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- Increasing interest among dentists in dental history.
- Encouraging dental schools to develop historical collections on dentistry, and to offer adequate instruction in dental history.
- Developing a broader understanding of the facts of dental history among the leaders in dentistry in order to aid them in their attempts in solving important problems in dental education and practice.
- Stimulating more thorough and comprehensive research in dental history, thereby extending the boundaries of dental knowledge, giving substantial support to growing professional culture.
- Creating an authoritative body to which important questions relating to dental history could be referred for factual verification.

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Introduction

Before the 18th century, choice of denture materials did not present much of a problem due to the limited available options. Dentures were carved primarily from wood, bone, or ivory to the best possible ability. Since their introduction in dentistry in the 18th century, noble metals such as gold and platinum enjoyed supremacy in their use as denture bases. The century was marked by the introduction of natural and plastic materials for use as denture bases. Naturally occurring materials, especially vulcanite, enjoyed great popularity for over 100 years. This article makes an attempt to summarize the historical 19th-century denture base materials.

Introduction

Dentistry in the 19th century witnessed the development of a variety of denture base materials, the aim being to find a suitable substitute for the expensive and technique-sensitive noble metal denture bases. The century was marked by the introduction of natural and plastic materials for use as denture bases. Naturally occurring materials, especially vulcanite, enjoyed great popularity for over 100 years. This article makes an attempt to summarize the historical 19th-century denture base materials.

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Gold and Other Noble Metals

By the end of the 18th century, gold was the most extensively used material for denture base fabrication. It had eliminated ivory and bone completely, as it possessed great artistic properties, was strong and clean, and had thermal and electrical conductivity. Although many other denture base materials were constantly being developed, the popularity of gold was not much affected.

The use of gold to retain prostheses had started much earlier, in 16th century Europe. In 1561, Ambroise Paré had used gold and silver wires to retain a partial prosthesis by tying it to the natural teeth. The use of gold or silver springs for retaining upper and lower complete dentures (double dentures) was begun by Pierre Fauchard in the middle of the 18th century. Both Paré and Fauchard made palatal obturators of gold; however, it was Fauchard who had used these as base plates for upper dentures.1,2,3,4

About the middle of the 18th century, Etienne M. Bourdet, one of Fauchard’s followers, described and illustrated in his Recherches de Observations sur Toutes les Parties de l’Art du Dentiste of 1757, an artificial denture with a gold base, which was enameled to conceal its conspicuous color; the artificial ivory teeth were set in shallow sockets and fixed with small pins.2,5

James Gardette has been given credit for using gold as a base plate to attach artificial teeth for the first time in America.6,7 Gardette was at first a surgeon in the French navy, and later began his practice of dentistry in Philadelphia in 1784.7 He is credited with having invented in 1784 his so-called “Mortise Plate” of gold, with substitute natural teeth attached to it by gold rivets.8,9,10 However, some reports have given John Greenwood the credit of swaging the first gold plate in America.3,4,10

Both Gardette and Greenwood are known to have made artificial dentures for President George Washington. Of the several sets of dentures made by Greenwood for Washington, an upper complete denture made in 1795 had a swaged base plate of gold that covered the palate. Two blocks of ivory teeth were attached to the plate by screws. The upper and lower dentures were connected by gold springs.8

James Gardette also made an upper denture for Washington from blocks of “sea-horse” (walrus) ivory. However, the President rejected this denture.8

The introduction of plaster of Paris dental models in America in 1820 resulted in more accurate adaptation of the swaged gold plate.3 A negative impression of a positive plaster model of the mouth was made in fine foundry sand. Molten lead or other metals were then poured into the negative impression to obtain a positive model. This lead model was then used as a die to strike gold plates.5

The next step was to cast the die in zinc, and a counter-die to it in lead. The gold plate was then swaged between the die and its counter-die.5 Usually, 18- to 20-carat gold alloyed with silver was used for making bases, and the teeth were attached to them by riveting.11

The composition of a gold alloy and gold solder has been described in the literature. The gold alloy was made of gold (22 carat), 2 oz 1 dwt; pure silver, 2 dwt 12 gr; and copper (coin), 2 dwt. This gave a carat value of slightly over 19 carats. The alloy gave satisfactory results in milling, swaging, and durability and rigidity in wear-and-tear of mastication. An easy-flowing gold solder was alloyed using gold (22 carat), 1 dwt; pure silver, 8 gr; and copper (coin), 1 gr.12

The introduction of vulcanite as a denture base material initiated new experiments aimed at devising methods for the attachment of vulcanite to the metal bases.3 Patents were granted to G. Davies in 1862,13 D. Steinburg in 1864,14 E. Collins in 1864,15 and S.D. Engle in 186416 for the introduction of various methods that involved the attachment of vulcanite to metal bases (gold, silver, and platinum). Next to rubber, the combination of gold and vulcanite was the most popular method of denture base construction because of better adaptation to the mouth, avoidance of warpage of the plate, firm attachment of teeth, and easy repair.

The development of a method of casting aluminum plates for artificial dentures by J.B.
Bean of Baltimore resulted in various experiments being carried out for casting other metals. W.H. Atkinson in 1879 mentioned that experiments were carried out for casting gold plates to the teeth, and in 1881, a denture base being cast from the “Reese’s gold alloy” has been mentioned. However, the successful casting of gold denture base was possible only after the invention of a casting machine in 1907 by William H. Taggart.

Silver, one of the constituents of gold alloys, was also used for constructing base plates. Brass with copper was used for soldering silver plates, later replaced with pure silver and platinum solder. Silver plates were also used in combination with vulcanite; however, the plate needed to be protected from direct contact with rubber by means of a tin foil.

Gold and silver continued to be used as principal materials until 1851, when the vulcanite patent was obtained and it became the principal denture base material.

Platinum as a denture base material came into use with the invention of the “continuous-gum dentures.” Platinum-gold alloys, consisting of three-fourths gold and one-fourth platinum, were introduced in 1847. Platinum plate in combination with vulcanite was also used for denture construction.

The main limitations to the use of noble metals as denture base materials were their high cost and precise fabrication techniques.

The Development of Continuous Gum Dentures

The continuous-gum denture was conceived by M. Delabarre in France as early as 1819–1820; however, continuous-gum dentures involving a platinum base were first introduced in America by Dr. John Allen of New York in 1846. He employed a platinum base on which layers of porcelain were fused to form a continuous or unbroken surface covering the lingual, buccal, or labial portions and extending around the necks of the teeth and into the interdental spaces, giving a life-like appearance. Dr. Allen obtained a patent for these dentures in 1851, which covered the entire process of the continuous-gum denture fabrication.

It is interesting to note the outstanding features of each period in the development of the continuous-gum dentures, which started with the introduction of porcelain in dentistry. Pierre Fauchard first suggested the use of porcelain for artificial teeth and dentures in 1728. What prompted this suggestion was the introduction of porcelain-making in Europe by Father d’Entrecolle, a Jesuit priest.

The real beginning of the use of porcelain in dentistry was in 1774, when Alexis Duchateau, a French chemist dissatisfied with his own hippopotamus ivory denture, made an attempt to use porcelain for denture fabrication, with assistance from Guerhard, a porcelain manufacturer of Paris. Since Duchateau was not a dentist, his efforts failed, due to his inability to control porcelain shrinkage.

M. Nicholas Dubois de Chemant, a Parisian dentist, continued the experiments started by Duchateau, and in 1788, he successfully produced porcelain with much less shrinkage and better color. The denture base and teeth were built up from the same porcelain mix and were of the same color (a single block). de Chemant named his new dentures “indestructible teeth.” In 1789, de Chemant patented an improved version of the “mineral paste” porcelain teeth. Figure 1 shows a leaflet circulated by de Chemant in 1790, advertising his discovery.

The porcelain dentures of de Chemant were opposed by some because they were fragile and dangerous, as they easily chipped in the mouth. One of the most notable opponents was M. Magiollo, an Italian dentist of Nancy, southern France, who made dentures with gold bases and carved teeth (Manual de l’Art du Dentiste, 1807, 1809, passim, and Plates I and II).

An all-porcelain denture without a platinum base was originated and patented by Mahlon Loomis in 1854. The porcelain dentures were hailed for being impervious to moisture and almost practically self-cleansing, unlike dentures made of wood, bone, ivory, etc.
The introduction of individually-baked porcelain teeth in 1808 by an Italian dentist Giuseppangelo Fonzi, practicing in Paris, and the subsequent development of pink enamel made the next period an outstanding one in aesthetics. Fonzi’s porcelain teeth contained small platinum hooks which were inserted into the artificial teeth before baking, and the hooks were then soldered to a metal base.\(^\text{10,23,27}\)

The next advancement was the development of continuous-gum dentures by Dr. John Allen. These dentures were made by soldering specially-constructed long platinum-pin teeth to a pure platinum base, and then fusing layers of porcelain over the lingual, buccal, and labial aspects of the base to form the gum. The last or outer layer was pink gum enamel, and it formed a continuous unbroken surface.\(^\text{27}\) The porcelain used was composed of kaolin, feldspar, silex, calcined borax, and caustic potash. English rose was used to produce the gum enamel. Platinum (gauge, 34–36) was used to swage the base. The heel and anterior portion of the plate were reinforced with a 24-gauge iridio-platinum plate, which provided strength and lightness to the base and allowed better porcelain manipulation.\(^\text{31}\)

Although continuous-gum dentures were rated as one of the finest accomplishment in the art of denture prosthesis, few continuous-gum dentures were made because of the skill required, laborious and long fabrication technique, high cost to the patient, and difficulty in repair. One of the most difficult problems was the control of the warpage of the base caused by shrinkage of porcelain. Low-fusing porcelain was used to prevent overfusing of teeth, which, being soldered to the platinum base, were consequently subjected to repeated firings. This porcelain was weak and porous, and it required strengthening with wire trusses.\(^\text{27}\)

An improved continuous-gum denture technique, first demonstrated in 1926 by J.L. Howard, employed a platinum base, pinless teeth, and high-fusing porcelain. The technique aimed at controlling the warpage of the platinum base, which occurred with Allen’s continuous-gum denture technique, without sacrificing aesthetics. A detailed description of this technique was published in the Journal of American Dental Association in June 1927, under the title “Controlling Warpage in Continuous-Gum Dentures.”\(^\text{27}\)

**Tortoise Shell**

In 1850, C. F. Harrington of Portsmouth introduced a tortoise shell base as the first thermoplastic denture base material, and blanks of this material were soon available in dental depots. Not much knowledge could be gained from the literature about this material.\(^\text{32,33}\)

**Gutta-Percha**

In 1842, Montgomery discovered gutta-percha. It was obtained from various sapotaceous trees in Malaysia.\(^\text{34}\) In 1851, the English dentist Dr. Edwin Truman (1819–1905) introduced gutta-percha as a denture base material under a process called “auroplasty.”\(^\text{3,24}\) Dr. Truman received a medal for his plates at the World’s Fair in London in 1851.\(^\text{35}\) Gutta-percha was improved and colored by N.B. Slayton in 1855 in America.\(^\text{3,24}\) However, it could not stand the test of time due to its lack of
durability and complicated fabrication techniques. Dr. Truman tried using gutta-percha for taking impressions of the mouth, but it was unsatisfactory since it distorted during removal and shrank upon cooling.

**Vulcanite**

Introduction of vulcanite, a natural polymer, in dentistry began a new era of economical and easy-to-work denture base material. It came as a suitable alternative to gold bases and continued to do so for nearly 100 years, until present-day acrylic resins replaced it in the 1930’s.

Vulcanite is a compound of latex and sulphur. Latex is the dried milky juice of various trees and plants found in the tropics. The material was used by Indians about 300 years ago for making water bottles and gum shoes, while in the US and Europe it was used for pencil erasers. This material became hard and brittle in cold weather and sticky in hot weather. Many experiments were done to overcome the objectionable qualities of this material.

Charles Goodyear developed the art of producing rubber in 1839, and in 1851, his brother Nelson Goodyear invented vulcanization, the process of making hard rubber, which was called vulcanite. The Goodyear vulcanizing process consisted essentially of heating India-rubber, i.e. latex, with sulphur at approximately about 233°F to harden it. This process resulted in the formation of a rubber with many desirable qualities.

<table>
<thead>
<tr>
<th>Properties</th>
<th>Vulcanite</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific Gravity</strong></td>
<td>1.15 to 1.75</td>
<td>Light in weight</td>
<td></td>
</tr>
<tr>
<td><strong>Solvent Action</strong></td>
<td>Only in cases not properly cured</td>
<td>No agent tolerated in mouth</td>
<td>Lack of cleanliness/improper vulcanization, results in contamination of rubber by secretions</td>
</tr>
<tr>
<td><strong>Odor &amp; Taste</strong></td>
<td>Odorless and tasteless when proper care &amp; hygiene measures undertaken</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Color Properties</strong></td>
<td>Opaque, does not blend with the gum tissues.</td>
<td></td>
<td>Unaesthetic</td>
</tr>
<tr>
<td><strong>Thermal Conductivity</strong></td>
<td>Poor conductor of heat</td>
<td></td>
<td>Quite uncomfortable for the patient and causes inflammation in mouth.</td>
</tr>
<tr>
<td><strong>Bacterial Growth</strong></td>
<td>Evident</td>
<td></td>
<td>Improperly cured porous vulcanite can be a seat of bacterial growth</td>
</tr>
<tr>
<td><strong>Ease of Manipulation</strong></td>
<td>Easy to manipulate</td>
<td>Responsible for great popularity of vulcanite</td>
<td></td>
</tr>
<tr>
<td><strong>Repair</strong></td>
<td>Easiest to repair</td>
<td>Definite advantage over other base materials</td>
<td></td>
</tr>
<tr>
<td><strong>Surface Hardness</strong></td>
<td>Sufficient when properly cured and cared for</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Adaptation</strong></td>
<td>Excellent</td>
<td>Conforms accurately to cast</td>
<td></td>
</tr>
<tr>
<td><strong>Economical</strong></td>
<td>Economical, both in terms of materials &amp; labor</td>
<td>Inexpensive when compared with metal bases, thus affordable for the patient</td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Advantages and disadvantages of vulcanite as a denture base material.
The American dentist Dr. Thomas W. Evans, living in Paris, was the first to make a dental plate of hard rubber, applying steam heat for the vulcanizing process.\textsuperscript{38}

Figures 2 and 3 show photographs of heavily-repaired vulcanite dentures, with a suction disc on the intaglio surface of the upper denture.

The essential components of vulcanite are latex and sulphur; the proportion of sulphur varies according to the use for which it is intended, with hardness varying accordingly. Other ingredients added were coloring agents. Both soft and hard varieties were available. The soft pliable variety, known as velum rubber, was used in cleft palate patients. The sulphur content was one-fifth the weight of latex.\textsuperscript{36} Hard, flexible vulcanite, also called ebonite, was produced with sulphur comprising half its weight, by mixing it in a kneading machine or between rollers, rolling into sheets, and heating for 2 hours at 320°F and then at 302°F for 4 hours. Various coloring agents added to the mass were vermilion (red sulphide of mercury) for red rubber, white oxide of zinc for greyish white rubber, oxide of zinc and vermilion in varying proportions according to the darkness of pink color required (for the gum area), and ivory black for black rubbers.\textsuperscript{38}

Presence of mercuric sulphide (vermilion) led to biocompatibility issues with vulcanite. Mercuric sulphide was, however, insoluble in all acids, alkalis, water, and alcohol and did not decompose at the vulcanizing temperatures. Release of free mercury from rubber due to the use of poor quality vermilion was still of concern, however, and dentists were advised to use high-quality rubber to avoid this problem.\textsuperscript{36}

After the invention of the vulcanization process, a patent was granted in May 1851 to Nelson Goodyear for the manufacture of vulcanite. Dr. John A. Cummings claimed that he was the first to apply the use of vulcanite in dentistry for the fabrication of dental plates. He claimed a patent for his invention and filed it in the US Patent Office in 1852, obtaining it on June 7,\textsuperscript{th} 1864, for a term of 17 years. The Cummings patent covered the entire process of denture fabrication, from impression to delivery with the vulcanite technique. On January 10,\textsuperscript{th} 1865, the patent was reissued. Dr. Cummings sold the patent rights to the Goodyear Dental Vulcanite Company, for which the company collected royalties from the dental profession for vulcanite denture bases they constructed. This led to much litigation and a search for suitable alternative denture base material. However, the patent expired in 1881, and the company made no further efforts to renew it.\textsuperscript{37}

**Cheoplastics**

In 1856, Alfred A. Blandy used a low-fusing alloy of silver, bismuth, and antimony for preparing dentures called “cheoplastics” dentures, and the method of manipulation which was patented was called “cheoplasty.” This metal denture was however not much accepted.\textsuperscript{3,24}
Aluminum

Aluminum was never found in its virgin form, but was manufactured. Sir Humphrey Davy, in 1802, first proved that alumina is an oxidized body. Wohler, in 1828, successfully obtained the pure metal aluminum, a grey powder, and, in 1845, he was successful in obtaining it in the form of globules. M. Deville, in 1854, first obtained it in the form of ingots. However, Monier is credited for having made aluminum for the first time in the United States in July of 1855. It is composed of clay, prussiate of potassa, and common salt. The metal was light, ductile, very malleable, and almost the color of silver or tin. Attempts were made to swage aluminum bases, but difficulty was encountered in attachment of teeth.39,40 Dr. James B. Bean from Baltimore, in 1867, first prepared aluminum denture bases by casting them. He invented a casting machine for this, the details of which were given in the US Patent No. 68,548.41 Aluminum plates with teeth set in vulcanite were then widely used. However, the casting procedure was difficult, expensive, and required great care and time.39,40

Another valuable discovery was made by Dr. Alfred Starr from New York City, who developed an aluminum solder, composed of seven parts aluminum to one part tin. Using this solder, it was possible to unite aluminum to other metals and to itself. Dr. Starr received a patent for this discovery. It was now possible to work aluminum as easily as gold and silver and in much less time.39, 42

A review of the literature reveals fabrication of cast aluminum bases to which teeth were attached using vulcanite. The palatal portion was covered with celluloid, and pink porcelain was used on the buccal and labial portions. These cast-aluminum dentures were light in weight, pleasing in appearance, and easy to clean. The metal base was a good conductor of heat, while the celluloid palatal portion gave a natural appearance.43

Campbell reported having used an aluminum alloy for casting denture bases, which contained 3.75% magnesium and 99.95% high purity aluminum.44 Sizeland-Coe was the first to discuss the use of super-pure aluminum alloy. The purity of this newer alloy eliminated the problem of intraoral corrosion to a great extent, which existed with the previous alloys.45 Anodizing aluminum alloy was also recommended, as it resulted in the formation of an oxide layer, which prevented tarnish and corrosion.46,47

Advantages of Aluminum

1. Light in weight.
2. Excellent thermal conductivity.
3. Malleability and rigidity, therefore, bases could be made less bulky without compromising strength.
4. Cleanliness and tastelessness.
5. Tenacity and durability.
6. Accuracy of fit.
7. Resistance to corrosion when anodized.

Disadvantages of Aluminum:

1. More than average skill and precise technique required.
2. Difficult to reline and repair.
3. Increased cost of fabrication.39,41
A literature review describes a solid collodion prepared by treating vegetable fibre, such as cotton, with nitric acid and sulphuric acid. Different preparations of this collodion were used as denture base materials under the names rose pearl, pyroxyline, and celluloid.

**Rose Pearl**

The solid collodion when treated with ether and heat formed a substance, which was commercially known as rose pearl. Dr. J. A. McClelland, of Louisville, Kentucky, is credited with the invention of this material in 1860. He was also granted a patent for this invention. He claimed that this material was twice as strong as vulcanite; could withstand the action of acids; possessed qualities of elasticity, strength, and durability; was not easily broken; and adapted itself nicely in the mouth. Despite the excellent aesthetic advantage due to close resemblance with the color of natural gums, this material was not very successful because of processing shrinkage.

In a literature review, a case has been reported where an artificial nose was prepared using rose pearl. The artificial nose closely matched the skin in color, tone, and translucency.

**Celluloid**

An Englishman, Alexander Parks, invented a plastic vegetable compound named ‘pyroxyline’, which he marketed under the trade name parksite or zylonite, and which won him a bronze medal at the 1862 World’s Fair in London. Zylonite was made by first dissolving guncotton in ether or methyl alcohol and then combining it with other ingredients. The resulting product was as hard as ivory and could be moulded when heated. However, products made from zylonite quickly warped and cracked after a short period of use.

John Wesley Hyatt, an American printer, took up from where Parks left off. Parks had failed in the use of a proper solvent. Hyatt, in 1868, discovered that when solid collodion was treated with gum camphor, a new plastic material resulted, which he named celluloid. His goal was to make a synthetic substitute for ivory billiard balls. In 1870, celluloid was first used as a denture base material, and a US patent was granted to Hyatt for the invention. Celluloid marked the introduction of plastics in dentistry; its history dates back to 1832, since Braccanot’s development of xyloidine from starch cotton and wood fibres. The celluloid base was also known as the Perkins-Hyatt base.

Celluloid was made from pyroxyline, or the woody or fibrous parts of plants. This material was treated with nitric and sulphuric acids, after which it became known as nitrocellulose, or guncotton, a highly explosive substance. Celluloid is made by the union of several ingredients by means of heat and pressure without dissolving the guncotton first, unlike zylonite.

The composition of celluloid used as a denture base material was guncotton, 100 parts; camphor, 40 parts; white oxide of zinc, 2 parts; and vermilion (mercuric sulphide), 0.6 parts.

The entire mass of components was subjected to a hydraulic pressure of 2000 psi, and this solidified the celluloid. Celluloid was then cut to proper sizes and molded under heat and pressure to form celluloid blanks. The blanks, still soft, were then seasoned for 2 months at 160°F before use.
Advantages of Celluloid

1. Excellent aesthetic characteristics. Its translucence and pink color closely mimicked oral tissues. The aesthetics of this material was described as “like rose-leaves on ivory crushed.”55
2. Cheaper alternative to vulcanite.
3. Ease of manipulation.
4. Both hard and elastic.
5. Strength.

Disadvantages of Celluloid

1. The material gradually dissolved in the fluids in the mouth, which resulted in thinning of base and subsequent breakage.
2. It developed a disagreeable odour probably due to camphor, which was so offending that denture wearing became uncomfortable for the patient.
3. Base gradually became discolored, assuming a dirty brown/green appearance.
4. Pressure applied in pressing the base often resulted in distorted cast and faulty adaptation of the base.36
5. Poor thermal conductivity like vulcanite. However, some of these disadvantages were due to the faults in technique and not due to the material alone.

Celluloid as a base for artificial dentures was serviceable, inexpensive, and closely resembled natural gums; however, it was not as durable as vulcanite.

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References


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**Bremner Award for Pre-Doctoral Dental Students**

A certificate, $500 cash prize and up to $500 travel and related expenses will be awarded to the winning unpublished essay on:

1) A subject relevant to the history of dentistry
2) The result of an original research effort related to dental history
3) A composition revealing an uncommon appreciation and understanding of historical items related to dentistry.

**Eligibility:** Contest open to all predoctoral students of dentistry in the US and Canada, including undergraduate students preparing for admission to dental school. Purpose is to encourage the student and research of the history of dentistry.

Entries must be original essays, not more than 5,000 words, on a subject relevant to dental history.

**Selection:** A special committee of the Academy will judge all entries received prior to March 1, 2012, for the current year's award. The winner will be announced prior to June 1, 2012, so that said winner may be in attendance at the annual meeting of the Academy.

**Application:** Send typed essays (in triplicate), following the Instructions for Authors for the *Journal of the History of Dentistry*, along with a statement of authenticity by the Dean or responsible faculty, by March 1, 2012.

**The Award is presented at the annual meeting of the American Academy of the History of Dentistry.**

Please submit papers prior to March 1, 2012.

Please direct correspondence to:

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Clark’s Rule vis à vis the Buccal Object Rule: Its Evolution & Application in Endodontics

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Originally, Clark’s rule was used to identify the position of unerupted or supernumerary teeth (a concept known as oral localization) prior to orthodontic tooth movement or surgical removal. However, the versatility of this rule’s principles and concepts are also highly applicable to endodontic diagnosis and treatment. While contemporarily known by many different names, such as the “buccal object rule” and the “cone beam-shift technique,” the importance of this rule in endodontics was not recognized in the literature until late in the 20th century, despite historical evidence demonstrating its incorporation into root canal procedures almost 100 years ago.

In 1909, Clark1 published a paper that detailed a method for ascertaining the relative position of unerupted teeth by means of radiographic films. This publication focused on the use of altered radiograph projection angles to provide a more “three-dimensional” assessment of tooth or root position:

It first occurred to me when radiographing superimposed buried teeth in the incisive and canine region owing to the difficulty of deciding which tooth is in front of the other, on behind the other, the one at the back is hidden by the one front. But if we obtain a view from either side, then, of necessity, they both come in to view more or less, as the angle at which they are viewed. So that, if we wish to ascertain on which side of the median line a buried canine is lying, three radiographs are taken: the first directly over the suspected tooth, and which we will call the central position, and another mesial to this position, while he third is taken distal of the first or central position.

In his publication, Clark did not attach any specific name to this technique. In 1953 and again in 1980, Richards2,3 labelled this technique the “buccal object rule” (BOR) in his attempt to enhance an understanding of this process:

Some experience in teaching radiographic technic to students and postgraduate dentists indicates that the interpretation of Clark’s rule for localization of oral structures can be quite confusing. For this reason, an attempt will be made to present a simple interpretation and some examples to illustrate the usefulness of this interpretation.

Richards proceeded to interpret the Clark’s intent as follows: “In general, the radiographic image of a buccal object can be shifted in any direction, relative to the image of a lingual object, by simply projecting the x-ray beam in that desired direction.”2

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This rule has also been referred to as the same lingual-opposite buccal rule (SLOB), Walton’s projection, Ingle’s MBD Rule, the cone or tube-shift technique, and the image shift principle. Simply stated: when a radiograph is taken from a specific angulation (mesial or distal), the lingual object will always be located on the same side as the X-ray cone. The routine use of this rule was expanded significantly for endodontic applications by Slowey in 1974, and this publication became the standard reference for the use of the BOR in determining all aspects of root morphology, extra root canals and working length determination.

Goerig & Neaverth expanded the application of the BOR within endodontics in 1987 to include a number of benefits in diagnosis and treatment, that include the ability to:

- Distinguish between normal anatomic landmarks and those associated with periapical pathosis
- Determine the position of root resorptions, fractures and perforations
- Differentiate between internal and external resorption
- Locate the embedding of foreign bodies following oral trauma
- Determination of important landmarks, such as the inferior alveolar canal, mental foramen and maxillary sinus when anticipating periapical surgery
- Location of hidden roots or apices prior to surgery procedures
- Move anatomical landmarks, such as the zygomatic or malar process, to improve visualization of root apices
- Determine the number, location, shape, size and direction of roots during non-surgical endodontic procedure (with particular reference to working length determination)

Historically, the application of the BOR to root canal treatment is somewhat elusive prior to more contemporary publications and reference to its usage. For example, in working length determination, the use of the BOR was virtually non-existent, primarily due to the fact the most posterior teeth were not subjected to root treatment; rather, extraction was often the selected treatment. Little information regarding the endodontic applications of the BOR is available in key textbooks published between 1926 and 1965. In fact, these texts indicated only that the use of the radiograph was helpful in determining the size, shape and direction of the root canals. There are, however, a few exceptions. In 1926, John Albert Marshall did note the need for angled...
radiographs in cases of possible superimposition of anatomical landmarks during the working length determination in maxillary molars. (Fig. 1)

In upper posterior teeth, especially molars, it is frequently difficult to secure the correct picture without superimposition of other roots or of the malar process. A picture should be taken of each of the roots at different angles, so that a correct relation is shown of the lingual root to the two buccal roots. The difficulties in the case of the lower molars are not quite so serious.

This same directive was presented by C. Edmund Kells in his classic textbook, Three Score Years and Nine, published in 1926, relative to mandibular molars. His directives embodied the concepts of the BOR as we know it today, but the technique had still not been labelled as such.\(^{11}\)

In taking a picture of a lower molar for root-canal work it must be noticed:

1. That when the rays are short at right angles to the tooth and film, the two mesial canals will probably be superimposed upon each other.

2. That when the rays are shot at a mesio-distal angle (tube placed horizontally, of course) the mesio-buccal canal should show upon the film as lying between the distal and the mesio-lingual canals.

3. That when the rays are shot from a disto-mesial position, then the mesio-lingual canal is shown between the other two canals.

Ironically, Kells had a difficult time applying these same principles to maxillary premolars. (Fig. 2) He states:

I don’t know how it is with others, but I often have a devil of a time with upper first bicuspids, because I just can’t get good outlines of their root-ends, as, owing to their position in the arch, the shadows are often distorted.

In the 1965 first edition of Ingle’s textbook Endodontics, there is a directive to use multiple-angled radiographs; however Ingle referred to this technique specifically as the MBD formula.\(^{18}\) This publication appeared within 12-15 months following the recognition of endodontics as a specialty within dentistry.

However, almost 50 years earlier, Walter F. Provan, in a paper titled, “Roots and Their Treatment” presented before the Harvard Odontological Society and published in The Dental Summary in 1916,\(^{19}\) made very specific reference to and placed emphasis on the use of this radiographic technique by expanding Clark’s concept to include applications in root treatment; however, no specific label was attached to this process:

By way of closing my paper I would like to say a few words about interpreting X-ray pictures. It must be borne in mind that these are not photographs of the actual objects themselves, but are shadows of different density thrown on the film. These shadows represent the degree of opacity to the ray that the different conditions in the bone present: also the plane that the picture is taken in will make a great deal of difference in what will be shown in the film. The picture will not lie, but it can be readily seen that if you hold two pencils in line perpendicularly and place a white screen behind them, then throw a light from the front that we will get only one shadow, while if the screen is placed to one side the light thrown from the other side, we will see two shadows.
Today, the BOR is used routinely for the very specific advantages identified by Goerig & Neaverth. However, with the advent of Cone Beam CT technology and its applications in endodontics, anatomical variations and pathological or odontiatrogenic* defects may be more readily visualized, diagnosed and managed.²⁰,²¹

*Odontiatrogenic may be a more appropriate designation for “of dentist origin” than iatrogenic, which refers to “of physician origin.”

References


An industrious self-made man, George Jacob Ziegler (1821-1895) was successively a hairdresser, dentist, physician, author and editor. He is best known as the medical editor of the Periscope section of the Dental Cosmos, and as a social activist who championed the welfare of soldiers, women, and nonsmokers. Ziegler’s most unfortunate legacy was his research on dogs, which he misinterpreted as demonstrating nitrous oxide’s safety in resuscitation. Pointing to Ziegler’s work, dental anesthetist G.Q. Colton would popularize clinical use of 100% nitrous-oxide anesthetics during his 35-year professional career. Consequently, hundreds of thousands of patients worldwide received asphyxial anesthetics.
Introduction

Born in the town of Lonaconing (“Long-a-Coming”), now known as Berlin, New Jersey, George Jacob Ziegler (1821-1895) (Fig. 1) was the third child of laborer and Pennsylvania native George E. Ziegler and his wife Elizabeth. A dutiful and respectful son, young George attended public schools after his parents moved the family across the Delaware River and into Philadelphia. Because of his family’s modest circumstances, young George held a variety of odd jobs, finally shifting from barbering to hairdressing.¹

Hairstylist-Dentist, Not Barber-Surgeon

For centuries, one well-trodden path to a healthcare profession was the route taken by the barber-surgeon. Ziegler blazed a less familiar trail, that of the hairdresser-dentist. Along with his partner, George Baker, Ziegler advertised their services as “Ziegler & Baker Hairdressers” in the Philadelphia city directories from 1844 to 1846.²³ Years later, Ziegler would be embarrassed by published comments that ridiculed his earlier career in dressing hair: “Mr. Zeigler [sic] is...a worthy mechanic. ‘Curling Hair’ is a respectable occupation.”⁴ An apparent master at cultivating professional relationships with female customers, Ziegler cut and curled women’s hair before eventually persuading many female Philadelphians to travel three blocks north of his previous hairdressing establishment on Chestnut Street to his new dental office on Mulberry (now Arch) Street. From 1847-51, Ziegler advertised his services as a dentist in the Philadelphia city directories.⁵⁶

Among his scattered male clientele for barbering had been a handful of students and a steady stream of faculty from the University of Pennsylvania, only a stone’s throw from “Ziegler & Baker Hair Dressers.” Like many barbers of that day, hairdressers often practiced rudimentary dentistry (usually only simple extractions.) Although he would later rue having worked as a hairdresser, Ziegler would always take pride in his limited earlier practice of dentistry. Pragmatically, hairdressing and dentistry provided young Ziegler with the finances to pay tuition and fees for his formal education at Penn’s Medical College.

Dispensary Dentist and Physician

Several factors meant that Ziegler would not receive the bulk of his clinical experience at a hospital for the rich and famous: his limited social connections, his bare ability to muster the tuition, and his surname’s order as alphabetically last in the class. Instead, he made his way to Spring Garden Street in West Philadelphia, to the Northern Dispensary of Philadelphia. There, having “supplemented by self-culture,” Ziegler began “reading medicine subsequently with Dr. George W. Patterson.”¹ As “the private pupil, for two years at least” of clinical preceptor George W. Patterson, MD, Ziegler was guaranteed that Patterson would tutor no other matriculants in Penn’s Medical College Class of 1850.⁷
Because this dispensary allowed hands-on dentistry by medical students, Ziegler felt comfortable enough with his dispensary-supplemented dental training to advertise his services as a dentist in the 1847 Philadelphia city directory. Obstetrics was a second hands-on experience that Preceptor Patterson encouraged. Perhaps these early clinical exposures helped predetermine Ziegler's sustained fascinations both with dentistry and with the diseases of women and children. (Sadly, in 1852, just two years after Ziegler would earn his MD, Patterson would fall “a victim of pulmonary consumption which had for some years past warned him of his approaching end.”)

Compounding prescriptions provided yet a third hands-on experience at the Northern Dispensary. In this dispensary, physicians learned “the best combination” of and “the most convenient form of medicines, as well as their effects...” During his rare lectures at the dispensary, the pharmacist-physician who served as Penn's Professor of the Medical Institutes, Samuel Jackson, MD, would visit Ziegler at the dispensary's compounding pharmacy. By the early 1850s, Professor Jackson would replace Patterson, Ziegler's deceased mentor, as the Consulting Physician for the Northern Dispensary's newest Attending Physician, George J. Ziegler, MD. In the late 1850s, Doctors Jackson and Ziegler would also serve as the Consultant-Attending team of physicians to the Home for Invalids with Diseases of the Chest, a favorite charity of America's (and soon the world's) leading vendor of dental supplies and future purveyor of nitrous oxide, Dr. Samuel S. "S.S." White.

**Brown and Broussais**

Ziegler's Scottish-American preceptor Patterson had subscribed to a system of medicine that had been promulgated from Edinburgh by Scotsman John Brown, MD (1735-1788). As delineated in 1780 in his tome *Elementa Medicinae*, Brown believed that excessive or defective excitation caused most diseases. Regardless of whether diseases manifested strength (sthenia) or weakness (asthenia), Brown usually advocated use of stimulating therapies. Patterson's brutal Brownian armamentarium of stimulants included cathartics, emetics, diuretics, diaphoretics, and vesicants. In full combination, such treatments could leave a patient sweating with blistered patches of skin, and with empty stomach, bladder, and bowels. In spite of such therapeutic weapons, Patterson's indigent patients cherished him. They appreciated his “urbane demeanor towards all, and particularly gentle care of the poor who came under his notice at the dispensary.” So kindly was his bedside manner and clinical conduct that patients would return repeatedly to Patterson, even for these therapies that could range from unpleasant to downright painful.

French physician François J.V. Broussais (1772-1838) promoted the a slightly different medical philosophy, claiming that most disease was caused by irritation from gastroenteritic inflammation; thus therapy should be “ab-irritative” or sedating, rather than stimulating like Brown's treatments. Many Broussaisian physicians prescribed abstinence, drinks of gum arabic solution, applications of cold, or even bleeding, particularly by leeches, whose gentle bite was naturally anesthetic. In contrast to harsher Brownian measures, Broussaisian ones seemed relatively painless by comparison.

Between the two required rounds of lectures at Penn from the Professor of the Institutes of Medicine, and the brief compounding lessons from that same professor at the Northern Dispensary, Ziegler soon mastered Professor Jackson's two-pronged (Brownian & Broussaisian) approach to classifying afflictions. Decades before teaching Ziegler, Jackson had delineated a circulatory understanding of disease pathophysiology. Diseases could be classified as to whether they reflected plethoric or anemic circulation, or fast or slow motion (metabolism). His categories of circulation included sthenia (hyperemic and fast), congestion (hyperemic and slow), asthenia (anemic and fast), and exhaustion (anemic and slow). An amiable clinician and a brilliant pharmacist-physician, Jackson considered Broussais' doctrine “as no more than the physiology and philosophy of irritation.”

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Dentist-Physician George J. Ziegler: Rogue Researcher, “Cosmic” Editor and Social Activist
Ziegler’s *Zoo-adynamia* and “Anaematosis”

Medical student Ziegler coined the term *zoo-adynamia*, defining it as “privation or deficiency of animal or living power.” In his thesis, he sidestepped discussing one aspect, psychico-adynamia (“deficiency or privation of mental power”), as too broad to cover adequately. However, he characterized neuro-adynamia (“deficiency or privation of nerve power”) as divided into general and local divisions. Building on the concepts of zoo-adynamia, Ziegler soon emphasized the importance of *haematosis*, which was comprised of “essential modifications in the fluids of the animal economy…effected through…aeration.” Consequently, haematosis introduced the:

> [A]tmospheric elements [nitrogen and oxygen to]… organic fluids… by and through which more perfect organic products are developed, the ultimate metamorphoses effected, excrementitious materials formed and eliminated, and organization, disorganization, and the aggregated vital processes and functions, finally accomplished.

In contrast, Ziegler defined *anaematosis* as “defective haematosis” due to “inefficient oxygenation and nitrogenization of the blood and the materials about to form.” Under the “Class Anaematosis,” Ziegler classified “Orders” of disease processes including adiposis, albuminosis, toxicosis, tuberculosis, and glucosis. Of these, he singled out the final two as worthy of their own publications.

Regarding glucosis, Ziegler insisted that nitrous oxide:

> [D]oes undergo decomposition in the blood, removes sugar therefrom, forms urea, which is deficient in this affection, regulates the renal as well as general secretion, modifies the action of the liver and alimentary canal, corrects organic aberration, and speedily restores the general haematosic and vital equilibrium. Therefore, though I have never [treated] ‘diabetes’… I have treated… minor conditions attended with the moderate saccharine contamination of the renal fluid.

In this revealing paper, Ziegler is actually recommending therapy for a patient population that he believes he has never treated.

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**Fig. 2.** George J. Ziegler’s *Zoo-adynamia*, his thesis published in 1850 for his medical doctorate from the University of Pennsylvania. *(Photograph courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, IL.)*

**The Nitrous-Oxide Remedy**

Ziegler prefaced his book *Zoo-adynamia* by calling “attention to a much-neglected remedial agent…Nitrous Oxide Gas.” Amazingly, he even recommended laughing gas for treating patients afflicted with cholera, noting that “even in collapse the nitrous oxide would probably assist materially in reviving the depressed vital forces, and thus preserve the life of the patient.” Deeming rabies’ effects on the bloodstream as analogous to that of the adynamic fevers, Ziegler recommended nitrous oxide to “prevent or subvert the change in the blood, therefore, and to support the vital energies…”

The professor who was assigned to examine the thesis that Ziegler had submitted for his medical doctorate, *Zoo-adynamia*, was none other than Samuel Jackson, MD. Ziegler’s thesis referred deferentially to Jackson at least eleven times. Not
surprisingly, *Zoo-adynamia* was not only accepted, but “published upon the recommendation of Prof. S. Jackson.” After all, Jackson relished contrasting “systems of medicine” and could certainly appreciate the therapeutic trend that Ziegler was consummating—from painful Brownian to painless Broussaisian, and now on to pleasant “Zieglerian” treatment, with exhilarating nitrous oxide. Jackson was noted for his “openness to conviction; he was not permanently wedded to any preconceived opinion or hypothesis, for he was willing to modify and even change his views in accordance with discovery.” In contrast, for the next four decades, Ziegler would stray from neither the “adynamic” theories of his medical student days nor his canine research on nitrous oxide that he had misinterpreted in print by 1852. Though industrious and well-read, Ziegler lacked both the depth and flexibility of intellect demonstrated by his mentor Jackson.

**Ziegler’s Dental Patrons**

In the 1850s, when dentists, surgeons and even professors were financially strapped for funds, major research required significant private patronage. How Ziegler first met his patrons, dentists S.S. and J.W. White, is subject to conjecture. For at least two years, “Ziegler & Baker Hair Dressers” was located across the street from James White’s future medical college at the University of Pennsylvania. Ziegler might have actually trimmed the ample beard or thinning hair of one or both White brothers— or the young hairdresser might even have cut or curled the tresses of the brothers’ female friends or family members. Ziegler also practiced rudimentary dentistry during his barbering career and hairdressing days, so by 1845 he might have purchased dental supplies from the firm of Jones, White & Co., located just seven blocks from his shop. From 1850-57, Ziegler managed to 1) serve as an attending physician to at least two of S.S. White’s charities, 2) write or edit items for S.S. White’s quarterly *Dental News Letter*, and 3) actually live less than a block from both of the S.S. White firm’s Mulberry Street addresses.

As two of Philadelphia’s leading philanthropists, the White brothers may have furnished dental supplies to the Northern Dispensary during Ziegler’s first years there “drawing teeth” as a medical student, and then again from the early to middle 1850s in Ziegler’s postgraduate years as attending physician. By the late 1850s, both Samuel and James White would have crossed paths with Ziegler as writer for their quarterly *Dental News Letter*, as editor for their monthly *Dental Cosmos*, and as attending physician at S.S. White’s “Home for Invalids with Diseases of the Chest.” Barbering, hairdressing, dental supplies, charitable institutions, and publications all afforded opportunities for Ziegler to interact with his long-term patrons the White brothers. This intimate professional relationship was facilitated from 1850-57 by Ziegler’s living less than a block west on Mulberry Street from the firm as it changed names from Jones, White & Co. to Jones, White & McCurdy.

**From Chloroform to Nitrous Oxide**

In 1848, the chloroform-assisted suicide of nitrous oxide’s original advocate, dentist-anesthetist Horace Wells, preceded a rash of widely publicized deaths worldwide of etherized or chloroformed patients. By 1850, all of these mortalities—plus the Whites’ pragmatic need for patients to tolerate receiving their proprietary porcelain teeth—helped motivate S.S. White towards “procuring a patent upon nitrous oxide…” Samuel White sent Ziegler, along with consultant George Welding, to the US Patent Office in Washington, DC.

White’s timing was atrocious:

By the 1851 Annual Report, Commissioner [of Patents Thomas] Ewbank… was complaining] that the office was so crowded that the mail had to be made up in the halls,… exposed to public view. The exhibition of [patent] models… was not only impossible, but it was also scarcely practicable to protect them from serious injury. He urged that the [two-thirds of the] office space… being used for exhibition[s]… should be cleared… for patent models as originally intended. To understand the intense difficulty… [remember] that patents were not printed at this date, and the only way that either
examiners or the public had to examine the prior art was to browse through the properly classified models.

Returning empty-handed from the Patent Office, and still assisting the White brothers with their quarterly Dental News Letter, Ziegler was afforded a marvelous research opportunity by the firm’s shifting addresses within the block just east of Ziegler’s residence on Mulberry Street. Now designated “Jones, White & McCurdy”, the White brothers’ company moved dental manufacturing and inventory from the firm’s third address, a cramped three-story building at 120 Mulberry Street, to a spacious new five-story “Dental Depot” at 116 Mulberry.19 By early 1852 Ziegler had set up a “Dog Hospital” in the rear of the Jones, White & McCurdy Dental Depot. A laboratory assistant reported that “from the back room of… [their] building at Arch [previously Mulberry] and Sixth” Streets, both Ziegler and he “began experimenting upon dogs, having, forty dogs at one time … all suspended by their tails, and he (Ziegler) injected the [nitrous oxide] gas per anum.”4

In a stroke of good fortune for Ziegler, the April 14 issue of the future New England Journal of Medicine, then known as the Boston Medical and Surgical Journal (BMSJ), highlighted an article with an editorial titled “Deaths from Chloroform.”

The latter cited recent chloroform mortalities of youthful patients having minor procedures—a 20-year-old sailor for toenail removal in Massachusetts, followed by a young lady having a dental extraction in Connecticut.20,21

Here was Ziegler’s chance: he believed his research on dogs showed the promise of nitrous oxide to both anesthetize and revive patients. Ziegler’s response, penned quickly on April 17 and published May 5, 1852 in the BMSJ, was carelessly mistitled “Toxicological applications of nitrous oxide”.22 He realized only after that article was published that readers could misinterpret the title as using laughing gas as a poison. In future publications, he would refer to this paper with a title correction reading “Antidotal applications of nitrous oxide.” By December 8 of that year, Ziegler released a follow-up paper detailing his laboratory results, “Experimental investigations on the antidotal and revivifying properties of nitrous oxide.”23

The outline below summarizes Ziegler’s results from his rectal administration of nitrous-oxide water as a resuscitating agent to canines challenged by methane, chloroform, carbon monoxide, carbon dioxide, cyanide or aconite poisoning, or by hanging or drowning.23

Expt. I. Carburetted Hydrogen. [the dog lived]
[partial asphyxia with the methane of “illuminating gas” followed by 1 quart of nitrous-oxide water rectally]
Expt. II. Carburetted Hydrogen.— Comparative
[killed the dog recycled from Expt. I.]
[asphyxia with the methane of “illuminating gas”]
Expt. III. Chloroform. [the dog lived]
[recovered 15 minutes after 1 fluid ounce chloroform overdose followed by less than 1 quart of nitrous-oxide water rectally in divided doses]
Expt. IV. Comparative— Chloroform. [recycled from Expt. III., dog lived]
[after 1 fluid ounce of chloroform overdose, recovery time twice as long without nitrous-oxide water rectally]
Expt. V. Carbonic Acid. [the dog died]
[rather than blaming the canine’s death on the carbon monoxide that he likely generated from “fumes arising from the combustion of charcoal,” Ziegler ascribed mortality to “faecal impaction” blocking rectally administered nitrous oxide water from rescuing the dog]
Expt. VI. Carbonic Acid. [the dog lived]
[actually generating carbon dioxide this time with “sulfuric acid on carbonate of lime”; followed 2 pints of nitrous-oxide water rectally in divided doses]
Expt. VII. Comparative— Carbonic Acid. [the dog lived]
[prematurely exhausted generating agent; faster respirations in setting of slower recovery]
Expt. VIII. Hanging. [the dog died]
[continuous 9-minute hanging]
Expt. IX. Comparative— Hanging. [the dog lived]
[intermittent 11-minute hanging; converted to “comparative” or control status after respirations quickly returned; behavioral “laziness” noted]
Expt. X. Hanging. [recycled from Expt. IX., the dog lived]

[intermittent 22-minute hanging followed by nitrous-oxide water rectally]

Expt. XI. Drowning. [the dog died]

[3-minute cold-water drowning with nitrous-oxide water rectally]

Expt. XII. Drowning. [the dog died]

[1-minute cold-water drowning with nitrous-oxide water rectally; both drowning deaths attributed to cold water]

Expt. XIII. Hydrocyanic Acid. [the dog lived]

[0.5 drachms Prussic Acid orally followed by 2.5-3 pints nitrous-oxide water rectally]

Expt. XIV. Comparative— Hydrocyanic Acid. [recycled from Expt. XIII, the dog lived]

[0.5 drachms Prussic Acid orally and dog recovered rapidly]

Expt. XV. Compt.— Hydrocyanic Acid. [recycled from Expts. XIII & XIV, the dog lived]

[24 hours later, same oral dose produced no loss of consciousness]

Expt. XVI. The Same. [recycled from Expts. XIII, XIV & XV, the dog lived]

[48 hours later, same oral dose produced no loss of consciousness; Ziegler concluded that dogs develop a tolerance to this poison]

Expt. XVII. Aconite [the dog died]

[following 0.5 fluid drachms of Aconite orally, 1.5 pints of nitrous-oxide water rectally resulted in three temporary periods of recovery].

Among many breaches in his experimental methods, Ziegler failed to properly apply experimental controls, and did not account for dogs whose results were not tabulated in his December publication. Indeed, his laboratory assistant had reported as many as 40 dogs suspended by their tails simultaneously. Ziegler also neglected to allow for cumulative damage to brain or heart by repeat exposures to his “challenges.” He made huge, sweeping conclusions from trials where only a single subject was challenged. Unfortunately, Ziegler’s research into resuscitating canines with rectally administered nitrous oxide would later be misinterpreted as evidence supporting the use of 100% pure nitrous oxide to anesthetize and revive human beings. A rogue researcher by today’s standards, Ziegler was reckless with his laboratory subjects, his research design and execution, and both his data collection and interpretation.

Flushed with fame (and perhaps some notoriety) for having revived and killed dogs in so many ways, Ziegler joined Philadelphia’s renowned Franklin Institute and served its Meteorology Committee by 1854. The following year he had invented a gynecological pessary, and by 1856, was elected a member of the Academy of Natural Sciences of Philadelphia. From 1857 to at least 1859 he enjoyed membership in the Academy’s upstart “Philadelphia Biological Society.” Having failed, as most of this group had, to resolve the philosophical differences between German empiricism and French positivism, Ziegler eventually joined the majority of the Society’s younger physicians in pursuing the private practice of clinical specialties. Ziegler chose Philadelphia Hospital for specializing further in obstetrics and then in medicine.

Hospital Physician and “Cosmic” Editor

In the late 1850s, Ziegler had worked compatibly with S.S. White’s dental preceptor John DeHaven White on the quarterly Dental News Letter, published by Jones, White & McCurdy. Consequently, even while serving on the busy Obstetrical Staff of the Philadelphia Hospital from 1859-63, Ziegler found the time to work as an associate editor for the periodical that replaced the quarterly News Letter, the monthly Dental Cosmos. With Samuel S. White’s younger brother James editing anonymously, Ziegler worked as the second of two associate editors to the formal editor-in-chief Samuel’s unrelated dental preceptor, John DeHaven White. Imitating the “Periscope” sections seen in other American and British journals, Ziegler reviewed the literature, both foreign and domestic. He periscoped, or “looked around,” for articles to review for his “Periscope of Medical and General Science in Their Relations to Dentistry.” In his “Salutatory,” Ziegler opened the inaugural Periscope with:
The object of this department of the journal is, as its title indicates, to present a periscopic view of medical and general science in their relations to dentistry.... to act in this respect, as a sort of mental lens to collect certain diffused rays of intelligence, and concentrate them upon the particular branch of science to the cultivation of which this journal is devoted.

In 1863 Ziegler transferred from the Obstetrical to the Medical Staff of the Philadelphia Hospital. He quickly learned that the raging Civil War was nearly as challenging for hospital physicians as for surgeons in the field. Indeed, one-fourth of Civil War soldiers who served would die, and only one-third of those deaths were from combat-related wounds. In the face of mounting numbers of soldiers hospitalized with “affections” (infections), in January of 1863 Ziegler published that nitrous oxide was a remedy for cholera, typhus, malaria, yellow fever, “and all other ataxic fevers....” Dusting off his decade-old canine research, Ziegler reminded readers that nitrous oxide could be:

Administered either in its gaseous state immediately by the lungs, or be combined with some liquid and thus introduced through the alimentary canal. For obvious reasons, water is the most eligible vehicle for the purpose, and when surcharged with protoxide of nitrogen forms a very convenient and not unpleasant preparation. The addition of aromatic and other compatible agents makes it a very palatable and agreeable beverage.

The Return of Colton and the Rise of Nitrous Oxide

Soon Ziegler would be upstaged by the man who first furnished nitrous oxide to dentist-anesthetist Horace Wells. After losing his fortune from the California Gold Rush, Gardner Q. Colton had resumed his public demonstrations of nitrous oxide during the Civil War. By the summer of 1863, Colton had also resumed using the gas for dental anesthesia. Colton would then organize his Colton Dental Association in New York City, before franchising his dental anesthetic “associations” to large cities nationwide. When asked later how he could justify administering 100% laughing gas to patients, Colton would point to the research and writings of a certain George Jacob Ziegler, MD.

Not to be outdone by Colton’s rising popularity, in December of 1863, Ziegler was spreading the gospel of nitrous oxide as panacea. “Truly sui generis, ..atmospheric air...may be regarded in fact, as its [nitrous oxide’s] natural prototype....” Ziegler regarded laughing gas as so unique that it could even lead to “super-oxidation and over-stimulation.... [The gas] may cause softening of the brain, nervous tissue, and other important structures” and even cardiovascular rupture. And since nitrous oxide is “ab initio primarily and permanently stimulant,” the gas avoids the sedative action and cardiovascular depression seen with ether and chloroform. Laughing gas’ “excitement... may produce both primary and secondary irritation, congestion, serous or haemorrhagic effusion...especially in the brains and kidneys” and at the surgical site.”

Ziegler believed that nitrous oxide targeted neural and genito-urinary tissues and that by “intensifying the general functions of life, protoxide of nitrogen produces such a high degree of exhilaration as to render the mind temporarily unconscious of, or indifferent to, impressions which would otherwise occasion pain and suffering.” However, Ziegler cautioned that nitrous oxide’s “powerful aphrodisiac effects... may intensify sexual desire to such a degree as to cause unpleasant exposure or even serious trouble... [To protect] the general health and safety of those subjected to its influence, as well as for the morality of the patient and reputation of the operator, nitrous oxide should always be administered with great care and precaution.”

Ziegler credits his remarkable panacea with holding the “power to aerate, depurate, and increase the plasticity of the blood, encourage healing by first intention, regulate innervations, circulation, nutrition, contractility, and other essential functions; and, by its general systemic invigoration and highly sanative influence, to protect the living organism against any temporary or permanent injury.”

Bause
Ironically, by February of 1864, Ziegler’s next editorial would chastise those who deemed harmless all clinical use of nitrous oxide. He cited the “law of idiosyncrasy”— that individual patients have individual responses to any pharmaceutical. Ziegler also warned that skilled anesthetists’ overstating the safety of anesthetics misleads inexperienced clinicians to try the same anesthetic on all their patients.

After the delayed postoperative death of a merchant who had received a nitrous-oxide anesthetic for dental extractions, one coroner’s inquest jury returned the following verdict which was published widely: “We find that deceased came to his death by congestion of the lungs, caused by inhaling nitrous oxide gas. We exonerate the person who administered it, but recommend that hereafter an examination be made by a competent person of any one who contemplates inhaling said gas.”

Sadly, in April of 1864, Ziegler was still playing his same tired hand of cards. Yes, in chemical combination with nitrogen, oxygen comprised one-third of nitrous oxide. And, yes, Ziegler contrasted that fraction to the mere one-fifth that oxygen comprises of the gas mixture called “room air.” And, finally, yes, Ziegler reminded his readers that just “like atmospheric air and oxygen, protoxide of nitrogen is an active supporter of combustion and of life…” However, Ziegler was terribly mistaken about nitrous oxide gas’ potential to support life.

During the latter half of the Civil War, Ziegler grew increasingly disturbed that dental anesthetist Colton was garnering all the recognition for resuscitating clinical use of nitrous oxide. In the Cosmos editor returned once again to the Philadelphian publisher who, just 15 years earlier, had released Ziegler’s thesis Zoo-adynamia. By September of 1865, J.B. Lippincott & Co. had printed Ziegler’s new 66-page text, Researches on the Medical Properties and Applications of Nitrous Oxide, Protoxide of Nitrogen, or Laughing Gas. In this booklet, Ziegler observed that nitrous oxide’s “peculiar chemical constitution and properties, its specialty and potency of physiological action, its extensive range and variety of sanative application— hygienic, therapeutic, revivifying, antidotal, and anaesthetic— it differs greatly from, and is superior to the best and most powerful of known remedies.” Indeed, laughing gas “promises to be a very efficient general substitute for some of the most potent and expensive remedial agents known, such as, for instance, alcohol, ammonia, quassia, strychnia, mercury, and others, variously classified as diffusible and permanent stimulants, tonics, antiperiodics, antispasmodics, alteratives, secrernents, &c.” Clearly, “protoxide of nitrogen has a very extensive range of medicinal application, and, coeteris paribus, is well adapted to the curative treatment of all depressed, morbid, and toxic states in which a curative treatment of all depressed, morbid, and toxic states in which a chemico-organic, arterial, nervous, cerebral, and general stimulant, nutrient, alterative, resolvent, absorbent, secrernent, antiseptic, antitoxic, and revivifying influence is required.”

Reviewers flagellated both Ziegler and his book. A critic from Buffalo opined: “The enthusiasm of the author is unbounded, and he speaks of his hoppy-horse [nitrous oxide] as though it should have been supplied instead of common air, being better suited… than any other discovered substance.” Even the journal which first published his resuscitation research on dogs, the BMSJ, lambasted Ziegler: “We were not prepared, however, for such transcendent powers as the author…attributes to…[nitrous oxide], for in it he has discovered the much-desired elixir of life.”

With the Civil War’s coming to a close, the firm of S.S. White moved in 1865 to a building near the intersection of 12th and Chestnut Streets, a mere five blocks from the pharmacist who was
supplying Ziegler with nitrous-oxide water. With this shifting of S.S. White’s headquarters, J.D. White retired as editor of Dental Cosmos, while Doctors J.H. McQuillen and G.J. Ziegler were promoted to new positions as, respectively, dental and medical co-editors for that journal. In his new post, Ziegler continued raising his reviewer’s Periscope. The war’s end saw Philadelphia inundated from 1865-73 by epidemic waves of cholera, scarlet fever, smallpox, typhus, typhoid, and yellow fever. By 1867 Ziegler “was compelled to resign [from the Medical Staff of Philadelphia Hospital] on account of ill health, the state of his health indeed having long been such as greatly to restrict his professional and literary efforts.”

Ziegler’s world began collapsing. From 1869-71, banking mismanagement, the lack of a gold standard, and unscrupulous speculators had all steered the United States into a significant post-war panic and depression. Even worse for Ziegler, in September of 1870, his father, George E. Ziegler, died of pulmonary disease. A final trauma happened the following year: S.S. White announced that the services of medical co-editor George J. Ziegler, M.D. and of dental co-editor John H. McQuillen, M.D., D.D.S. would no longer be required:

This [December of 1870] number of the Dental Cosmos completes the Thirteenth Volume. The first number of the Fourteenth Volume will be issued January 1st, 1872. Drs. McQuillen and Ziegler retire from its editorial supervision, which will in the future be impersonal [objective].

With such advanced notice, Ziegler could bow out gracefully. He composed a “Valedictory” for his final Periscope:

Our editorial connection with the Dental Cosmos closes with this number. With the facilities afforded by the publisher, we have faithfully endeavored to enlarge the knowledge and promote the best interests of the specialty of dentistry. To what extent we aided in bringing it to its present advanced position it is not for us to estimate, but to rest with the assurance that, in common with all other things, the Infinite will rightly judge, as He only can determine the true value of human effort. We wish the journal every success, and believe it will be eminently useful under its new management. We shall concentrate our editorial labors upon a periodical devoted to general medicine, and hope to make it a medium of much good to all branches of the profession and the world at large.

That “periodical” was Ziegler’s 16-page Medical Cosmos. Subtitled “A Monthly Abstract of Medical Science and Art,” the Medical Cosmos contained “a concise summary of the latest advances in Practical Medicine, from all parts of the world, with Notes by the Editor.” Ziegler advertised his new 16-page monthly as “especially adapted to the needs of the busy practitioner and those who have little time to read.” Since he was Editor and Publisher of the Medical Cosmos, Ziegler sustained a major economic blow when readership failed to materialize for this new publication. Then, on April 4, 1872, his great mentor and publications advisor Professor Samuel Jackson died from neuralgia, ataxia and old age. By October of 1872, Ziegler had abandoned publishing his Medical Cosmos. His “cosmic” editorial career—and of surveying the worlds of dental and of medical literature for the Dental and then the Medical Cosmos—was finally over.

Social Activism

Beyond his work as a researcher and editor, Ziegler was a bold social activist. His advocacy of both women’s and non-smokers’ rights was decades ahead of his time. Ziegler’s initial efforts, however, focused on the welfare of soldiers.

When the Civil War erupted in the United States, the world’s leading dental supplier, Philadelphia’s S.S. White, terminated all of his contracts for selling dental goods to Southerners. So avidly did he support President Lincoln and the Union cause, White led the charge in subscribing for War Bonds issued by the Secretary of the Treasury, Salmon P. Chase.

Not surprisingly, S.S. White also threw the weight of his publishing house behind the Union cause. Having funded Ziegler’s early research efforts on nitrous oxide and the dentist-physician’s later editorials for the Dental Cosmos, the patriotic White now published Ziegler’s pamphlet titled The Soldier’s Friend, or, Hints for the Physical and Moral Welfare of the Soldiers of the United States. Released
in 1861, this 8-page brochure was “designed for circulation in the army...[and consisted] of several aphorisms relating to the preservation of health, and so stated that the common soldier [could]...understand and practise them.”

In the nobler sense of the phrase, Ziegler could have been called a “ladies’ man.” He was a dutiful son, a hairstylist, a dentist who appealed heavily to female patients, and finally a physician who specialized in the diseases of women and children. In 1854, Ziegler invented a pessary for treating uterine prolapse— a support device for “fallen womb.” Four years later, he published observations on infantile seizures. (Since he advocated using nitrous oxide to treat convulsing infants, Ziegler likely saw—and arguably precipitated—more seizures in newborns than had most obstetricians. Even as late as 1887, Ziegler was suggesting new treatments for dealing with uterine inversion (“inside-out womb”). Ziegler maintained a long-term interest in the care of women.

Perhaps it was natural, then, for Ziegler to spearhead social efforts backing women’s rights in his masterwork, *The Centennial Declaration of Human Rights as Exemplified in the Natural Laws of Marriage, Legitimacy, and Life in General*. He self-published this tome in 1876 to coincide with the centennial of America’s Declaration of Independence from Great Britain. According to Ziegler’s *Centennial Declaration*, the:

> [A]ct of sexual connection constitutes marriage, it being, in fact, the natural wedlock and real marriage, formed as it is by the mutual attraction and consentaneous action of mind and body of both sexes in accordance with the laws of their being, appointed by the creative and omnipotent power, independently of all human ordinances and ritual ceremonies....As sexual conjugation is the objective, basic, procreative and natural union, it is the real and true marriage, and no human power can make it otherwise or render it illegal.

Ziegler also advocated that fathers financially support unwed mothers and their illegitimate children.

Ziegler’s views were courageous and radical for his day. Even a journal from his hometown of Philadelphia complained that Ziegler’s “confident ignorance obscures this subject. With equal strength of assertion and debility of proof, he insists that married couples cannot limit the number of their children without injury.... What twaddle is this!” A few months later, the Cincinnati *Ledger & Observer* berated Ziegler’s *Centennial Declaration* even more severely:

> [This] volume of 263 pages, [is] bound in tinted paper covers, that seem to blush at contact with the vulgar printed matter they inclose. If the author had entitled his work, ‘A Plea for Illegitimacy,’ the title would have been more appropriate....[With his doctrines like ‘natural marriage,’ Ziegler’s] book is permeated...and oozes its slimy moral poisons from each contaminated leaf....The book panders to the lowest and most morbid tastes of the community, and outtrivels in indecency the vilest bawdy publications.

As an Attending Physician through much of the 1850s at S.S. White’s “Home for Invalids with Diseases of the Chest,” Ziegler saw a patient mixture of terminal consumptives and end-stage smokers. His most unfortunate patients were those tortured by both tuberculosis and tobacco. Certainly by 1878, Ziegler was nationally publicized as a pulmonary specialist. Not only trumpeting women’s rights, Ziegler’s 1876 *Centennial Declaration* had also vented one of Ziegler’s earliest tirades against smoking. The *Lancet and Observer* complained that under “pretense of inculcating virtue, the author indulges in an abusive tirade against tobacco....[which] taken in excess...[is] less dangerous to the people than the perusal of works of such a character as the one under review.”

Nine years after his *Centennial Declaration*, Ziegler launched two more salvos against users of tobacco. He observed that smokers “inflict this baneful tobacco poison upon [nonsmokers] ... without regard to their health or right to be exempt from this....” Addressed to the editor of the *Journal of the American Medical Association*, even this letter by Ziegler failed to exorcise his anti-smoking demon. In a follow-up 19-page diatribe to the journal *Sanitarian*, Ziegler expanded his crusade against tobacco: “In every land and in every clime where the use of tobacco prevails it causes degeneration, degradation, debasement—physical, mental, and moral—disease, and death, or individual and national decadence.”
Critical Failures

With the death in 1879 of his long-term patron S.S. White, Ziegler relocated closer to the Delaware River—southeast to 132 Richmond Street, where he would spend the final 15 years of his life. Within five years of this move, Ziegler would self-publish *The Basic Pathology and Specific Treatment of Diphtheria, Typhoid, Zymotic, Septic, Scorbatic, Putrescent and Mephitic Diseases Generally*.

In spite of the increasing public knowledge about both Koch’s isolation disease-causing microbes and Pasteur’s early germ theory, Ziegler added to his gaseous cure-all nitrous oxide a series of acidic liquid panaceas for neutralizing the ammonia-laden “affections” (now known as infections). Ziegler believed that “superammoniation,” or marked rises in ammonia, caused (rather than resulted from) diseases. Ziegler’s suggested cures were mild acid solutions to neutralize the alkalinity of the ammonia buildup.50

Beyond its dubious content, Ziegler’s *Basic Pathology* also had problems with style. Suffering marginal health himself, Ziegler now afflicted his hapless readers with sentences such as:50

In the following pages I have tried to show that all the varied and complex diseases classed as scorbatic, necraemic, typhoid, zymotic, septic, infectious, malarial, gangrenous, putrescent, and allied affections, by whatever name designated, from the simplest to the most malignant, are dependent upon or complicated with one common basic, alkaline, pathogenic factor, mostly the volatile organic alkali—ammonia, incidental to all forms of life, and differing only in quantity and the constitutional and local manifestations and complications arising from diverse etiological and pathological conditions, yet underlying and intensifying them all, and thus often complicating and rendering more severe every form of disease even of the simplest kind for the successful treatment of which, this primal morbific factor must be decomposed, neutralized, or removed, which can usually be readily effected by acidulous, antalkaline, resolving and counteracting agents, thus simplifying the hygienic and therapeutic problems in general, and giving more definiteness and certainty to sanitation and therapeutics, a both preventive and curative medicine.

Complaining about such Zieglerian “veritable ten-story tenement houses of sentences,” the *Therapeutic Gazette* conceded that “we have not read the book. Where is the man who has… and lives?” The Detroit publication also confessed that it knew “of no place where so much of terror can be purchased for two dollars as in the store that retails this work.”51

Astonishingly, Ziegler penned, and the American Medical Association actually published, articles from 1886-88 which suggested using an emetic, lemonade, and finally buttermilk to prevent (or treat) respectively, smallpox, yellow fever, and diphtheria.52-54 An advocate first of nitrous oxide and eventually of mild acids as panaceas, Ziegler must have been frustrated by his impotence in improving his own failing health. From 1889-95, the ailing Ziegler was forced to partner with his neighbor, Peter Rambo, MD, to form the medical firm of Rambo & Ziegler.55,56

Had any of this affected the world’s busiest dental anesthetist, Gardner Q. Colton? From 1863-98, Colton never questioned Ziegler’s research a single moment. Within a year of reintroducing the clinical use of 100% nitrous oxide in 1863, Colton had quoted Ziegler’s response as to how to treat collapse of the chloroformed patient: “Arterialization and respiration can be most readily induced in asphyxia by nitrous oxide… gaseous… through the lungs, or… in water… by the mouth or bowels.”57 Just two years before Ziegler’s death, Colton recalled that:58

Prof. Zeigler [sic] of Philadelphia, in an able work on ‘Anaesthetics,’ states that chloroform (and he might have added ether) should never be administered without having some nitrous oxide present to restore the patient in case asphyxia is threatened. Why did he not say ‘oxygen’ instead of ‘nitrous oxide’? Simply because he knew that pure oxygen should be but slightly absorbed by the blood in the lungs, while the oxygen in the nitrous oxide gas would be readily absorbed.

Although Colton clearly remembered Ziegler as late as 1893, few others would even mention Ziegler’s death in 1895. His passing went unnoticed, even by the *Dental Cosmos* that he had edited for nearly 13 years. Not until three years
later, in 1898, would the 35-year career of dental anesthetist G.Q. Colton finally conclude. On the basis of Ziegler’s tenuous research supporting laughing gas’ safety, Colton— and his disciples worldwide—had by 1898 exposed hundreds of thousands of patients to asphyxial anesthetics of 100% nitrous oxide.

George J. Ziegler, MD was a courageous advocate for the welfare of soldiers, women, and nonsmokers. Although best known as the medical editor of the “Periscope” section of the Dental Cosmos, Ziegler’s most unfortunate legacy was his marginal research on using nitrous oxide for resuscitating dogs. In justifying his 35 years of popularizing asphyxial dental anesthetics worldwide with 100% nitrous oxide, dental-anesthetist Gardner Q. Colton pointed to Ziegler’s research and writings on the safety of laughing gas.

**Acknowledgments**


Images courtesy of the Wood Library-Museum of Anesthesiology, Park Ridge, IL.

**References**


44. Ziegler GJ. Reduction of inverted uterus. *JAMA.* 1887; 8:83.


52. Ziegler GJ. Inoculation from the pustule of tartar emetic to prevent small-pox. *JAMA.* 1886; 6:82.


Edward Townsend Stotesbury (1849-1938), a prominent Philadelphia tycoon, made his millions as an investment banker and financier. In 1927, his fortune was estimated to be $100 million. In 1912, at age 63, Stotesbury, then a widower for over thirty years, married a captivating Chicago widow, Eva Roberts Cromwell. As a “glittering socialite,” Cromwell had an extraordinary sense of personal theatre, a keen eye for beauty and a calculating mind. Throughout the 1920s and 30s, the couple built three lavish palatial estates. At these mansions, they entertained on an imposing scale. Stotesbury especially enjoyed entertaining his guests with recollections of the events he experienced as a Civil War drummer boy. To conclude his program, he shared this lively tune: “The Old Family Toothbrush That Hung by the Sink.”
On January 18, 1912, the 63-year-old Stotesbury, then a widower for over thirty years, married a captivating Chicago widow, Eva Roberts Cromwell. The event, taking place at her home in Washington, DC, was the highlight of the social season. At the time of this, her second marriage, Eva was already one of the grande dames of “The Great American Matriarchy,” a feminine core of upper-class refinement which ruled American society from the 1880s until World War II. Ned’s new bride had “a sense of personal theatre and a gift for enjoying beautiful things.” Her charisma, bordering on enchantment, assures its possessor that, when she has entered a room, something important has happened. A curtain has risen, and the pink spotlight has fallen on the face of a star. It picks her out from the others, and follows her as she moves. The audience is hushed, expectant. Tilting her head just slightly to acknowledge the packed auditorium, she smiles, then she speaks. Her timing and inflection are perfect. The drama, which is her creation, has begun.

Furthermore, Eva possessed another extraordinary talent: the ability to remember the name of every guest in a roomful of hundreds of people, as well as the names of their children. In short, Eva was an “impressive, glittering socialite” of keen intelligence, a regal presence who reigned supremely during the couple’s lavish parties, which were typically held in their townhouse at 20th Avenue and Walnut Street.

Figure 1. Ned and Eva Stotesbury, circa 1925. Their names appeared regularly on “best dressed” lists. In this photograph, she is about 60 years old and he, 76.

From the early 1880s to the late 1930s, millionaire Edward Townsend Stotesbury (1849-1938) was a prominent figure in Philadelphia, making his name as an investment banker, a financier and a senior partner at J.P. Morgan & Company and its affiliate, Drexel & Co. In 1927, his fortune was estimated to be $100 million.

A hale, hearty, dapper little man, he was known to his family and friends as “Ned.” With his trim figure and carefully clipped moustache, he was something of a fashion plate, favoring English-cut tweed jackets, elaborately-designed, custom-made shoes, and the finest white flannel trousers. Edward was also noted for his punctuality and his meticulous record-keeping: he could account for his business and personal expenditures down to the penny. Years later, he shared another reason for his financial success: “I kept my mouth shut and my ears open.”

Figure 2. A 1926 oil painting of 61-year-old Eva Stotesbury, by Douglas Chandor. (Note her diamond and emerald tiara and elaborate sapphire necklace.)
Throughout the 1920s and 1930s, Eva and Ned Stotesbury entertained in a manner which has rarely been exceeded to this day. Birmingham explains:

Eva liked to say that she had taught her husband “how to play,” another comment that was greeted sneeringly in Philadelphia; the term “playboy” had come into fashion, carrying derisive overtones, and the image of a millionaire in his seventies cavorting across an endless series of ballrooms made Ned Stotesbury seem something of a caricature of the type. And it was true that, Ned was at his office at Drexel’s every morning at eight, most of the Stotesbury’s evenings were spent in some form of fun. The wardrobes of jewels, furs, and gowns increased, and both Ned’s and Eva’s names now appeared regularly on best-dressed lists...

As the fame of Eva’s parties grew, so did the span of her social horizon. Seated dinners for forty were her usual dos, and she often gave as many as three a week. There were also frequent teas and receptions, for as many as six hundred and fifty people. Soon it was estimated that the Stotesbury’s entertainments, on an average, two hundred people a week, all told, a hundred thousand guests had crossed the threshold of their house. Eva had become one of the most extraordinary hostesses in the world, and even the State Department began turning to her for advice on protocol and the proper way to entertain visiting foreign dignitaries.

Over time, Edward and Eva financed the building of three palatial estates: Whitemarsh Hall (outside of Philadelphia); Wingwood House (in Bar Harbor, Maine); and El Mirasol (in Palm Beach, Florida). El Mirasol (The Sunflower), their winter home, was a lavish 147-room, $3 million Spanish-style mansion maintained by 75 servants. Even the basement of this abode was a wonder, housing bakeries, a barber shop and a movie theater. The lush surrounding grounds, impeccably kept by 15 gardeners, included a lively zoo inhabited by chattering monkeys and other creatures, and a colorful aviary housing a variety of feathered friends, including cooing lovebirds.

The frequent parties which the couple held in this abundant, luxurious setting firmly established Eva, the regally-attired hostess, as the “Queen of Palm Beach.” This splendidly appointed lady did, however, suffer one chronic penalty for her royal visage: the diamond-laden tiara that typically graced her tresses on these social occasions left her with a painfully stiff neck.

In Palm Beach during the 1920s and 1930s, the birthday of Edward Stotesbury was an eagerly-anticipated annual event. Each year on February 26, several hundred outstanding local citizens crowded the patio courtyard at the El Mirasol mansion where they enjoyed an afternoon of refreshments, festivities and traditional story-telling.

The March 9, 1936 issue of Time magazine reported details of Edward Townsend Stotesbury’s 87th birthday party. Some 400 guests sipped champagne, ate plentiful hors’ d’ oeuvres and enjoyed the popular renditions of Meyer Davis and his orchestra, a prestigious group who typically performed for high-society galas. As his bevy of admirers enjoyed slices of an elaborate birthday cake, along with strawberry ice cream and assorted beverages, Stotesbury graciously accepted many fond toasts. His audience, now satiated, sat back and enjoyed the one-man show that followed: Stotesbury loquaciously entertained his guests with lively tales of his past. Among them were vividly recalled events of his experiences as a drummer boy during the Civil War. Having taken to the instrument, Ned continued to play a Civil War-era snare drum over the ensuing years, captivating his guests with impromptu drum rolls. Invariably, as his impressive performance was about to close, he would be prevailed upon to warble what had long ago become his signature theme song, “The Old Family Toothbrush.” Accompanied by the orchestra’s strains of “The Old Oaken Bucket,” he would belt out the following lyrics:
How dear to my heart is the old family toothbrush,
The old family toothbrush that hung by the sink.
The old family toothbrush, the moss-covered toothbrush,
The old family toothbrush that hung by the sink.

Oh, first it was Father’s, and then it was Mother’s,
And then it was Sister’s, and now it is mine.
Oh, first it was white, and then it was yellow,
And now it is black and all covered with slime.

[Chorus] The old family toothbrush, the old family toothbrush, the old family toothbrush that hung by the sink.

During the chorus, the entire audience would join in with a raucous gusto seldom exhibited by conservative members of high society.

It was from the well-known song of the 1800s, “The Old Oaken Bucket” (Ned’s favorite since his youth), that the words and melody of the toothbrush ditty had originated. While the lyrics (of unknown authorship) had been set to music by Samuel Woodworth in 1818, a newer, 1870 musical rendition, composed by George Kiallmark, replaced the old tune, but not the words. This version became enormously popular, and continues to be sung today.

Each year since 1927, the annual Stotesbury Cup Regatta, now one of the oldest and largest United States high school rowing competitions is held on the Schuylkill River in Philadelphia. Also, a coal mining town in Raleigh County, West Virginia, bears the name Stotesbury.

On May 21, 1938, Edward Townsend Stotesbury died at age 89, and was buried in the Woodlands Cemetery in Philadelphia. Eva Stotesbury passed away on May 31, 1946, little more than eight years after Ned’s death. She was eighty-one.

Along with his fame, fortune and lavish life style, Stotesbury is also remembered as the fun-loving extrovert who spontaneously spiced up the recollections of his Civil War experiences, gave snare drum performances at “the drop of a hat,” and warbled a lively tune about “The Old Family Toothbrush That Hung by the Sink!”

References


The Byzantine World covers the eleven-century period between 323-1453 AD and was characterized by a comprehensive system of medicine based on the fundamental principles of Ancient Greek medicine. Several clinical entities, such as epulis, parulis, constrictions of the tongue (short frenum), sublingual ranula, jaws fractures and disclocations, oral fistulae were well-known and treated during the Byzantine period with primarily surgical, but also non-surgical, interventions. Tooth extractions and operations on the uvula were also popular. The variety of these operations, for which special dental instruments were used, demonstrates the high level of surgical knowledge among physicians in Byzantine times.
Introduction

The Byzantine World covers the eleventh-century period between 323-1453 AD and was characterized by a comprehensive system of medicine based on the fundamental principles of Ancient Greek medicine, especially those of Hippocrates and Galen. The value of oral health has been recognized since Hippocrates, who dedicated a distinct treatise of his “Corpus Hippocraticum” named “On Dentition” to the subject of teeth. Aretaeus of Cappadocia refers to mouth as the area where symptoms of systemic diseases appear. Moreover, the most systematic analysis of this region seems to belong to Galen, whose authority is invoked by almost all later Byzantine medical writers.

The aim of this work is to collect and discuss the main references concerning oral surgery operations that are contained in the Byzantine physicians’ texts.

A thorough study was undertaken of the most eminent physicians who flourished during the Byzantine period. These included Oribasius of Pergamus (4th century AD) (Figure 1), Aetius of Amida (6th century AD) (Figure 2), Alexander of Tralles (6th century AD), Paul of Aegina (7th century AD) (Figure 3), Nikolaos Myrepsos (13th century AD), Ioannes Actuarios (14th century AD) (Figure 4) and Neophytus Prodromenus (14th century AD).

Several references to oral clinical entities and operations were found and are presented below, concerning epulis, parulis, tooth extractions, constrictions of the tongue (short frenum), sublingual ranula, jaw fractures and dislocations, oral fistulae and operations on the uvula. Except for surgery, ancient medical remedies based on natural or chemical substances were also popular, whereas several special dental surgical instruments are mentioned, i.e. odontagra, glossocatochus, phlebotomus, mydion, smili, spathe, pericharacter, staphylagra, sarcolabus, staphylocaustos and staphylotomus.

(All images from Codex 3632 of the 14th century, University Library of Bologna)
Epulis and Parulis

Epulis, (from επί, upon, and ούλο, the gum) according to Oribasius of Pergamum, trusted physician of the Roman emperor Julian, is “an inflammation-derived fleshy gum mass formed at the posterior molar tooth” which is often accompanied by fever and pain.1 Oribasius also defines parulis (from παρά, near, and ούλο, gum) as “an inflammation of part of the gums, which if not subsided, may result in abscess formation”. He recommends opening of the parulis with the venesector (φλεβοτόμο), purification with a linen rag and application of equal amounts of “sulfur, pepper and fissile alum (a mixture with astringent properties containing copper).”2

Aetius of Amida, the court physician of Justinian I, discourages the early surgical intervention for epulis, suggesting various remedies for inflammation reduction, such as “melikraton” (μελίκρατον, a mixture of honey and milk or water), barley mush or linseed decoction. When the inflammation settles, he proposes the application of substances causing epulis contraction, such as chalcitis (copper sulphate) and calamine (the ancient name for zinc oxide). If the epulis is shrinking slowly, Aetius suggests the usage of verdigris and galls (outgrowths of plant tissues) and if the epulis persists, he suggests excision with several types of chisels («μυδιοσκέλῳ ή σμιλαρίῳ ή σπαθίῳ»)3 and postoperative cataplasms with honied water. For parulis, Aetius applies burnt alum or sori (an ore); but if the area is suppurated he undergoes surgical evacuation and excision with the venesector. After the operation, he ensures good local hygiene using motus or othonion scraps (linen strips of cloth) and a medication made of tares.4

Paul of Aegina, an eminent surgeon and writer of the seventh-century, describes epulis as “a fleshy excrescence which forms upon the gums beside one of the teeth” and parulis as “an abscess which forms near the gums”. He directs us to raise the epulis with a flesh forceps (σαρκολάβῳ) or a hook (ἀγκίστρῳ) and cut it out. For parulis he recommends circular excision and fills the gap with tents, but he also notes that quite often, pus drainage with the venesector is more than enough for an entire parulis treatment. Postoperative poultices with mead are also propounded, and cauterization with an olive-shaped cauter is kept for cases of gum sepsis.5,6

Tooth Extraction

According to Oribasius, for painless tooth extraction application of flour with the juice of spurge (tithymalus, plant of the genus Euphorbia) and a lat leaf above will make the tooth fall out.7 For the same purpose Aetius suggests earthworms, which when burnt, pounded and applied circularly upon the well-demarcated tooth facilitate its extraction.8 He also recommends the choice of pellitory (a caustic perennial herb), which he applies in the affected tooth after having the other teeth protected with a waxed cream. Then, the impacted tooth is removed with the fingers. Other remedies include sori and strong vinegar rubbed in the summer sun, sandarach (red sulphide of arsenic) or sori, spurge and galbanum (a gum-resin). Moreover, the root of the wild cucumber, the grains of the shrub Thymelaea (granum Cnidium) and the heated root of xanthium (the cocklebur bush) are also mentioned. Another invasive intervention consists of the placement of the root of the wild colocynth in the damaged part of the tooth. Alternatively, the colocynct can be pounded, filtrated and soaked in vinegar for many days, so that it becomes viscous like honey. Afterwards and having placed the scarifier into the remedy, one makes a scarification, directing the patient to close his mouth slightly. Other medications effective in painless tooth extraction are, according to Aetius, the extracts from sumach (shrub of the Rhus genus), mulberry bark, wild olive, wild fig or spurge (tithymalus).9

Alexander of Tralles, a famous physician of Asia Minor, supported an equal-proportion mixture of pounded roses, galls, wild grapes, alum, sulphur vivum and long pepper.10 The result is then compounded with gum juniper and applied to the tooth destined for extraction. The same substances are also recommended by Aetius.
Paul of Aegina analyzes tooth extraction thusly:5,11

Having scarified around the tooth down to the socket, we must by degrees shake the teeth with a tooth-extractor and draw it out but “if it is carious we must first plug up the hole with a small tent, that it may not break when compressed by the instrument”. He underlines that “after the extraction we may consume the flesh that is left by sprinkling it with finely levigated salts, and afterwards gargles of wine or oxycrate may by used until the completion of the cure.

Nicolaos Myrepsos, known from his treatise on pharmacology, proposes to achieve painless tooth extraction soaking a pellitory root in strong vinegar, allowing it to remain for 40 days. Having coated the other teeth with wax, in the same manner as Aetius, he then applies the substance to the troublesome tooth, and extracts it with his fingers. Another remedy allowing tooth fragmentation and extraction without using dental instruments is the one produced by the tears of ivy and the common pepper (one ounce each) or one made of pounded fissile and round alum, chalcitis and misy (partly oxidized iron or copper pyrites) (in proportion 1:8:1).12

Neophytus Prodromenus recommends application of waxed triturated lead upon the damaged tooth.13

**Constrictions of the Tongue (Short Frenum) and Ranula**

Oribasius describes in detail the three membranes that connect the tongue with the mandible, stressing the frenum as the middle one. He believed that tongue constrictions are caused by membrane dysplasia, but can be easily treated: He advises us to sever the membranes, stating that we can do it without running the risk of damaging vessels and nerves because they are deeply seated.14 For sublingual ranula, Oribasius suggests sublingual smears with equal parts of dry misy and verdigris, emphasizing the value of dividing the sublingual veins in adults.15

Aetius distinguishes between congenital (malformation of the sublingual membranes) and acquired tongue constrictions due to scar formation secondary to sublingual ulcers. He accepts surgery as the only option for these patients. After having placed the patient on a seat, he raises the tongue to the palate. Then, if the constriction is congenital, he retracts the membranes with a curved hook and, in contrast with Oribasius, cuts them carefully to avoid severing the underlying vessels. In case the cause of the constriction is a scar, he retracts the scar with a hook and excises it. He encourages postoperative poultices of cold water or oxycrate (a water-vinegar mixture) before the application of frankincense and a bandage. For the days after surgery he recommends sprinkling with honied water, smearings with Egyptia and removal of the bandages to avoid the constriction’s regrowth.16

Aetius defines ranula as a “swelling of the sublingual parts, especially veins” and treats it with verdigris, chalcitis, galls and sweet wine. He also proposes sublingual smearing with tares, galls or the seeds of roses (each one mixed with honey), and sprinklings with a decoction of olive leaves. For adults he suggests incision of the sublingual veins.16

For the constriction of the tongue, Paul of Aegina states:5,17

> The patient is to be placed on a proper seat, the tongue raised to the roof of the mouth and the membranous fraenum cut transversely. If the curvature is occasioned by a cicatrix we transfix the callus with a hook and draw it upwards and making a cross incision free the bent part, taking care not to make deep incisions of the parts; for hemorrhages which have been found difficult to stop. After the operation the part is to be washed with cold water or oxycrate and after all these things the cure is to be completed with relaxing and incarnative applications.

Ioannes Actuarius, the last eminent Byzantine physician, believed that the best treatment for ranula in children is to reduce it by removing the excess flesh. For adults, he also advocated sublingual phlebotomy.18

**Jaw Fractures and Dislocations**

According to Oribasius, the operation to repair a broken jaw is based on moving the bone fragments towards the chin and the head. Bandages should be loosely applied, with their width...
progressively narrowing. In order to establish whether the fracture is displaced, one can apply a finger to the patient’s mouth and press outward the fractured part that inclines inward.\textsuperscript{19}

Oribasius gives a thorough description of the realignment of the dislocation of the lower jaw: preparing the nerves and muscles, pulling the jaw downwards and transposing it from the upper jaw («προδιακινῆσαι καὶ προμαλάξαι δεῖ τὰ νεῦρα καὶ τοὺς μύας ἐλκοντα κάτω τὴν γένυν, ἀπάγοντά τε (απομακρύνοντάς την) κατὰ όσον ἐνδέχεται τῆς ἀνω»). Then, one should force it suddenly to its correct anatomical position and then again backwards. The patient's mouth should follow the surgeon’s movements. When both sides of the jaw are relocated, the temporal muscles are contracted to attract the whole jaw towards them. The presence of a surgeon’s assistant, who pushes the head gently downwards, is valuable. In case of a bilateral lower jaw luxation, Oribasius urges early operation before the straining of the muscles. The operation is slightly different from the one performed to lateral jaw luxations, and a simple bone traction downwards seems enough («διακινήσαντα καὶ πρὸς τὰ κάτω τὸ ὀστοῦν ἑλκύσαντα…ὠθεῖν ἐκατέρωθεν ὅλην τὴν γένυν»).\textsuperscript{20}

Paul of Aegina distinguishes between partial and complete fractures. For the former, he urges us to:\textsuperscript{21, 22}

| Push outwards the internal curvature of the fracture, which is to be secured with the other hand externally”, but complete fractures have to “be set my making extension and counter-extension, with the aid of an assistant, and the teeth separated at the broken part, are to be fastened together with a ligature or thread of gold”. In all cases “the bones of the jaw are ascertained to be set straight by the equality of the teeth. For complete dislocations of the lower jaw, Paul adopts Hippocrates’ description, which he considers “brief, complete and clear” and reproduces word by word: “Somebody must hold the patient’s head, another grasps the lower jaw internally and externally with his fingers at the chin... We must perform three evolutions at the same time: a) move the jaw from its distorted shape to its natural, b) push the jaw backwards, and c) shut the jaws close and prevent yawning”.\textsuperscript{23, 24}

**Oral Fistulae**

In cases of soft palate fistulae, Oribasius suggests surgical excision, because otherwise it may reach and erode the bone. But, if the bone is affected superficially, cauterization seems preferable and is done in a similar manner as is performed nowadays. The surgeon must be equipped with a crescent-shaped copper tube of specific length, so that when its one extremity is placed on the soft palate, the other is projecting of the teeth («ὡστε τού ἔτερον πέρατον ἐνερείδοντος εἰς τὸ πεπονθὸς μέρος τῆς ύπερψας, τὸ ἐξωθεὶν τῶν ὀδόντων ύπερέχειν»). Then a cautery which snugly fits the tube but moves freely («ὁμοιόσχημον τῷ αὐλίσκῳ πρὸς τὸ διοδεύειν δύνασθαι διὰ αὐτοῦ»), is inserted to the tube and is passed down to burn the damaged bone. Oribasius guarantees that this way the surrounding tissues are not harmed.\textsuperscript{25}

When the fistula is formed in the gums, Aetius preaches the necessity of surgical opening of the fistula tract; but if it reaches the root of adjacent teeth, the fistula’s treatment is tooth extraction.\textsuperscript{26}

**Operations on the Uvula**

For uvulitis causing the uvula’s elongation and deviation, Oribasius suggests astringent medications of variable potency, depending on the severity of the lesion. The mild ones consist of decoctions of dates and roses, of wine tendrils and bramble, of lentisk, turpentine, cypress and hypocistis (plant species). The stronger are comprised of myrtle decoctions, sour quince, apple tops, ilex, fagus (beech), medlars and cornel fruits, whereas the strongest contains galls, sumach and flowers of the wild and cultivated pomegranate. Oribasius proceeds to the surgical excision only when the uvula is particularly skinny («ὁ κίων ἰσχνός καὶ ἱμαντώδης γένηται»). After the operation he recommends application of diphryges (a kind of slag formed when copper is melted), until wound healing is complete.\textsuperscript{27}

Aetius approves operation when the uvula is troublesome, posing a risk of suffocation or when it becomes atrophic and skinny, or in cases of uvular paresis. He identifies that the best time
for the operation is after the inflammation subsides («ἐπάν ἡ φλεγμονὴ λήξῃ»). The surgeon should seize the uvula with the fleshy forceps (μύδιον, σταφυλάγρα), and remove it by cutting the tissue under the forceps, preserving the basis of the uvula («καταλιπεῖν τὴν πρὸς τὴν ὑπερῴαν αὐτῆς βάσιν»). Postoperatively he applies oxycrate (οξύκρατον υδαρές).28

Paul of Aegina considers surgery for the uvula only if conservative interventions fail. He emphasizes that only the superfluous portion of the uvula must be cut off:29

[H]aving placed the patient on a seat in the rays of the sun and directed him to gape wide, we seize with the forceps adapted for this purpose (staphylagra) or a common tenaculum, upon the redundant part and drag it downward, and cut it out with the instrument called staphylotomus or the scalpel used in the operation for the suture of the upper eyelid.

According to Paul, an alternative conservative treatment option, consisting of applying caustic medicines, is reserved for cases that operation is contraindicated because of the patient’s fear or the risk of hemorrhage. In such cases, the substance must “fill the hollows of the instrument called staphylicaustos” and “directing the patient to gape wide and getting the tongue pressed down with a tongue spatula, we open the instrument sufficiently and grasp with it as much of the uva as we cut off in the operation.” Paul is confident that this way “the part becomes dead in one hour and falls off about the third or fourth day”. After the burning “having wrapped the index-finger round with soft wool or tow, we wipe the parts about the uvula or direct the patient to gargle with water.”29, 30

**Conclusion**

Byzantine physicians provide detailed descriptions of several surgical and non-surgical interventions to cure a large number of oral diseases. The variety of these operations, for which special dental instruments were used, demonstrates the high level of surgical knowledge that was achieved during this period.

**References**


13. Μυρεψός Ν. *Περί συνθέσεως φαρμάκων*. Athens: National Library (fourteenth century AD); codex 1478, fol.144.

14. Νεοφύτου Π. *Διδασκαλία περί των τοις οδούς παθών*. κώδιξ 1481; Εθνική Βιβλιοθήκη Αθηνών, φ.15.


16. ibid, p. 548.


21. ibid, p. 211.


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Our meeting will coincide with the Spoleto Festival USA 2011.
This summer celebration of the arts is a sister festival with the city of Spoleto in Perugia, Italy. For more information about the music, dance, theatre and special events at this year’s festival, visit
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Photos: William Struhs
Are You Feeling Down in the Mouth?

Lithograph, 1905. 86 x 138 mm.
This 88 x 138 mm color lithographic postcard, copyrighted in 1905 by the E. B. & E. Postcard Company of Detroit, Michigan, was created for the Santa Cruz, California market. The farcical dentist and patient shown in this comic scene illustrate the caption, “Are you feeling down in the mouth?” Below it, “Santa Cruz” states its place of sale. On the face of the card, an individual, “A. S. Al,” has written the following comment: “Be careful and not hurt him.”

The drawing depicts a disproportionately large-headed, open mouthed patient sitting in a dental chair, hesitatingly allowing his frenzied dentist to yank out one of his molars. The balding patient, with his eyes tightly closed, submits himself to the ministrations of his determined, wild-eyed dentist. As the patient grips the arm rest of the chair, he weakly positions his left hand on the left arm of the dentist as if to restrain him from the job at hand. The fringe-haired dentist, his own teeth clenched, leans toward the patient, positioning his leg on the patient’s knee to gain traction over the lower right molar to be extracted.

According to historical sources, the expression “down in the mouth” dates back to the mid 1600s. This slang phrase describes a person who is feeling low in spirits, overcome by “the blues.” Literally, it conjures the image of one whose mouth is turned downward in a frown.

The double entendre of this portrayal is cleverly presented. On this postcard, both dentist and patient wear downturned grimaces. Given his need for an extraction, we can only assume that the patient has felt “down in the mouth” for some time already.
Depiction of toothache in print has classically been rendered as a red, swollen, round asymmetrical face, with some type of bandage wrapped around the suffering victim’s head. Such sad visages were seen on Victorian Era trade cards which advertised toothache remedies, but were also common on “stock” cards of the era, and others that promoted products or services unrelated to toothaches or dentistry. A stock chromolithographic card (called a “chromo”) had a preprinted image on the front side and a blank reverse side. A merchant or buyer who wished to have an advertising message printed on a specific stock card would compose text as desired, on the front, back, or both sides of the card, and the commission a certain number of cards to be printed. The pictured cards show a variety of toothache images on stock cards and custom-designed cards. Merchants of the Victorian Era must have believed that cellulitis sells!

Lithographs, ca. 1880s-1890s. Various sizes.

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MARSHALL & BALL, CLOTHIERS.
This biography, weaving the life and career of a “1921 Dentist”* in Yorkshire, England, was written by the subject’s grandson, Dr. Anthony Brown (a third generation general dental practitioner). The author, drawing from genealogical, social and cultural primary source material, accomplishes his quest to present a candid, three-dimensional portrait of “Tom Senior,” an impoverished young country boy who seized an opportunity to advance through the dental profession.

While American readers may not be familiar with the professional and political development of organized dentistry in the United Kingdom, the biography concisely portrays the experiences of a “rank-and-file” dental practitioner who entered the profession through the apprenticeship system of the late 19th century.

This biographer combined “family, dental, social and local history” in telling the story of his grandfather’s determination and ingenuity in achieving professional and economic success. 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 first half of the twentieth century.

Of particular interest to this reviewer was the subject’s interest in and eventual mastery of early popular photography, and his entrepreneurial production of postcards. I empathize with the author on the loss of his grandfather’s “large collection of lantern slides,” a loss not only personal, but also to historians interested in images depicting the early 20th century.

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*The 1921 Dentists Act required all dentists from that year on to be registered, and only those trained at dental schools were permitted to register. However, some dentists who had not trained in dental schools were permitted to register, provided they were over 23 years of age, of “good personal character,” and had been in “reputable practice.” These excepted persons became known as “1921 Dentists.”
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."

The bibliography sections appear extensive and current. There were, however, some small reference omissions and irregularities, such the author's utilizing J.M. Campbell's two-page article, “Toothpicks and toothbrushes,” cited in Dental Health (1964), but not including his larger paper of the same title, appearing in the April 1952 issue of Dental Items of Interest. In addition, her citation of Max Giesecke's article from the Journal of the All India Dental Association of 1956, was originally published in the Journal of the Colorado Dental Association in 1954. Other than these very minor errata, this book is highly recommended for one's reference shelf.

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From the Archives: Vol. 3, Nos. 3 & 4

Volume III, No. 3

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BULLETIN OF THE HISTORY OF DENTISTRY

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ERRATUM
E/ The historical papers on the A.A.H.D. program, the publica-
tion of which was reported in the February Bulletin, were read
at the Cleveland meeting in 1953. The papers given at the Miami
meeting in 1954 will appear later in the Journal of the College
of Dentists.

EARLIEST PORCELAIN TEETH IN AMERICA
E/ An interesting advertisement of one Oliver Holmes, dentist,
and his partner, Thomas Barnes, from the Boston Repertory,
February 14, 1815 (now in the collection of Robert Meibauer, of
New York City) has been called to the editor's attention by Dr.
Curt Proskauer. The advertisement announces:

PATENT MINERAL TEETH Which have recently been dis-
covered by the subscribers, and are equal to those
now set in London by the celebrated Dentist, De
Cammet (DeChemant). These teeth are composed
of mineral substance of so hard a nature that they
cannot be wrought upon by a file or affected by
the most powerful acid, and consequently cannot
decay, lose their colour, or render the breath dis-
agreeable.

The date of this announcement is two or three years earlier than
the time when Anthony A. Plantou is supposed to have manufactured
the first porcelain teeth in America. Suitable native materials
were found in this country shortly after 1800, and at that time
the porcelain industry began. It would have been altogether pos-
sible for some enterprising person to make porcelain teeth in
this country before 1815. On the other hand, it is also possible
that, despite the assertion of Holmes and Barnes to the contrary,
they imported porcelain teeth from abroad.

According to some interesting documentary material discovered by
M. Georges Dagen, and supplied by Dr. Milton Asbell, Plantou made
three trips to the Western Hemisphere before 1829. He left his
homeland, as he testifies, before the French law of 1803 went
into effect, and spent some time as a dentist in the French West
Indies and the United States. This fact would preclude his having
brought to America the individual type of porcelain tooth, intro-
duced in France by Fonzi in 1804. The porcelain teeth later man-
ufactured by Plantou were individual teeth not blocks such as made
by DeChemant earlier than 1803. Plantou returned to Paris by 1811
and made his second trip to America not earlier than the latter
part of 1814. This date would preclude the possibility that his porcelain work in America antedated the claims of Holmes and Barnes. Plantou returned to France in 1826 and before 1829 came again to America. A United States patent was granted to Plantou, April 5, 1828, for "terra-metallic" teeth of a description similar to those introduced by Fonzi (J. Franklin Institute II:3:345 1829).

There is some reason to believe that the French and English development of porcelain artificial teeth was not altogether unknown in America. William Pitt Greenwood who also practiced in Boston, reported that in 1800 he made a set of teeth for a lady, to replace a broken porcelain set constructed by DeChamant, and that she presented him with the broken set. B. W. Weinberger (Introduction, Vol. 1, p. 377) advances some claims of the use of porcelain teeth in America as early as 1794 to 1798, presumably teeth imported from France or England. Weinberger also asserts that John Greenwood, on his return from Europe in 1807, "brought back some of these teeth in order to experiment with them". Greenwood's advertisements immediately after his return (cited by Weinberger, Vol. 2, p. 241-242), however, mention only "natural and artificial teeth", which, of course, need not imply porcelain teeth.

It is certain, as mentioned in the February Bulletin, that Aaron Burr brought nearly one thousand of Fonzi's teeth to America, and according to Isaac John Greenwood, presented them to his father, John Greenwood. Burr arrived in America May 5, 1812. He also brought with him a copy of Fonzi's Réponse à M. Dubois-Poucou, which could have furnished considerable information to anybody wishing to try his hand at making porcelain teeth.

As to the two partners in Boston, Weinberger (Introduction, Vol. 2, p. 263) has noted the existence of Barnes in 1816. An Oliver Holmes of Baltimore was among the dentists elected to membership in the American Society of Dental Surgeons at its first meeting in 1840, and he attended the third and fourth meetings of that organization (Am. J. D. Science, I:1:168; I:3:74; I:4:69 1839-1843).

DENTISTRY IN TWO SOUTH AMERICAN COUNTRIES

Dentistry in two of the less well known countries of South America was described in articles appearing during the last year. Boletín de la Academia de Estomatología del Perú for November 1954 was devoted to the celebration of the twenty-fifth anniversary of the founding of that organization and contains material of interest to the dental historian.

A NEW (?) HISTORY OF DENTISTRY

A. Lévi-Évrard, Paris, has announced the publication this month of Histoire Générale de la Chirurgie-dentaire (General History of Dentistry) by J. Léonard-Andre-Bonnet. Although no mention of the fact appears in the publisher’s announcement, this work appears to be a republication, with some added sections and illustrations, of an interesting but unsystematic work issued originally by Andre-Bonnet in 1910 under the same title.

ICONOGRAPHY OF THE DENTIST

The physician, the nurse, and the pharmacist, have been pictured frequently throughout the years in sympathetic and even sentimental guise. Not so the dentist, who has failed to inspire the artist with kindlier feelings, although he has served as the subject of countless caricatures, depicting chicanery, callousness and greed.

The editor has had occasion recently to examine several hundred lithographs and engravings depicting dental scenes, with the purpose of securing a few original artistic prints that would represent the status and work of the dentist. To the editor graphic representations of the dentist seem to fall into three classes as to their attitude toward the practitioner. There is a fair number of what might be called objective depictions, especially among the works of artists down to the middle of the eighteenth century, attempting merely to present the toothpuller as he commonly appeared at fairs and on the public thoroughfares, and the more reputable dentist in his own cabinet—a rather unattractive fellow on the whole. There are also myriads of satirical and severe caricatures, especially in the latter eighteenth, nineteenth, and twentieth centuries. The editor has succeeded in discovering not more than a half dozen prints in which the dentist appeared to be a humane and conscientious person, concerned about the condition and feelings of his patient. Attention should be called to some of these treatments of the dentist in a favorable light, because of their rarity.

Gerard Dow (1613-1675) seems to have had some kindly feeling for dentists and painted several pictures expressing this attitude. An oil in the Louvre depicts the toothpuller in his cabinet extracting a tooth from a peasant who has brought his basket of eggs with him. The dentist’s expression as he carefully prys the painful tooth seems to indicate solicitude and attention (Proskauer, Iconographia Odontologica, Pl. 57).

An oil painting by Johann Gottlieb Hantzch in the National Galley at Berlin shows the dentist seated in a shop for dentist, bather,
and barber, examining a tooth of a child who is reassured by his father. The dentist looking through his glasses with an attentive air has placed his finger gently on the offending tooth (Proskauer Pl. 142).

An etching dated 1861, which Hedvig Strömgren has used to illustrate the cover of her Geschichte der Zahnheilkunde im neunzehnten Jahrhundert (History of Dentistry in the Nineteenth Century) is a particularly sympathetic study of the dentist and child patient. It is by a Scandinavian artist, C. Larsson, and is entitled Hos Tandlakaren.

A print which from an historical point of view has the merit of representing the mechanical nature of the dentist's activities early in the nineteenth century is the illustration of the laboratory of Maury, Parisian dentist, described in the Bulletin 2:2 June 1954.

PHARMACY HISTORIANS PUBLISH BULLETIN
The American Institute of the History of Pharmacy has with this month begun the publication of a bulletin entitled A.I.H.P. Notes. No. 1, April, has 6 mimeographed pages. The new bulletin proposes to "bring to members some of the information (other than historical essays) that would be found in a journal: announcements, book notes, progress reports on institute activities, personal notes and the like, which have historical interest". The A.A.H.D. is glad to see a sister organization in the field of history of the health professions issue a bulletin somewhat similar to its own.

FURTHER DETAILS ABOUT OLIVER HOLMES
Oliver Holmes, whose early use of porcelain teeth in Boston was reported in the March Bulletin, apparently came to Baltimore to make it his headquarters about 1818. At that time the Medical and Chirurgical Faculty of Maryland was granting licenses to dentists. Oliver Holmes was licensed in 1819 (Proceedings Dental Centenary Celebration, 1940, p. 1013).

Dr. J. Ben Robinson has contributed further information in the form of two advertisements by Holmes, one in a St. Louis newspaper, dated April 26, 1820; and the second in a Maryland newspaper, dated January 3, 1821, announcing his return to practice in Baltimore. Although in both advertisements, Holmes declares that "he sets natural and artificial teeth, from one to a whole set", he does not mention the use of "mineral paste teeth". Perhaps he had found that an itinerant dentist could scarcely carry about the clumsy furnaces of that day or even find industrial porcelain manufacturers to make teeth.

The various notes that the editor has received from A.A.H.D. members on porcelain teeth in Europe and in America have contributed to building up knowledge of the subject. Much the same can be said of the notes received on toothbrushes. These instances show how the Academy furthers historical knowledge.
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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.

Copies are available ($79) from the US Government Printing Office (http://bookstore.gpo.gov). Use the search function where the subject, title, first author (Hyson), Stock Number (008-023-00137-5) or ISBN (9780160821592) can be entered to locate the book. PDF file version will be available for download by May 2009 at the publisher's website (The Borden Institute).

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by Bartholomæus Eustachius
Edited by David A. Chernin, DMD, MLS & Gerald Shklar, DDS, MS

One of the greatest anatomists of all time, Eustachius’ major studies remained unknown until their eventual Dutch translation and publication in 1714. Eustachius contributed substantially to the development of dental science. His conceptual advances concerning tooth development and function, based on anatomical dissections, 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.

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

864 pages, hardcover

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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. The work is divided into six chapters such as “How the teeth come and what is a tooth,” “The cause of the pain of the teeth,” “Why and what are the considerations to draw the teeth and which is necessary to pull them.”

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**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.

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