relationships between naturalism and strategy appeared in the literature, no study demonstrated if naturalism influenced significant sections of the community or if such beliefs were widely held among those who voted against fluoridation. Hence, naturalism remained a vague concept and did not provide a stand-alone explanation for widespread opposition to fluoridation.

The lack of official interest in naturalism was understandable because it mirrored scientists’ post-1945 belief that the source of the bioavailable fluoride ion was irrelevant. USPHS researcher John Knutson confirmed this with his reflection on the 1945 Grand Rapids field trial: “we were merely replicating nature’s best.” Knutson and other dental researchers saw fluoridation as a synthesis of nature and science. Davis appreciated that the scientific view did not parallel social perceptions, and argued that fluoride advocates’ failure to emphasize fluoridation as natural was a major tactical blunder in the promotion of fluoridation.

Myths can endure in the community and can eventually become apparent reality. Vitamin manufacturers and naturopaths played major roles in fluoridation opposition and naturalism had a wide audience. While some fluoride advocates acknowledged “pseudo health believers” and “poisons,” personal links between a penchant for natural foods and political position on fluoridation were not investigated. Hence, while both sides used naturalism as a tactic, its implications for influencing public opinion and the outcome of a proposal to fluoridate attracted little investigation.

The Alienation Argument

Alienation, a widely used term to describe estrangement from political and social norms, has also been used as an explanation for antifluoridationists’ activity. Based on a principle that deprivation produces a distrust of authority, the alienation hypothesis enjoyed a post-1950 resurgence as “a predictable element of most sociological and many psychological theories of political behavior.” It is not surprising that subtle forms of alienation theory appear in the early behavioral analyses relating to fluoridation.

The role of alienation was not without its critics and increasing numbers of social scientists questioned its validity and relevance to an analysis of social movements. Outside the fluoride debates, attempts to define and measure specific forms of alienation met with limited success. Strong evidence suggests that alienation is not only a complex phenomenon that manifests itself in various ways but also a broad and expedient label that lends itself to a range of interpretations. When applied to fluoride politics, the alienation investigations fragmented into distinct streams of inquiry. Many argued that antifluoridationists’ lives lacked power or personal meaning. Others suggested the antifluoride position related to obscure fears of a threat from science. A third group saw a wider phenomenon: voters’ opposition to fluoridation was associated with mass protests by the powerless, leading to the defeat of referenda on many issues. The Assistant Chief, Division of Dental Public Health of the USPHS, Donald Galagan, perceived “individuals who have seized on the fluoridation controversy for personal notoriety, or for increased status or prestige.” The concept of “relative deprivation” under the guise of “economic…prestige…political deprivation… and rank disequilibrium” also emerged. Hence, alienation was a complex and imprecise explanation for behavior that engaged different personal values and produced different responses at the ballot box.

Several researchers modified the alienation hypothesis by selectively applying aspects of it as a
partial explanation for antifluoride activity. Arnold Green from the Harvard School of Public Health examined alienation and antifluoridation leaders’ attitudes to authority, poisoning and ideology. While he mentioned unfulfilled aspirations and argued that fluoride opposition was set in wider personal beliefs, he did not single out alienation as a factor in fluoride opposition. However, the inference is there. Despite alienation explanations being in vogue in the 1950s and 1960s, the evidence linking them to fluoridation attitudes and proposal outcome was always incomplete.

Within the confines of fluoride politics, researchers soon acknowledged that the results of many alienation studies had further limitations. Analyses of antifluoride literature, reviews of statements from high profile antifluoridationists and attitudinal surveys focused not only on a narrow spectrum of variables but also ignored other issues influencing the outcome of a proposal to fluoridate. The alienation studies were also limited in size and did not explain changes in opinion during electoral campaigns. For the latter reason, Crain et al. rejected alienation and its linkage to sociological theories that connected mass behavior and mass movements to the characteristics of the social structure and community integration. Assistant Professor of Political Science at the Massachusetts Institute of Technology, Harvey Sapolsky, concurred and not only questioned the extrapolation of leaders’ traits to communities but also rejected the proposition that major sections of the population rejected science. Ample evidence confirms positive community perceptions regarding both the role of science and scientists. It was apparent that antifluoride attitude involved more than opposition to scientific knowledge and benefit.

The alleged link between alienation and opposition to scientific knowledge raised vexatious questions such as what constituted anti-scientific attitudes and how these sentiments were linked to political behaviour? Post-1965 challenges to the alienation explanation became more aggressive. Very few empirical studies have been designed to investigate the ways in which alienation differentially conditions the political participation of different types of individuals. Furthermore, some fluoride advocates undoubtedly capitalized on alienation theories and portrayed their opponents as either marginalized or non-conformist “crackpots.” However, few antifluoridationist leaders matched these profiles and, in reality, alienation had a narrow application and many limitations. It also failed to explain why communities either implemented or rejected fluoridation. Hence, alienation as an explanation of opposition to fluoridation was inadequate. It also contributed little to understanding the decision to implement or reject fluoridation.

**The Confusion Argument**

During the debates over whether or not New York City should fluoridate its municipal water supply, public administrator Luther Gulick highlighted conflicting expert opinion and succinctly asked, “Who are we to believe?” While not applying his query to the circumstances surrounding referenda, Gulick unwittingly encapsulated a primitive version of the confusion argument. It stated that people generally vote “no” in referenda because they are confused. While one researcher implied confusion under the guise of a lack of information, the application of the confusion hypothesis to fluoridation first surfaced when Sapolsky argued that the key to rejection lay in referendum campaigns, which converted uncertainty to confusion. This led some voters to adopt what might be perceived the safest course, the rejection of fluoridation and maintenance of the *status quo*. Knutson accepted confusion: “confrontation dialogues increased confusion rather than understanding.” He added that opinion polls suggesting 70 percent support for fluoridation did not always produce a successful referendum result for fluoride advocates. Another finding seemingly suggests that a confusion factor is relevant to decision-outcome. Between 1959 and 1968, only 44 to 76 percent of surveyed US citizens understood the reason for fluoridating water. These findings, while identifying a potential role for confusion, did not link this explanation with either community apathy or official rejection of this public health measure.
As with the explanations involving alienation and naturalism, the confusion argument encounters problems of definition and method. Confusion also implicates apathy, acceptance of misinformation, inadequate understanding of scientific and statistical method, lack of information and ignorance.\(^5\) Another study reports that educational campaigns for fluoridation led to a breakdown in communication, a “turn-off” by poorly informed and apathetic voters and a switch to the opposing view.\(^3\) These references to voters introduced another important consideration: the confusion hypothesis only becomes relevant when either a referendum is called or community consultation is involved.

Another problem with the confusion explanation is the influence of a referendum on the circumstances under investigation. A referendum means a voter forms and assumes responsibility for a decision, which government had neither made nor endorsed. Other factors such as the relative strength of the opposing sides, an ideological identification with the proposed change, voter turnout, the campaign and the general political agenda complicate the assessments of how people cast their vote in referenda.\(^2\) Those opposed to fluoridation also held communication advantages in that their arguments were simple and based on emotions and cultural ideas.\(^3\) These largely unexplored variables influenced the outcome. They also explained why the findings of public opinion polls, randomly conducted at times when controversy was absent, could not be extrapolated to either referenda circumstances or predictions of referenda outcomes.

The confusion argument presented investigators with a further difficulty. While it shifted interest back on to the participating voter it ignored the reasons for politicians placing voters in that position. In the 1960s, health officers estimated 50 percent of North American referenda were called because politicians were unsure of the community acceptance of fluoridation.\(^2\) Moreover, with regard to referenda outcomes, Crain et al. implicated the attitude of the elected officials, the role of the mayor, the degree of centralized municipal authority, the political vulnerability of key players, conjunctural referenda and the presence of a respectable and experienced proponent leader. Furthermore, voting was optional and voter turnout was often low. These variables received little investigation.

In brief, the confusion explanation needs appropriate political circumstances before it becomes an important factor in the proposal outcome. It thrives on perceived controversy and its application is limited to circumstances involving either referenda or community consultation. Confusion implicates other variables such as apathy, ignorance, emotions and communication strategies while ignoring various key factors, most notably executive decisions to implement fluoridation.

**The Diffusion of Innovation Argument**

Another explanation for personal opposition and administrative hesitance towards fluoridation is the diffusion of innovation hypothesis, which proposes that there is an innate human resistance to change. This reasoning appeared in 1940 when Edgar McVoy at the University of Minnesota investigated the spread of social inventions and perceived regional proximity to a radiating centre of creativity as a primary determinant in adopting innovation.\(^6\) When applied to the early implementation of fluoridation, the diffusion argument meant a cross-pressure or a state domino pattern of fluoridation acceptance or rejection as evidenced by geographic patterns of municipal rejection or adoption.

In the 1960s, researchers rejuvenated the diffusion of innovation hypothesis by examining either adoption or rejection of technology\(^6\) and information among health professionals.\(^6\) Support for the diffusion theory came from several sources. Georgia implemented 45 fluoridated water systems supplying more than a million people and 11 out of 11 referenda were successful for fluoride advocates.\(^6\) Secondly, Crain initially accepted the general diffusion principles of regional proximity and peer adoption but stipulated that large cities and cities with white-collar populations were the most
influential. Furthermore, Crain et al. observed that heavy US adopters of fluoridation were the states in the Midwest, and heavy resistors were states in the Northeast and West. These findings leant weight to the argument that implementation of fluoridation was a regional phenomenon.

Like other theories, diffusion as an explanation contained analytical problems. For example, in Georgia, the Branch of Dental Health of the Department of Public Health actively supported fluoridation with local epidemiological evidence that confirmed the effectiveness of the measure. In this regard, the diffusion explanation ignored the role of scientific authority, in the form of extensive local epidemiology and co-ordinated bureaucracy, which facilitated political acceptance of fluoridation. Crain et al. gradually adopted a less enthusiastic view of the diffusion hypothesis and raised confounding factors such as subcultures based on geography, the prevailing climate of opinion and the time factor relating to loss of innovative status.

The evidence supporting the diffusion hypothesis was always thin. General factors such as communicability, the complexity of the innovation and the visibility of benefit appeared to be relevant to outcome. In this regard, fluoridation involved many disciplines, was difficult to communicate, appeared complex and provided only a partial prevention for dental caries. Furthermore, by 1970, fluoridation was hardly a novel concept, yet rejection and apathy persisted. A further research difficulty for the diffusion argument was poor analysis of the communication system relating to how information about innovation was transferred. This may have been official or informal and may have advocated or opposed the implementation of fluoridation. Diffusion of information could either assist or impede fluoridation. There was little literature on the negative impact of diffusion, so the application of this reasoning to low fluoridation status remained speculative. Hence, the diffusion argument was another limited explanation in that it ignored the underlying rationale for the municipal implementation or rejection of fluoridation. It was not a stand-alone explanation and there was little evidence supporting its relevance.

The Ideological Argument

Many nations venerate individual liberty by enshrining it as a principle in their constitution. Conspiracy and compulsion also feature in antifluoridationists’ literature. This background attracted researchers’ attention to ill-defined ideological issues relating to personal liberty and choice. However, the sociological literature linking ideology and opposition to fluoridation is not convincing. Even though groups such as the John Birch Society and the Ku Klux Klan took up the antifluoride cause and emphasized liberty, the ideological stream of literature suffers from confusion in terminology. When social scientists referred to ideology in the fluoride debates, their explanations were broad and embraced other general beliefs.

Classical liberalism involves many variants of a theme and includes an emphasis on freedom, individualism, enterprise, choice and distrust of government. When applied to fluoride explanations, behavioral scientists included alienation and naturalism as ideologies and their use of the term “liberal” lacked definition. Surprisingly little was written about liberal ideology and opposition to fluoridation. This paucity of investigation almost certainly had varied origins. For fluoride advocates, fluoridation was a health and not a political issue. While profluoridationists played a pivotal role in advising government on public policy, they only reluctantly entered the fray of public politics.

Widespread community conflict often leads to litigation, so it is reasonable to suggest that judgments involving the national constitution and individual rights may be another source of information about ideology. Since 1952, many US challenges based on the rights of the individual have been unsuccessful and the state’s right to fluoridate has been widely endorsed. Hence, apart from confirming the role of centralized authority in implementing fluoridation, judgments incorporate legal interpretations and contribute little to the analysis of the role of ideology, especially liberalism, in explaining either acceptance or rejection of fluoridation.
Several studies of fluoridation litigation warrant mention if for no other reason than that they dominate the available literature. Green investigated 28 Massachusetts antifluoride leaders to see if ideology and the intensity of the objections were trigger factors in controversy. He also attempted to ascertain if fluoride opposition was embedded in wider beliefs. The findings suggested that “presumed violation of personal freedom” is the fundamental issue. However, while Green provided a symbolic link between alienation, fear of poisoning and perceived erosion of individual liberty, there are problems with his method. His definition and analysis of ideology were based on the poison theme, rather than issues of compulsion and freedom of choice. Furthermore, while Green established that some antifluoridationists use the poison theme as a tactic, even though they do not believe it, he did not quantify the tactical and ideological divisions. Green also concluded that antifluoride leaders display no uniform interest in health issues. This dilutes the significance of ideology in his study, because compulsion exists in the implementation of other public health measures. Furthermore, the study involved a small, local cohort of partisans and acknowledged that findings do not reflect the views of voters. Given the aforementioned caveats, Green’s treatise warrants cautious interpretation.

Investigations into the relationship between ideology and fluoridation were limited in number and scope. William Gamson, Research Associate in Social Psychology at Harvard University, interviewed 141 antifluoride voters after a 1959 referendum and found that safety concerns did not equate to anxieties about socialism. In spite of antifluoridationist leaders’ near unanimity in voicing ideological concerns about fluoridation, he rejected strong linkage between individual rights and ideological opposition to fluoridation. Gamson did not define ideology and revisited alienation by reverting to “helplessness and lower sense of political efficacy” as being relevant to antifluoridationists’ beliefs. Yet another Massachusetts study analyzed voting behavior at precincts in a 1953 Cambridge referendum. This investigation found that “the exact nature of the conservative-liberal dimension that is related to the fluoridation question is unclear.”

These sweeping definitions of ideology meant that the ideological analyses contributed little to meaningful explanation.

Another intriguing feature of the fluoridation literature is little, if any, investigation into the ideological beliefs of fluoride proponents. Moreover, within mainstream political science, ideological analysis is far more complicated than many of the aforementioned social scientists portrayed. This background, together with the investigative opportunities offered by social changes and conflict emerging in the US in the 1960s, explain the lack of behavioural scientists’ interest in ideological explanations relating to fluoridation.

In summary, the pre-1970 conceptual investigations of community debates regarding fluoridation represent five overlapping streams of inquiry. Like their demographic counterparts, they focus predominantly on controversy and referenda and largely ignore underlying monetary, legislative and political circumstances surrounding fluoridation decisions. Because of their incomplete and unsatisfactory nature, research boundaries changed and new explanations emerged.

**Phase III: Community Power Structure**

In the 1950s and early 1960s, analyses of societal conflict relating to school desegregation and urban renewal in the US led to community power structure hypotheses. These state that economic and political relationships in a community determine power bases and affect public policy. At the University of Michigan, Amos Hawley argued that concentrated community power produces collective and cohesive government action and leads to policy implementation. This thesis parallels some findings on proposal outcome relating to fluoridation, where researchers analyzed decision-making and concluded that if governmental structure allowed citizen participation in public policy, the consequence was more reliance on referenda. However, there are problems with this line of reasoning. Power is either held by elites or dispersed to many.
Because of investigators’ early focus on controversy and referenda, community power structure studies had an inauspicious beginning and lingered through the 1960s before appearing in fluoridation analyses. At Johns Hopkins University, Maurice Pinard evaluated fluoride referenda in 262 communities and proposed that “attachment of community members to power elites and the interconnectedness of members” affect the result. Variables such as community size, racial composition and growth rate were found to influence the referendum outcome and were key components of this attachment proposition. While Pinard continued with mass theory analyses, their application to fluoridation referenda attracted little attention until a 1969 review of community mechanisms in decisions on fluoridation. This review cites references about leaders’ overt and covert policies, which raised questions regarding both the observable and hidden use of power. The visibility of the exercise of power is another issue that soon permeated the community power structure arguments.

**Crain, Katz and Rosenthal**

One study, innovative in terms of size, geographic diversity and method, propelled community power structure inquiry into prominence. In the late 1960s, the USPHS instigated and funded research to obtain a census of fluoridation status, a description of local campaign tactics and an analysis of referendum results. These investigations focused on local government decision-making and included autonomous administrative implementations. Consequently, in 1969, Crain et al. published findings relating to fluoride decisions in 1,181 municipalities across North America. While problems with their statistical analyses were acknowledged, they argued that the magnitude and diversity of their examinations compensated for these inadequacies.

Apart from its size, Crain et al.’s study is extraordinary in that it includes non-controversial adoptions, provides a literature review, institutes statistical analyses of transnational data across 700 cities and does not make an a priori assumption that water fluoridation is always a wise decision. Unlike prior case studies, this investigation gave a systematic analysis of the political, bureaucratic, procedural and relevant structural variables. These include the length of the campaign and the roles of the mayor and inside and outside participants such as local public-health officers and newspaper publishers. Consequently, the study systemically explored many variables affecting outcomes and outlined minimal conditions for administrative adoption. Their findings refuted the alienation hypothesis in that many educated, middle class communities were shown to reject water fluoridation.

The real importance of Crain et al.’s findings is their identification of two core factors influencing fluoridation proposal outcomes: voter participation and centralization of authority in the municipality. However, their research avoided an important point: the relevant centralized authority can be located at national, state or local government level. Nevertheless, they presented the first detailed community power hypothesis for fluoride politics. It loosely asserts that local government configuration and decision-making systems facilitating greater citizen participation in the formulation of public policy tend to produce more fluoridation referenda and fewer fluoridation adoptions. Put simply, widespread public participation in the decision-process lessens the prospects for adoption. Of course, underpinning and complicating this hypothesis is the role of centralized municipal authority, which can either facilitate or obstruct the implementation of fluoridation. This context of few decision-makers, political will and relevant centralized authority are key factors in decision-outcome.

Crain et al.’s study is pivotal to analyses of outcomes of community debates regarding fluoridation because it portrays the exercise of power as visible and almost measurable. These are contentious propositions. In the early 1970s, when political scientists rejuvenated their interest in power analysis, at least one argued that the exercise of power is not always observable. Also questioned was the methodology of community power analyses. The concept of the hidden exercise of power...
underpins, albeit in a far less sophisticated fashion, antifluoridationists’ claims that the evolution and implementation of fluoridation involves conspiracy. The USPHS role in funding Crain et al.’s research and in researching and promoting fluoridation generated similar criticisms. Social scientists’ sympathy towards fluoridation and historian Donald McNeil’s contributions only fanned such claims. Hence, in spite of Crain et al.’s dominance in this stream of literature, these studies were not without critics. However, while the interest in fluoride-related conflict analysis waned during the 1970s, variants of the community power structure thesis left an important message for fluoride advocates: avoid a referendum.

**Encore**

The literature relating to community debates about fluoridation waned in the early 1970s but at Florida State University, Richard Smith not only persisted with the community power structure hypothesis but also extended its application. Smith argued that a municipal decision involves interactions between major variables involving centralized or dispersed community power, the nature of the policy and the characteristics of the community. Reporting on 47 communities in New York State, Smith revisited Pinard’s 1963 findings of “attachment of community members to power elites and the interconnectedness between members.” Again ignoring the national and state perspective, Smith used community complexity, social integration and centralization of authority as indices to evaluate the relationship between community structural characteristics and fluoridation outcome. Using data from “The Census of Population (1960),” Smith found that high readings in the above three indices appear to produce an environment most receptive to fluoridation acceptance. While these results endorsed Crain et al.’s findings on the significance of centralized municipal authority, the additional two indices complicated analysis. At least one researcher later labeled Smith’s findings as “tentative” and called for replication in further studies. It was not forthcoming.

**Conclusion**

This review interprets not only the strengths and shortfalls in the literature relating to behavioral reactions to fluoridation proposals but also the reasons why municipalities either adopt or reject this widely endorsed public health measure. While the number of publications on fluoridation is enormous, research into the community reaction to the transfer of this scientific knowledge to public health policy is surprisingly scarce. The rationale behind peoples’ beliefs and governments’ responses to community attitudes versus scientific evidence on fluoridation is also largely unidentified. From the outset, there were no pre-1970 studies into the sociological legacies from either the early USPHS investigations into dental fluorosis or the Delaney Hearings. The multidisciplinary nature of the scientific investigations and the polarized nature of fluoride politics undoubtedly contribute to the diverse sociological explanations for decision-outcomes. Nonetheless, while inquiry into the behavioral and political reasons for implementing or not implementing fluoridation is thin, available studies indicate that the outcome involves many scientific and social factors that have a dynamic and complex inter-relationship.
References


For well over a century, the Gates-Glidden bur (or drill, as some would have it), has been a mainstay in the armamentarium of the both the general dentist and the endodontist. The instrument has multiple uses, including the opening of the root canal orifice, shaping of the root canal in the coronal and middle thirds of the root, and initially even to the apical extent of the canal. This latter indication becomes more apparent with the evolution of the instrument, as will be discussed in this paper. Furthermore, dentists have also used this instrument to remove “putrescent pulps” (a commonly used term within the annals of history) and debris in the root canal system that may have been used to place medicaments, such as cotton fibers. Historically the instrument came in three sizes; six sizes are available today. However, the question often arises: Who was Gates? Who was Glidden? And how did this specific dental instrument become named after these two dentists who practiced in the late 1800s. Even after exhaustive searches, the answers are still elusive.

For over 125 years the use of the Gates-Glidden bur to open the root canal orifice and prepare the coronal portion of the canal has been the *modus operandi* for dentists and endodontists globally. Only recently with the development of orifice openers/shapers and tapered nickel-titanium rotary instruments has the use of the Gates-Glidden bur been somewhat curtailed. Historically, the questions posed are: Who was Gates? Who was Glidden? And how did this specific dental instrument become named after these two dentists who practiced in the late 1800s. Even after exhaustive searches, the answers are still elusive.

The pursuit of historical facts often leads to the challenge of “who did it first and when?” and it is no different with the case of the Gates-Glidden bur (or drill, as some would have it), has been a mainstay in the armamentarium of the both the general dentist and the endodontist. The instrument has multiple uses, including the opening of the root canal orifice, shaping of the root canal in the coronal and middle thirds of the root, and initially even to the apical extent of the canal. This latter indication becomes more apparent with the evolution of the instrument, as will be discussed in this paper. Furthermore, dentists have also used this instrument to remove “putrescent pulps” (a commonly used term within the annals of history) and debris in the root canal system that may have been used to place medicaments, such as cotton fibers. Historically the instrument came in three sizes; six sizes are available today. However, the question often arises: Who was Gates? Who was Glidden? And how and when did this instrument evolve within its structure and nomenclature?

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bur. However, care must always be exercised in this pursuit because more often than not “who did it first and when they did it” is not always “who recorded it first.” Therefore, historical pursuits will not always reveal the true secrets that remain secured in the impenetrable vaults of antiquity.

Following an exhaustive search within the annals of dental history, the actual identification of Dr. Gates and his development of the Gates bur is somewhat obscure. In the 1875 edition of *A Catalogue of Artificial Teeth, Dental Materials, Instruments, Tools, Furniture, Etc*, coming from Claudius Ash & Sons, London (Fig. 1), there is a mention of the “Nerve & Bur Drills” of Dr. Gates, however no description of the instruments is provided. When viewing the offerings in this catalogue, they are listed under the title of Dr. Palmer’s (Fig. 2). In actuality Dr. Palmer’s contribution appears to be the holder in which these burs can be placed, as it is indicated that these were steel handles (not pictured in this figure but in the catalogue). Going one step further, the listing of the Nerve and Bur Drills (Dr. Gates’) would have to be presumed to be Nos. 2-7 in the figure, if in actuality these drawing depict the burs in question. A quick look at these would create questions for the reader about the design relative to what is known later about the Gates instruments. However, the use of his burs seems to come to the forefront with the mention of Dr. Glidden in an essay by Dr. G.O. Howard of Galena, Illinois two years earlier in 1873. It is in this essay that Dr. Glidden is identified as being from St. Paul, MN. Dr. Glidden used his burs to the apical extent of the root canal to wipe the walls of the canal with creosote.

…where a fistulous opening exists, that after creosote, or its equivalent, has been forced through it, the root may be filled at the first sitting, and the abscess, in most cases, effectually cured… But where there is no such opening, even the filling of the canal with cotton dipped in creosote, and sealing with sandarac [a brittle faintly aromatic translucent resin obtained from a northern African tree (*Tetraclinis articulata*) of the cypress family and used chiefly in making varnish and as incense—Ed.], will often produce intolerable pain.

The gentlemen from St. Paul does not claim to cure abscess by his mode of treatment, but to produce a fistula by closing the root canals, and then let the abscess take care of itself. He would advise the younger members of the profession not to adopt this mode too rashly, as he would be fearful of the results; it was, at least, unsafe practice.

While advocating this technique, Dr. Glidden did not claim overwhelming success… “Dr. Glidden said it was possible that he may have had failures with this method, but they have not come under his observation”…he…”does not force the creosote through the apex, but simply wipes out [the canal] without pressure.” Here is where we get our first glimpse of the nature of Dr. Glidden’s burs and how they may simulate those of Dr. Gates… “His nerve-drills have four cutting grooves fashioned similar to Gates’s, and have guide-points of various lengths and sizes. In crooked roots these instruments are particularly useful (which would imply flexibility). Apparently, the Glidden burs were used to transform the root into “the barrel of
The Gates-Glidden Bur: the Search Continues…

a syringe with a smooth opening.” However, the Gates bur also served the same purpose and if those depicted in Figure 2 are truly the original Gates instruments, this would make sense; although some clinicians did not favor the use of this bur to create cylinder type of preparation as indicated by Dr. W.H. Webb of Lancaster, PA;

When you cannot reach the end of the root with a broach, it may oftentimes be accomplished with drills. Take the finest Gates drill and follow up the canal to the end and then enlarge with other sizes. He (Webb) does not think it well to drill as much as is done, and does not believe in cylinder-fillings.3

For the next few years, evidence for the use of these burs was incidental and anecdotal; even their source was not readily available in the until 1876 when advertising began to appear in the Dental Cosmos. However, in that same year, there appeared an advertisement in The Catalogue of Dental Instruments and Equipment (Fig. 3), which was a publication of the Samuel S. White Company (Fig. 4), and which highlighted a full range of dental supplies and supportive materials. Under the heading of “DRILLS” on the lower left-hand portion of the page (p. 86), the drills in question (the Gates and Gates-Glidden) are listed as “Flexible” Burs and Drills. Note the description of these tools in the legend provided in the advertisement. First, the flexibility is stressed; but second, there is a distinction between the bur-heads from Dr. Gates’ (Nos. 155-157 in Fig. 3) and the already-renamed Gates-Glidden burs (Nos. 158-160) in Fig. 3. When and how this conjoining and renaming came to be remains unknown at this juncture. Again in 1883, Dr. M. H. Webb, Lecturer on Operative Dentistry and Dental Histology at the University of Pennsylvania (Fig. 5), who was a strong advocate of these fine burs, recommended that they not be used to the end of the root canal; “It is sometimes necessary to take a fine drill and carefully enlarge the pulp-chamber, but it is better to fill to the end of the root without the drilling.”4 However, by the nature of the burs/drills depicted in his article, it is
most difficult to determine if they were Gates or Gates-Glidden burs. In that same year, Dr. Johathan Taft, Professor of Principles and Practice of Operative Dentistry at the University of Michigan, published his Practical Treatise on Operative Dentistry, in which he depicted two sets of burs/drills side by side.\(^5\) (Fig. 6) He referred to them as “flexible burs and drills,” however when viewing the burs on the left, the one on the far left appears to be an original Gates bur with the third one from the left appearing as a Gates-Glidden due to the guiding point, as advocated by Dr. Glidden (to be discussed later in Fig. 8).

In 1886 another advertisement appeared in the Dental Cosmos under DRILLS that highlighted the “Flexible Burs” but on the same page there appeared a picture of Brewer’s Drills, which very closely resembled the flexible burs. (Fig. 7) There was no mention of either the Gates or Gates-Glidden burs. However, on the very next page of the advertisements on the top of the page there appeared a large proffering of “Improved Gates-Glidden Nerve-Canal Drills.” (Fig. 8) Here two important issues are brought to light. One, there were four sizes, but more importantly we get an insight into the contribution to this instrument made by Dr. Glidden, which was discussed previously. This was

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**Fig. 5.** M. H. Webb in 1883.

**Fig. 6.** Flexible burs and drills as depicted by J. Taft in 1883.

**Fig. 7.** Advertisement from Dental Cosmos, Vol 28, 1886.
the Glidden guide-point, which did not cut the canal but served...

merely [to] guide the Drill into a canal no wider than itself, until it reaches the root-apex, through which only the sharp points will pass, and produce a sensation of pain that gives notice to its protrusion; yet, unless the foramen is wider than the base of the guide, the Gates Drill will not cut through the end of the root—a danger that the improved drill was specially designed to avoid.

Even in the description of the improved drill it is referred to as the Gates Drill, which makes the description somewhat ambiguous, since the Glidden tip is what makes it unique.

To this point, very little could be identified regarding Dr. Gates and his instruments. Because the Ash catalogue was the first to mention these instruments, could Dr. Gates have been from England? However, the most likely individual to focus on was Dr. W. H. Gates from Georgia who graduated from the Baltimore College of Dental Surgery in 1860. He moved to Philadelphia to practice and was inducted into the Odontographic Society of Pennsylvania in 1873. The dental literature, which at that time reported everything of interest about members of the profession, was replete about Dr. Gates’ litigation proceedings regarding vulcanite materials.

The use of the Gates bur/drill, however, was sparsely documented. Some instances of this use were evident in 1877:

First put on the dam, and with your engine cut back until you can get into each of the roots from the cavity; remove all decayed dentine, and wash out with syringe and solution of salicylic acid and alcohol, then, with a probe (I use a nerve broach with the barbs off), find the length and direction of the fangs, then take a Gates drill and drill them out to the apex as near as possible...

Again in 1879 and 1881:

The discolored dentine that extended some distance into the root was cut away; all foreign particles were removed, and the pulp-chamber was somewhat enlarged with a Gates drill to the apical foramen...

Many of the roots which present are those in which the pulps have been killed or have died. When you cannot reach the end of the root with a broach, it may oftentimes be accomplished with drills. Take the finest Gates drill and follow up the canal to the end and then enlarge with other sizes.

Finally in 1888 we are able to actually see a clearer comparison of the Gates’s Drills and the Gates-Glidden Drills. (Fig. 9, top) However, as a bonus we are also introduced to digitally operated (thumb-finger) nerve-canal drills, as suggested by Dr. W. W. Walker for use in “cleaning the anterior roots of lower molars and bicusps.” (Fig. 9, bottom). These instruments certainly appear to be based on the Gates-Glidden model. From this point forward the routine use of the Gates-Glidden drill was commonplace, and no more so than in a classic article written by a stalwart in dentistry at that time, Dr. Rodrigues Ottolengui in 1892 on the methods of filling teeth. However, a most unique finding was that Dr. G.V. Black did not even mention these instruments in the classic two-volume textbook, A Work on Operative Dentistry, published in 1908.
The instruments used in cleaning the canals are the barbed broach and the smooth broach with absorbent cotton; the same instruments as used in aseptic cases.

In 1889, Dr. Thomas Fillebrown, Professor of Operative Dentistry at the Dental School at Harvard University provided us with two very important pieces of information in A Textbook of Operative Dentistry, one that addressed the nature of the burs/drills in question and one that dealt with root canal preparation using the burs that set the stage for future guidelines of apical preparation. First, the burs that he depicted, while not specifically providing any designated nomenclature, could actually be seen to be Gates-Glidden burs due their apical design that displayed the guide point. (Fig. 10) Second, when using these burs he advocated the development of an apical stop or apical box short of the true foramen inside the root, a practice still advocated today in the teaching curricula in many countries around the world, in particular the Scandinavian countries. In this same year Auguste Maillefer (Fig. 11), a watchmaker who became a dentist at age 48, began producing dental instruments in his original location in Le Ruisseau, Ballaigues, Switzerland, with evidence that the Gates-Glidden bur was being produced by 1898. Prior evidence for the manufacturing of these instruments in the European sectors remains elusive.

If the foramen is found to be large, so that an instrument may pass through, measure the length of the root with a fine hook broach passed through the foramen, and drawn back until the hook catches on the end of the root. Mark this length from the surface on the instrument by a small bit of rubber dam through which the instrument was previously passed [use of a stop on the instrument]. Remove the broach, then, with a drill a little larger than the foramen, the length being marked in the same manner, but a little less than the first, enlarge the canal to this extent, thus leaving a square shoulder near the foramen.
While the use of the Gates-Glidden burs/drills gained wide acceptance in the late 1800s and through the last century to today, there was still concern on the part of many clinicians on their use in difficult canal anatomies and pulp canals with septic conditions. One in particular was Dr. John S. Marshall, Dental Surgeon in the US Army and President of the Army Examining Board for Dental Surgeons. In his textbook, *Principles and Practices of Operative Dentistry* he indicated;

Nearly every pulp-canal that will permit the passage of a broach or a Donaldson bristle is placed in better condition for cleansing and filling by being opened and enlarged with a reamer or Gates-Glidden drill for at least a part of its extent; but the dangers are so great, if the root is curved or very much flattened mesiodistally, of making an aperture through the side of the root, or near its apex, or of forcing septic material through the apical foramen, or breaking off the head of the drill and leaving it lodged in the canal, that these instruments should be used with the greatest caution. Breaking the drill while reaming the canal is much more liable to occur if the burring engine is used than when hand instruments are employed. Swiss jewellers’ broaches of spring temper are very valuable instruments for enlarging the pulp-canals and cleansing them of debris, and are much less liable to be broken and lodged in the canal than any other form of instrument. They cut much slower and do not clog so readily as the Gates-Glidden drill, and for these reasons, in small and constricted canals they are much the safest instruments to use. The breaking of an instrument in a pulp-canal is an exceedingly vexatious accident, as its removal often entails no inconsiderable amount of labor and the consumption of much valuable time.

While we can speculate that Dr. Gates and Dr. Glidden came to a meeting of the minds somewhere between 1873 and 1886 regarding the incorporation of the best attributes of each other’s instruments into one, the available literature is void of any documentation as to this occurrence. Likewise, combining the attributes may have been solely due to industrial insight and design. So the search remains for the elusive details that would enable us to have a better picture of the evolution of the Gates-Glidden bur/drill.

**Acknowledgement**

The authors are grateful to Mr. Beat Wicky (Dental Private Label and Medical Products Specialist, Dentsply Maillefer, Ballaigues, Switzerland) for his help in the investigation of information relative to this historical challenge.

**References**


In 1895, a poem appeared in the *Dental Items of Interest* from a patient that addressed “My Toothache.” Patients’ perspectives are always interesting regarding tooth pain, especially when they contain a degree of levity. —Ed.

Stepping, running, flying—on we go,  
Throbbing, beating, thumping—here we are.  
O the dreadful road to reach relief,  
When a jumping, thundering toothache comes.

Ah, what charming, calming lullaby,  
Is the very thought of pulling teeth!  
How the thought of those dread instruments  
Drives out all the dreadful sense of pain!

But elusive is the dreadful calm—  
That tremendous toothache comes again—  
Worse than ever is the raging pain;  
And we do again for ease and rest.

Now it comes! O fool; it does not come!  
Shiv‘ring toothache makes us cowards, all.  
Willing, then unwilling; yes, and no;  
Now take hold—no let go! Now, you may;

No, you shan’t. “Be gone you wretch,” he said.  
O my dreadful toothache crazes me!  
Now I come again—a jerk; ’tis out!—  
Quickly I am changed from fool to man.

—*Welch*

“*My Toothache*”
Advertising trade cards that feature goods and their prices are fascinating to collectors interested in the history of everyday commerce in the Victorian Era. These two cards are “stock” cards with pre-printed images on the front. They were selected by the merchants to attract customers to peruse the products and prices on the reverse of the card.

The E. & S. Hill Dry and Fancy Goods store in New York City offered Sozodont, Calder’s, Lyons, Thurston’s (tooth wash, we assume), Colgate’s Dental Powder, and Oriental Tooth Paste. In addition, Pike’s Toothache Drops and many patent medicines were in the store inventory.
The larger card shows both the “regular price” for the store’s products and the enticing “reduced price.” Unfortunately, the beginning of the store’s name was torn off when the card was removed from a collector’s scrapbook. Such damage is very common in Victorian trade cards. This store also carried Oriental Tooth Paste (J and B [jar and bottle?]), Sozodont, and Calder’s Dentine.

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During the past 20 years, the dental profession has become increasingly focused on cosmetic dentistry. As a result, dental procedures, including the use of bonding, porcelain veneers, dental crowns, teeth whitening treatments, orthodontics, dental implants, gingival sculpting and temporary “snap-on-teeth,” have been designed to enhance patients’ personal appearance and thus, their smiles. Some current dental advertising stresses that modern dental procedures can give patients “A Reason to Smile!” and that “The World Looks Better From Behind A Smile!”

This antique U.S. full color lithographic 1909 postcard carries the caption, “Do you remember those smiles we used to smile together?” The accompanying illustration shows two clown-like drinking buddies grinning at each other as they reminisce about old times. The scrawny fellow on the left wears a black top hat, a red tie and a green jacket. His whiskered lower chin suggests that he has been “on the town” for an extended period of time. His friend on the right wears a pink striped, long sleeve shirt, a dark blue tie and a light gray, floppy hat that is perched casually on the back of his head. Toasting each other, the two friends touch knuckles as they joyfully clink glasses. The toothy grins of these two comic characters are illustrated by their wide open mouths, wrinkled at the corners, and the furrowed skin adjacent to their eyes, maxilla and forehead. While the man on the left has momentarily closed his eyes in apparent pleasure, his partner’s eyes are fully open and bulging with intensity. Their abnormally large, mishaped teeth add further spice to their buffoon-like appearance. The figure on the left has no mandibular teeth, while his partner appears to have at least one remaining lower tooth. They are indeed an oafish pair.

This card, measuring 86 x 135 mm, was sent from Jackson, Michigan, and addressed in neat and flourishing handwriting to Miss Retta Hasbrouck, 509 West 135 Street, N.Y.C., New York. On the correspondence side, there is no message. It is postmarked June 24, 1909, and a one-cent postage stamp (Scott Catalog #A-138 Green, Franklin Regular Issue, 1908-09) is affixed above the address.
Dental Postcards LVII

Collected and analyzed by
Arden G. Christen, DDS, MSD, MA
Joan A. Christen, BGS, MS
Indiana University School of Dentistry
From the Archives: Vol. 5, Nos. 3 & 4

Volume V, No. 3  March 1957

BULLETIN OF THE HISTORY OF DENTISTRY

official monthly publication of
American Academy of the History of Dentistry

NAMES OF THE HARD TISSUES OF THE TEETH

The work of Purkyne in the field of dental histology, discussed in the February Bulletin brought up the discovery of cementum and the introduction by Cuvier of the name ciment. Early investigators apparently had some difficulty in finding a good descriptive term for this tissue. This difficulty was perhaps enhanced by the fact that they had already assigned the character of bone to the dentin. Blumenbach, the anatomist, called cementum substantia cornea (horny substance); F. Cuvier called it cortical substance, which R. Owen translated into cortex ossis; Fraenkel (1835) labelled it substantia osteidea. The least descriptive name was Blake's (1802) crusta petrosa (stony rind). Since Baron Georges Cuvier was familiar with cementum only on and in animal teeth, he probably chose the term cement (cement) because of the function of that tissue in joining the plates of compound teeth such as those of the elephant. The earliest use in English, according to the Oxford English Dictionary, is 1849, but it occurs much earlier.

Dentin, the tissue most recently to receive its present designation, was so named (dentine) by Richard Owen in his Odon- tography published 1840-1845. Previously, it had been designated by the English writers usually as tooth bone, and by the French as ivory.

Enamel in English, email in French and Schmelz in German were very old terms for that tissue. The Oxford English Dictionary gives 1718 as its earliest known use in English. Charles Allen, in his Curious Observations of the Teeth (1685), referred to enamel as "This natural Enamel which I call the gloss of the Tooth." Eighteenth century writers in French and German used the corresponding terms email and Schmelz. The name of the tissue in all three languages has reference to jeweler's enamel, which is a glass baked onto metal. The latest international congress on anatomy held in Paris in 1955 adopted the Latinized form enamellus as the official designation. Earlier (1895) it was designated in Latin as substantia adamantina.

Many of the dental terms and their changes reflect the contemporary state of knowledge concerning the entities designated.

Dr. Ira C. Brownlie of 2040 Clairmont Street, Denver, Colorado, a member of the A.A.H.D., died December 8, 1956.
MAIL ORDER DENTURES

Most dentists of the 18th and early 19th centuries were in the habit of making prostheses for patients who were unable to visit their offices. Before impressions were regularly taken in the latter 18th century, the dentist usually constructed the denture from measurements made directly in the patient's mouth, and he resorted to impressions in wax only when the patient could not be present. This device, which was considered only a make-shift procedure, later superseded the older method and then the dentist himself took the impression which in earlier times had been made by the patient.

Dr. J. Menzies Campbell has supplied an unpublished letter dated November 20, 1807 from William Wade, Master of Ceremonies at the Royal Pavilion, Brighton to Nicolas de Chemant, the earliest dentist to construct practical porcelain dentures.

Sir,

I have received a letter from my son, Lieutenant-Colonel Wade of His Majesty's 25th. Light Dragoons, dated Calcutta 27th. March last 1807.

My son has sent the enclosed patterns of drawings for his false teeth, which he desires you will execute in a masterly style and pack them up safe in cotton, and put them in a small box proper for the purpose; and send them to me here, directed for "William Wade, Esq., M.C., No. 2, New Street, Brighton" and send the bill of what they come to.

As the ships will sail very soon for Madras, where my son is gone, I desire you will lose no time to execute the order and send to me here. Keep the enclosed by you safe, that in case my son may have occasion for more, you will be able to execute them for him.

I am, Sir,
Your most obedient humble servant,
William Wade.

CONFERENCE OF HISTORY ORGANIZATIONS

Representatives of the national organizations interested in the history of health sciences will meet at an informal luncheon conference in New York City, May 3. The societies represented will be the American Association of the History of Medicine, the American Institute of the History of Pharmacy, the History of Science Society, the American Academy of the History of Dentistry, and the Section on Historical Pharmacy of the American Pharmaceutical Association. George Griffenhagen, secretary of the latter section, is host.
DEATH OF SIGERIST

E/ Henry E. Sigerist, the outstanding figure in the history of medical science since Sudhoff, died March 17 of this year. Author of many works on the health sciences, he had retired to Pura, Switzerland, to write his projected eight-volume history of medicine. The first volume, dealing with pre-history, ancient Egypt and Assyria had already been completed and published before his death. Sigerist's point of view in this volume signalized a new and more significant approach, since, instead of the biographical bibliographical sequence characteristic of former histories of medicine, it presents the whole medical milieu, including patient, physician, disease, and therapy. A second volume is ready for publication, but unfortunately the author was not permitted to live to complete his masterpiece.

SCHMELZ AND EMAIL

E/ The editor's attention has been called to the fact that in German a distinction is made between enamel, the tissue, which is Schmelz (Zahnenschmelz), and the jeweler's enamel, which is Email. Although Schmelz can be employed to designate jeweler's enamel, Email is never used to designate tooth enamel. The two words, however, seem to have a common origin, probably in Medieval Latin smaltum, with the meaning of smalt.

DENTISTS AND CUTLERS

E/ Clinica Odontotratrice (11:289-296 Dec. 31, 1956) publishes an article by Francesco Aulizio on the collection of extraction instruments at the V. Putti Foundation at Rome.

Among the instruments described and pictured is an elevator identical with one illustrated in Garrente's New Treatise of Most Useful Surgical Instruments, 1723. The identity of the instrument is shown by the “ace of clubs” mark impressed in the steel. All the instruments in Garrente’s book bear this mark and indicate collaboration between the author and a famous cutler of the time.

Early in the eighteenth century, the celebrated surgeon, Jean Louis Petit, gave a course of public demonstrations, repeated several years, at the Surgeons’ Amphitheatre (Amphitheatre des Chirurgiens) of Paris, in order to make students acquainted with the character, form, and requirements of surgical instruments, and perhaps even to instruct the cutlers by making his explanations so that “even the workmen derive profit for their good construction.” Relying heavily on this course for
information with regard to recent instruments and improvements, the surgeon, Garegeot, in 1723, published a work entitled New Treatise on the Most Useful Instruments of Surgery (Nouveau Traite des Instrumens de Chirurgie les Plus Utiles) in which the instruments used in all surgical operations of the time were presented with regard to their construction and use. Dental Instruments were included.

The purpose of the work was partly to be instructive to young surgeons and partly to be "very useful to cutlers." It was expected that the manufacturer should learn the best design and proportions of every instrument from this work. In order to carry out this plan, Garegeot enlisted the aid of a well known Parisian cutler, Guillaume Vigneron, Jr., who not only supplied him with the cutler's technical language for describing the parts of the instruments but furnished him with the instruments themselves, which were reproduced in the illustrations, marked with the sign of the maker, "the ace of clubs" on each instrument. Garegeot acknowledged that the credit due the cutler was similar to that received by the surgeon. "If surgeons who invent instruments more convenient and more perfect than those that preceded them," he wrote, "deserve the esteem of good and skilful people, then, likewise, the artists who know so well how to carry out their plans, have also a share in their glory and acquire a superior reputation in the profession."

BIBLIOGRAPHICAL NOTES

The following historical articles have appeared recently:


Mena Serra, Cesar. Comandante Largo Cordero Calvo. Protesis Clinica 18:3-4 Feb. 1957. (Biographical sketch of an early Cuban dentist and patriot.)


Book Shop

150 Years of the American Dental Association
Published by the American Dental Association
color, hardcover, 200 pages

For 15 generations, the American Dental Association has been recognized as the world’s largest and oldest national association within the profession. This new 200-page, full-color hardcover book explores the rich 150-year history of the ADA. The text and rare photographs offer a valuable resource for the dental historian and the dentist’s personal library. Additionally, it may offer an interesting read for patients in the reception room. Its 300 historical photographs, many of which are especially intriguing, were principally taken from the archives of the ADA.

The impressive Appendix lists every ADA annual session site, all former presidents, secretaries, executive directors and other notables of the organization.

$44.95 for ADA Members, $74.95 for non-members
Available from: www.adacatalog.org (item J105)
Or call (800) 947-4746

Tom Brown: Victorian Middlesbrough Dentist
by Dr. Anthony Brown

This biography combines “family, dental, social and local history” in telling the story of Tom Brown’s determination and ingenuity in achieving professional and economic success in the late 19th century. The inclusion of numerous images (photographed, developed and printed by Tom Brown himself), and annotations blended throughout provide additional insight into the subject’s social and cultural milieu. In addition, the author has been able to accurately describe dental practice during this period, with its emphasis on the so-called “mechanical dentistry” provided by dentists prior to the expansion and integration of the commercial dental laboratory system in the twentieth century.

£12.50 (plus overseas postage)
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fundraising@theteessidehospice.co.uk
A Guide to Bone Toothbrushes of the 19th and Early 20th Centuries

by Dr. Barbara E. Mattick

While this book’s primary audience is archeologists, the subject of toothbrushes is intimately connected to our profession. A valuable reference source has been provided to those with an interest in collecting bone toothbrushes, and for anyone with an interest in dental history. Dr. Mattick has assembled, in a useable and well-visualized monograph, essential information for identifying such material.

The basis of this book is derived from research for her master’s thesis in anthropology, which proved that “bone toothbrushes are excellent dating tools for historical archaeologists.”

$41.99
Available from: www.xlibris.com/bookstore
or by calling 1-888-795-4274 x7876

The Toothpick and its History

by Dr. Hans Sachs
Translated by Anna C. Souchuk, PhD
Published by Steven Potashnick, DDS
Soft cover, 51 pages, 86 illustrations

There have been a number of English language articles about the toothpick, J. Menzies Campbell’s 1952 paper (Campbell JM. Toothpicks and toothbrushes. Dent Items of Interest. 1952;74: 295-305.) is of particular note. However, Der Zahnstocher und Seine Geschichte eine kulturgeschichtlich-kunstgerbliche studie (The Toothpick and its History: A cultural-historical and arts and crafts study) remains the premier reference resource. We must congratulate Dr. Potashnick for the time, effort and cost in providing this English translation.

$35
Postage: $5 US, $14 Europe
Available from: Dr. Steven Potashnick
528-A West Barry Avenue
Chicago, IL 60657-5417
potash@rcn.com
ISBN 978-1456494179
A Sourcebook of Dental Medicine
Being a Documentary History of Dentistry and Stomatology from the Earliest Times to the Middle of the Twentieth Century.

by Gerald Shklar, DDS, MS
& David A. Chernin, DMD, MLS
864 pages, hardcover

The aim of this book is to make available to the profession of Dental Medicine and other interested parties the extensive literature of the past dealing with the diagnosis, description, causes, treatment and prevention of oral diseases. Drs. Shklar and Chernin are presenting the original texts concerning the diagnosis and management of oral diseases ranging from ancient Egypt through the world of the 20th Century.

Many of the basic texts of the past have already been translated into English, French and German from the original Sanskrit, Greek, Latin and Arabic. However, a number of important texts have never before been translated into English. The authors are presenting all these materials to the English-reading professionals in medicine and dental medicine in this 864-page reference book.

$90
Available from: Maro Publications
P.O. Box 145
Waban, MA 02468
www.maropub.com

Intriguing and Eccentric Characters
& Stories from the World of Dentistry
by Arden G. Christen, DDS, MSD, MA
& Joan A. Christen, BGS, MS

In this 230-page book, the authors have glimpsed into the lives of 32 dental characters: professionals who range from the noble to the bizarre. Introducing this work is a chapter on one of the most memorable and controversial characters of all time, Dr. Painless Parker (1872-1952). All of these fascinating individuals have left indelible marks on their chosen profession. The stories from this collection may be inspiring or infuriating, ingenious or absurd, credible or questionable—but seldom are they dull.

$20, postage paid.
Available from: Dr. Arden G. Christen
7112 Sylvan Ridge Road
Indianapolis, IN 46240-3541 (US check only)

Limericks With A Smile:
Dental, Oral and Facial Limericks of Yesterday and Today
by Joan A. Christen, BGS, MA
& Arden G. Christen, DDS, MSD, MA

The authors have compiled 188 previously-published limericks related to dental, oral and facial themes; plus they offer an additional 384 personally-composed limericks. The humorous verses in this collection are at once bawdy, whimsical, ludicrous and cynical, and though simple in format, they communicate in few words their strong, sometimes paradoxical message. 159 pages with complete index.

$20, postage paid.
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Indianapolis, IN 46240-3541 (US check only)

A Little Treatise on the Teeth:
The First Authoritative Book on Dentistry (1563)
by Bartholomaeus Eustachius
Edited by David A. Chernin, DMD, MLS
& Gerald Shklar, DDS, MS

This volume presents the first direct English translation from the original Latin Libellus De Dentibus, and maintains the Latin and English texts on facing pages. His conceptual advances concerning tooth development and function were further buttressed by detailed plates of the musculature of the face, floor of the mouth, the neck, the tongue, and the roots and crowns of the teeth. In addition to giving us the first clear description of the dental pulp and root canal, Eustachius also conceived of the periodontal membrane as a gomphosis. Eustachius’ observations are an illuminating precursor to 21st-century medical science, and still represent a timely and relevant reference for any practicing dentist.

$60
Available from: Maro Publications
P.O. Box 145
Waban, MA 02468
www.maropub.com
Flower of Remedies Against the Toothache
by M. Arnauld Gilles, Operator for the Aches of the Teeth

The first French text on dentistry and the diseases of the teeth. This work was published in 1621, more than 100 years before Pierre Fauchard's classic work *Le Chirurgien Dentiste*. Re-discovered by Dr. Jacques R. Foure, who translated the work into English, he has provided us with an insight into the clinical treatments that were available in early 17th century France. M. Arnauld Gilles was a Parisian dental practitioner who was fully recognized by the state licensing authorities as "Operator for the Ache in the Teeth."

The printing of the book has the left-hand pages as an exact facsimile of the original French text, with the English translation on the right facing page.

$25
Available from: Maro Publications
P.O. Box 145
Waban, MA 02468
www.maropub.com

Painless Parker: A Dental Renegade’s Fight to Make Advertising Ethical
By Arden G. Christen and Peter M. Pronych

Throughout his professional life, Painless Parker—a self-promoting dental crusader and patient advocate—sought to gain respectability from the profession of which he was a member. Instead, he was rejected by his colleagues because he used the unacceptable practice of advertising blatantly to the public. The ultraconservative Profession of Dentistry regarded Painless as an outlaw, a renegade, a fraud, a charlatan, a quack, a scoundrel, a thorn in the side, and above all else—unprofessional. However, Painless may have been years ahead of his time as he can be credited with pioneering many innovative practices now accepted by modern dentistry. He developed and perfected the concept of group dental practice. As he stated, “You (the dentist) have to be organized, systematized, capitalized, advertised, standardized and specialized.” This 491 page book tells Painless’ story as he wanted it told: from his perspective, using many of his own words.

$25, postage paid.
Available from: Dr. Arden G. Christen
7112 Sylvan Ridge Road
Indianapolis, IN 46240-3541 (US check only)

A History of Dentistry in the US Army to World War II
By John M. Hyson, Jr., Joseph W.A. Whitehorne & John T. Greenwood
890 pages hardcover

Dental health has been a core requirement for soldiers since the earliest military history. When the muzzle-loading rifle made strong teeth critical to the operation of weapons, dentistry as a profession did not yet exist to assure this element of soldier fitness. This book documents the reciprocal influence of the maturation of the dental profession, and establishment of Army dental care programs. The theme of symbiosis of civilian and Army dentistry defines this period of dentistry’s history, in this well-illustrated volume, written by three accomplished historians. The project took over ten years and was initiated and supported by the Office of the Chief of the U.S. Army Dental Corps, and sustained during the tenures of five of the men who occupied that position.

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