

SEVENTH EDITION

# Review of dentistry

QUESTIONS AND ANSWERS

*Editor*

MAYNARD K. HINE

*Coeditor*

RALPH W. PHILLIPS

# Review of dentistry

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# **Review of dentistry**

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# Preface

The rapid rate of development of all of the sciences—including, of course, the dentally related sciences—makes it mandatory that every reference and textbook be revised regularly. For this reason, authors contributing to this edition of *Review of Dentistry* have been asked to rewrite all chapters, update the information included, and delete the outmoded. In addition, new chapters have been added covering preventive dentistry, occlusion, and the behavioral sciences as they affect dentistry.

Each chapter has been reviewed by at least three individuals so that the material is authoritative and is representative of current opinion. As in the earlier editions, no attempt has been made to be certain that all contributors present identical viewpoints, so different opinions on some controversial issues are reflected in this book. When such differences of opinion, in which both sides have merit, have occurred the editors have not arbitrarily ruled as to which is desirable. In many cases differences in terminology, characteristic of the various fields of specialization, have been retained as an asset for general review.

The almost universal acceptance of the American Dental Association's National Board Examination by state boards and dental schools, coupled with the increased use of written examinations to select career dentists, has amplified the value of a book such as this, designed to guide the reader in a general review of the entire field of dentistry.

Any individual who plans to take a board examination would do well to give careful thought to the methods employed by examiners and to consider carefully how to answer various types of examination questions. Obviously the best way to pass any examination is to know thoroughly the subject under consideration. Even so, many students never do as well on written examinations as they should, because they have a poor technique of answering questions.

The common faults displayed by those who take examinations are many, but three are especially frequent. First, many individuals fail to read the question completely through. Obviously, if the instructions are not followed or if a part of the question is unread and thus unanswered, the results will not be satisfactory. Second, the individual often begins to write an answer before analyzing the question and deciding how to best present the answer. The method of presentation of an answer often determines whether or not the individual earns a high grade. For example, many examiners mark down answers that list rare conditions first and the common ones last. Third, the answers are often given in a rambling, disorganized, and incomplete manner.

Those taking examinations should be considerate of the examiner who must grade the papers. Examiners usually upgrade terse, logical, accurate answers and downgrade voluminous answers that are rambling and include irrelevant verbiage,

even though the latter may eventually include the information requested. The individual writing an examination should relax, read the questions slowly, write slowly (and legibly!), and present answers in a concise, understandable manner.

Many believe that the best method of determining the extent of one's knowledge is through the use of an essay type of examination, in which questions are short but usually require long and organized answers. Although the essay examination may be best for gauging one's understanding of a subject, it is both hard and time-consuming to grade. As a result, there has been a trend in recent years toward use of the so-called "objective" test question. Four common types of the objective examination questions—true-false, multiple choice, completion, and matching—are represented in this book. Such questions, to be valid, are difficult to prepare; but they can be graded quickly, more or less mechanically. They make it possible to cover a broad area of knowledge quickly. Unfortunately, the use of this type of question tends to promote guessing. Also, unless the question is properly prepared, the good student is actually handicapped. As has been pointed out many times, the more a person knows about a subject, the more difficult it is for him to answer a question "true" or "false." This is particularly true if there is a divergence of opinion regarding the question; for example, "sugar causes dental caries" is consid-

ered a true statement by some but at least an incomplete one by others.

Obviously, facts included in this book may be covered by a different type of question than used by the authors. The reader should remember that the material in this book is intended to serve only as a guide during review, not as a verbatim presentation of state board questions.

Death and retirement of previous contributors have made it necessary to name others for this edition. Dr. William K. Elwood assumed the responsibility for general anatomy, replacing Dr. Harry Sicher, and Dr. A. H. Kafrawy replaced Dr. David Mitchell. Dr. Gerald Stibbs (operative dentistry) was replaced by Dr. H. William Gilmore, Dr. Jay Eshleman (practice administration and ethics) by Dr. Elliot N. Gale, and Dr. Gordon Fitzgerald by Dr. Myron Kastle. Dr. Victor Steffel died during the processing of this book and Dr. Robert Derry consented to read proof for the section on removable partial dentures. Sincere thanks are due these former contributors; and we appreciate receiving their permission to edit, rather than rewrite, their chapters.

We wish to thank all of the contributors for their cooperation, for without their assistance this book could not have been published on schedule.

**Maynard K. Hine**  
**Ralph W. Phillips**

# **Review of dentistry**

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## CHAPTER 1

# History of dentistry

Gardner P. H. Foley

**Cite two items of dental importance obtained from Babylonian sources.**

1. The code of Hammurabi (c. 1900 B.C.) presented for the first time the concept of the civil and penal responsibilities of the physician.

2. In one of the letters of a court physician to his king, found in a collection of clay tablets (722–609 B.C.), there is the first reference to the therapeutic extraction of teeth. The Assyrian physician associated diseased teeth with a systemic disturbance and recommended extraction in cases of oral sepsis.

**What role did the Phoenicians play in the development of dentistry?** A people of cosmopolitan interests, the Phoenicians industriously sought and accumulated knowledge and skills during their travels and residence in other countries. By the reverse process they made available their dental knowledge to the rest of the known world. Although specific information is extremely limited, two fine examples of Phoenician retentive prosthesis (fifth century B.C.) were discovered in the necropolis of Sidon. Ligatures of gold wire were woven around the teeth of the device, and the unit was firmly bound to the natural teeth. Evidently these prostheses provided both good service and esthetic benefits.

**From the controversial and conjectural evidence, what are the dependable facts about the practice of dentistry by the ancient Egyptians?** The ancient Egyptians

did not fill teeth. They knew how to apply artificial teeth (for retention only). According to the testimony of Herodotus, dentistry was specialized. They possessed a rudimentary knowledge of oral surgery. They treated dental diseases therapeutically. The art of dentistry had its origin in Egypt in the sixth century B.C.

**Summarize the dental interests and practices of the ancient Hebrews.** The ancient Hebrews stressed the importance of the dental apparatus as a prime element of mental and physical force and vigor. They used therapeutic remedies in the treatment of dental disorders. They treated pathological conditions of the teeth and their adjoining structures. In addition to gold and silver shell crowns and fixed and removable crowns, they made bridgework and pivot teeth.

**Give four facts about the ancient Chinese practice of dentistry.**

1. The *Canon of Medicine* (c. 2700 B.C.), written by Huang-Ti, the Yellow Emperor, is the oldest known medical work. It contains two chapters about dentistry—on diseases of the mouth and on dental and gingival diseases.

2. The ancient Chinese considered dissection to be sacrilegious.

3. They were the first to use the chewstick. (The modern toothbrush was invented by the Chinese in 1498.)

4. Their therapeutic method of acupuncture included 388 points of puncturing. Of these, 26 were used as a remedy

for the toothache and 6 others for curing pains in the gums. The puncturing was usually followed by cauterization for drawing out the corrupt humors.

**What subjects of dental importance are discussed in the Hippocratic collection?** The authentic history of dentistry began with the writings of Hippocrates (c. 460–c. 377 B.C.), and from them we derive most of our knowledge of ancient dentistry. A large number of passages scattered throughout the collection reflect the great importance that Hippocrates ascribed to the teeth and their maladies.

The following subjects are among the many of dental interest discussed in the collection: formation of the teeth, relation of the teeth to speaking, erosion and decay of the teeth, toothache and extraction (earliest reference to instrumentation), mouthwashes and dentifrices, relations between the malformation of the skull and palate and irregularities of the teeth, scurbutus, necrosis of the jaw, influence of atmospheric conditions on the occurrence of oral maladies, dental or gingival symptoms originating in different maladies, ulcers caused by broken or sharp teeth, complete and incomplete fractures of the jaw, and fractures of the symphysis. Of particular importance, because of its acceptance throughout many centuries, is the Hippocratic precept that only loose teeth are to be extracted.

**Explain the significance of Aristotle as a contributor to dental knowledge.** Although Aristotle (384–322 B.C.) wrote of the teeth in many of his works, especially in his *History of Animals*, he unfortunately expressed several curious beliefs that were perpetuated by his successors over many centuries: that man has more teeth than woman; that teeth increase in length during life; that individuals with many teeth live longer; and that teeth are generated after the body has already been constituted. His presentation of the dental systems of different classes of animals is recognized as a valuable contribution.

**What is the nature of the Etruscan con-**

**tribution to the art of dentistry?** The Etruscans, who flourished before the founding of Rome (753 B.C.), probably derived knowledge of the dental art from their intercourse with the Egyptians and Phoenicians. They eventually became the finest prosthodontists of antiquity. Some of their appliances were constructed of gold bands that covered a large part of the dental crown, the bands resting, like a bridge, on the neighboring teeth. They also made partial dentures of the bridgework type, both removable and permanent. They used gold frames to hold loose teeth, to support others, and to contain artificial teeth.

**What information do we possess about early Roman dentistry?** That the early Romans attached great importance to the teeth is indicated in the Law of the Twelve Tables (450 B.C.). Law VII stipulated that fines shall be paid by whoever shall cause a tooth to fall, be the victim free man or slave. The mention in Law X of teeth bound together with gold shows that there were already in Rome men who practiced dental operations.

The early Roman practitioners used a gold rolled splint to support loose teeth, executed gold shell crowns and bridge-work, and produced prosthetic band devices similar to the Etruscan prostheses.

The later developments in the dentistry of Rome are described in the works of her medical writers.

**For what reasons is the work of Cornelius Celsus important to dental history?** The work of Celsus (25 B.C.–A.D. 50) constitutes a digest of medical and surgical science from the earliest times to the period of Augustus Caesar. In *De Medicina* there is the earliest record of orthodontic treatment (by finger pressure). Obedient to the Hippocratic admonition, Celsus causes the painful tooth to fall to pieces by introducing into the cavity certain astringent substances, such as pared pepper berry, or by applying a paste around the tooth. He also discussed the removal of stains from the teeth, the treatment of ulcers of

the tongue and mouth, and the surgical operations necessitated by various oral diseases.

**What are some of the peculiar items of dental information given by Gaius Plinius Secundus?** Pliny the Elder (A.D. 23–79), in his *Natural History*, offers many unusual (though typical of his time) observations and recommendations:

In the human teeth there exists a poisonous substance that has the effect of dimming the brightness of a mirror when they are presented uncovered before it.—A very efficacious remedy for pains in the gum is to scratch them with the tooth of a man who has suffered a violent death.—For toothache bite off a piece from wood that has been struck by lightning and touch the tooth with it.—The ashes of stag's horn, rubbed over loose and aching teeth, make them firm and soothe the pain.—The ashes of the head of a hare are a useful dentifrice. . . . To improve the odor of the breath, rub the teeth with ashes of mice mixed with honey.—To secure protection against the toothache, it is sufficient to wash the mouth three times a year with the blood of a tortoise.

Of scientific value is his observation that the great frequency of periodontal disease among the Romans was caused by their eating highly spiced foods and their practice of provoking vomiting.

**What are the remedies for toothache advocated by Scribonius Largus (fl. A.D. 43)?** The author of *De Compositione Medicamentorum* suggests various ways to calm the aching tooth: with mouthwashes, masticatories, and fumigations or by direct application of medicaments. The fumigation was made by scattering *Hyoscyamus* seeds on burning charcoal. The patient then rinsed his mouth with hot water. The expelling of small worms was the expected aftermath of the fumigation procedure. The associated ideas of fumigation and worms in the teeth persisted into the eighteenth century.

**What valuable allusions to dentistry are to be found in the epigrams of Martial?**

Martial (c. 40–101), in his *Epigrams*, provides the earliest record of the use of artificial teeth made of bone and ivory. He mentions Cascellius as one who extracts teeth and cures dental diseases, the first dentist whose name has been perpetuated.

**What is the principal contribution of Archigenus?** Archigenus (fl. in Rome A.D. 100) surmised that toothache often results from a disease of the interior part of the tooth (inflammation of the pulp) and discovered an excellent method of cure. He perforated the tooth with a small drill of his own invention. Applying the instrument to that part of the crown most discolored, he drilled down to the center of the tooth. He was induced to use this method by the idea of the existence of morbid substances in the interior of the tooth and by the resulting indication of giving them an outlet.

**Give the principal reasons why Claudius Galen is an important figure in the history of dentistry.** Galen (130–200), after Hippocrates the greatest physician of ancient times, was the first to write of nerves of the teeth.

He believed that the teeth are continually worn down by the effect of mastication but that nutrition repairs the losses and the teeth preserve the same size. But when a tooth, from want of an antagonist, is consumed but little or not at all by mastication, it grows gradually longer because the increase caused by nutrition is not offset by a corresponding waste.

He stated that dental caries is produced by the internal action of acrid and corroding humors.

Because of Galen's great reputation, his interpretations of the elongation theory and the concept of humoral pathology were accepted by the majority of medical writers in many succeeding centuries, to the serious detriment of progress in dental science.

**What are the basic facts about Saint Apollonia, the patron saint of dentistry?** Apollonia of Alexandria was a victim of the fanatical persecution of Christian subjects

fostered by the Roman authorities. The executors of the imperial will knocked out her teeth, struck her on the jaws, and threatened to burn her alive. Having been granted a brief respite by her tormentors, she suddenly leaped into the fire and was devoured by the flames. She was canonized a saint in 249 about fifty years after her death. The *Utrecht Brevier* (1508) contains the first mention of her as the patroness of those suffering from toothache. The custom of each guild, trade, and profession to place its members under the protection of a heavenly patron led the practitioners of the art and science of dentistry to place themselves under the spiritual patronage of Apollonia.

**Summarize the general contribution of the Arabians to dentistry and cite specific contributions of their chief medical writers.** The Arabians maintained the study of medicine in an age of decadence and barbarism. As conservators of learning when the sources of knowledge in Christendom were threatened with extinction, they preserved and consolidated the teachings of the ancient writers and made them available to the scholars and scientists of the Renaissance. The Arabians, while making important progress in chemistry and pharmacology, made very little progress in the healing arts. The *Koran's* prohibition of the dissection of human bodies made anatomical research impossible.

Rhazes (ninth century), earliest of the important Arabian physicians, recommended filling the carious cavity with a cement composed of mastic and alum.

Avicenna (980–1037) acquired wide fame, and his *Canon* was a standard text until the end of the fifteenth century, although it presented a small measure of original information. He recommended arsenic as an eradicating remedy, and offered much good advice regarding preservation and hygiene of the teeth.

Abulcasis (c. 1050–1122) was the most important Arabian author in relation to dentistry. His *De Chirurgia* was the first book to include illustrations of dental in-

struments (set of fourteen). In cauterization for the toothache, Abulcasis applied to the tooth a red-hot iron passed through an iron or copper tube to protect the adjacent parts from the heat's action. He was the first author to give effective consideration to dental calculus and its removal.

Avenzoar (1131–1162), last of the galaxy of Arabian physicians, wrote a valuable work on medicine—*Teisir*. However, because by his time the medical men had relinquished oral operations and remedies to barbers and others, Avenzoar gave very little attention to dental therapy.

**Give the rules of Abulcasis for the extraction of a tooth (to be attempted only when unavoidable).**

1. First, ascertain which is the aching tooth.
2. Detach the gum from the tooth with a scalpel.
3. With the fingers or with a light pair of forceps, shake the tooth very gently until it is loosened.
4. Keeping the head of the patient firmly between the knees, apply a stronger pair of forceps and extract the tooth in a straight direction, so as not to break it.
5. If, as often happens, hemorrhage is produced, apply powdered blue vitriol inside the wound; and if this remedy be ineffective, cauterize the part with a red-hot iron.

This procedure, considering its source, would certainly suggest that the typical operator of both the ancient and the medieval periods exercised excessive caution and that the patient underwent excessive torture.

**What Christian concept of sinful conduct acted as a serious deterrent to oral hygiene in the Middle Ages?** Throughout the medieval period, Christians in many of the European countries believed that cleaning of the teeth and operations on the teeth, except extraction, were motivated by personal vanity and thus were not to be tolerated by the true professor of the faith.

**Why is the *Chirurgia Magna* considered a valuable source book of dental history?**

In this work Guy de Chauliac (c. 1300–1368), the greatest surgeon of the Middle Ages, presented a valuable report of dentistry in the fourteenth century. Evidently dentistry had not made any progress since the time of Abulcasis (about 250 years). Guy de Chauliac comments that operations on the teeth are the proper concern of barbers and “dentatores” to whom the doctors have abandoned them. But he admonishes the patients, for safety’s sake, to have such operations performed under the direction of capable medical men. It may be concluded from his testimony that the dentatores were not mere toothpullers but that the best of them were concerned with therapy, operative dentistry, and prosthesis.

**What impression of dentistry in medieval England do we get from Gaddesden’s book?** John Gaddesden (flourished in Oxford in the first half of the fourteenth century) wrote *Rosa Anglica*, which is chiefly a collection of materials from the Roman and Arabian writers, with supplementary comments on similar English beliefs and methods. Apparently there were no important differences between English dentistry and that of the then relatively progressive countries of Europe. Particularly colorful and revealing are Gaddesden’s methods of treating the toothache: purgation, bloodletting, scarification of the labial and sublingual mucous membrane, leeching, fumigation, cauterization, and the application of plasters, powders, and ointments.

**Why is the work of Giovanni di Arcoli (fifteenth century) a noteworthy contribution to dental literature?** He was the first writer to allude to filling teeth with gold. His *Practica* (1483) contains drawings of three dental instruments: the pelican, curved forceps, and stork’s bill. It is also notable for the citation of ten rules for the preservation of dental health.

**What figure of the fifteenth century achieved fame for his advocacy of the dental patient’s welfare?** Giovanni Plateario introduced the sitting position for opera-

tions on the teeth. His predecessors had made the patient lie in a horizontal position or held his head between their knees. However, about three centuries later the use of the horizontal position was still popular enough to warrant Fauchard’s criticism of it. Plateario also recommended that the air in the operating area be pure, since complications may more easily occur in a tainted atmosphere.

**What contributions to dental knowledge originated with Alessandro Benedetti and Leonardo da Vinci?** Benedetti (1460–1525) of Verona was the first writer to note the harmful effects of mercury on the teeth and gums, whether applied internally or externally.

The protean da Vinci (1452–1519) gave in his anatomical books the earliest accurate representation of the skull, teeth, and related structures and the first recognition of articulation of the teeth. He also was the first to establish that the height of the face is equal to one eighth of the height of the body. He determined and illustrated the number of teeth and the dental roots and made drawings of the hollow walls of the alveoli.

**What is the foundation stone of dental literature?** In 1530 *Zene Artzney*, the work of an unknown physician, was published. It was the first book written entirely on the subject of dentistry, significant also because it was written in the German language, not in Latin. Its many editions made available to the uneducated barbers and other operators a compendium of the contemporary knowledge of dental diseases.

**Explain the reason for the place achieved by Walter Hermann Ryff in the history of dentistry.** Ryff, a German physician and surgeon, published in 1545 a small book of great historical significance. His *Nützlicher Bericht* is a noteworthy contribution because it was the first book designed to give the public useful knowledge of oral hygiene. Its three parts dealt with the eyes, the teeth, and the first dentition. Although unoriginal and of little

worth scientifically, it merits recognition as the foundation book of the literature devoted to public health dentistry.

**How did Vesalius indirectly and directly influence the progress of dental science?** Andrea Vesalius (1514–1564), professor of anatomy at Louvain and at Padua, wrote one of the immortal works of anatomy—*On the Fabric of the Human Body* (1543). By his greatly improved methods of scientific investigation and his more accurate interpretations, he broke the influence that the authority of Galen had exercised on medical science for over thirteen centuries. Thus Vesalius became the prime motivating factor in the opening of a new era in the medical sciences, an achievement that had impressive effects on the advancement of dental science.

Although his concept of anatomy of the teeth was less accurate than that of other parts of the body, his description of the dental apparatus was far more exact than that of the blindly venerated Galen. Vesalius was the first to present evidence of the existence of the central chamber of the teeth.

**Give the highlights of the reputation of Ambroise Paré in relation to dental progress.** The chief surgeon to the courts of two French kings, Paré (1510–1592) in his early experience had been a barber and later a surgeon-barber. In these circumstances he achieved a wide practical knowledge of dental practice. In his works he discussed thoroughly dental maladies and their cures. An advocate of replantation whenever indicated, he was also among the first to mention transplantation.

His chief claim to fame is that he was the first to write of palatal obturators. They were made of gold or silver with a sponge attached for insertion in the opening. By absorbing humidity, the sponge swelled and thus held the device firmly in place. Another obturator, without a sponge, was like a cuff button designed to permit easy insertion and turning for effective placement.

**Summarize the contributions to dental**

**knowledge made by the great Italian anatomists Gabriel Fallopius and Bartholomeus Eustachius.** In his *Observationes Anatomicae* (1562) Fallopius (1523–1562) presented the results of his accurate research regarding the development of the teeth. He was the first to write clearly of the dental follicle.

The *Libellus de Dentibus* (1563) of Eustachius (c. 1524–1574), the first treatise devoted solely to the anatomy of the teeth, is a landmark of progress in this area of knowledge. With remarkable accuracy Eustachius presented in several tables the number of roots of molar teeth and all the variations occurring in their number and in their length and form.

The works of Fallopius and Eustachius became basic and promotional media for all future research in the development of the teeth.

**What were the seven principal operations on the teeth as cited by Girolamo Fabrizio?** The operations listed by this celebrated anatomist and surgeon (1537–1619) reflect the status of dental surgery at the end of the sixteenth century:

1. Forced opening of the dental arches in cases of prolonged constriction.
2. Cleaning of the teeth.
3. Medication of carious cavities.
4. Filling with gold leaf.
5. Removal or resection of teeth abnormally situated.
6. Removal of any unevenness or sharpness of teeth.
7. Extraction.

**Give briefly the story of the golden tooth.** In 1593 rumor spread throughout Germany that a golden tooth had erupted in the mouth of a child 7 years of age. This phenomenon attracted thousands of visitors to Schiverdnitz in Silesia. The many dissertations that were written about it demonstrated the wide acceptance of the fact of the anomaly. Besides supernatural causes, the development of the tooth was attributed to the secretion of golden matter.

After the crown had been worn down by