

PART III.

THIRD PERIOD—MODERN TIMES.

CHAPTER X.

THE SIXTEENTH CENTURY.

WE have now arrived at the sixteenth century. The middle ages, that is, the period of transition between ancient and modern civilization, has now come to an end. Events of the highest importance, such as the invention of printing (1436), the taking of Constantinople by the Turks (1453), with the consequent emigration of many Greek men of letters and science, who took up their residence in the West and especially in Italy, and lastly, the discovery of America (1492), marked the beginning of a new era, and are the most essential factors in bringing about the revival of art and science.

In the midst of the vigorous intellectual life which characterized the sixteenth century, dentistry, too, like many other branches of science, made very notable progress; we, therefore, in this period shall have to record many important facts and many important names.

It is, indeed, in the sixteenth century, and, to be more precise, about the year 1544, that we meet for the first time with a monograph, in which dental affections are spoken of independently of general medicine and surgery. The book we allude to, by WALTER HERMANN RYFF, is also noteworthy because it is not written like the preceding works, in Latin, the customary language of the learned, but, instead, in German, that is, in a living tongue.

As we are now mentioning the first German author on Dentistry, it may be permitted us briefly to glance at the beginning of medicine and dental art among the German peoples.

Among the Germans, as in other nations, the first to practise the healing art were priests, priestesses, and wise women. To cure disease they used partly empirical remedies, and partly witchcraft and superstitious means of every kind. Thus, to facilitate dentition, it was thought an excellent thing to pass a thread through the eyes of a mouse and then to

tie the blood-covered thread around the neck of the child. It was held, besides—and this prejudice has left even until now some traces—that the putting of the milk teeth, when they fall out, into the nest of a mouse assures the cutting of new teeth.

We must here mention, with regard to the origin of dentistry among the Germans, a very important fact related by Joseph Linderer,¹ a fact which shows that even among the ancient Germans recourse was had to the application of artificial teeth.

We here reproduce the very words of the said author, translated literally:

“Being by chance a few years ago at Dresden and visiting the Museum of Antiquities, my attention was attracted, in the last room, to two osseous pieces, which with other objects were enclosed in a glass case, with the written inscriptions: *Comb-shaped osseous pieces, found in ancient German urns.* As soon as I had observed them, I saw at once that they were artificial teeth; but as I had to be contented with examining them through the glass of the case, it was not possible for me to decide whether these pieces were really of bone, as they seemed to be, or of another substance. Taking into account their antiquity, their whiteness is very notable. Every piece is composed, if I remember rightly, of five teeth, that is, of a canine and four incisors; the chief difference of these pieces from the prosthetic pieces in ivory still in use (the author is writing in 1848) consists in this, that the pieces of which I speak have not at all a broad base, designed to rest on the gums, the base having instead the same thickness as the rest. The five teeth are well separated from one another. Besides, the canine makes the proper angle with the incisors, and at each side of the piece is found, in a convenient place, a hole, which shows that these teeth were fastened to those of the subject by means of a metallic or other kind of thread. As the above-described pieces are white, we must infer that they were removed from the mouth of the respective individuals before the body was burnt, and afterward put into the urn with the ashes, just as they used to put in coins, bits of arrows, and the like.”

For many centuries dental surgery—which, however, was still in a very primitive state—was practised in Germany, as in many other countries, principally by barbers. These in certain places, and at certain periods, formed corporate bodies, whose members were legally authorized to extract teeth and to practise minor surgery in general. But besides barbers, there were various kinds of individuals, unfurnished with any authorization—tooth-drawers, charlatans, wandering story-tellers, necromancers, Jews, and even hangmen—who invaded the field of medical practice,

¹ Handbuch der Zahnheilkunde, Berlin, 1848, ii, 406.

in spite of its being forbidden them, except in fairs, to administer medications and to perform surgical operations.¹

In 1460 there appeared in Germany a book on Surgery by Heinrich von Pfolsprundt, Knight of the Teutonic Order.² The author had acquired great experience as surgeon in the military expeditions of his order, and we see from his book that he was very skilled in the cure of wounds and fractures. On the other hand, he shows himself hostile to every bloody operation with the exception of rhinoplast. Pains of the teeth and gums were cured by him by means of beverages.³

Artzney Buch
lein/wider allerlei kran-
ckeyten vnd gebrechen der tzen/gezogen
aufs dem Galeno/Auicenna/Mesue/
Cornelio Celso vnd andern mehr
der Artzney Doctorn /seher
nützlich zu
lesen.
M. D. XXX.



Title page of Zahnarzneybuchlein.

¹ Geist-Jacobi, Geschichte der Zahnheilkunde, p. 80.

² A religious order of knights, established toward the close of the twelfth century, viz., during the third crusade. The original object of the association was to defend the Christian religion against the infidels, and to take care of the sick in the Holy Land.

³ Geist-Jacobi, Geschichte der Zahnheilkunde, p. 82.

[The accompanying reproduction of the title page and two text pages from an edition of *Zahnarzneybuchlein*, printed by Michael Blum, in Leipzig, 1530, and translated below, is of interest in connection with the history of the use of gold-foil as a filling material, in that a marginal note refers to Mesue as the author from whom the three methods of treating caries has been derived, one of these methods being the filling of the carious cavity with gold-foil.

Mesue was Surgeon to the Caliph Haroun al Raschid, who flourished 786-809. If the reference to Mesue is correct, it would, therefore, indicate that the filling of teeth with gold was known to the Arabs as early as the latter part of the eighth century. Examination of the writings of Mesue has thus far failed to bring to light any record therein of the treatment of caries by gold filling, although in his work previously referred to (see page 138) the other methods quoted by the anonymous author of *Zahnarzneybuchlein* are fully set forth.

Das Funfft Capittel. Von den gelöcherten vnd hohlen Zenen.

Corrosio ist eine Kranckheit vnd vehel
der zen wenn sie löcherigk vnd hol werdē
welchs am meisten den backzenē geschicht
vornemicklichen so einer ist vnnd sie nicht
von der anhangēde speise reiniget/welchs
faul wirdt/ vnd macht darnach böse sch
arffe feuchtigkeit die sie aus frist vñ erget/
vnd ymmer all melich oberhant nymmet
bass sie auch ganz vnd gar die zen verder
bet / vnnd darnach nicht ane schmerzen
müssen stückicht wegt faulen.

Mesue
ut sup.
capite
pprio.

Diss wirt als der Mesue schreibet vor
nemicklich dreyerley weyse curirt vñ ent
nomen. Zū ersten mit purgierung als oben
berürt / Zum andern mit resoluierung der
materien die sie aus holet vnd wegt frist/
also das man Koche ratten das im Korn
ader weytz wechset/mit effige vnd im mun
de halde/aber mit effige do cappres wort
zel mit Ingwer inne gesotten ist/vnd der
gleichen andere remedia mehr.

Zum

[Translation.]

FIFTH CHAPTER.

ON CARIOUS AND HOLLOW TEETH.

Corrosion is a disease and defect of the teeth when they become carious and hollow, which most often happens in the molars, especially if one does not clean them of the

adhering food which becomes moist and consequently produces bad, sharp [acid] moisture that eats and corrodes them, always gradually increasing, until it spoils the teeth entirely, which afterward must fall away in pieces not without pains.

"*Mesue ut supra capite proprio.*" This, as Mesue writes, is chiefly cured and removed in three ways. First, by purging as treated upon above. Second, by dissolving the material which renders them hollow and eats them away; also by boiling cockles that grow in barley or wheat, in vinegar and holding this in the mouth. In this vinegar the root of caper and ginger and other similar remedies must have been previously boiled. Third, by removing the decay, which is done in two ways. First, by scraping and cleaning the hole and the carious part with a fine chisel, knife, or file, or other suitable instrument, as is well known to practitioners, and then by filling the cavity with gold leaves for the preservation of the other portion of the tooth. Second, by using suitable medicine, such as oak apples or wild galls, with which the tooth is filled after having been cleaned.

Zum dritten das man die ausholung
wegk nimmet/welchs auch auf zweyerley
weyse geschicht/ Zum ersten das man das
loch vnd die aufsfressunge mit einem sub-
tilen meisselchen ader messerchen veilchē/
ader mit einem andern instrument darzu
bequemiclich/wegk schabe/vnd reinige/
als dy practickanten wol wissen/vnd dar-
zu erhaltung des andern teyles des zanes
das löchlichen mit golt blettern zu fullet.
Zum andern das man gebrauche erztey
darzu dñlich welchs geschicht mit Galles
epffel vnd wilder galgen so der zan nach
der reinigung darmit wirdt gefüllet.

Vñ pilsen samen mit dem gumē sto-
racis vormischt / reuche darmitte durch
einen trichter den gelöcherten zan.

Galbanum ist ein gummi gleich dem
olibano auff die ausgeholte zen gelegeth
lindert den schmerzen.

So die hollen zene mit opopannaco ge-
fület werden stillt ehr den schmerzen.

Corellen zustoßen vnd in die hollen zen
gelegt macht sie ausfallen.

B üü Etliche

The following editions of *Zahnarzneybuchlein*, besides the Basle and Mayence editions noted by Dr. Guerini at page 166, were issued and copies thereof are preserved in the libraries of the several collectors as stated. Edition of 1530, printed by Michael Blum, Leipzig, in collection of Edward C. Kirk. Edition of 1536, printed by Chr. Egenolff, Frankfurt a/M, in collection of William H. Trueman. Edition of 1541, printed by Chr. Egenolff, Frankfurt a/M, in *Dental Cosmos* library and collection of E. Sauvez. Edition of 1576, printed by Chr. Egenolffserben, in collection of H. E. Friesell.—E. C. K.]

The book, therefore, lacks importance from a dental point of view, except in the sense that it shows how little skilled in the cure of dental affections were the German surgeons of those days

It is worthy of note that this author, also, speaks of anesthetic inhalations; he, however, only translates, almost to a word, what Guy de Chauliac says on this subject.

Toward the end of the fifteenth century and in the first half of the sixteenth there were published in German, by anonymous authors, some short translations and compilations on dental subjects, taken especially from Greek and Arabian authors.¹ Of these writings, the first one known, taken from Galen and Abulcasis, was printed at Basle in 1490; and another—one of the best—saw the light at Mayence in 1532. These works were perhaps due to intelligent barbers, or perhaps—and this seems to be the most probable—they were written, through the initiative of enterprising printers, by doctors and surgeons, who wished to remain unknown, on account of the special subject treated; for, owing to the fact that the diseases of the dental system were generally left in the hands of barbers and other unprofessional persons, the doctors and surgeons of those days would have been ashamed to interest themselves in such things.

WALTER HERMANN RYFF, of Strasburg, was born in the beginning of the sixteenth century, and died about 1570. He was a rather mediocre doctor and surgeon, and a man of the worst morals, so much so that many cities expelled him from their midst.² He wrote many medical works, in which, however, there is very little original matter. Their principal merit consists, perhaps, in the fact that they were written not in Latin, as then was universally customary, but rather in the vernacular of the author and in a popular style; so that Ryff may be looked upon as the first who endeavored to diffuse among the people useful medical and hygienic knowledge.

Among Ryff's books there are two which are very important to us. One is his *Major Surgery*, and the other is a pamphlet entitled *Useful Instruction on the Way to Keep Healthy, to Strengthen and Reinvigorate the Eyes and the Sight. With Further Instruction on the Way of Keeping the Mouth Fresh, the Teeth Clean, and the Gums Firm*.³

Of these books, there now only exist some extremely rare copies; so much so that neither Albert von Haller nor Kurt and Wilhelm Sprengel, who rendered such great services to the history of surgery, ever had the pleasure of examining them. Dr. Geist-Jacobi has been more fortunate

¹ Geist-Jacobi, p. 88.

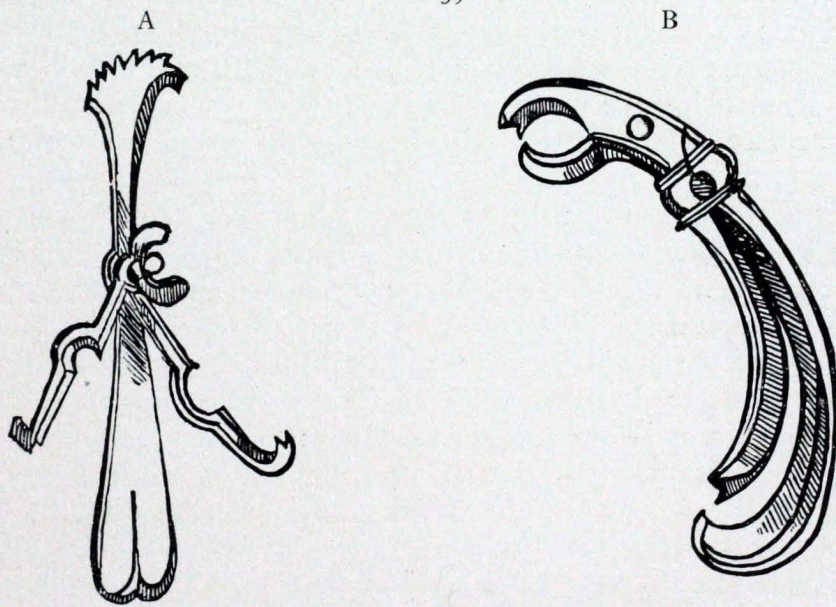
² Albert von Haller, *Bibliotheca chirurgica*, i, 190.

³ Nuetzlicher Bericht, wie man die Augen und das Gesicht schaerfen und gesund erhalten, die Zaehne frisch und fest erhalten soll. Würzburg, 1548.

than they, and has therefore been able to give us some very interesting information about their contents.

The *Major Surgery* is a mere compilation which does not contain anything new of importance. It was published in part in 1545, and in part in 1572, after the death of the author. The work is illustrated with very beautiful wood engravings; and it is just this which gives the principal value to this book. Some of the illustrations contained in the first part of it—that is, in that published in 1545—represent dental instruments, notwithstanding dental surgery is not treated in this part of the book. The author gives notice that he will treat all that concerns dental affections in the latter part of this book, in a special chapter. Unfortunately, this chapter was never written, because death prevented Ryff from completing the second part of his work.

FIG. 59



Pelican and dental forceps (Walter Hermann Ryff).

The dental instruments represented in his *Major Surgery* are many in number. Among them, first of all, are found the fourteen dental scrapers of Abulcasis, then the “duck-bill”—designed for the extraction of dental roots and broken teeth—various kinds of pelican (Fig. 59 A), the “common dental forceps” (Fig. 59 B), the “goat’s foot,” and many other kinds of elevators, among which, observes Geist-Jacobi, may be seen instruments even now in use, and even some which are said to have been recently invented.

Ryff’s other book is especially noteworthy because, as we have already mentioned, it treats, for the first time, of dental matters, independently

of general medicine and surgery. This pamphlet, printed at Würzburg about the year 1544, is made up of sixty-one pages, and is divided into three parts, the first of which is dedicated to the eyes, the second to the teeth, and the third to the first dentition. It is written in popular style, and the author certainly intended it for the instruction of the public, and not for professional men; so true is this, that in it he does not speak of the technical part of the extraction of teeth, or of gold filling—a method already known for a long time—or of dental prosthesis.

The first part, relative to diseases of the eyes and the manner of curing them, has no importance for us. The second part begins with the following paragraph:

“The eyes and the teeth have an extraordinary affinity or reciprocal relation to one another, by which they very easily communicate to each other their defects and diseases, so that the one cannot be perfectly healthy without the other being so too.”¹

This last statement is absolutely false, as a disease of the eyes may very well exist with a perfect condition of the teeth, and *vice versa*. However, Ryff has the merit of being, perhaps, the first who has noted the undeniable relation which exists between the dental and ocular affections.

After a rapid glance at the anatomy and physiology of the teeth, the author enumerates the causes of dental disease, which, according to him, are principally heat, cold, the gathering of humors, and traumatic actions.

The prophylaxis of dental diseases is beyond any doubt one of the best parts of the book; however, the ten rules counselled by Ryff for keeping the teeth healthy—rules which Dr. Geist-Jacobi has made known to us in full—are reproduced, almost to a word, from Giovanni d’Arcoli’s work; therefore, the author has no other merit than that of having translated them into the vulgar tongue, thus diffusing the knowledge of useful precepts for preventing dental diseases. We refrain from reproducing the aforesaid rules here, as they are, with slight variations, identical with those which we gave when speaking of Arculanus.

Nor can any credit be given to Ryff for the rules which he gives in regard to the diagnosis of dental pains, as this part of his work is also taken wholly from the Italian author just mentioned.

After these diagnostic rules Ryff, continuing to translate from the book of Giovanni d’Arcoli, adds:

“If the pain comes from the gums, extraction is of no use; if it comes from the tooth, extraction makes it cease; when, lastly, it is in the nerve, sometimes extraction removes it, and sometimes it does not, according as the matter obtains or not a free exit.”

¹ See *Giornale di Corrispondenza pei dentisti*, 1895, xxiv, 289.

The barbers and tooth-drawers, he says, must well remember this rule, in order to avoid extracting, thoughtlessly and with no benefit, sound teeth, since then the pain persists in spite of the operation. Also, it must be borne in mind that, in case of violent pain, it is necessary to operate as soon as possible, so that the patient may not faint or be attacked by the falling sickness, if the pain should be communicated to the heart or brain.

The idea that violent dental pains could give rise to syncope or to epilepsy (in regard to which we only observe that even very recent writers enumerate dental caries among the causes of the so-called reflex epilepsy) is also found in Giovanni d'Arcoli, who expresses himself in regard to this in the following terms: "Such very violent pains are sometimes followed by syncope or epilepsy, through injury communicated to the heart or brain."¹

"The most atrocious pain," says Ryff, "is when an apostema ripens in the root;" literal translation of words written about a century before by Arculanus: "Fortissima dolor est, qui provenit ab apostemate, quod in radice dentis maturatur."

Likewise taken from Arculanus is the observation (already made, however, by much more ancient writers) that "when the cheeks swell, toothache ceases." Arculanus, however, expresses himself in a less absolute manner, and therefore more corresponding to the truth, since he says "the pain generally ceases" (*secundum plurimum dolor sedatur*).

Even in regard to the therapeutics of dental pains, Ryff does not tell us anything new. Dr. Geist-Jacobi gives this author the merit of having made, in regard to the cure of dental pains, a distinction between *cura mendosa* (that is, imperfect, palliative, tending simply to calm the pain) and *cura vera* (that is, directed against the causes of the disease). But this very important distinction is also taken from Arculanus, who in his turn took it from Mesue. In fact, after having spoken of the general rules relative to the cure of dental diseases, Giovanni of Arcoli adds: "As to the particular therapy, it is divided into *cura mendosa* and *cura vera*, as may be found in Mesue. And the *cura mendosa* is so called because it calms the pain by abolishing sensibility, not by taking away the cause of it. Such is, for the sake of example, the cure, consisting in fumigations of henbane, made to reach the diseased tooth by means of a small tube, adapted to a funnel."

The third part of Ryff's pamphlet has as its title:

"How the pains of the gums should be calmed or mitigated in suckling infants, so as to promote the cutting of the teeth without pain."

This part, as Geist-Jacobi informs us, is very brief, not taking up more

¹ Joannis Arculani. Commentaria, Venetiis, 1542, cap. xlviii, De dolore dentium, p. 192.

than a page and one-half of print. Neither does it contain anything of importance. To render the cutting of teeth easier, Ryff advises that infants should have little wax candles given to them to chew and the gums anointed with butter, duck's fat, hare's brains, and the like. The tooth of a wolf may be hung around the neck of the child, so that it may gnaw at it. It is also recommended that the head of the child should be bathed with an infusion of chamomile.

From what has been said, one may see very clearly that the aforesaid book is, from the scientific point of view, entirely valueless, because the best part of it is merely copied from the work of Giovanni d'Arcoli. However, the author has the indisputable merit of having endeavored to diffuse the knowledge of useful precepts of dental hygiene. His book, besides, we repeat, has great historical value, for from it dates the beginning of odontologic literature, properly so called.

On this point we believe it is necessary to correct an error into which Dr. Geist-Jacobi has fallen. At the beginning of his very valuable article on Walter Hermann Ryff¹ he says: "In the fifth century of the Christian era, the iatrosophist Adamantius of Alexandria published an exclusively odontalgic work, of which, however, we only know the title." The same he repeats in his *History of Dental Art* (pp. 55 and 56), without, however, giving us any proof of his statement. "Of the odontologic treatise of Adamantius," he says, "unfortunately the title alone is known to us, and even that has reached us indirectly, that is, by means of Ætius; it is of the following tenor."

Now, whoever takes the trouble to translate these Greek words will easily perceive that they do not constitute one title, but two distinct ones (which even Dr. Geist-Jacobi has had to unite by the conjunction *and*). These, however, are nothing more than the titles of two chapters of the *Tetrabiblos* of Ætius, as anyone may see for himself by turning over the pages of this work either in the Greek original, or in the beautiful Latin translation of Giano Cornario (Venice, 1553). In this great composition of Ætius dental diseases are treated of in Chapters XXVII to XXXV of Sermo IV, *Tetrabiblos* II; and the two Greek titles above referred to are the titles of Chapters XXVII and XXXI.

In the translation of Giano Cornario they read as follows:

Cura dentium a calido morbo doloroso affectorum, ex Adamantio sophista (cure of teeth affected by warm, painful disease, according to Adamantius the sophist).

Cura dentium a siccitate dolore affectorum, ex Adamantio sophista (cure of teeth affected by pain from dryness, according to Adamantius the sophist).

¹ "The first dental book in the German language" (see *Giornale di Corrispondenza dei dentisti*, loc. cit.).

The work of Adamantius, from which Ætius took the contents of the chapters thus entitled, is lost to us, but we have no reason, and not even the least indication, for supposing that this work was a treatise on dental diseases, and not one on general medicine. It is absurd to consider the above-mentioned titles as belonging to an odontological monograph, on the one hand, because, admitting for a moment the existence of such a work, it should have had but one title and not two, and on the other hand, because it is by no means to be supposed that a great and wise physician, such as Adamantius undoubtedly was, should have had the whim to write a book, not on dental disease or on dental pains in general, but only and exclusively on dental pains caused by heat or by dryness. What reason would there have been for not extending the treatment of the subject to those cases of odontalgia resulting from humidity or from cold, that is, from causes as common and, according to the ideas of that time, very frequently associated with one of the first two (as humidity with heat, and cold with dryness)?

Besides, if the titles of the two chapters spoken of be compared with those of the others, in which Ætius treats of dental affections, such analogy will be noticed between the various titles as to make us consider that they have been formulated by Ætius himself, even when the contents of these chapters are taken from other writers. So that the two aforesaid titles not only do not belong to any dental work, but probably they have never existed, even as simple titles of chapters, in the medical book of Adamantius, from which the contents of the two chapters of Ætius above mentioned have been taken.

In order that every one may easily be convinced that the two titles made so conspicuous by Dr. Geist-Jacobi have nothing particular about them, but are, instead, perfectly analogous to the titles of various other chapters of Ætius, we give here the translation of the titles of five chapters, all concerning dental maladies, that is, the two chapters in discussion and other three:

Chapter XXVII: Cure of teeth affected by warm, painful disease, according to Adamantius the sophist.

Chapter XXIX: Cure of teeth affected with pain from humidity.

Chapter XXXI: Cure of teeth affected by pain from dryness, according to Adamantius the sophist.

Chapter XXXII: Cure of teeth affected by pain from heat and humidity.

Chapter XXXIII: Cure of decayed teeth, according to Galen.

It appears very clear, therefore, from the great analogy existing between the headings of all the above-mentioned chapters, that the titles referred to by Geist-Jacobi have not at all the historical importance and significance that he attributes to them, and that the same have been formulated

by Ætius himself. To argue from such titles that Adamantius was the author of a book on dentistry is not only inadmissible, for all the reasons already given, but also because if it were allowable to reason with such lightness, it might also be stated—by arguing from the title of Chapter XXXIII—that Galen was the author of a monograph on the treatment of dental caries; a thing which is absolutely untrue. Consequently, the beginning of odontologic literature cannot be traced back to Adamantius, but, as Dr. Geist-Jacobi would have it, to an author much less ancient, that is, to Walter Hermann Ryff, or, if it is preferred, even to the anonymous writers of the odontologic compilations which appeared in Germany at the end of the fifteenth century.

ANDREAS VESALIUS. We must now speak of Andreas Vesalius, an extraordinary man, who by his genius infused new life into medical science, and who, although he gave but little attention to dental matters, yet fully deserves a place of honor in the history of dentistry; for this, like every other branch of medicine, received great advantage from his reforming work, which broke down forever the authority of Galen, thus freeing the minds of medical men from an enslavement which made every real progress impossible.

Andreas Vesalius was born at Brussels, December 31, 1514. He studied at Louvain and then at Paris, where at that time great scientists taught, and among others the celebrated anatomist Jacques Dubois, generally known by the Latinized name of Sylvius.¹ The latter, a great admirer of Galen, whose anatomical writings served as texts for his lectures, became jealous of the young Belgian student, who was his assistant, and who gave undoubted proofs of great genius, and of extraordinary passion in anatomical research. Vesalius often defied the greatest dangers in order to obtain corpses either from the cemetery of the Innocents or from the scaffold at Montfaucon. He soon surpassed his most illustrious masters, and at only twenty-five years of age published splendid anatomical plates, which astonished the learned. He acquired also great renown as surgeon, and in this capacity he followed the army of Charles V in one of his wars against France. After having been professor of anatomy in the celebrated University of Louvain (Belgium), he was invited by the Venetian Republic to teach in the University of Padua, which, through him, became the first anatomical school in Europe. Yielding to the requests of the magistrates of Bologna and Pisa, he also taught in those famous universities, before immense audiences.

Before Vesalius, Galen's anatomy had served as the constant basis for the teaching of this science. Although even from the end of the fifteenth century dead bodies were dissected in all the principal universities, the

¹ A Latin translation of the French name *Du bois*.



Nate. Bruxell.
An. 1514.
Obijt circa Zacynthum.
An. 1562. M. Oct.

Corporis humani qui membra secaret & artus,
Vesalio nemo doctior ante fuit. Mm 2

teachers of anatomy always conformed, in their descriptions, to those of Galen, so that the authority of this master, held infallible, prevailed even over the reality of facts.

Vesalius, for the first time, dared to unveil and clearly put in evidence the errors of Galen; but this made him many enemies among the blind followers and worshippers of that demigod of medicine. Europe resounded with the invectives that were bestowed upon Vesalius. Among others, there rose against him Eustachio at Rome, Dryander at Marburg, Sylvius at Paris, and this last did not spare any calumny that might degrade his old pupil, who had become so celebrated. In spite of this, the fame of Vesalius kept on growing more and more, so much so that Charles V called him to Madrid, to the post of chief physician of his Court, a place which he kept under Philip II, also after the abdication of Charles V. The good fortune of Vesalius, unhappily, was not to be of long duration. In 1564 a Spanish gentleman died, in spite of the care bestowed upon him by Vesalius, and the illustrious scientist requested from the family, and with difficulty obtained, the permission to dissect the body. At the moment in which the thoracic cavity was opened the heart was seen, or thought to be seen, beating. The matter reached the ears of the relations of the deceased, and they accused Vesalius, before the Inquisition, of murder and sacrilege; and he certainly would not have escaped death except by the intervention of Philip II, who, to save him, desired that he should go on a pilgrimage to the Holy Land, as an expiation. On his return, the ship which carried Vesalius was wrecked, and he was cast on a desert beach of the Isle of Zante, where, according to the testimony of a Venetian traveller, he died of hunger, October 15, 1564.

Vesalius left to the world an immortal monument, his splendid treatise on Anatomy,¹ published by him when only twenty-eight years of age, and of which, from 1543 to 1725, not less than fifteen editions were issued. The appearance of this work marked the commencement of a new era. The struggle between the supporters of Galen and those of Vesalius rendered necessary, on both sides, active research concerning the structure of the human body, so that anatomy, the principal basis of scientific medicine, gradually became more and more perfect, and, as a consequence of this, as well as of the importance which the direct observation of facts acquired over the authority of the ancients, there began in all branches of medicine a continual, ever-increasing progress, which gave and still gives splendid results, such as would have been impossible under the dominion of Galenic dogmatism.

In the great work of Vesalius the anatomy of the teeth is unfortunately treated with much less accuracy than that of the other parts of the body.

¹ *De humani corporis fabrica, libri septem.*

However, his description of the dental apparatus¹ is far more exact than that of Galen, and represents real progress. The number of the roots of the molar teeth (large and small) is indicated by Galen in a very vague and inexact manner, since he says that the ten upper molars have generally three, sometimes four roots, and that the lower ones have generally two, and rarely three. Vesalius, having examined the teeth and the number of their roots in a great number of skulls, was able to be much more precise. In regard to roots, he makes, for the first time, a very clear distinction between the premolars next to the canine (small molars) and the other three, and says that the former in the upper jaw usually have two roots, and in the lower, one only, whilst the last three upper molars usually have three roots and the lower ones two. As everyone sees, these indications are, in the main, exact.

Other important facts established by Vesalius are as follows:

The canines are, of all the teeth, those which have the longest roots. The middle upper incisors are larger and broader than the lateral ones, and their roots are longer. The roots of the last molars are smaller than those of the two preceding molars. In the penultimate and antepenultimate molars, more often than in the other teeth, it sometimes happens that a greater number of roots than usual are found, it being not very rare to meet with upper molars with four roots, and lower ones with three. The molars are not always five in each half jaw; sometimes there are only four, either on each side, or on one side only, in only one jaw or in both. Such differences generally depend on the last molar, which does not always appear externally, remaining sometimes completely hidden in the maxillary bone, or only just piercing with some of its cusps the thin plate of bone which covers it; a thing which Vesalius could observe in many skulls in the cemeteries.

In regard to the last molar, the author speaks of its tardy eruption and of the violent pains which not unfrequently accompany it. The doctors, he adds, not recognizing the cause of the pain, to make it cease have recourse to the extraction of teeth, or else, attributing it to some defects of the humors, overwhelm the sufferer with pills and other internal remedies, whereas the best remedy would have been the scarification of the gums in the region of the last molar and sometimes the piercing of the osseous plate which covers it.

This curative method, of which no one can fail to recognize the importance, was experimented by Vesalius on himself, in his twenty-sixth year, precisely at the time that he had just begun to write his great treatise on anatomy.

¹ *De humani corporis fabrica libri septem*, cap. xi, *De dentibus*, pp. 40 to 42 (complete edition of the works of Vesalius, published at Leyden in 1725).

The existence of the central chamber of the teeth appears to have been unknown to Galen, as he does not allude to it in the least. Vesalius was the first to put this most important anatomical fact in evidence. He expresses an opinion that the central cavity facilitates the nutrition of the tooth. He says, besides, that when a hole is produced in a tooth by reason of acrid corrosive humors, the corrosion, when once the internal cavity is reached, spreads rapidly and deeply in the tooth, owing to the existence of the said cavity, and sometimes reaches even the end of the root.

In the chapter in which Vesalius treats of the anatomy of the teeth (Chapter XI, p. 40), two very well-drawn figures are found, one of which represents a section of a lower molar, showing the pulp cavity and its prolongation into the two root canals. The other represents the upper and lower teeth of the right side, in their reciprocal positions, and shows very clearly their general shape, the length of their roots, and the number of these.

The changes which take place in the alveolus, after the extraction of a tooth have not escaped the notice of Vesalius. He says that after an extraction the walls of the alveolus approach one another, and the cavity is gradually obliterated.

Aristotle had affirmed that men have a greater number of teeth than women. Vesalius declares this opinion absolutely false—although, after Aristotle, it has been repeated by many other ancient writers—and says that anyone can convince himself that the assertion of Aristotle is contrary to the truth, as it is possible for everybody to count his own teeth.

In spite of this, we find the above-mentioned error even in writers subsequent to Vesalius; for example, in Heurnius (professor at Leyden toward the end of the sixteenth century), who expresses an opinion that rarely do women have thirty-two teeth, like men.

We find but little in Vesalius concerning the development of the teeth. He, indeed, made some observations and researches on this point, but these, from their insufficiency, led him to quite mistaken conclusions. The teeth of children, he says, have imperfect, soft, and, as it were, medullary roots; and the part of the tooth which appears above the gums is united to the root, so to say, as a mere appendix, after the fall of which there grows from the root the permanent tooth. This error arose in the mind of Vesalius from observing that when children lose their milk teeth, these have the appearance of a kind of stump, as if the root had actually remained in the socket. Besides this, he had observed with what facility the milk teeth fall out; and he here calls to mind that, when about seven years old, he himself and his companions used to pluck out their loosened teeth, and especially the incisors, with their fingers, or with a thread tied around the tooth. The softness of the dental roots in children, the easy fall of the milk teeth, and the want of the lower part of the roots in these,

must have raised the idea in his mind that the roots of the milk teeth remained in the socket, and that the upper part of the temporary teeth, instead of being a continuation of the root, was joined to this as a simple appendix, and in a very weak way, as though designed to remain in place for a limited length of time only.

In Vesalius¹ is found a dental terminology—Latin, Greek, Hebrew, and Arabic—which affords some interest. The incisors are called in Latin *incisarii*, *risorii*, *quaterni*, *quadrupli*; and the two middle incisors have been denominated by some authors *duales*. The canines are called in Greek *kynodontes*, which means the same as the Latin *canini*, dog's teeth. In Latin they have been also denominated *mordentes*, and by some also *risorii*, a name which by others is given to the incisors, as we have already seen. The molars have also been called in Latin *maxillares*, *paxillares*, *mensales*, *genuini*.² But some authors give this last name only to the last molars, or wisdom teeth, *dentes sensus et sapientiæ et intellectus*. These teeth have also been called *serotini* (that is, tardy), *ætatem complentes* (that is, completing the age, the growth), and also, in barbaric Latin, *cayseles* or *caysales*, *negugidi*, etc.

In the rebellion against the authority of the ancients, Vesalius had a predecessor whose name, deservedly famous, may be recorded here. PARACELSUS (born in 1493 at Maria-Einsiedeln, Switzerland), on being nominated, in 1527, Professor of Medicine and Surgery at Basle, inaugurated his lectures by burning in the presence of his audience, who were stunned by such temerity, the writings of Galen and Avicenna, just as Luther, seven years before, had burnt in the public square of Wittenberg the papal bulls and decretals. The sixteenth century, in its exuberance of intellectual life, was undoubtedly one of the grandest centuries in history; human thought in that glorious epoch shattered its chains, and declared its freedom both in matters of science and of religion.

Paracelsus, a man of powerful genius, but not well balanced in mind, of corrupt morals, and of an unlimited pride, had, notwithstanding these undeniable defects, the merit of beginning a healthy reform in the science and practice of medicine, by substituting the study of nature for the authority of the ancients and by giving a great importance to chemistry, both for the explanation of organic phenomena and for the cure of disease.

It is to be lamented that this man of genius did not contribute in any way to the progress of dentistry. His works have no importance for us. As a matter of mere curiosity we only record here that Paracelsus considered the too precocious development of the teeth as a great anomaly, and regarded as monsters those children who were born with teeth.³

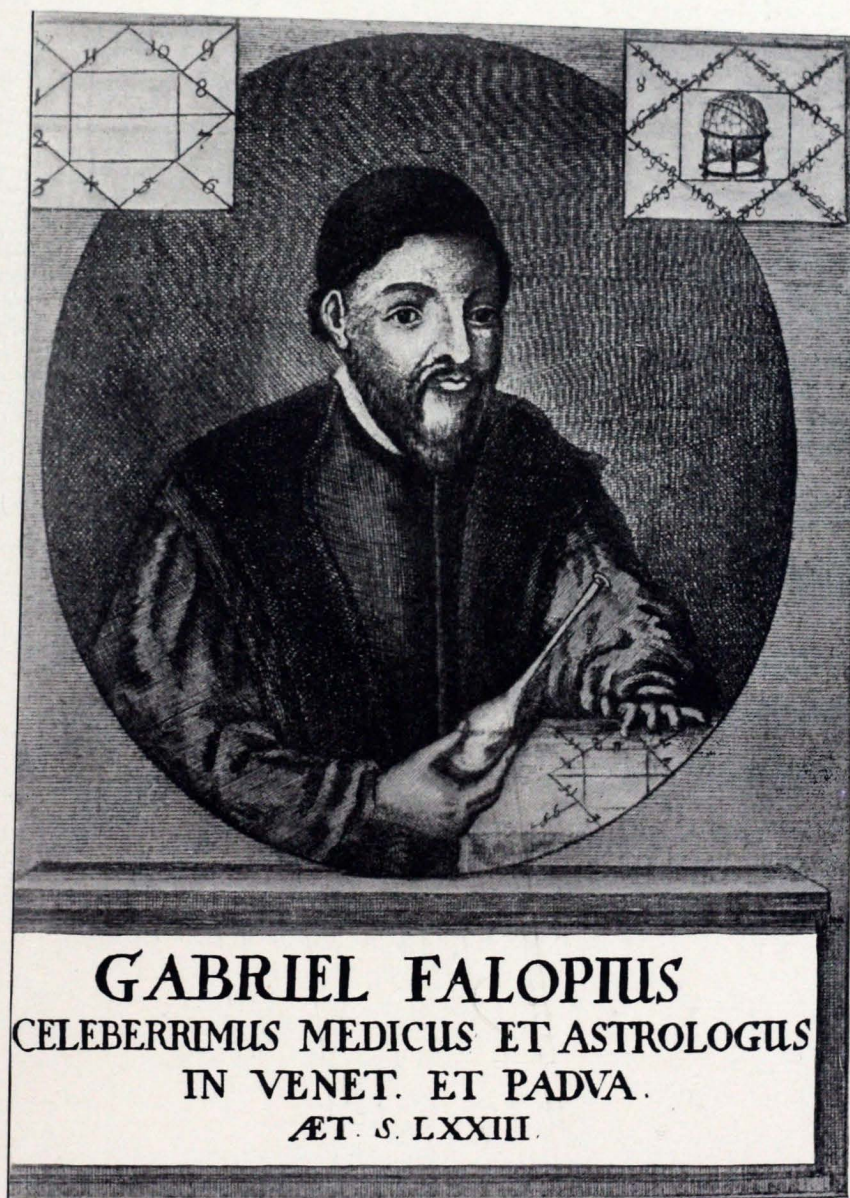
¹ Lib. i, cap. xlii, p. 141.

² From *gena*, a cheek.

³ Blandin, *Anatomie du système dentaire*, Paris, 1836, p. 19







GIAN FILIPPO INGRASSIA (1510 to 1580), a distinguished Sicilian anatomist, was one of the first who spoke of the dental germ. He says that the existence of the tooth properly so called is preceded by that of a soft dental substance enclosed in the bone, and which he considers almost as a secretion of the latter.

MATTEO REALDO COLOMBO, of Cremona, a pupil of Vesalius and his successor in the professorship of Anatomy at Padua, added but little, as regards the teeth, to what his master has taught. He combated the erroneous idea that the teeth were formed in the alveoli shortly before their eruption. Having dissected the jaws of many fetuses, and having always observed in them the existence of teeth, he could affirm with every certainty that the teeth begin to be formed in intra-uterine life.

Like Vesalius, Realdo Colombo believed that the permanent teeth were developed from the roots of the milk teeth; and, therefore, he advised the utmost caution in extracting these, since, if the whole root were removed, the tooth would not grow again.¹

GABRIEL FALLOPIUS (1523 to 1562), the eminent anatomist of Modena, also a disciple of Vesalius, carried out accurate and successful researches in regard to the development of the teeth, and made them known in his book, *Observationes anatomicæ*, published at Venice in 1562, the year in which he died.

His investigations enabled him to show the falsity of the opinion held by Vesalius, that the permanent teeth are developed from the roots of the temporary ones. He was, besides, the first who spoke in clear terms of the dental follicle.

The teeth, says Fallopius,² are generated twice over, that is, the first time in the uterus, after the formation of the jaws, and the second time in extra-uterine life, before the seventh year. The first teeth are, at the time of birth, still imperfect, without roots, completely enclosed in their alveoli, and formed of two different substances; the part with which they must break their way out is osseous and hollowed; the deeper part, instead, is soft and humid and is seen covered with a thin pellicle, a thing which may also be observed in the feathers of birds when they are still tender. In fact, the part of the feather which comes out of the skin is hard and corneous, whilst the part which is embedded in the wings is soft and humid and has the appearance of coagulated blood or mucus. So also in the fetal teeth, the part corresponding to the future root presents itself like coagulated mucus. Little by little this soft substance hardens and becomes osseous, thus constituting the root of the tooth.

¹ Portal, *Histoire de l'anatomie et de la chirurgie*, tome i, p. 545.

² *Observationes anatomicæ*, p. 39, et seq.

Fallopian's reference to the analogy between the development of teeth and that of feathers was highly important, as a point of departure for embryological researches which showed clearly the real nature of teeth, thus destroying the mistaken idea—held by Galen and many other authors—that these organs were bones.

On coming to speak of the teeth generated in extra-uterine life, that is of the permanent teeth, Fallopian relates having observed that they have their origin in the following manner: A membranous follicle is formed inside the bone furnished with two apices, one posterior (that is to say, deeper down, more distant from the surface of the gums), to which is joined a small nerve, a small artery, and a small vein (*cui nervulus, et arteriola, et venula applicantur*); the other anterior (that is more superficial), which terminates in a filament or small string, like a tail. This string reaches right to the gum, passing through a very narrow aperture in the bone, by the side of the tooth which is to be substituted by the new one. Inside the follicle is formed a special white and tenacious substance, and from this the tooth itself, which at first is osseous only in the part nearest the surface, whilst the deeper part is still soft, that is, formed of the above-mentioned substance. Each tooth comes out traversing and widening the narrow aperture through which the "tail" of the follicle passes. The latter breaks, and the tooth comes out of the gum, bare and hard; and in process of time the formation of its deeper part is completed.

The author says that his long and laborious researches into the development of the teeth were carried out with great accuracy, and he is, therefore, in a position to give as absolute certainties the facts exposed by him. Indeed, the observations of Fallopian were, for the most part, confirmed by subsequent research. As to the "tail" of the dental follicle, it is identical with the *iter dentis* or *gubernaculum dentis* of some authors. Fallopian described it as a simple string, but later on this prolongation of the dental follicle has been considered, at least by some, as the narrowest part or neck of the follicle itself, that is, as a channel through which the tooth passes, widening it, on its way out, and precisely for this reason it has been called *iter dentis* (the way of the tooth) or *gubernaculum dentis* (helm or guide of the tooth).

BARTHOLOMEUS EUSTACHIUS, another great anatomist of the sixteenth century, occupied himself in the study of teeth with special interest, and wrote a very valuable monograph on this subject. He was a native of San Severino, Marche (Italy), and a contemporary of Vesalius, Ingrassia, Realdo Colombo, and Fallopian; he died in 1574, after having immortalized his name through many anatomical discoveries and writings of the highest value.

His book on the teeth, *Libellus de dentibus*, published at Venice in 1563,



BARTOLOMEUS EUSTACHIUS

is the first treatise ever written on the anatomy of teeth, and represents a noteworthy progress in this branch of study.

In this little book—divided into thirty chapters, forming in all ninety-five pages—the author treats with great accuracy and in an admirable manner all that concerns the anatomy, physiology, and development of the teeth.

Eustachius not only treasured up what ancient authors had written on this subject, but he himself made very long and patient researches and observations on men and animals, on living individuals as well as on corpses, and not only on adult subjects, but also on children of every age, on stillborn children and on abortive fetuses.

The macroscopic anatomy of the teeth was brought by him to a high degree of perfection. Very wonderful, among other things, is the accuracy with which he studied and specified in several synoptical tables the number of the roots of molar teeth, and all the variations occurring not only in their number, but also in their form, length, etc.

In Chapter IV, speaking of the means by which teeth are held in their sockets, Eustachius mentions in quite explicit terms the ligaments of the teeth. He begins by saying that the perfect correspondence between the dental roots and the alveoli, both in shape and in size, is one of the elements which contribute to the firmness of the teeth, since the alveolus, being exactly applied, on all sides, to the root or roots of the tooth, causes the latter, by this simple fact, to be fixed in a determined position. Also, the nerves inserted in each single tooth contribute, as was already the opinion of Galen, to the stability of these organs. "There exist besides"—Eustachius continues—"very strong ligaments, principally attached to the roots, by which these latter are tightly connected with the alveoli" (*adsunt præterea vincula fortissima radicibus præcipue adherentia, quibus præsepiolis artissime colligantur*). Lastly, says the author, the gums, too, embracing the teeth at their exit from the alveoli, contribute to their firmness. And here Eustachius notes that in the joining of the gums to the teeth there is great analogy to that of the skin with the finger nails; a very proper observation, which makes us almost suppose that the perspicacious mind of Eustachius may have guessed the kindred nature of nails and teeth.

In Chapter XV are related the researches made by the author to ascertain at what period the development of the teeth begins. Here is a passage of this chapter, almost literally translated:

"Hippocrates, before anyone else, wrote that the first teeth are formed in the uterus. Wishing to assure myself thereof, I dissected many abortive fetuses, and by very careful observations I found it to be true that the teeth have their origin during intra-uterine life. Wherefore, the opinion of those who consider that the first teeth are formed from the milk,

and those of the second dentition from food and drink, must be declared entirely false. In fact, by opening both jaws of a stillborn fetus, one may find, on each side of each jaw, the incisors, the canine, and three molars, partly mucous and partly osseous, and already sufficiently large and entirely surrounded by their alveoli. Then removing, with a skilful hand, the incisors and the canines, there may be observed a very thin partition only just ossified; and if this be removed with equal care, an equal number of incisors and canines, almost mucous and very much smaller, appear, which, enclosed in special alveoli behind the first, would exactly correspond in position each with its congener, if in both jaws the canine were not resting for the greater part on the next incisor so as almost to hide it."

As to the molars (by which name also the bicuspidis are here meant), Eustachius says that he found but three on each side, and no trace whatever of the others. Nevertheless, he considers it quite probable that the germs of the latter should also exist in the fetus, although so small as to escape observation. He gives many ingenious reasons in support of his mode of thinking, and comes to the general conclusion, that not only the temporary teeth but also the permanent ones have, all of them, their origin during fetal life; a false conclusion simply because too general, and which shows once more how, in biological science, one runs great risk of falling into error whenever one tries to draw too free deductions from observed phenomena.

The researches of Fallopius and Eustachius confirm and complete each other. These two eminent anatomists, who gave great glory to Italy by their immortal discoveries and works, were the first to shed a brilliant light upon the development of the teeth, and thus opened up the way to all subsequent research on odontogeny.

In settling the period in which the formation of the teeth begins, Fallopius was still more successful than Eustachius. His patient investigations showed him that the development of the teeth commences partly in the uterus and partly after birth, which is perfectly true, as was made clear by later embryological researches. Fallopius found in each fetal jaw twelve teeth.¹ In this he agrees perfectly with his contemporary, Eustachius, who, as we have seen a short while ago, found in fetusus, only just born, the incisors, the canines, and three molars for each side of each jaw. Eustachius, however, observed in the fetus the germs of the permanent incisors and canines as well, a thing not noted by Fallopius.

It is not to be wondered at that some discrepancy should exist between

¹ *In utero duodocim dentes formantur in malis, et totidem in maxilla* (in the uterus are formed twelve teeth in the upper jaw and as many in the lower). Fallopii Gabrielis observationes anatomicæ, Venetiis, 1562, p. 39.

the observations of these two eminent anatomists. The researches of which we are speaking are sufficiently delicate and difficult; and even much more recent authors are far from agreeing perfectly, as far as regards the period, in which the development of the teeth begins. Serres, in his *Essai sur l'anatomie et la physiologie des dents* (Paris, 1817), sustains the view that in the fetus he has observed the germs of all the teeth, both temporary and permanent, while Joseph Linderer (*Handbuch der Zahnheilkunde*, Berlin, 1842) says that, although he has followed the preparative method indicated by Serres, he could never discover in the fetus the germs of all the teeth. Perhaps, he adds, the time when the development of the teeth begins varies considerably in individuals, just as we remark differences in the time of eruption.

In Chapter XVII of his book, Eustachius speaks of the process of formation of the teeth, which he studied in abortive fetuses, in stillborn children, in children a few months old, and also in kids.

On dissecting a fetal jaw, there may be found on each side, as we have already seen, the incisors, the canines, and three molars, still soft and imperfect, separated from one another by very thin osseous partitions. Each of these teeth is enclosed within a follicle or little bag of a grayish white color, rather more mucous and glutinous than membranous, and in form somewhat like the pod of a vegetable, with the only difference that it shows an opening at one of the extremities, from which the tooth somewhat protrudes, as if it were germinating. The more recent and softer the tooth, the more its follicle has a mucous appearance and differs from the nature of membranes. As it does not adhere to the underlying tooth, it is easy to separate them. As to the tooth, it is at that period of its development partly osseous and partly mucous, since that part which later on projects from the gum soon becomes transformed into a white thin and concave scale, which gives the idea of one of the little cells of a honeycomb. This scale is harder and more conspicuous in the incisors, since these, at this stage, are better formed; the canines are less advanced in development, and the molars still less; and among these latter, those are less developed which are more distant from the canines. The deeper part of the tooth consists of a mucous and tenacious substance, harder, however, than the substance of the follicle, and of a whitish color with a tendency to dark red, translucent, and somewhat brilliant.

Thus, says Eustachius, the teeth present themselves in a human fetus; but he who cannot obtain a human fetus may observe the same things in a kid.

Although the author does not express himself very explicitly, he seems to consider the follicle of the tooth substantially identical with its ligament. "This is at first mucous, but afterward, becoming more consistent,

causes the tooth to adhere to the socket and gum very firmly, as if it were glued."

"As the part of the tooth which comes out of the gum projects from the aperture of the follicle like a gem from its bezel, so—says Eustachius—some believe that the crown of a temporary tooth is a mere appendix, and that the follicle comes out of its concavity through a dividing line which they imagine to exist between this supposed appendix and the remaining part of the tooth. But assuredly those who assert such things show that they have studied the anatomy of the teeth so carelessly that, by this one error, they make manifest their great ignorance together with their great temerity.¹ The line which is observed on the tooth on the part corresponding to the adhesion of the gingival margin and of the dental ligament is very superficial, and after having scraped it away, there does not remain any trace of a division. But apart from this everyone can very easily observe, even in infants, or in kids, that the tooth when ossified does not present any line of division and that the still mucous follicle envelops it freely, and may be easily separated from the tooth; which would not be the case, if the follicle issued from between the tooth and its supposed appendix."

Thus, Eustachius declares entirely false the opinion already expressed by Celsus, that the permanent tooth grows from the root of the milk tooth. He affirms clearly and decisively that between the external and the radical part of a milk tooth no real division exists, and that the ossification of the tooth, beginning from the crown, proceeds without any interruption right down to the end of the root. If it were true, says he, that in children only the imaginary epiphysis or appendix falls, and that the new tooth is substantially represented by the remaining part of the first, it could never happen, as instead it often does, that the new tooth appears before the first one falls. Besides, between the lower part of the first tooth and the upper part of the second no correspondence exists either in size or shape, as ought necessarily to be the case if the two parts were joined together. This is not all; the lower part of the temporary tooth is perforated, and receives in its interior bloodvessels and nerves, whilst the upper part of the permanent tooth is quite massive and imperforated. How, then, could this second tooth transmit bloodvessels and nerves into the cavity of the first? Again, how could the continuity of these bloodvessels and nerves with their respective branches be possible, if an imperforate body, such as the crown of the permanent tooth, were really interposed?

But what is the use of so many arguments? exclaimed Eustachius.

¹ This sharp reproof and accusation of ignorance are made for the benefit of the immortal anatomist Andreas Vesalius, to the number of whose adversaries Eustachius likewise belonged. What unjust fury of party passion!

To remove even the slightest doubt and to put an end to any controversy on such a point, only one fact is sufficient, which is revealed to us by anatomical dissection, and that is, that the teeth which appear about the seventh year are not only not united to those which fall at the same period, but cannot even be in contact with them, owing to the presence of a thin osseous partition.

In the following chapter¹ Eustachius speaks of the central cavity of the teeth and of the substance contained in it. In young teeth, he says, the dental cavity is very large, in proportion to the size of the tooth. According to some anatomists, the central cavity of a tooth is coated by a very soft and thin membrane, formed by a tissue of very small vessels and nerves; and besides, this cavity is filled with marrow, like hollow bones. The observations of the author, however, do not agree with these statements. The dental cavity does not contain any fatty substance analogous to the marrow of bones. As to the above-mentioned membrane, Eustachius doubts its existence. The large hollow existing in children's teeth contains, he says, a mucous substance, somewhat hard, and very smooth at its surface—almost like a cuticle—but which has rather the appearance of a concretion than of a membranous tissue. At any rate, adds Eustachius, if the substance alluded to is made to dry up in the shade, it acquires an appearance not unlike that of a membrane. It is certain, however, that at an early age the substance contained in the dental cavity does not adhere to the walls of the latter after the manner of a periosteum, but is found in simple contact with the same, and can, therefore, be separated from them with the greatest ease.

As years pass by, the dental cavity becomes narrower and narrower, because the substance contained inside the tooth gradually becomes ossified at the surface, adhering to the dental scale previously formed, in the very same manner as the internal or woody part of a tree adheres to the bark. Of the two hard substances which make up a tooth, the outer one is white, tense, and dense, like marble, the underlying one, instead, is somewhat dark, rough, and less compact. To observe accurately the above-mentioned facts, the author advises searching for them, first, in the molar teeth of the ox or the ram, and then in human teeth, and likewise, first in children or in recently born animals, and then in adults.

Chapters XIX and XX are, comparatively speaking, of little importance. In the former the author undertakes especially to examine the opinions of Galen on dental bloodvessels and nerves, and discusses whether it were known to him that these vessels and nerves penetrate into the internal part of the teeth. In the latter, Eustachius speaks of the great

¹ Chap. xviii, p. 54.

difficulties that are encountered in dissecting dental bloodvessels and nerves, and reproves those who, by inaccurate illustrative figures, convey the erroneous idea that these parts are very clearly and easily observable.

In Chapter XXI the author goes on to speak of the best mode of proceeding in order to make successful observation of the small nerves and vessels going to the roots of the teeth. These researches are much more easily made in large animals than in man; and therefore such things as cannot be observed well in the latter must be studied in the former.

In the first place, it is necessary to dissect the lower jaw; and after having done so several times, with all the accuracy required in making researches of this kind, one may proceed to study the dental nerves and vessels of the upper jaw, which is much more difficult. Having opened up the inside of the lower jaw, one observes a cavity full of marrow, and within this a nerve enclosed entirely in its own sheath. Having removed the marrow, and opened the sheath lengthwise, one perceives that the nerve therein enclosed is constituted (analogous to what may be observed in the large nerves of the limbs) by several nervous strings, and that among these runs a comparatively large artery, besides small vascular branches of minor importance. If one then removes the sheath from the bone, together with the nerve and the vessels contained in it, raising it very gently, one sees, issuing therefrom, some very slender fibers, on the nature of which it is, however, difficult to pronounce; and, considering their thinness, one can hardly conceive that they are composed of three different elements, that is, of small nervous, arterial, and venous twigs. At any rate, the author admits that this may be so. On arriving at the lesser teeth, the nerve and the artery that accompanies it divide into two branches, one of which traverses the opening presented by the bone at that point (*mental foramen*), and is destined to the lower lip; the other directs its course toward the roots of the incisors. The small twigs which penetrate into the roots of the incisor and canine teeth are less slender than those which enter the roots of the molars, and are easily to be seen not only in large animals, but also in man. If the tooth of an ox or that of a ram be split through the middle, the mucous substance contained in the interior is seen to be traversed by small bloodvessels; and one perceives, besides, certain fibers, which are probably nerves. All these things, says Eustachius, I have observed many times in different animals, in some cases more, in others less distinctly. But it is an exceedingly difficult thing to follow the single twigs, of which we have spoken, from their origin to their insertion, or, *vice versa*, from their insertion to their origin. And so, adds the great anatomist, being able to observe but a small part of the things I should like to see, I find myself compelled, in my perplexity, to supply by the aid of ratiocination the deficiency of the senses. I therefore maintain that the interior part of a tooth is susceptible

of experiencing pain accompanied by a feeling of pulsation (a fact already mentioned by Galen), because a nerve and an artery penetrate into it. In the ox the penetration of bloodvessels into the roots of the teeth can be more readily ascertained than in man. It may be admitted that the same occurs in the human teeth; and this, for the reasons already given, and also because only by admitting the existence of an artery within the cavity of the tooth can be explained the copious flow of florid red blood from a decayed tooth, which has, in some cases, been known to imperil the life of a patient. And I myself, says Eustachius, have observed with my own eyes an accident of this kind.

The author then passes on to speak of the eruption of the teeth,¹ but the data with which he furnishes us are neither very precise nor very exact.

Eustachius, without declaring himself for or against it, cites, in this chapter, the opinion of those who believe in the possibility of a third dentition in old people. He returns to this subject in the last chapter but one of his book, which treats of dental anomalies: "Ali," says he, "testifies to old persons having had all their teeth renewed. This has been derided as chimerical by medical men of later date, or at least only admitted under the condition that such teeth be of a nature completely different from the first."

Our teeth, says the author, grow old together with us, and toward the term of life they abandon us, a fact which also distinguishes them from the other bones. When, however, it occurs, through illness, that the teeth are extracted or fall out spontaneously before the period of old age, the alveoli become filled up with a bony substance; and in addition the two osseous scales of the maxillary bones approach one another and unite together in such a manner as to form a sharp margin, every vestige of a cavity being obliterated.

Speaking of the nutrition and growth of the teeth,² Eustachius says that—given the existence of the dental nerves and bloodvessels—it is not difficult to explain how the teeth are nourished, grow, live, and feel. He therefore rejects the opinion of those who held that the teeth of the lower jaw derived their nourishment from the marrow contained within this bone, and that those of the upper jaw received it from a humorous substance similar to marrow, existing in the large cavity of the upper maxillary bone. Against the supporters of this opinion Eustachius raises, among others, the following objections, viz., that the marrow of the inferior jaw does not in any way touch the teeth, so that such a mode of nourishment cannot be imagined, and that it is completely erroneous that the large cavity of the upper maxillary bone contains a humor

¹ Chap. xxii, p. 65.

² Chap. xxiii, p. 70.

similar to marrow. This passage of Eustachius' book gives clear evidence that he was well acquainted with the maxillary sinus, described a century later by the English anatomist, Highmore, who gave it his name. The existence of this cavity was, besides, already known before the time of Eustachius.

The author also says that those who believe that the internal cavity of the teeth contains marrow, and that this serves to nourish them, are grossly deceived.

In the same chapter, Eustachius confutes an opinion, at that time generally diffused and put forward for the first time by Aristotle, viz., that the teeth grow throughout a whole lifetime. In the senile age, he says, the teeth become impaired still earlier than the other organs. They become thinner by deficiency of nourishment, and, at the same time, discolored; the incisors and canines, as they waste away, come to be also less sharp than they were; and the molars, losing their tubercles or cups, become levelled down and smooth. If, notwithstanding the evident wearing out of the teeth, they seem sometimes to grow longer, this appearance is not to be trusted, for it happens not unfrequently that the teeth appear to have grown longer simply by atrophy of the gums, or also because some humor or other morbid substance pushes them outward.

As to the sensibility of the teeth,¹ Eustachius is of the opinion that these organs possess, besides the sensibility to pain, two other species of sensibility; for, following the ideas of Galen, he also holds that the teeth together with the tongue partake in the sense of taste; and he further considers the disagreeable sensation known as *setting on edge of the teeth*, as a species of tactile sensation peculiar to these organs.

But in which part of the tooth does the faculty of feeling reside?

Among the authors previous to, or contemporaries of, Eustachius, some affirmed that the sensibility of the tooth resides in the pellicle which lines its inside cavity, others in the membrane which, like periosteum, clothes the root of the tooth, others in both these parts. Eustachius does not show himself more partial to the one than the other of these opinions; he is, however, firmly persuaded that the hard substance of the tooth is also endowed with sensibility. Though it is not easy to explain how this may be, he considers it probable that the nerve, fraying itself out inside of the tooth in minute filaments at the time when the substance of the tooth is still soft and mucous, intermixes intimately with it, thus communicating to it the faculty of feeling, which then persists in it, even after the ossification of the tooth. Such an hypothesis is certainly worthy of the lofty intellect of Eustachius, and has in itself, so it seems to me, something of truth.

¹ Chap. xxv, xxvi.

In the two following chapters,¹ the author speaks in a masterly and admirable manner of the functions of the teeth and of their utility.

Among many other true and interesting observations, he remarks that by the loss of their teeth even the most powerful dogs become cowards.

Besides what concerns the human teeth, excellent notions of comparative anatomy, above all in what regards the monkey, the dog, and the ruminants, are to be found in this little but most precious book of Eustachius.

The teeth, says he, are not equally hard in all animals, and many ancient authors have affirmed that ferocious animals have much harder teeth than tame ones.

Chapter XXIX, relating to dental anomalies, is one of the most interesting. We here quote the greater part of it.

"Some historians relate that Pyrrhus, King of Epirus, Eurifeus, of Greece, and many others, had, instead of teeth, a continuous bone, furrowed by somewhat deep vertical lines, in no way different from what one sees in the multiple molars of the goat. It has never happened to me, says Eustachius, to witness a similar union of all the teeth; I have, however, sometimes observed continuity between three or four molars, precisely in the same manner as in sheep. It also once happened to me to observe in the case of an old man, a fellow citizen of mine, that the teeth were covered up on every side by a hard and almost stony substance, and no longer exhibited any trace of separation, offering instead the appearance of a single bone."

"One reads that Timarchus, of Cyprus, had two rows or series of teeth and Hercules three."

The author never had any opportunity of observing any such anomalies; notwithstanding, he refers to cases of the kind observed by other anatomists of his time, and, in a particular manner, to the case of a triple dental series in a youth who died at the age of eighteen. As the truth of the fact was testified to by highly respectable medical men, Eustachius lends faith thereto. "Neither can it be said"—he adds—"that in the case we are speaking of the new teeth erupted from other sockets before the temporary ones were shed, for there would then have been only a double and not a triple series; indeed, the series would not even have been double along all the line, but only along the line of the temporary teeth; and besides this, the double series would not have been maintained up to eighteen years of age—the time of the death of the subject—but only until the shedding of the deciduous teeth."

"That teeth are sometimes cut in the palate is a fact attested to by Alessandro de Benedetti and others. It has also occurred, within my own experience, to observe this in the person of a Roman woman, who had a

¹ Chap. xxvii, xxviii.

tooth in the roof of the mouth, near the opening which is in proximity to the incisors,¹ and at Gubbio there is, in the monastery of the Trinità, a nephew of the distinguished jurisconsult Girolamo Gabrielli, who at the age of eighteen cut a tooth in the middle of the palate."

"Pliny and Solinus tell of individuals born with all their teeth. Other authors, that Pheretes was without teeth all his life."

"I hold it to be a fable that some women lose a tooth for each child they bear."

"In some cases it has happened that the falling out and renewal of the teeth has not taken place before the age of thirteen or fourteen. In other cases, the same teeth were shed and renewed twice, that is, once after the seventh year, and again after the fourteenth year. It ought also to be mentioned that in some young persons of twenty, the last molar, or wisdom tooth, having been drawn, it was renewed during the same year. Lastly, it is also to be noted that in strong and healthy young persons, one of the other molars being extracted, it is sometimes renewed."²

In the last chapter³ the author alludes to some dental affections. In referring to the fluxions to which teeth are subject, he says he has observed more than one case in which such a quantity of matter resembling chalk was collected in the alveoli, that these gradually being filled thereby, all the teeth became loosened and dropped out little by little.

Speaking of dental diseases requiring surgical intervention, the author remarks that dental surgery was, in his days, a most abject calling, notwithstanding its having had, according to Cicero, a very high initiator—Æsculapius, the god of medicine.

AMBROISE PARÉ. Whilst the anatomy of the dental system was illustrated by the researches of Fallopius and Eustachius, the celebrated French surgeon Ambroise Paré was contributing in the highest degree to the progress of practical dentistry.

Ambroise Paré (Latinized Paræus) was born at Bourg-Hersent in the year 1517. His father and one of his brothers were box-makers; another brother was a barber. We have no very precise information about the early years of his life; so much is certain, however, that Ambroise Paré

¹ The inferior orifice of the foramen incisivum.

² It is superfluous to say that these cases are unreal and simply dependent upon erroneous observations; for instance, in the case of the second molar being extracted before the erupting of the third, the second molar figured as, and supposed to be, the latter, when, finally, the wisdom tooth appeared, it was believed to be the last molar renewed. It is no rare thing, also, in these days, not only for unprofessional persons, but also for medical practitioners, to fall into errors of this kind, especially because, in similar cases, the wisdom tooth, having but a limited space in which to erupt, is in the habit of filling the void left by the second molar, where it meets with less resistance.

³ Page 93.



*Humanam AMBROSII vere hæc pictura PARÆI
Effigiem sed Opus continet Ambrosiam.*

did not enjoy any of those advantages deriving from a good literary education, and after having received some instruction from a chaplain, whose disciple and servant he was at one and the same time, he was bound over as apprentice to a barber, who also taught him the art of bleeding. Toward the age of sixteen we find him in Paris in the employ of a *chirurgien-barbier*. After this he practised minor surgery for some years in the Hôtel-Dieu. But having undertaken the study of surgery without literary preparation and without any knowledge of Latin, he was obliged, especially for the latter reason, to contend with great difficulties, so that, although he had acquired in a few years sufficient practice in surgery to enable him to pass from the Hôtel-Dieu to the sanitary service of the French army, it was only in 1554, that is, at thirty-seven years of age, that he was permitted to take the examination required for becoming a member of the College of Surgeons of Paris. Within the short space of five months he was successively named Bachelor, Licentiate, and Doctor in Surgery. His reputation, which had already become extraordinary even before he had any academic degree, procured him introduction to the Court of France as surgeon in ordinary. In 1562 he became chief surgeon to the Court and occupied this post under the reigns of Charles IX and Henri III. Ambroise Paré was a Protestant, and it is said that in the massacre of St. Bartholomew's night, he owed his escape to the king, Charles IX, who, to save his life, hid him in his wardrobe. He died full of honors, in the year 1592.

In his works this great surgeon treats the subject of dental maladies and their cure very thoroughly; this may be in part attributed to the circumstance of his having first been simply a barber (and, therefore, also a tooth-puller) and afterward a surgeon-barber, which placed him in very favorable conditions for acquiring vast experience in the practice of dentistry.

In Chapter II, Book IV, of his works,¹ Ambroise Paré speaks of the anatomy and physiology of the teeth. It must, however, be confessed that Vesalius and, still more so, Eustachius treat of dental anatomy with much more exactness than he does.

After having spoken of the incisors and the canines, he says that the ten upper molars generally have three roots, and very often four, whilst the ten lower ones have only three; this is because the lower jaw is harder than the upper, and also because the lower molars, *estant assises sur la racine, et non suspendues, comme celles de la mandibule d'en haut, n'avoient besoin de tant de racines pour leur stabilité assurance*.²

¹ Œuvres complètes d'Ambroise Paré, accompagnées de notes historiques et critiques, par J. F. Malgaigne, Paris, 1840, vol. i, p. 231.

² The lower molars, being seated on the roots and not suspended like those of the upper jaw, are not in want of so many roots to assure their stability.

Ambroise Paré, too, admits that the teeth grow throughout the whole lifetime, and that the wearing away consequent on reciprocal friction and mastication is compensated in this way.

Galen had already affirmed, and Ambroise Paré also held erroneously, that the exquisite sensibility of the teeth aids the sense of taste.

In speaking of the development of the teeth, Ambroise Paré says only that they are already solid and osseous before birth, he himself having observed this in dissecting the jaws of a child who had died immediately after birth.

In Chapter VII, Book XIII,¹ Paré treats of fracture of the lower jaw. The method of cure he proposes is altogether identical with that of Celsus. With regard to the teeth, he says that "*si elles sont divisées, ebranlées, ou séparées hors de leurs alvéoles ou petites cavités, elles doivent estre reduites en leurs places et seront liées et attachées contre celles qui sont fermes, avecques un fil d'or ou d'argent, ou de lin. Et les y faut tenir jusques à ce qu'elles soient bien affermies, et le callus soient refait et rendu solide.*"²

Toothache, says Paré,³ is, of all others, the most atrocious pain that can torment a man without being followed by death. It depends, in many cases, on a humorous fluxion of a hot or cold nature which flows into the alveolus, forcing the tooth outward, loosening it, and causing the patient so much pain on the slightest pressure being exercised on it, that he cannot dare to bite with it in the least. If, however, the tooth is corroded, hollowed out, or pierced to the root, the pain is so strong, when the patient drinks—particularly if the liquid is cold—that he seems to have had a stab with a stiletto inside the tooth.

If the pain is acute and pungent, like that produced by needles being thrust into the diseased tooth; if the patient complains of a strong pulsation at the root of the tooth, and in the temples; if the application of cold remedies calms the pain, all these signs indicate that the cause of the evil is heat. Instead, the cause of the pain may be held to be cold when the patient complains of a great heaviness in the head, emits a quantity of saliva, and finds relief in the application of hot remedies. In the treatment of toothache one must fulfil the following three indications:

1. Regulate fittingly the mode of living.
2. Evacuate or dissipate the morbid humors; this may be effected by various means, namely, by purgatives, by bleeding, by gingival

¹ Vol. ii, p. 307.

² . . . if they are divided, shaken, or separated from their alveoli or little cavities, they must be reduced into their places and should be bound and fastened against those that are firm with a thread of gold, silver, or flax. And they must be held thus until they are quite firm and the callus is formed and have become solid.

³ Lib. xv, ch. xvi, vol. ii, p. 443.

scarification, by the application of leeches on the site of the pain, by cupping on the back of the neck, or on the shoulders.

3. Applying in each single case the medicaments best adapted for calming the pain.

The author here goes through a long enumeration of anti-odontalgic remedies that offer no particular interest, as they are not at all new.

When a decayed tooth becomes the seat of excessive pain, and this does not yield to any remedy, one must either have recourse to extraction or cauterize it; this can be done either with potential caustics—such as oil of vitriol, aqua fortis—or with the actual cautery. By cauterizing, Paré adds, one burns the nerve, thus rendering it incapable of again feeling or causing pain.

Erosion or caries¹ is the effect of an acute and acrid humor, that corrodes and perforates the teeth, often to their very roots. To combat this morbid condition, even when it is not accompanied by pain, one must also have recourse (besides general treatment) to cauterization either with oil of vitriol, with aqua fortis, or with a small actual cautery.

If, as often happens, that the seat of the erosion lies in such a manner between two teeth as to make it impossible to apply caustics or other medicaments, one must file just sufficiently between the healthy and the corroded tooth to render the part accessible, taking care, however, to file more on the side of the affected tooth than on that of the healthy one.

The file may be used, besides, to plane down a tooth that stands out above the level of the others, and for similar purposes.

If one or more teeth have been shaken by a blow or a fall, or have come out of their alveoli altogether, the surgeon should not remove them, but rather reduce them and bind to the neighboring teeth, that they may entirely reacquire their original firmness.

In allusion to this subject, Ambroise Paré refers to the case of a friend of his, who having sustained, through a blow from the hilt of a dagger, a fracture of the lower jaw with almost complete expulsion of three teeth from their alveoli, had the fracture reduced by him; after replacing the teeth and binding them to the neighboring ones, he prescribed astringent mouth washes and liquid or semiliquid nourishment, such as meat juice, *panada*, barley soup, jelly, and such like. The patient was completely cured and able to masticate with the three teeth as well as before.

Also in the case of extraction of a healthy instead of a diseased tooth, Paré recommends replacing it immediately and binding it to the neighboring ones, for, he says, by this means the tooth can take root again.

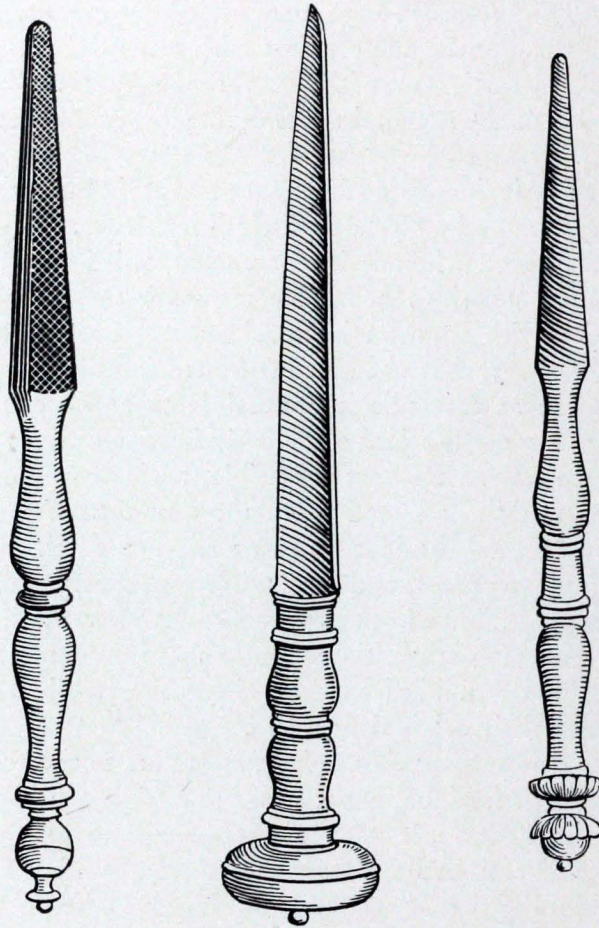
As we have seen, the first author who speaks of replantation is Abulcasis, but to Ambroise Paré belongs the merit of having treated the subject

¹ Lib. xv, cap. xxvii, vol. ii, p. 448.

much more explicitly, and of having insisted on the utility of this operation, indeed, on the duty of carrying it out whenever it seems indicated.

Further, he is the first to mention another very important operation, namely, transplantation, albeit he himself had never performed it. The case he refers to has become a generally known anecdote. We give it in

FIG. 60



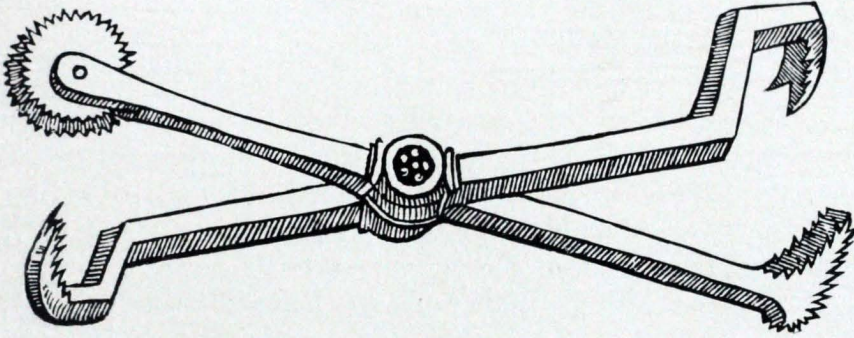
Dental files (Ambroise Paré).

his own words: "*Un homme digne d'estre creu m'a affirmé qu'une princesse ayant fait arracher une dent, s'en fit remettre subit une autre d'une sienne demoiselle, laquelle se reprint, et quelque temps après maschoit dessus comme sus celle qu'elle avoit fait arracher auparavant.*"¹

¹ A man, worthy of being believed, has assured me that a certain princess having had a tooth taken out, immediately had it replaced by another supplied by one of her ladies, which took root, and after a time she masticated with it as well as she had done with the former one.

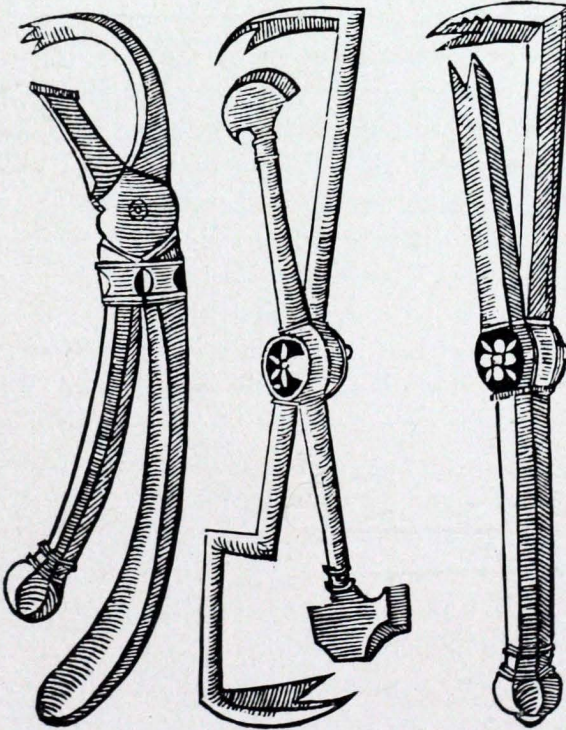
Ambroise Paré has recourse to extraction when a tooth is the cause of very violent pain, or when the existence of a carious cavity and concomitant putrefying processes render the breath fetid, and endanger the healthy

FIG. 61



One of the pelicans used by Ambroise Paré.

FIG. 62



Two other pelicans and a pair of curved pincers (Ambroise Paré).

teeth in its vicinity. If the persistence of a deciduous tooth should cause the cutting of the corresponding permanent tooth outside the line of the dental arch, thus giving rise to deformity, Paré advises laying bare and

then extracting the deciduous tooth; for after this the new tooth may be pressed toward the point before occupied by the other, until it assumes its natural position.

Sometimes, when a tooth is too firmly planted, one prefers, says Paré, instead of extracting it, to break off the crown for the purpose of being able to act directly on the dental nerve with appropriate remedies, or to destroy the sensibility of the nerve entirely, by cauterization. This unreasonable and reprehensible method of cure is also quoted, under the denomination of *deschapellement*, by another French author, a contemporary of Paré—Urbain Hemard—who observes, however, that one rarely had recourse to it; for the pain and shock which are caused by this operation are not less than those caused by extraction.

It very often happens that the patient cannot indicate exactly which tooth it is that gives him pain, his sufferings being so acute as to appear spread over a great part of the jaw. One cannot, therefore, trust too much to the indications given by the patient as to the point of departure of the pain, and must take care not to extract a healthy instead of a diseased tooth.

The extraction of a tooth should not be carried out with too much violence, as one risks producing luxation of the jaw or concussion of the brain and the eyes, or even bringing away a portion of the jaw together with the tooth (the author himself has observed this in several cases), not to speak of other serious accidents which may supervene, as, for example, fever, apostema, abundant hemorrhage, and even death.

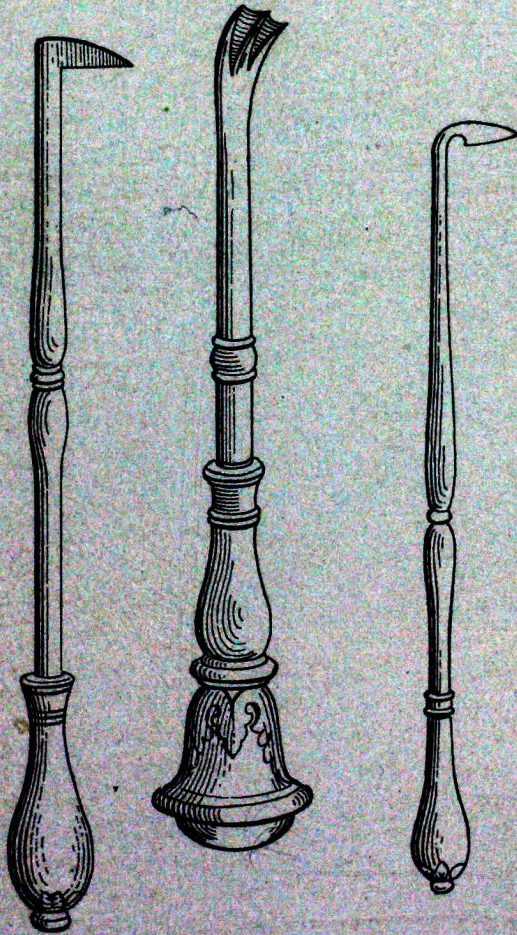
In extracting a tooth it is necessary to place the patient on a very low seat, or even on the ground, with his head between the legs of the operator.¹ After having laid the tooth bare sufficiently, if one sees that it is very loose, one may push it out of its socket with a *poussoir*, that is, with a trifid lever. But if the tooth is too firmly rooted to be extracted with this instrument, one must make use of curved pincers, or else one may have recourse to a pelican. The author notes, however, that much skill is required in using this latter instrument, for otherwise it will almost certainly happen that several good teeth will be knocked out, instead of the one intended to be extracted. In proof of this, he relates the following anecdote, which we relate in the words of the author, that it may not lose anything of its quaint originality:

“Je veux icy reciter une histoire d’un maistre barbier, demeurant à Orleans, nommé maistre François Louïs, lequel avoit par dessus tous, l’honneur de bien arracher une dent, de façon que tous les samedis plusieurs paysans ayans mal aux dents venoient vers luy pour les faire arracher, ce qu’il faisait fort dextrement avec un polican, et lorsqu’il

¹ Lib. xv, cap. xxviii.

avoit fait, le jettoit sus un ais en sa boutique. Or avoit-il un serviteur nouveau, Picard, grand et fort, qui desiroit tirer les dents à la mode de son maistre. Arriva cependant que ledit François Louys disnoit, un villageois, requerant qu'on luy arrachait une dent, ce Picard print l'instrument de son maistre et s'essaya faire comme luy; mais en lieu d'oster la mauvaise dent au pauvre villageois, luy en poussa et arracha trois bonnes.

FIG. 63



Two gum lancets and a trifid lever called "poussoir" (Ambroise Paré).

Et sentant une douleur extrême, et voyont trois dents hors de sa bouche, commença à crier contre le Picard; lequel pour le faire taire luy dit qu'il ne dist mot, et qu'il ne criast si haut, attendu que si le maistre venoit il luy feroit payer les trois dent pour une. Donc le maistre oyant tel bruit, sortit hors de table pour sçavoir la cause et raison de leur noise et contestation; mais le pauvre paysan redoutant les menaces du Picard, et encore apres avoir enduré telle douleur qu'on ne luy fist payer triple-

ment la peine dudit Picard, se teut, n'osant declarer audit maistre ce beau chef d'œuvre; et ainsi le pauvre badaud de village s'en alla quitte; et pour une dent qu'il pensoit faire arracher, en remporta trois en sa bourse, et celle qui luy causoit le mal en sa bouche."¹ Paré adds in conclusion: "Partant je conseille à ceux qui voudront faire arracher les dents, qu'ils aillent aux vieux dentateurs, et non aux jeunes qui n'auront encore reconneu leurs fautes."²

But let us now return to our subject. After the extraction of a tooth, it is necessary—says Paré—to leave the wound to bleed freely, so that the part may get rid of the morbid humors; then the gums and the alveolus must be pressed, on both sides, with the fingers, to readjust the socket, which will have been widened and sometimes even broken in extracting the tooth. After this, the patient should rinse his mouth with oxycrate; and when the weather is cold and windy, the patient should take care to avoid fluxion in the other teeth.

The following chapter speaks "*de la limosité ou rouillure des dents, et de la manière de les conserver.*"

After meals the mouth must be rinsed with water and wine, or with water with a little vinegar added to it, and the teeth cleaned from all residues of food, so that their putrefying may not spoil the teeth and make the breath fetid. An earthy yellowish substance, like rust, often forms on the teeth from want of cleanliness and also when they are not used to masticate; this substance corrodes the teeth, just as rust corrodes iron. It is necessary to remove this substance, by scraping the teeth with small instruments suitable for the purpose, and then the teeth themselves must

¹ I will here tell a story of a master barber living at Orleans, named maistre François Louys, who had the honor of pulling a tooth better than any one else, so that on Saturdays many country folks having toothache came to him to have them pulled out, which he did very dexterously with a pelican, and when he had done, threw it on a bench in his shop. Now he had a new servant, Picard, tall and strong, who wanted to pull teeth like his master. It happened that whilst the said François Louys was dining, a villager wanting a tooth pulled, Picard took his master's instrument and tried to do like him, but instead of taking out the bad tooth, he knocked and tore out three good ones for him, who, feeling great pain and seeing three teeth out of his mouth, began to cry out against Picard, but he, to make him hold his peace, told him not to say a word about it and not to shout so, because if his master came he would make him pay for three teeth instead of one. Now the master, hearing such a noise, came out from table to know the cause of it and the reason of the quarrel, but the poor peasant fearing the threats of Picard and still more after enduring such pain being made to pay a threefold fee by the said Picard, was silent, not daring to reveal to the master this fine piece of work of the said Picard; and thus the poor bumpkin went away, and for one tooth that he had thought to have pulled, he carried away three in his pouch and the one that hurt him in his mouth."

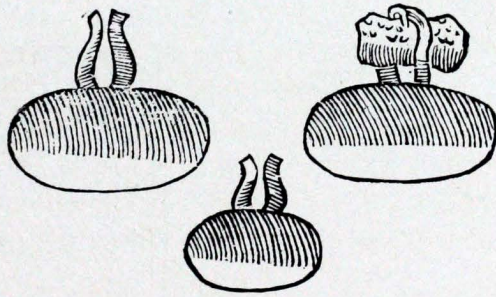
² For which reason I advise those who would have their teeth pulled to go to the older tooth-pullers, and not to the younger ones who will not yet have recognized their shortcomings."

be rubbed with a little aqua fortis and aqua vitæ mixed together, to take away what the instruments have not been able to remove. In order to preserve the teeth it is necessary, besides, to rub the teeth frequently with appropriate dentifrices. Among these the author mentions simple bread crust, burnt and reduced to powder.

In Chapter III of Book XVII he speaks of artificial teeth. Sometimes, says Paré, by the effect of a blow, the front teeth are lost; this not only constitutes a deformity, but is also the cause of defects of speech. Therefore, after the necessary treatment, when the gums are hardened, the lost teeth must be substituted with artificial ones made out of bone, ivory, or the teeth of the *Rohart*,¹ which are excellent for this purpose; and the artificial teeth must be tied to the neighboring ones with gold or silver wire.

Chapter IV of the same book is most important, for palatal obturators are therein spoken of for the first time. "Sometimes a portion of the bone of the palate is destroyed by the shot of an arquebus, or by some

FIG. 64



The palatine obturator with sponge of Ambroise Paré.

other wound or by a syphilitic ulcer (*par ulcère de verole*), the patients being thereby disabled from properly pronouncing words and from making themselves understood. To repair this defect we have found an expedient through the help and ministry of our art. It consists in the application of an instrument somewhat larger than the palatal perforation; this is made of gold or silver, of about the thickness of a crown (coin), and has the form of a vaulted roof, to which a sponge is attached; when introduced into the aperture, the sponge, absorbing the humidity natural to such parts, will very soon swell up, and thus the instrument is held firm. In this way, words are better pronounced."

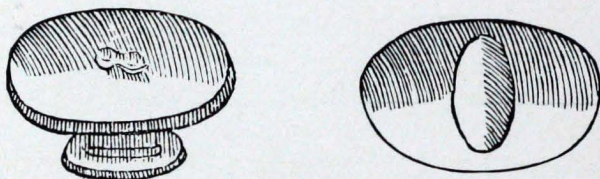
Besides the above instrument, the author gives us the figure of another instrument, *sans esponge* (without sponge), which, taken altogether, is like a large cuff button. The small part, designed to be introduced

¹ An old French word meaning perhaps hippopotamus.

into the aperture of the palate, can be made to turn round from below, by means of a small pair of pincers, so as to fix the obturator.

In the last chapter of Book XVIII, first dentition and the treatment required during this period are spoken of. The cutting of teeth, says Paré, is accompanied by pain, itching, and pricking of the gums; often, as well by diarrhea, fever, epileptic convulsions, which sometimes end fatally. The symptoms by which it may be known that teeth are about to come forth are as follows: The wet-nurse feels the mouth of the suckling infant to be hotter than usual; the gums are swollen; the child is restless, crying often and sleeping but little; it emits a quantity of saliva from the mouth, and frequently puts its fingers in its mouth, trying to rub its gums, and soothe, in this way, the pain and itching which it feels. It is then necessary to treat the nurse as if she had fever, and the infant should be suckled less than usual; some cooling and thirst quenching drinks should be given to it—for a child in such conditions suffers from intense thirst; the nurse should often rub the gums of the little patient with softening and soothing substances, as, for example, oil of sweet

FIG. 65



Paré's palatine obturator without sponge.

almonds, fresh butter, honey, or mucilage made from the seeds of the fleawort or of the quince; the brains of a hare (these may be roasted or boiled) have not only a very soothing action, but also, according to a very ancient belief shared by Paré, possess the occult property of aiding the cutting of the teeth. But oftentimes, neither these nor other remedies are of any use, because the gums are too hard and the teeth cannot cut their way through at all; the tension of the gums then produces very violent pain, fever, and other accidents, death even supervening in some cases. The author, therefore, advises lancing the gums deeply, just above the tooth which ought to appear, thus opening it a way, that it may more easily come out. He relates that he has performed this operation on his own children in the presence of many medical authorities.

Almost as if to show the high value of this operative procedure, Paré tells the case of a child, the son of the Duke of Nevers, who died at the age of about eight months without having cut any teeth. He, together with other doctors, was invited to carry out an autopsy. No lesion whatever was found sufficient to cause death, but the gums were very hard, thick,

and swollen; an incision into them showed that the teeth were ready to come out, if only their eruption had been facilitated by lancing at the right time. Paré and the other doctors were of the unanimous opinion that death was caused solely by the impossibility of cutting the teeth on account of the hardness of the gums.

Among the many strange cases given in Book XIX (*Des monstres et prodiges*), Paré also speaks—trusting to the word of Alexander Benedetti—of the case of a woman, who, after the complete loss of her teeth caused by age, cut them all again at eighty years of age.

Although Paré treats so amply and with such competence all that concerns dental diseases and their cure, he does not make the least allusion to the stopping of teeth, beyond recommending, as had already been done by Celsus, that when a tooth that is to be extracted shows a large cavity, the latter should be well filled with linen or lead, so that the tooth be not fractured under the pressure of the instrument and so leave the root behind in the alveolus.

A century before Ambroise Paré, Giovanni d'Arcoli had already mentioned the filling of teeth with gold leaf, and, as we have seen already, there is very good reason to believe that the practice of this operation dated back to a still earlier period. How is it, then, that the illustrious French surgeon does not say a word about this? Very probably stoppings were not at all in use among French *dentateurs* and perhaps, even in Italy, this operation was only rarely carried out.

JACQUES HOULLIER (1498 to 1562), a celebrated French physician and surgeon, also known under the Latinized name of Jacobus Hollerius, was the first to stand out, although timidly, against the theory of dental worms. He did not decidedly deny their existence, this having been affirmed by so many illustrious writers; he, however, speaks of them as if the point were a doubtful one: "*It is said that worms are generated in the teeth, which corrode the teeth themselves, and produce a pain which is not very violent and causes itching with little or no salivation (vermes ajunt subnasci dentibus, et hos corrodere, à quibus dolor non ita fortis, pruriginosus, nulla aut pauca salivatio).*"

But even while putting in doubt the existence of dental worms, he believes it his duty to enumerate the various remedies, recommended for their destruction. As to fumigations with the seeds of the hyoscyamus, Houllier, declares that what is believed by the common people, and what has been written by doctors of antiquity about worms being killed and seen to fall from the teeth by the effect of these fumigations, is all nonsense. In fact, he says, when the seeds of the hyoscyamus are burnt there fly away from them what appear to be little worms, even if the fumes do not reach the worm-eaten tooth. (*Quod autem vulgus sibi persuadet, et ab antiquis medicis scriptum est de suffumigio è semine hyoscyami, videtur*

fabulosum. Nam inde ajunt manifeste vermes excidere. Re vera, incenso semine, evolant tanqua vermiculi, etiam si non attingit fumus vermiculosum dentem.)

Apart from this, in the works of Houllier, nothing is found that is of interest for the history of dentistry. He repeats several errors and prejudices of the ancients; he says, for example, that men have ordinarily thirty-two teeth, women, twenty-eight; and he, too, believes in the expulsive virtues of the fat of green frogs when applied to a tooth (*adeps ranæ viridis dentem depellit*).

Houllier does not contribute in any way to dental therapeutics, he only enumerates the methods of cure recommended by preceding authors.¹

VOLCHERUS COITER (1534 to 1600), of Gröningen, an ardent student of anatomy, and a pupil of Fallopius, Eustachius, and Aranzio, studied with great attention the development of bones, dissecting many fetuses and children of various ages for that purpose. He clearly states his opinion that the teeth are not bones, since they do not pass, like the latter, through the cartilaginous stage, but are derived instead from a mucous substance.²

JOHANN JACOB WECKER, a doctor of Colmar, published in 1576 a valuable medical work composed of synoptical tables, in which is briefly summarized the best of what had been written by preceding Greek, Latin, and Arabic authors.

One gathers from this author that at the time in which he wrote it was considered an excellent preservative against the plague to rub the teeth with theriac, mithridate, angelica, and zedoary. From this it may be perceived that even in those days doctors had understood the importance of the cleanliness and disinfection of the mouth as a prophylactic against infective diseases.

In the above-mentioned book may be found a sufficiently complete exposition of dental therapeutics of that and of the preceding periods. There is nothing, however, which is not already known to us from our examination of the earlier writers. Worthy of notice is the information that, among other things, to facilitate the cutting of teeth rubbing the jaws with turpentine was recommended at that time.³

DONATO ANTONIO OF ALTOMARE, a Neapolitan physician and philosopher, dedicated a long chapter of his *Ars medica*⁴ to the subject of dental pains and their treatment. He classifies these pains with great

¹ Jacobi Hollerii medici parisiensis omnia opera practica, Genève, 1635, lib. ii, p. 117, et seq.

² Blandin, Anatomie du système dentaire, Paris, 1836, p. 25.

³ Hoann Jac. Weckerus, medicinæ utriusque syntaxes, ex Græcorum, Latinorum, Arabumque thesauris collectæ, Basilea, 1576.

⁴ Donati Antonii ab Altomari medici ac philosophi neapolitani Ars Medica, Venetiis, 1558, cap. xli, p. 190.



J. H. W. G. sculpsit

VOLCHERUS COSTERUS GRÖNINGÆ
Frisius, D. Medicus Chirurgus et Anatomicus
Excellentissimus, Physicus Reipubl Noriberg
Ordinarius, Anno Christi 1575 Aet. 47 Obiit. A. 1600.

accuracy, taking into account their seat and causes, and pointing out in each single case the method of cure to be followed according to the warm, cold, dry, or humid nature of the pain. In what he says, however, we do not find anything new.

GIULIO CESARE ARANZIO (1530 to 1589), a celebrated surgeon and anatomist of Bologna, in which city he taught from the age of twenty-six years until his death, is of the opinion that parulides—that is to say, inflammations or abscesses of the gums—and epulides—that is fleshy excrescences of the same—are usually caused by caries or putrescence of the teeth; but that in certain individuals, from a peculiar weakness of the gums, these are easily attacked by inflammation when the wind is in the south.

In the case of parulides, to soothe the pain and to accelerate the suppurative process, emollient substances should be used; afterward it is necessary to open the abscess with a lancet, to wash the mouth with mulse, and to aid the process of cicatrization by using syrup of roses.

As to epulides, these must be made to disappear, by sprinkling the tumor with the powder of gall-nuts, or by moistening them frequently with a decoction of gall-nuts, or with sulphur water. But if they do not yield to these remedies, and are the cause of functional disturbances, the surest and most prudent method of cure would be the use of the red-hot iron.

GIOVANNI ANDREA DELLA CROCE, a celebrated Venetian physician and surgeon, was the author of a most valuable treatise on surgery, which was published first in Latin (*Chirurgiæ universalis opus absolutum*, Venetitiis, 1573), and then in Italian under the title of *Chirurgia universale e perfetta*, Venezia, 1583. According to this author, dental fistulæ are more common to the lower jaw than to the upper one. To cure these fistulæ, it is necessary to extract the diseased teeth from which they originate, even should they ache but little or not at all. To confirm this, he relates in full a very interesting case of a dental fistula, that he cured by the extraction of a tooth which hardly ached at all.

Flajani¹ chose to see in this case a precocious example of the opening of Highmore's antrum through the alveolus. But the description given by Andrea della Croce of his case does not at all warrant this supposition.

At the end of his book Andrea della Croce gives us the figures of many dental instruments, which have, however, nothing new about them.

GEROLAMO CAPIVACCI, of Padua, repeats the advice (already given by preceding authors) to avoid, in eating and drinking, the rapid changes from heat to cold, and *vice versa*, since, says he, nature does not tolerate

¹ Collezione d'osservazioni e riflessioni, vol. iii, oss. 84, p. 374.

these rough changes.¹ In the mercurial treatment of syphilis,² he recommends the patient, as soon as the action of the remedy manifests itself in the oral cavity, to keep a piece of gold in his mouth, that the mercury, on account of its particular affinity, may unite with the gold and the harmful effects of this strange remedy on the mouth may be thus avoided. A strange method of curing mercurial stomatitis!

JOHANN SCHENCK VON GRAFENBERG (1530 to 1598), a celebrated doctor of Freyburg-in-Breisgau, has left us, in his *Observationes medicæ*, a very rich and interesting collection of clinical cases. In this work he refers to many observations upon dental diseases by earlier authors, which, however, have already been noted by us in their time and place. Among other things, Schenck von Grafenberg relates that Cardanus was able, more than twenty times, to calm a violent toothache which tormented him by lightly pressing the sick tooth between the thumb and index finger of his left hand.

PETER FOREEST (1522 to 1597), a very famous Dutch doctor of Alkmaar, repeats the very old error—already in decisive terms denied by Andreas Vesalius—that women have only twenty-eight teeth, whilst men usually have thirty-two. To the two central incisors he gives the name of *columellares*. Sugar and all sweet things, says this author, are very harmful to the teeth, and he gives as a proof the fact that apothecaries have, in general, very bad teeth, on account of the frequency with which they taste syrups and the like. Perhaps things are now changed, since I am not aware that chemists in our days are to be distinguished by the bad state of their teeth!

In regard to toothache, Foreest records an important observation which he had made on himself; an aching tooth which a surgeon had not succeeded in extracting, but which was simply loosened, ceased, without anything else being done, from giving him pain, and in a short while became firm again, and he continued to use this tooth for about five years. However, on a renewal of the pain he was obliged at last to have it extracted. On the strength of this observation, the author believes that in certain appropriate cases, recourse may be had to the luxation of a tooth, rather than to its extraction to obtain a cessation of toothache.

This method of cure had already been advised by a still earlier writer, that is, by Avicenna. When a subluxation produces the rupture of the dental nerve, this, in its results is equivalent to a replantation.

Foreest is the first to speak of the violent inflammation of the gums and of the whole mouth, caused by the application of artificial teeth of ivory fixed in their place with gold wire. This cannot at all astonish

¹ Hieronymi Capivacci Patavini opera omnia, Venetiis, 1617, edit. sexta, lib. i, cap. liii; de affectibus dentium, p. 515.

² Lib. ii, cap. v, de lue venerea, p. 712.

us when we consider how imperfectly, in those days, dental prosthesis was carried out and how the immobility of the artificial pieces, caused them to be a source of permanent irritation to the neighboring parts, especially on account of the difficulty met with in giving proper care to cleanliness. He, therefore, entirely rejects the application of artificial teeth. He is likewise but little inclined to the use of the pelican, it being very easy to break the teeth with it, and, instead, he recommends the use, whenever it be possible, of another instrument which he calls *pes bovinus*.

Foreest relates several cases of dental fistulæ which he had cured by the extraction of the faulty teeth. In one of these cases, observed in a lady, the fistula had opened between the nose and the cheek, so that a malady of the upper jaw was feared (and, in fact, as William Sprengel observes, it is not improbable that this was a case of affection of Highmore's antrum); he obtained a complete cure in a short time by the extraction of a diseased tooth.

According to Peter Foreest, the existence of dental worms is as certain as is that of intestinal, auricular, and other worms. Even on the pretended efficacy of remedies, capable of making the teeth fall out without pain, he does not throw the slightest doubt.

Foreest attributes to his master, Benedictus of Faenza, the merit of having introduced into therapeutics the trephining of teeth for the cure of certain violent pains not accompanied by any external lesion of the tooth. We know, however, that the invention of this operation dates back to Archigenes. Benedictus trephined the tooth with a very fine drill (*stylo vel terebello subtilissimo*) and then filled it with theriac, using, likewise, as occasion required, other remedies.

To demonstrate the propriety and the necessity of laying bare the neck of the tooth before extracting it, he relates a case in which fracture of the jaw was the result of having neglected this precaution.

Among the sundry causes of the looseness of teeth, he mentions the softening of the dental nerve (*emollitio*), but this erroneous opinion had already been expressed by Galen.

As a means of cleaning teeth and keeping them free from tartar, he advises, among other things, the use of pumice-stone powder. He disapproves, however, of the use of oil of vitriol—unless in very minute quantities of, at the very most, one or two drops.¹

URBAIN HÉMARD, a surgeon to the Cardinal d'Armagnac, published in 1582, at Lyons, a booklet entitled: *Recherche de la vraye anathomie des dents, nature et proprieté d'icelles, où est amplement discoursu de ce qu'elles ont plus que les autres os; avecque les maladies qui leur adviennent, et les remedies*. This is the first dental monograph that appeared in France. The pamphlet is written with much erudition, but its contents

¹ Petri Foresti, Alcmariani, opera omnia quatuor tomis digesta, Rothomagi, 1653.

are almost entirely taken from preceding authors. Hémard indicates by the term *deschapellement* (decrowning) the removal of the crown of a tooth for curative purposes. He speaks of this operation as of a method but recently introduced into therapeutics; but, and very reasonably, too, he shows himself somewhat hostile to such a method of cure.

As to what concerns the anatomy of the teeth, Hémard's book does not contain anything original. The following passage, transcribed by Portal,¹ shows luminously that Urbain Hémard, instead of making researches of his own, has simply copied the Italian Eustachius, translating the latter almost literally. The beauty of it is that Portal had not noticed the plagiarism in the least, since he says that if Urbain Hémard had taken into account the researches of Fallopius and Eustachius as well, his book would have acquired still greater value. But, in truth, he has taken into account, and has valued the researches of Eustachius so much as to palm them off as his own! We here quote, side by side, with a paragraph taken from Hémard's book, the corresponding passage of Eustachius, that our readers may be convinced of the truth of what we have stated:

EUSTACHIUS.

. . . aperta utraque maxilla occurrunt incisores, canini, ac tres molares, nimirum secundus, tertius et quartus; partim mucosi, partim ossei, non obscuræ magnitudinis, suisque præsepiolis undique vallati:

incisoribus autem et caninis docta manu detractis, tenuissimum interstitium vix osseum factum conspicitur; quo pari diligentia amoto, obviam veniunt totidem incisores et canini pene mucosi et longe minores, qui post alios priores in propriis caveis latentes, singuli singulis e regione oppositi collocati essent, nisi utriusque maxillæ caninus magna ex parte proximo incisori incumbere, eumque propterea fere occultaret.²

Primorum molarium et genuinorum qui circa septennium ac longe etiam postea oriuntur, fateor me nullum vestigium vidisse.

HÉMARD.

. . . leur ayant ouverte l'une et l'autre mâchoire, j'y ai trouvé seulement les dents incisoyres, les canines, et les trois mâchelières de chaque cousté de mâchoire; à sçavoir la seconde, la troisième et la quatrième, lesquelles estoit partie osseuses parti mucillagineuses, de médiocre grandeur, garnies à l'entour de leurs petits estuis ou alvéoles. Et depuis ayant tirees dehors lesdictes dents incisives et canines, il se trouve un entre-deux osseux; lequel ayant pareillement osté, il se presente de dessous autant de dents incisives et canines, toutes presque mucillagineuses, représentant la substance d'un blanc d'œuf à demy cuite moindres pourtant que les précédentes estant cachées dans les mesmes estuis après les premières.

Quant est des premières mâchelières et des gemes qui à sept ans, ou longtemps après commencent à sortir, je confesse n'en avoir trouvé jamais aucune trace n'y commencement.

¹ Histoire de l'anatomie et de la chirurgie, Paris, 1770.

² Hémard has omitted translating this passage, probably because he did not well understand it.

EUSTACHIUS.

Verisimile tamen est, rationique consensaneum, eos perinde ac secundos incisores et caninos rude quoddam, sed minus perspicuum initium ortus in utero sumere; sensimque postea similiter formari et absolvi

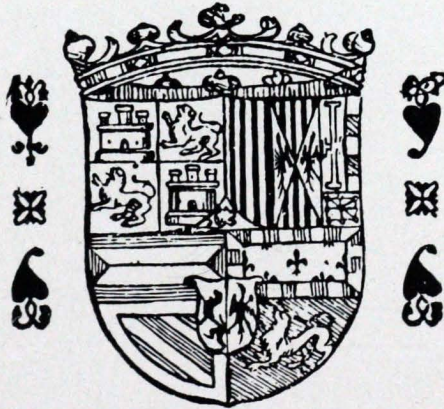
HÉMARD.

Toutesfois, il est vraysemblable et raisonnable aussi, qu'elles ayent pris dans la matrice, tout ainsi que les incisoyres et canines secondes, quelque petit commencement de naysance et forme, moins apparante toutesfois, mais qui depuis se façonne et parfaict tout ainsi que des autres.

At the time when Urbain Hémard was publishing his pamphlet in France, several other monographs were already appearing in various parts of Europe on teeth and their affections. A few years after Ryff had initiated dental literature in Germany, other odontological writings were published in Spain and in Italy.

FIG. 66

COLOQVIO BREVE Y
cōpédioso. Sobre la materia d la dē
tadura, y marauillofa obra d la bo
ca. Cō muchos remedios y au
fos necessarios. Y la ordē
de curar, y adreçar
los dientes.



¶ Dirigido, al muy alto y muy poder
oso señor: el Principe dō Carlos nro se
ñor. Cōpuesto por el Bachiller Fráncisco
Martinez. Natural dela villa de Catrillo
de onielo. Estáte en Valladolid. 1557.

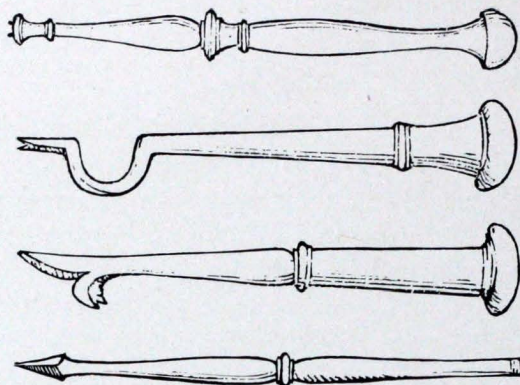
Con preuilegio.

¶ Esta tassado en L VII. mm.

Title page of Francisco Martinez's book (Valladolid, 1557).

FRANCISCO MARTINEZ,¹ in 1557, gave to the press in Valladolid a *Coloquio breve y compendioso sobre la materia de la dentadura y maravillosa obra de la boca, con muchos remedios y avisos necesarios, y la orden de curar y adreçar los dientes.*

FIG. 67



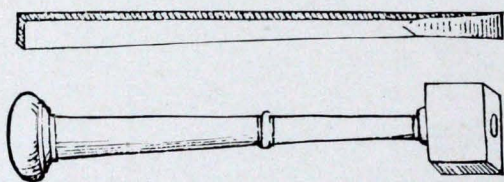
Four of the instruments represented in Francisco Martinez's book.

FIG. 68



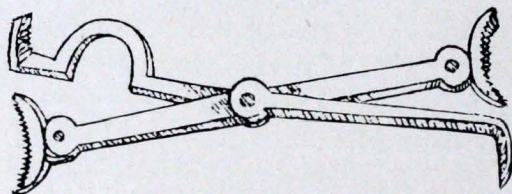
A dental excavator used for ascertaining which one among several decayed teeth was the one causing the pain (F. Martinez).

FIG. 69



A chisel and a mallet for separating teeth (F. Martinez).

FIG. 70



A pelican (F. Martinez).

¹[For a fuller review of this author see A Dental Book of the Sixteenth Century, by Julio Endelman, Dental Cosmos, 1903, vol. xlv, p. 39.—E. C. K.]



In the same year and city was printed a Latin pamphlet, *De dentione*, by Franciscus Martinus de Castrillo, probably the author of the preceding book. In 1563 was published in Venice the excellent treatise of Eustachius on the anatomy of the teeth (*Libellus de dentibus*). At Frankfort was published, in 1576, the second dental monograph in the German language, *Zahnarzney*, by Adam Bodenstein von Carlstad; and two years later Petrus Monavius published in Basle a Latin pamphlet on dental diseases (*De dentium affectibus*).

FIG. 71

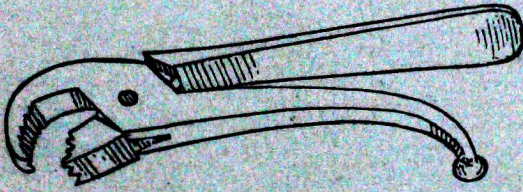
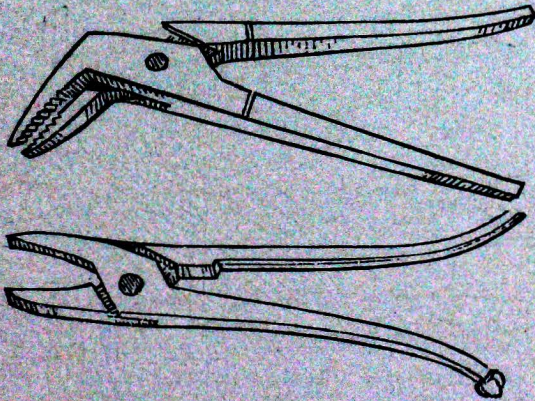


FIG. 72



Different kinds of forceps (F. Martinez).

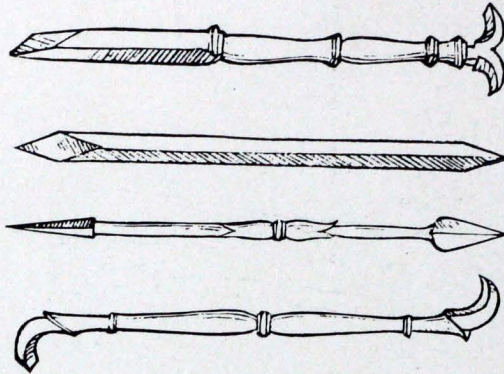
The above-mentioned works, apart from the book of Eustachius, which is, of its kind, a real masterpiece, have but little importance. We have cited them here solely to show in what years and in what countries the very first dental monographs appeared.

GIROLAMO FABRIZIO, of Aquapendente (1537 to 1619), a celebrated anatomist and surgeon, wrote some very valuable works, among which a treatise on surgery, in which the part relative to the affections of the dental system is treated briefly but with great orderliness and clearness, thus giving a very precise idea of what dental surgery was at the end of the sixteenth century.

The principal operations which it is necessary to perform on teeth are, he says, seven in number,¹ viz.:

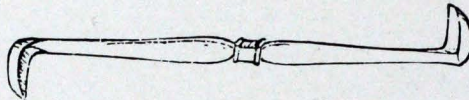
1. Forced opening of the dental arches in cases of prolonged constriction of the same, so as to prevent the patient from dying of hunger.

FIG. 73

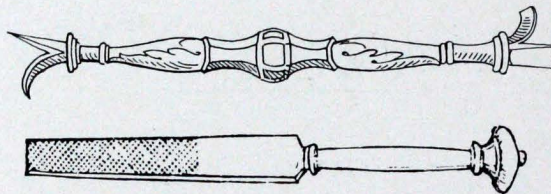


Instruments for removing deposits from the teeth (F. Martinez).

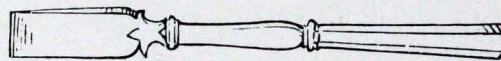
FIG. 74



A dental scraper.



A universal toothpick and a file for sharpening its points.



An instrument for removing sharp corners from the molar teeth (F. Martinez).

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 the teeth.
7. Extraction.

¹ Hieronymi Fabricii ab Aquapendente opera chirurgica, Lugduni Batavorum, 1723, cap. xxxii, p. 451.

In regard to the first operation, the author first of all examines the various causes of the constriction of the dental arches, and according to the various nature of this, he indicates in what cases it is fitting to have recourse to the forced opening of the jaws by means of appropriate dilators, and in what cases it is best to avoid it. In the latter case one must seek to feed the patient in other ways—that is, either by alimentary

FIG. 75

Parte:**Fo. 152**

**Virgo martir egregia
 pronobis Apollonia:
 Funde preces ad dominū
 ne pro reatu criminū
 Vexemur morbo dētiū.**

A figure representing St. Apollonia, reproduced from the last page of F. Martinez's book.

clysters, or by a little tube passed through a space already existing or purposely made by the extraction of one or two teeth; or else by letting a cannula reach down to the pharynx, through the nose, or, lastly, by introducing a cannula into the oral cavity through the free space existing behind the last molars. But in regard to this last method, Fabricius notes that if the constriction is of a spasmodic nature, the spasm may affect not only the elevator muscles of the jaws, but also those that govern

deglutition, including sometimes even those of the tongue itself, and in this case, as the food introduced into the oral cavity could not be swallowed, it is preferable to convey it directly into the pharynx, by means of a cannula passed through the nostrils.

The second of the above-mentioned operations¹ is designed, says Fabricius, to take away the dirtiness of the teeth and the bad odor of the mouth (*dentium immunditiam et oris fætorem tollit*). The dental tartar (*ostracoderma*) must be removed by slender instruments of an appropriate shape, which, for people of high position (*promagnatibus*) shall be made of silver. This advice is sufficient to make us understand that Fabricius, although an excellent surgeon, had no practice in dental operations; otherwise he would have known that the hardness and adhesion of tartar is generally so great that its removal absolutely requires scrapers of tempered steel and not of a soft metal like silver.

To arrest caries, he first drops into the carious hollow, by means of a small silver funnel, some drops of oil of vitriol, or of some other caustic liquid; and then he performs actual cauterization with appropriate instruments; after which the cavity is filled with gold leaf (*auro foliato*).

When one or more teeth have appeared in an irregular position and offend the walls of the oral cavity or else the tongue, the excision (resection) of the tooth or teeth must be performed with a pair of strong pincers, whose shape must vary according to whether the teeth are situated externally or internally with regard to the dental arches. But as after the resection there will almost always remain some points or sharp irregularities, which by their presence would continue to irritate the soft parts, it will be necessary to remove these irritating prominences by means of the file.

As to extraction, Fabricius of Aquapendente counsels great prudence in performing the operation, and on this point he repeats all the warnings already given by Celsus, an author whom he greatly admires and the study of whose writings he warmly recommends.

It seems that in those times there was more than sufficient reason to inculcate extreme caution in regard to the extraction of teeth. This was not then performed by true dentists, but rather by barbers and by ignorant tooth pullers, or else, in exceptional cases, by general surgeons, very skilful, perhaps, in everything else, but little practised in the operation we are speaking of; besides this, the instruments left much to be desired; and lastly there was not, nor could there be, any idea of asepsis. What wonder, therefore, if the extraction of teeth was frequently the cause of serious injuries! Fabricius relates that it often happened to him to have to extract, in little fragments, half or sometimes a whole jaw, which

¹ Cap. xxxiii, p. 455.

had been attacked by putrefaction, as the result of the extraction of one single tooth. This, adds the author, may easily happen, because, when the jaw is attacked by pus in one point, its very anatomical constitution favors the rapid spreading of the putrefying process to the other parts of the bone, as this latter, apart from its external lamina, is entirely composed of a sponge-like substance.

The instruments which are used for the extraction of teeth, are, says Fabricius, of nine kinds;¹ and the most important among them—generically called *forceps*—are indicated by special names, taken from their resemblance to the mouth or beak of certain animals. Thus, the forceps with which it is usual to perform the extraction of molar teeth are called “pelicans,” and of these there are two kinds, according as they are used for the right or the left side, for the upper molars or the lower ones.

A third kind of instrument goes under the name of “beak” (rostrum), and serves for the extraction of the incisors.

A fourth kind is the “crow’s beak,” or “crow’s bill,” which is used for the extraction of roots.

Two other instruments are named in Italian “cagnoli,” for they imitate the strong bite of the dog (in Italian *cane*) and are used in cases where the pelican is not adapted.

A seventh instrument is called by the Latin term of *terebra* (drill or auger). It is used instead of a lever to separate the teeth from one another when they are too close to each other, and so render their extraction much easier.

The eighth instrument is a “trifid lever” (*vectis trifidus*), so called because it is furnished with three points.

The ninth and last kind of instruments are the *dentiscalpia*, slender, sharp, and oblong tools, with which the gums are separated from the teeth before extraction.

Fabricius also speaks of dental prosthesis, but very briefly. He says that artificial teeth are made of ivory or of bone (for example, from the tibia of the ox) and are fastened by gold wire. One has recourse to this means especially to correct the bad appearance and the defects in speech deriving from the loss of the front teeth.

This author also makes some allusion to palatal obturators,² but in very general terms, limiting himself to saying that when a perforation exists in the hard palate, it may be corrected by a piece of sponge or cotton, or with a plate of silver fixed in the palate, so as to close up the aperture (*corrigitur spongia, vel gossypio, vel lamina argentea, quæ palato appendatur, ut foramen obstruat*).

¹ Cap. xxxiv, p. 456; *de instrumentis extrahendis dentibus idoneis*.

² Cap. xxxv, p. 457.

For epulides and parulides Fabricius advises the same methods of cure that had been recommended by Paul of Ægina.

In the case of flaccidity of the gums accompanied by looseness of the teeth, the treatment must consist, first of all, in superficial cauterization with the red-hot iron, after which the gums must be smeared with honey, the mouth washed with mulse, and lastly astringent powders must be used.

If the gums are much swollen, in near relation to the molar teeth, the use of the red-hot iron, says Fabricius, becomes very difficult from the want of space, and from the close vicinity of the healthy parts, which must not be injured. In such a case, it is necessary to remove, with suitable cutting instruments, as much as is possible of the morbid tissue (*caro crassa et putrida*); then to cauterize the remaining part, making the cautery, if necessary, pass through a tube, so as not to injure the surrounding parts. When, however, the gingival swelling bleeds very easily, and its excision thus might give rise to a profuse hemorrhage, it will be best to perform the operation with cutting instruments heated red-hot.

Fabricius remarks that although other authors do not make any allusion to these large gingival excrescences, he had had occasion to observe several cases, and had also had various instruments especially constructed for their cure.¹

JOHANN HEURN, or in Latin Heurnius (1543 to 1601), of Utrecht, in his book on the diseases of the eyes, ears, nose, teeth, and mouth, treats sufficiently at length of dental diseases and their cure, but without adding anything of importance to what had been written by preceding authors. His work is a mere compilation, which would be without any importance whatever if it did not serve to show what credit was still given at that period to all the errors and prejudices which are to be found in the writings of the ancients.

Heurnius, although he wrote a long time after Vesalius, still adheres, in regard to the number of teeth, to the already mentioned opinion of Aristotle; he says, in fact, that women rarely have thirty-two teeth like men.²

He warns those who suffer from odontalgia not to have recourse thoughtlessly to tooth drawers, but to recur, instead, to the doctor, who will always treat the affection according to the cause on which it depends.

And here the author repeats the numerous distinctions found in many preceding writers, and especially in Arculanus. The pain may be located

¹ Cap. xxx, de gingivarum chirurgia, p. 450.

² Joannis Heurnii Ultrajectini de morbis oculorum, aurum, nasi, dentium et oris, liber Raphelengii, 1602, cap. xi, de dentium et oris passionibus, p. 79.

in the gums, in the dental nerve, or in the very substance of the tooth; and in each of these cases it may depend on warm or cold matter, on dryness, humidity, etc.

The method of treatment must vary in all these cases; and in regard to this the author enters into minute particulars, commencing with dietetic cure—which itself must be varied according to the causes of the affection—

FIG. 76



A Dutch dentist. (From a picture of the XVI century.) By Lucas Van Leyden.

and then treats of all the other therapeutic means—purgatives, blood-letting, revulsives, local narcotic or resolvent medicaments, and so forth. The letting of blood was, it seems, a very favorite method of cure; not only were the veins of the arm opened, but also those of the tongue, of the gums, of the lips, and of the ears!

Another remedy which the author seems to have a predilection for is oil of vitriol. When a tooth shows a carious perforation, he applies

inside it, by means of a split feather, a drop of oil of vitriol, which, says he, causes the fall of the tooth after a few days.

Elsewhere he says that "sometimes worms are produced in carious teeth; to kill them a drop of oil of vitriol is an excellent remedy; and this at the same time cures the decay of the tooth and takes away the sensibility of the nerve."

This passage does not agree very well with the preceding one, according to which oil of vitriol would act much more radically by causing the tooth to fall out altogether. But we will not take exception to so small a matter; so much the more, as the author, if he were still alive, might perhaps show us by some subtle distinction that the contradiction alluded to is only an apparent one!

To free the teeth from tartar, Heurn likewise counsels oil of vitriol, diluted, however, with other liquids.

A tooth must not be sacrificed excepting when it is loose and attacked by incipient necrosis, so as to leave no hope of arresting the putrefactive process. It is then our duty, says Heurn, to remove the tooth without causing much pain. For this purpose, after the tooth has been separated all around from the gums, it must be raised somewhat from the alveolus; then it must be sprinkled with powder of euphorbia, or a paste made with flour and the juice of the tithymalus must be applied around it, taking care, however, to cover the neighboring teeth with wax. After two or three days the tooth will be so loose that it can be pulled out very easily with the fingers or with a pair of pincers.

Dental surgery properly so called has been entirely neglected by Heurn. He was perhaps so persuaded of the efficacy of the above-mentioned remedies as to believe that every other species of intervention was useless. On the contrary, he does not abstain from speaking very seriously of the miraculous virtues of certain remedies (serpent scales, dog's teeth, etc.); and tells us, among other things, that the broth made from a frog, when held for a length of time in the mouth, soothes dental pains, whatever be the causes from which they originate. One would seem to have gone back again to the days of Pliny!

THE STORY OF THE GOLDEN TOOTH.

In 1593 a rumor spread throughout Germany of a great marvel that had appeared at Schweidnitz in Silesia: a golden tooth had erupted in the mouth of a child aged seven years, which, more precisely designated, was the first large molar on the left of the lower jaw.

In our days news of such a kind would be immediately qualified, and universally held to be an imposture. But three centuries ago the

most marvellous and unlikely things were easily believed in, often even by the learned; and, therefore, the fact alluded to was taken into serious consideration, so much so that for a long time many learned pamphlets and dissertations were written concerning it.

JACOB HORST, Physician and Professor of Medicine at the Julius University in Helmstadt, published, in 1595, a very singular book on the golden tooth of the Silesian child.¹ Without raising any doubt as to the reality of the fact, he maintained that the phenomenon was produced from the effect partly of natural and partly of supernatural causes, in relation with the constellation under which the child was born. On the day of its birth, that is, December 22, 1585, the sun was in conjunction with Saturn in the sign of Aries. In consequence of this circumstance the nutritive force had developed marvellously on account of the increase in heat, and consequently, instead of osseous substance, golden matter had been secreted!

After having explained (!) in this way the origin of the phenomenon, Horst passes on to examine what events may be portended by this unheard-of marvel, he not having the least doubt that it—like earthquakes, eclipses, and comets—must be the precursory sign of important events. Supporting his assertions by arguments of various kinds, some of which are taken from the Bible, he concludes that the gold tooth of the Silesian child means neither more nor less than the approach of the golden age! The Roman Emperor would sweep the Turks, the enemies of Christianity, out of Europe, and the Millenium or Golden Age would commence. As the tooth was situated on the left side of the lower jaw, it might be deduced, according to Horst, that heavy calamities would precede the beginning of the epoch of happiness thus predicted. On the other hand, as the golden tooth was the last of the dental series of the child, this was to signify that the golden epoch thus foretold would be the last of the ages of this world before the universal judgment!

MARTIN RULAND, in the same year, 1595, wrote about the gold tooth.² Shortly after, he was answered by JOHANN INGOLSTETTER; and the controversy which arose between them in this important subject lasted for a long time, without, however, leading to any definite conclusion.

BALTHASAR CAMINDUS, a doctor of Frankfort, meanwhile had noted that for some months the marvellous Silesian boy had not lent himself to being examined by the learned, becoming terribly enraged whenever they wished to compel him. From this he inferred that it was a case of nothing else but an imposture, and that the famous tooth could not have

¹ *De aureo dente maxillari pueri Silesii*, Lipsiæ, 1595.

² Martini Rulandi, *Nova et in omni memoria inaudita historia de aureo dente*, Francofurti, 1595.

anything special about it, save that its crown had been very skilfully covered with a thin plate of gold.

In spite of this the discussions on the portentous tooth continued for a long time; and even one hundred years after, that is, in 1695, a new dissertation appeared on the golden tooth.

The greater number of those who wrote on this subject did not throw the slightest doubt upon the reality of the fact, but only sought to explain in the most varied ways the genesis of this phenomenon.

DUNCAN LIDDEL. Among those who had the good sense not to put faith in the thing, and who very decidedly affirmed that this was a mere case of imposture, Duncan Liddel, a Scotchman and professor in a German University, deserves to be recorded.¹

He had heard that the famous gold tooth was larger than the others, and that the neighboring molar was wanting; from which he argued that this was simply the case of a tooth the crown of which had been covered with a plate of gold. Answering the arguments of Horst, he accused him of gross ignorance in the most elementary notions of astronomy, and this for having affirmed that when the famous child was born, that is, December 22, the sun happened to be in conjunction with Saturn in the sign of the Ram. As the sun does not enter the sign of the Ram until March, if it had been there on December 22 this would have been a greater portent than if the whole body of the child had been formed of nothing else but teeth of gold!²

¹ Liddelius, *Tractatus de dente aureo pueri Silesiani*, Hamburg, 1626.

² [In the introductory portion of Liddell's work on the "Golden Tooth" is published a number of letters bearing on the case, among others one which gives rather a circumstantial account of the imposture, and of which the following is a translation:

"Herr Balthazer Caminäus sends Greeting:

"For your letter, most kind Herr Doctor Caselius, in which you explicitly desired me to thank (my) colleagues for their good wishes, 'wedding wishes,' and to inform you as to the 'Golden Tooth,' I have long been in debt to you—not that I intended to leave your letter unanswered, but because no messengers presented themselves. Now that I have found one, I announce that I have obeyed your commands. As for the 'Golden Tooth,' I ought not to hide from you that we have more than once marvelled at your shrewdness, in that you are so anxious to ascribe the devices of wickedness and the tricks (fakes) of cunning to Nature. For it was no portent, only a deception and pure cheat, so that unless some Lemnian (Prometheus or Vulcan) should come to their aid, these acute authors will, nay, already are, a by-word to those who are more cautious and not so prone to believe. For the 'Golden Toothed' boy, according to the account brought thither by many persons, both by letter and oral report, some of whom had themselves seen this wonder, hailed from a village near Schwidnitz in Silesia, and had been so trained by his swindling father or master, that, at his will, whenever in any assembly of men, some very simple and illiterate persons desired to see the tooth and had paid the fee, for the rascals made great gains, he would open his mouth wide and allow himself to be touched. But if educated men and those who seemed likely to make more careful scrutiny and experi-

The above-mentioned fact is not the only one of its kind. Serres relates that once there was a great noise made in Poland about the pretended golden teeth of another child who was carried round from city to city for the purpose of making money. A Franciscan monk had sought to explain, in one of his writings, the formation of these teeth. The anatomist Kircher answered him in a pamphlet which had the very suitable epigraph: *O præclare pater, nimium ne crede colori*.¹ In fact, the pretended teeth were only covered with a layer of tartar of golden color. As the falsity of the pretended miracle might be brought to light at any moment with much scandal, a bishop thought it well to put an end in haste to the comedy, by ordering the removal of the deceitful layer of tartar from the teeth of the child, to be performed in public, so that the imposture might be made completely clear.

From the above story we can, at any rate, deduce an important conclusion for the history of dental art, that is to say, that even as early as 1593 there was an artificer (we do not know whether a goldsmith or dentist) who knew how to construct a gold crown, although only for the purposes of deception.

ment on any point, presented themselves, he contorted his countenance, remained silent, and simulated a kind of madness, the idea being that he permitted himself to be examined at stated times only when the conditions allowed. Now, the tooth was covered with a plate, lamina (or layer), skilfully wrought of the best gold, and the gold was let down so deep into the gum that the cheat was not observed. However, as the plate was sometimes rubbed with a touch-stone as a test and was daily worn down by chewing, the real tooth at last began to appear. Of this fact a certain nobleman got an inkling, came to the place pretty drunk, and demanded that the tooth should be shown him, when the young fellow, at his master's word, kept silent, the nobleman struck his dagger into the boy's mouth, wounding him so badly that the aid of a surgeon had to be called, and so the deception was fully exposed.

"Thus the Herr Baron Fabianus, in Crema, at present Rector Magnificus of our University, told me the story in full, and those inhabitants of the place who have scholarly tastes maintain it to a man. The author of the fraud, if I remember aright, was said to have taken refuge in flight, the boy to be in chains.

"Our Pelargus, who is a native of Schwidnitz, can inform you more fully. I have often heard from him the same facts which I am writing. Farewell, and laugh in safety as much as you please at those sagacious authors.

"FRANKFORT, December 31, 1595."

Elsewhere it is stated that the boy who was the possessor of the "Golden Tooth" was born December 22, 1586. As Horst's Treatise appeared in 1595, the Silesian boy was probably not over seven or eight years of age. We also find that the "Golden Tooth" was a lower molar, and upon the left side, and further, that there was no molar posterior to it.—E. C. K.]

¹ Illustrious Father, do not believe too much in the color.—[Virgil, Ec. ii, 16.]

CHAPTER XI.

THE SEVENTEENTH CENTURY.

THE first signs of the separation of dental science from general medicine were to be perceived in the sixteenth century, the period in which, as we have seen, the earliest dental monographs appeared. From that time this separation tended to accentuate itself ever more strongly; dental monographs became more numerous and dentistry progressed ever more rapidly, both in its scientific and practical aspects.

In the seventeenth century, about which we are now to speak, we shall have to call attention to many facts of the highest importance for the development of dentistry, and with regard to literature, it is worthy of note that while the publications on dentistry that appeared in the various countries of Europe during the preceding century only amounted to about twenty (taking also into account several pamphlets on the famous golden tooth!), in the seventeenth century the number was considerably higher, that is, about a hundred. We shall speak of the most important of these, as also of the works on general medicine or on surgery of the same period, that present some interest from the point of view of dentistry.

JOHANN STEPHAN STROBELBERGER, physician to the imperial baths of Carlsbad, published in the year 1630 a very curious book, the title of which, being translated, runs somewhat as follows: *Complete Treatise of Gout in the teeth, or, more properly said, of Odontagra or toothache; in which are set forth, theoretically and practically, for the use of physicians and surgeons, the means of mitigating these pains, as well as the various modes of ably extracting teeth with or without instruments.*¹

This book merely presents some interest, because it gives us a clear idea of the pitiful state in which the dental art still was in the first half of the seventeenth century, and shows us most clearly what enormous progress our specialty has made in little less than two centuries. Apart from this, Strobelberger's monograph is of no importance, it being

¹ Joh. Stephani Strobelbergeri, thermiatri cæsarei emeriti, etc., de dentium podagre, seu potius de odontagra, doloreve dentium, tractatus absolutissimus, in quo, tam doloris istius mitigandi rationes, quam dentium sine et cum ferro artificiose extrahendorum varii modi, theoretice ac practice proponuntur, in medicorum ac chirurgorum quorumvis gratiam. Lepsiaë, 1630.

nothing more than a most accurate compilation of all that is to be found on the subject of dental affections in earlier works, especially from the medical point of view; the surgical part of dental therapeutics is treated in a much less complete manner, and prosthesis is entirely excluded from the plan of the work, which, however, is fully in accordance with the title of the book.

Under the generic name of gout,¹ or podagra, are meant, says the author (Chapter I), all the affections produced by diseased humors, falling "by drops" into the articular cavities and the parts surrounding them. Strictly speaking, however, only gout in the feet is named *podagra*, whilst when the disease is seated in other parts of the body it is indicated by other names, gout in the hands being called *chiragra*; in the fingers *dactilagra*; in the knee, *gonagra*; in the elbow, *pechiagra*; in the shoulder, *omagra*; in the spinal column, *rachisagra*, and so on. When the seat of the evil is in the teeth or in their articulations, by analogy it is denominated odontagra, or odontalgia, an affection which Paul of Ægina was the first to consider as being of a gouty nature (Chapter II).

After having spoken of the sensibility of the teeth (Chapter III), of the various kinds of dental pains (Chapter IV), of the different causes, external and internal, which produce them (Chapters V to VII), of the signs which make known their special nature in each case (Chapters VIII to X), and of the prognosis (Chapter XI), the author occupies himself very minutely, throughout the rest of the book, with all that concerns means of cure, dedicating to this subject sixty-seven chapters and a long appendix.

If, after the publication of Strobelberger's book, all previous works treating of dental affections had been entirely lost, it would be of inestimable value for the history of dentistry, the author having gathered together in an almost complete manner—citing faithfully the respective authors—all that had been written about dental diseases before him. On the other hand, the book contains almost nothing original; therefore, rather than analyze minutely its contents—which would involve a long repetition of things already noted—we limit ourselves merely to a few observations.

Strobelberger, like Heurnius, is of opinion that for the cure of dental pains it is necessary to have recourse to doctors rather than to *dentispices*, or tooth drawers (Chapter XII); however, he does not consider the calling of the latter absolutely useless; indeed, he expressly advises (page 174) that they should be applied to for the instrumental extraction of the teeth, it not being possible for such operations to be carried out well and without danger except by those who, through great practice, have acquired the necessary skill in the use of the relative instruments. He refers to

¹ In Latin, *gutta*, that is, drop.

the words of Hollerius, already quoted, as to the falseness of the opinion that fumigations made with the seeds of *hyoscyamus* cause the worms to fall out of the teeth. Notwithstanding, he does not in the least doubt the existence of the worms themselves; and he, like Heurnius, recommends killing them with oil of vitriol or with a decoction made from a frog cooked in water and vinegar (Chapter XXXIII). From this, one clearly perceives that the doubts expressed by Hollerius about the existence of dental worms had not in the least shaken the popular belief in them. Nor, indeed, could it be otherwise when one considers that Hollerius, as we duly noted in another place, had not the courage either decidedly to deny the existence of dental worms, or to formulate in a clear and explicit manner the doubts which had arisen in his mind on this subject. We are, therefore, unable to recognize the merit which Linderer¹ and Geist-Jacobi² have attributed to this author, viz., that of having effectually affirmed the non-existence of dental worms.

Among innumerable vegetable remedies recommended by Strobelberger against odontalgia, we will only cite two American plants, the guaiacum and the tobacco-plant (*Nicotiana tabacum*). Of the decoction of guaiacum (Chapter XXXVI) the author says that, used as a mouth wash, it has the triple virtue of strengthening the gums, of preventing putrefactive processes, and of calming toothache.

The anti-odontalgic virtue of tobacco is mentioned (Chapter XXXVIII) for the first time in this work, but, as we learn from Strobelberger himself, Heurnius has already obtained, experimenting in his own case, the cessation of an attack of toothache by holding in his mouth spoonfuls of tepid decoction of *nicotiana* for the space of two hours.

The same soothing effects may be obtained, says the author, from the smoke of tobacco; but he attributes this not to the narcotic action of the remedy, but to the fact that it causes the flow of much saliva from the mouth and mucus from the nostrils, through which the morbid humors which provoke the pain are eliminated.

To those suffering from odontalgia, says Strobelberger (Chapter XL), the internal use of certain mineral waters is also of value, and especially that of the waters of Carlsbad (*Thermæ Carolinæ*). Like many other remedies, they are useful in rendering the secretions more active, favoring thus the elimination of morbid substances from the blood. For the same object of purifying the organism and dispersing the accumulated humors causing the pain, many other means of cure were in usage, such as aperients (Chapter XXV), phlebotomy, and arteriotomy (Chapter XXVIII), leeching (Chapter XXIX), scarification and cupping (Chapter

¹ Handbuch der Zahnheilkunde, Berlin, 1848, ii, 422.

² Geschichte der Zahnheilkunde, p. 101.

XXX), blistering and cauterizing (Chapter XXXI), masticatories, viz., substances intended to be chewed for the purpose of exciting salivary secretion (Chapter XXVI), sternutatories, viz., substances which provoke sneezing (Chapter XXVII), and so forth.

Like Arculanus, Strobelberger makes a distinction between the *real* and the *false* cure of odontalgia (*cura vera et cura mendosa*). This latter he also subdivides in *palliative* cure and *vain* cure (Chapter LV). The palliative cure is constituted by the use of narcotics and stupefying remedies (Chapter LVI), whilst the vain cure is represented by certain remedies which he calls "fanatical" or rather "fantastical." The *vain* cure, in its turn, undergoes a new distinction, since it comprises three species of remedies, that is, the wearing of amulets, the superstitious remedies, and the ridiculous remedies. Indeed, this last appellation might also fittingly be applied to the preceding ones!

One would be inclined to believe that the author who qualifies these remedies as vain, fantastic, superstitious, and ridiculous was a thoroughly unprejudiced man; however, this is not so. Strobelberger, too, had to pay his tribute to the dominating prejudices of his century; this manifestly appears from various passages in his book, and especially from the Chapters XVI and XLIV. The first of these bears the following title: "How to procure immunity from toothache," and Strobelberger therein asserts in all seriousness, basing his assertion on the authority of Rhazes, that "if the canine tooth of a lion be suspended to a child's neck before the milk teeth fall out and during the eruption of the second teeth, it will secure the child immunity from dental pains." In Chapter XLIV the author speaks of those animals whose teeth are useful to man as remedies against toothache, and reiterates—lending, as it seems, perfect faith thereto—various prejudices that are found in Pliny and other writers of antiquity.

As to the remedies which Strobelberger recognizes as *vain*—that is, as devoid of real curative virtue—he remarks that they may nevertheless be useful by acting powerfully on the imagination of the sufferer, thus causing, in fact, the cessation of pain (Chapter LVII). This clear and explicit affirmation of the efficacy of suggestion in a book published 270 years ago is certainly not without interest.

If, says Strobelberger, a place is to be accorded, in dental therapeutics, to the *vain* remedies, among these, amulets deserve the preference; and the best accredited amulet is the root of the lepidium, already recommended by Dioscorides, who affirms that if it be hung around the neck of the sufferer it will cause the pain to cease.

One of the *superstitious* remedies to be used against this affection (Chapter LVIII), consists in touching the aching tooth with the tooth of a dead person, and afterward greasing it with horse's marrow.

Among the *ridiculous* remedies (Chapter LIX), the author describes one that was especially in use among soldiers. With a piece of chalk or of rubble one writes on a table:

Chiacia	Chiacia	Chiacia
X O X	X O X	X O X

One then pricks the tooth with a knife or an iron toothpick until it bleeds slightly; then thrusting the point of the instrument, to which the blood adheres, into the first cross, then into the second, then into the third, and so on, one asks the patient each time if the tooth still pains him. Before one gets to the last cross the pain ceases! This stolid cure, says the author, has no other value than that of the scarification of the part affected.

Strobelberger held, as did many of the preceding authors, that the extraction of a tooth ought to be the *last* remedy, that is, to be had recourse to when all others, including cauterization, which he considers as the *last but one*, have proved ineffectual. There are cases, however, in which the extraction of a tooth is absolutely indicated, and here, by the way, the author acquaints us with the following poetic aphorism, which expressed the unanimous opinion of doctors:

Si dens pertusus, vel putridus esse notatur,
Corrumpens alios, tunc protinus ejiciatur.

That is, if one finds that a tooth is hollow or decayed, and corrupts the others, it must at once be extracted.

Strobelberger, like the greater number of his predecessors, is fully persuaded that diseased teeth may be made to fall out by the use of special remedies; indeed, this clearly appears from the title of the work itself, as, without doubt, the reader will already have observed. Such remedies are called by him "odontagoga," and he describes them at great length in five different chapters (X to XIV) of the second section of his book, dedicated to the surgical care of the teeth.

In regard to *violent extraction* of teeth, Strobelberger shows still greater cautiousness and timidity than Celsus or Abulcasis. He requires that, after the gum has been detached, one should endeavor to extract the tooth with the fingers or by means of a thread; if, however, this does not succeed, one may have recourse to the trifid lever; only at last, that is, when even the lever has failed, does he allow the use of an appropriate dental forceps.

ARNAULD GILLES, a Frenchman, in the year 1622, published in Paris a work whose curious title we will here note: *The flower of the remedies against toothache*.¹ We know nothing else about this publication,

¹ Arnauld Gilles, *La fleur des remèdes contre le mal des dents*, Paris, 1622.



which, however, to judge from its title, cannot be other than a mere compilation.

DUPONT, another Frenchman, in 1633, published an important pamphlet, which I have, unfortunately, not been able to see. I can, therefore, only quote what Sprengel says of it.¹ Dupont recommends, in cases of obstinate toothache, the extraction and immediate replantation of the tooth; which, he says, becomes quite firm again, but will no more cause any pain. In confirmation of this, Denis Pomaret related, a little later, a case in which a healthy tooth having been pulled out by mistake, and immediately put back into the socket and treated with astringent remedies, became perfectly firm again.²

Although Abulcasis and Ambroise Paré had already recommended the replantation of teeth, the loss of which had been caused by trauma, and although Peter Foreest had already made known as a result of his own personal experience that the luxation (not, however, complete extraction) of a tooth and its successive replantation is capable of causing toothache to cease, nevertheless, we must recognize that the merit of having elevated replantation in non-traumatic cases to a special method of cure must be attributed to Dupont.

WILHELM FABRY (1560 to 1634), a German, and native of the small town of Hilden near Cologne, better known by his Latin name of Fabricius Hildanus, was chief doctor to the city of Berne, and acquired great fame as well by his extraordinary professional ability as by his works, consisting principally in reports of many hundreds of important and instructive clinical cases. He is rightly considered one of the most illustrious German surgeons. His writings have largely contributed not only to the progress of surgery in general, but also to that of dental surgery in particular.

One of his observations clearly shows the etiological relation frequently existing between a prosopalgia or a supposed hemicrania and a dental affection. The case referred to is that of a lady who had been subject for six months to violent pain in the upper teeth of one side of the jaw. The toothache little by little disappeared, giving place to an obstinate cephalalgia in the same side of the head, which gradually became so intense as to be perfectly insupportable, the patient being particularly subject to it when the weather was cold and damp. After four years of atrocious suffering, and after innumerable remedies had been tried without avail, Fabricius Hildanus—having had the luminous idea of seeking the cause of the evil in the teeth—obtained a complete cure, without further trouble, by extracting four of the patient's teeth, which were decayed.

Nowadays, it is an all-important canon of medical practice, that in

¹ *Remèdes contre le mal des dents*, Paris, 1633.

² Sprengel, *Geschichte der Chirurgie*, Part II, p. 293.

every case of neuralgia occurring within the region influenced by the tri-facial nerve one should give particular attention to the state of the teeth and carefully treat every affection of the same. Notwithstanding—we say it with regret—there are still medical men who ignore or neglect this precept, and prescribe internal remedies or have recourse to injections of morphine when they ought, in the first place, to call in the aid of a dentist. How many patients would have been delivered from slow martyrdom if the example of the clear-seeing physician of Berne had been followed from his days up to the present time!

Fabricius Hildanus relates, besides, many cases of dental fistula, cured by him through the extraction of roots or of decayed teeth. In one such case the fistula dated from fourteen years back. Fabricius Hildanus, contrary to the opinion of many other doctors, extracted a decayed tooth, and by this operation obtained, in a brief period of time, the complete recovery of the patient.

Among the many very important clinical cases cited by Fabricius Hildanus, the following deserves to be recorded: In the year 1590 a woman presented herself to him who had a hard tumor in the space behind the last molar on the right side. The author, after having prepared the patient for the operation by the methods then in use (that is, by aperient medicine, by bleeding, and appropriate diet), destroyed the tumor by the application of escharotic substances. The remaining wound, however, defying all the cicatrizing remedies which the author had recourse to, one after the other, by reason of its being continually disturbed by the movements of the jaws, he then thought of maintaining the dental arches in a determined position, and this he obtained by means of two pieces of wood somewhat hollowed out above and below, which he placed on the right and on the left between the upper and the lower teeth, fixing them to the teeth themselves by brass wires passing through two openings made expressly in each of the two pieces of wood. In this way he succeeded in obtaining the absolute immobility of the jaws and the complete cure of the wound in a few days, during which time the patient was nourished with liquid food.¹

A very interesting case, inasmuch as it demonstrated the damage and peril which may result from certain absurd means of cure, was reported to this author by Claudio Deodato, physician to the Prince-Bishop of Basle. The case was that of a patient who, after having tried in vain a great number of remedies for a stubborn toothache, finally had recourse to the use of aqua fortis; but this substance, which in those days was in frequent use for dental caries and for toothache, produced most

¹ Guilhelmi Fabricii Hilandi opera omnia, Francofurti ad Moenum, 1646, Centuria I observatio xxxviii, p. 33.

deleterious effects in the patient, that is to say, the loss of almost all his teeth, necrosis of the inferior jaw, with fistulous sinuses and ulceration of the neck, abundant sanious discharge, fever, a cachectic condition, incipient necrosis of the upper jaw, etc.¹ Fabricius Hildanus, consulted by Claudio Deodato about this most serious case, proposed both a local and a general treatment, the result of which is, however, not mentioned in his book.

In the fifth "*centuria* of medical and surgical observations and cures"² we find a case of oral surgery, to which it is worth while briefly to refer here. It relates to an epulis situated next to the upper canine of the left side. The tumor, already of ancient date, had at this time reached the size of a walnut, was very hard, livid in color, irregular in form, and adhered somewhat to the upper lip; according to the author, it was of a cancerous nature. After the usual preparative measures, Fabricius Hildanus proceeded to the ablation of the tumor, and to this end he first pierced it with a curved needle and strong thread, in order to get a good hold on it, and he then removed it entirely down to the bone, by means of a curved bistoury.³

Fabricius Hildanus, having dissected several abortive fetuses of under four months, was able to verify the exactitude of the assertion made by Hippocrates, afterward luminously confirmed by different Italian anatomists, that the teeth begin to be formed during intra-uterine life. And with reference to this he also relates the following fact:

The wife of a Protestant minister gave birth to a female child which already had a fully developed tooth, a lower middle incisor, equal in size to that of a child of two years old, and which interfered with the sucking by injuring the nipple of the mother's breast and the tongue of the child itself. So it was necessary that it should be removed. But it was found to be so firm that the surgeon sought in vain to extract it with a thread, and was obliged to have recourse to the forceps.⁴

Observation XXXI of the third *centuria* relates a case of rhinoplasty. In the year 1590, when the Duke of Savoy made war on the inhabitants of Geneva, a girl named Susanna N. fell into the hands of the soldiers, who tried to deflower her; enraged at not succeeding in their intent, they cut off her nose. Two years later the girl went to Lausanne, the residence of J. Griffon, an eminent surgeon of that time, who performed the rhinoplastic operation on her in so splendid a manner that one would

¹ Cent. iv, obs. xxi, p. 302.

² The most important of Fabricius Hildanus' works consists of six *centuriæ* (hundreds) of remarkable cases, published by the author in successive epochs, and which were afterward reunited under the title of *Observationum et curationum chirurgicarum centuriæ sex*.

³ Cent. v, obs. xxvii, p. 406.

⁴ G. F. Hildani, opera omnia, Epist. ad J. Rheterium, p. 1010.

have taken the new nose for a natural one, not only from its normal appearance, but also because the scar was hardly visible. Fabricius Hildanus, having had occasion to see and examine the patient several times, even up to twenty-one years after the operation, was able to testify to the perfect condition of the nose; in the extreme cold of the winter, however, it was apt to become livid at the point. He does not describe the operative process followed by Griffon, but merely says that the first inventor of this operation was Gaspare Tagliacozzi, of the University of Bologna, and that Griffon had undertaken the reproduction of the same from his own conception of it, based on the information imparted to him in conversation, by an Italian who had been operated upon by Tagliacozzi.

JOHANN SCHULTES (1595 to 1645), a physician in Ulm, was the author of a very important work entitled *Armamentarium chirurgicum*, in which are given plates and descriptions of almost all the surgical instruments that had been in use up to that date. As to the part relating to dental and oral surgery, we find the following instruments named in this work:

1. Several kinds of pelicans; an instrument which was so called from its resemblance to the beak of the bird of the same name, and used for extracting the molar teeth.

2. The common dental forceps, then named *cagnolo* by the Italians, because of the supposed likeness to a dog's muzzle.

3. The crow's beak forceps (*rostrum corvinum*), designed for the extraction of dental roots, and, therefore, corresponding to the rhizagra of Celsus.

4. Two special dental forceps, or *dentiduces*, for the removal of teeth which could not be extracted either with the pelican or with the common dental forceps.

5. Bifid and trifid elevators (*vectes bifidi et trifidi*), to be used for the extracting of incisors and canine teeth, as well as roots.

6. *Dentiscalpia* for detaching the gum from the tooth before proceeding to extract it, in order that this may be the more easily accomplished and with less danger.

7. A silver funnel or cannula (*infundibulum seu fistula argentea*), for nourishing patients affected with trismus, by conveying liquid food into the fauces, through the free space behind the last molars.

8. Forceps more or less like in form to the beak of the parrot or the vulture (*rostrum psittacinum et vulturinum*), for the removal or resection of teeth that have grown in abnormal positions.

9. A screw dilator (*dilatatorium cum cochlea*), for gradually opening the dental arches in cases of spasmodic constriction of the jaws.¹

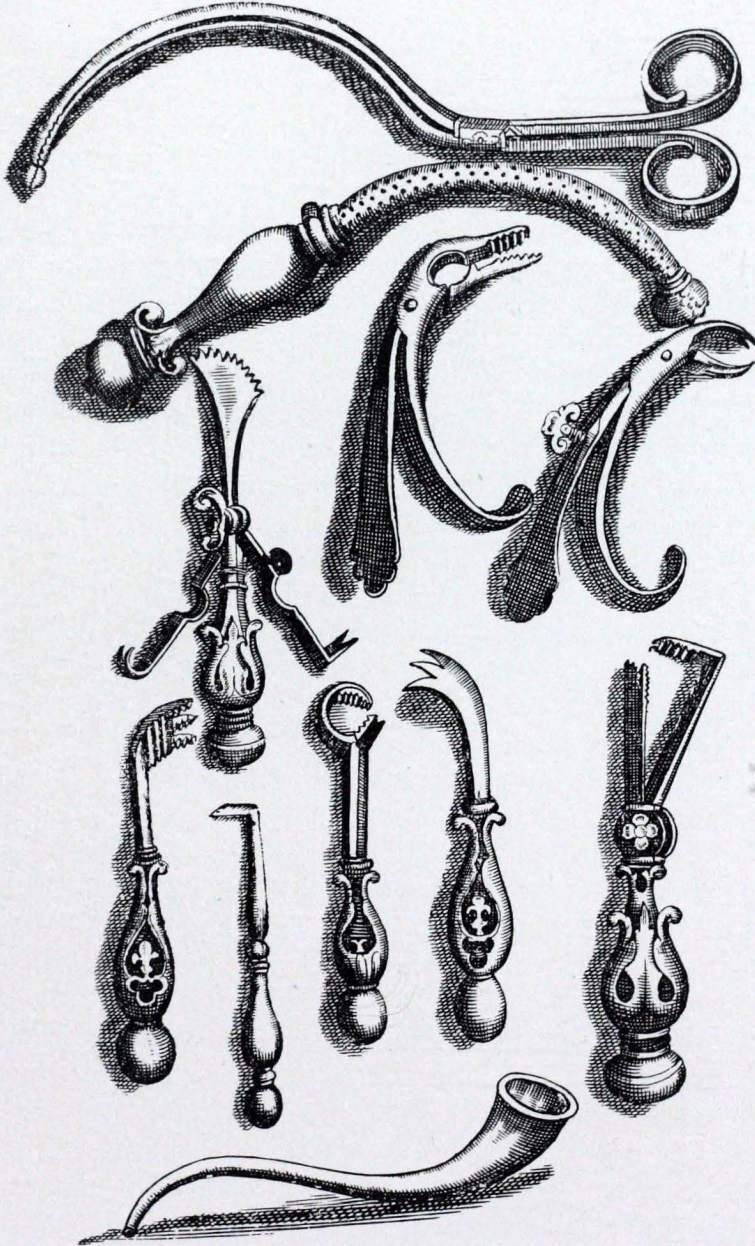
¹ Joannis Sculteti, Ulmensis, armamentarium chirurgicum, Francofurti, 1666, Plates X, XI, XII, XXXII.



*A plate of Schulte's "Armamentarium Chirurgicum,"
showing some dental and other operations.*

MARCO AURELIO SEVERINO (1580 to 1656), of Tarsia, a celebrated professor of surgery in the Neapolitan University, had a great predilection

FIG. 77



A plate from Schultes' "*Armamentarium chirurgicum*," showing several dental instruments.

for the use of the cauterizing iron, which he also used very frequently in curing caries and other dental diseases. At times, to effect a cessation of violent toothache, he would have recourse to the cauterization of the

antihelix! Against flaccidity of the gums and loosening of the teeth he also used cauterization, disapproving the use of astringent substances, as these cannot get so far as the roots of the affected teeth. Severino boasts of having cured by cauterization at least two hundred cases of dental diseases.

LAZARE RIVIÈRE (1589 to 1655), a professor at the University of Montpellier, also known by his latinized name of Lazarus Riverius, treats of dental affections and their cure, in various parts of his works, considering them, however, almost exclusively from a medical point of view.

He speaks first of all of the different causes of odontalgia, and, among these, does not omit to mention worms. These, he says, may be generated in the carious cavities, owing to the putrefaction of substances retained in their interior. Whenever odontalgia is caused by worms, the pain, says Rivière, is not continuous, but ceases and returns at brief intervals; besides, the sufferer perceives at times the movement of the worm inside the tooth!

What one reads in the works of this author as to remedies to be used for odontalgia clearly demonstrates how irrationally dental diseases were treated in the seventeenth century and what tortures were inflicted on the patients. In many cases, and especially when the pain was held to be occasioned by "hot humors," the treatment was begun by bleeding in the arm. The following day an aperient was administered. Afterward, if the pain still persisted, the sufferer was cupped in the region of the scapulæ or of the spine, blisters were applied to the nape of the neck or behind the ears, resinous plasters to the temples; all this without taking into account the remedies which were introduced into the ears, or the various medications or operations performed on the aching part itself, and many other things besides. In fact, in order to cure a toothache, the whole body of the sufferer was seized upon and put to torture, and in the majority of cases they assuredly finished by extracting the diseased tooth! When we reflect on the extraordinary frequency of dental disorders we cannot do less than recognize that the dentists, by the radical change effected in the methods of treatment, have diminished in no small degree the sufferings of humanity!

According to Rivière, the small veins (sic) that nourish the teeth pass through the ear (!); and this would explain how the cessation of a toothache may be obtained by the introduction of certain remedies into the meatus auditorius externus. Relief may be obtained, for instance, by dropping oil of bitter almonds into the ear on the side affected by the pain, or by allowing the vapor of hot vinegar, in which pennyroyal or origanum has been boiled, to penetrate into it. Others, adds the author, pour a little pure vinegar into the ear, which is especially efficacious against

"hot fluxions." When, however, the toothache depends on a "cold fluxion," it calms the pain wonderfully to drop into the ear a tepid mixture of garlic juice and theriac. The same advantage, says the author, may be obtained by introducing a piece of garlic, peeled and cut into the form of a suppository, into the ear.

The author also makes a lengthy enumeration of anodyne and narcotic remedies (among which opium), observing, however, that those remedies, unless the vehemence of the pain obliges the use of them, ought not to have the preference, it being much more rational and much more advantageous to institute a cure which aims directly at the cause itself of the pain (fluxions, worms, etc.).

He informs us that Amatus Lusitanus, a celebrated physician of the sixteenth century, extolled, as a remedy for toothache, a decoction of gum sandarach in wine and vinegar; the said decoction was to be made with an ounce of sandarach in six ounces of wine and the same quantity of vinegar, and ought to be kept in the mouth some length of time, whilst hot.

Rivière further speaks of various masticatories, which were composed of mastich, staphisagria, pyrethrum, henbane, etc.

He also mentions oil of cloves, which even then was used against toothache, by introducing into carious cavities a small piece of cotton-wool soaked in it. Oil of camphor was used in the same manner, but the most efficacious of all, according to the author, was oil of boxwood.

As to worms in the teeth, they may be destroyed by the use of bitter substances!

In the case of a caries penetrating into the inner cavity of the tooth, to effect the cessation of pain, it is necessary to burn the nerve with the actual cautery, or with aqua fortis, or with oil of vitriol. If this be repeated several times, the tooth gradually falls to pieces.

After having enumerated all these remedies, the author speaks of the extraction of the teeth, and of all the precautions with which this must be carried out in order to avoid the various accidents which may result from the operations and may even, sometimes, become a cause of death.

When abundant hemorrhage follows the extraction of a tooth, this may often be made to cease by applying a small, very compact ball of linen into the alveolus and maintaining it there by pressure during one or two hours. Should this not suffice, one can combine with compression the use of astringent substances. Finally, as a last remedy, use may be made of the red-hot iron.

In the case of timid patients, who shrink from an instrumental operation, recourse may be had to eradicating remedies, the author being fully convinced of their efficacy. Indeed, one of these—helleboraster—is said to be so powerful that, when rubbed on the teeth, these fall out

within the space of a few hours; for which reason it is absolutely necessary, in making use of it, to cover over the neighboring teeth with wax, so that the healthy ones may not also fall out, as happened, says the author, in the case of a poor peasant.

The internal use of mercury, and even the use of certain mercurial preparations used by women as cosmetics, is of damage to the teeth and imparts to them a blackish or dirty looking color.

Numerous remedies exist for cleaning the teeth, but according to Rivière the best way of cleaning them consists in rubbing them with a small stick immersed in sulphuric acid (*spiritus sulphuris aut vitrioli*) and afterward drying them with a piece of linen. This remedy not only cleans and renders the teeth white, but it preserves them also from caries! If the teeth are very dirty, the spirit of vitriol may be used pure; otherwise one mixes it with *mel rosatum* or with water.

The great enthusiasm shown by Rivière for the above-mentioned remedy does not, however, derive from a long experience, made by himself or by others, of its advantages, but is based principally on a fact referred to by Montanus, and which,¹ we will here recount, because, from it, one clearly perceives how credulously our forebears accepted general affirmations and formulated therapeutic precepts.

Montanus recounts in one of his writings, how, being in Rome in his early youth, he became acquainted with a woman of about twenty years of age, known by the name of Maria Greca (by the way the author speaks of her, one is led to suspect she was a courtesan); and how, having seen her again, thirty years later, and found her in pretty much the same conditions as formerly, he expressed his surprise at this; whereupon Maria Greca told him that she herself believed that she owed the conservation of her beauty to the habit, already of many years' standing, of using one or two drops of oil of vitriol every morning, as a friction for the teeth and gums. In her youth she had had very bad teeth, but by reason of this cure they had become, and were at the time being, beautiful and perfectly firm; the gums also were in excellent condition; it seemed, therefore, to her that this conservation of health and freshness, in spite of her fifty years, depended precisely on the daily use, in the manner described, of oil of vitriol!²

Rivière, besides, recommends tobacco ashes for cleaning the teeth, a counsel not yet given by any previous author. He also gives the formulæ for two dentifrice powders, the basis of which is alum; he calls attention

¹ Giovanni Battista Montano (1488 to 1551), of Verona, Professor of Medicine at Padua.

² It is marvellous that an intelligent physician should have lent faith to such a story, related, too, by such a woman, never reflecting that the daily use of sulphuric acid for the space of thirty years, that is, about 11,000 applications, instead of curing and beautifying bad teeth, would certainly rather have had the effect of totally destroying the denture of even a mastodon.

to the great importance of taking assiduous care to keep the teeth clean, and advises that after each meal the residues of food be removed from the interstices of the teeth and the mouth well rinsed with wine.¹

NICOLAUS TULP, in Latin, Tulpius (1593 to 1674), a distinguished physician and anatomist of Amsterdam, contradicts the then prevailing opinion among doctors, that is, that the cure of dental affections and the operations relating thereto were matters to be held in little account. He observes that diseases of the teeth may give rise to the most serious consequences, which can even be the cause of death, and are, therefore, worthy of being taken into equally serious consideration as all the other diseases of the several parts of the human body.

This author relates a clinical case tending to demonstrate how incisions made in the gums, advised in the first place by Vesalius, in order to facilitate the erupting of the last molar, are not always exempt from danger. A young doctor of Amsterdam, by name Goswin Hall, being tormented by insupportable pain caused by the difficult eruption of a wisdom tooth, had the gum lanced above it. But the pain, instead of diminishing, became worse; fever and delirium supervened, followed by death! (Here, however, we must be allowed to observe that nothing demonstrates that the real cause of death was the lancing of the gum, or that without this the case would have had a different termination. An event can occur after another and yet be quite independent of the former and result from quite different causes.)

Among the cases cited by Tulp, the following is also worthy of mention. He relates having arrested a violent and persistent attack of hemorrhage, which came on after the extraction of a tooth, by applying and compressing a piece of sponge inside the alveolus.²

The belief that dental caries and toothache could be caused by worms was, at that time, still in full vigor, and it gained still greater force by reason of observations recorded by different scientists, whose affirmations could with difficulty be doubted, for at that period the greater number still swore blindly *in verba magistri*.

OLIGERUS JACOBÆNS (1650 to 1701), a Danish physician and anatomist, who taught in the University of Copenhagen, declared that in scraping the decayed cavity of a tooth that was the cause of violent pain, he had seen a worm come forth, which, having been put into water, moved about in it for a long time.

MARTIN SIX, having split some decayed teeth a short time after they had been extracted, asserts that he determined the existence of worms in

¹ Lazari Riverii, opera medica omnia, Genevæ, 1737; Praxeos medicæ liber sextus, cap. i; De dolore dentium, cap. ii; De dentium nigredine et erosione.

² Nicolai Tulpii, Amstelodamensis, Osservationes medicæ, Amstelodami, 1685, lib. i, cap. xxxvi, p. 68; cap. xlix, p. 90.

them. (It is probable that this observer, as well as others, mistook the dental pulp for a worm, an unpardonable error, in truth, at a time when the anatomical constitution of the teeth had already been very well studied by several scientists, and especially by the celebrated Bartolomeo Eustachius.)

GABRIEL CLAUDER (1633 to 1691) not only believed in dental worms, but maintained besides that these were the most frequent among all the causes of toothache. In a certain way, to sustain this opinion of his, he relates a case in which a tooth of healthy appearance being the seat of great pain, a tooth-drawer had asserted that there must be a worm in its interior; and, in fact, on the tooth being extracted and afterward split, the little animal whose existence the tooth-drawer had divined, was found to be existing inside of it!

PHILIP SALMUTH asserts that by using rancid oil he got a worm out of the decayed tooth of a person suffering from violent toothache, thus causing the cessation of the pain. The worm, he says, was an inch and a half in length (!) and similar in form to a cheese maggot.

NICOLAUS PECHLIN (1646 to 1706), professor of medicine at Kiel, testifies to having seen five such dental worms, like maggots, come out by the use of honey, though he does not say whether they issued from several cavities or from one only!

GOTTFRIED SCHULZ. But all this is nothing compared to what Gottfried Schulz has dared to assert, viz., that by using the gastric juice of the pig, worms of great size can be enticed out of decayed teeth; some of these even reaching the dimension of an earth-worm!

It is not much to be wondered at that these things should have been blindly believed in, if we reflect that only a short time previous to this the story of the golden tooth had been taken seriously by men of great erudition, and that in the very epoch of which we are speaking the illustrious anatomist THOMAS BARTHOLIN (1616 to 1680), of Copenhagen, relates having seen a man, at Padua, who had an iron tooth! Besides, the possibility of such a phenomenon was explained in a most curious manner by THOMAS MINADOUS, who explained that in the same way as iron is generated in the macrocosm, that is, in the world, so it is equally admissible that it may be generated in the microcosm, that is, in man!¹

NATHANIEL HIGHMORE. In the year 1651 the English physician and anatomist Nathaniel Highmore (1613 to 1684), of Hampton, published a treatise on anatomy (*Corporis humani disquisitio anatomica*, etc.), by which he acquired a celebrity superior, perhaps, to his merits. This work, however, served without doubt to diffuse the knowledge of an

¹ Sprengel, *Geschichte der Chirurgie*, vol. ii, pp. 294, 299.

anatomical fact of the highest importance, especially from the point of view of dentistry and surgery.

There is no doubt that the existence of the maxillary sinus was already known before Highmore, the celebrated anatomists Vesalius, Ingrassias, Eustachius, and Fallopius having spoken of it very clearly; only through ignorance of the history of anatomy has it been affirmed by many that this cavity was discovered by Highmore, to whom is only due the merit of having described the maxillary sinus, by him called *antrum*, most accurately, and of having made known the possibility of a communication between it and the mouth. Highmore calls attention to the fact that the inferior wall of the antrum often presents small projections, which correspond with the tops of the alveoli, and that the osseous lamina which interposes between these latter and the maxillary sinus is often extremely thin; for which reason, it may easily happen that, in extracting one of the teeth below the cavity, one may bring away together with the tooth the small osseous plate that forms the bottom of the alveolus, thus leaving the maxillary sinus open at its inferior part. With regard to this, he refers to a most interesting case which afterward acquired a high degree of notoriety. It relates to a lady who had suffered from toothache for some years, and who from time to time had had several decayed teeth extracted, without, however, finding relief. The pain only ceased after the patient had had the left upper canine removed. But after this operation an incessant flow of humors from the alveolus of the extracted tooth took place. The patient, in great anxiety at this circumstance and desirous of seeing clearly into the causes of it, herself explored the affected part with a silver probe, the entire length of which penetrated into the cavity, producing in the patient the effect of its having reached the eye. Still more amazed, and urged on by the desire of becoming still better acquainted with the extent of the evil, she now made use of a long feather, which she had previously stripped, and discovered to her painful surprise that this new instrument of exploration entered to so great a distance that it, according to her idea, penetrated into the skull. From this she derived argument for the belief that the morbid phenomenon had its origin in her brain. Believing herself affected with a serious malady, she consulted Highmore, who had the satisfaction of being able to tranquillize her completely by making her understand that the jaw bone is hollow in the inside, and that its cavity had remained open underneath in consequence of the extraction of the canine tooth; and also, that the feather had not penetrated to such a distance as she supposed, but had curved inside the bone. As to the discharge which had given so much trouble and alarm, Highmore considered it quite a natural circumstance, derived simply from the opening of the antrum, as he held that in many cases the maxillary sinus contains mucus, and that this condition was,

therefore, altogether normal. So he did not propose any treatment, and the lady thenceforth supported her infirmity with resignation.

This most interesting case soon became generally known, and contributed, without doubt, not a little to attract the attention of medical men to the anatomical peculiarities which Highmore had pointed out in the upper maxillary bone, thus causing his name to become inseparably associated with the maxillary sinus.

It is evident, however, that Highmore never even suspected to what very important practical applications his description would give rise. He knew nothing about the diseases of the antrum, and believed that, even in perfectly normal conditions, this cavity is often filled with liquid; the idea, therefore, of its being advisable, in certain cases, to extract a tooth and perforate the alveolus in order to give exit to the liquid contained in the maxillary sinus never occurred to him.

About fifty years went by before a rational treatment for affections of the antrum was initiated, the merit of which, as we shall see at its time and place, was due to William Cowper. During that half century maladies of the maxillary sinus continued to be badly diagnosticated and badly treated.

BERNARDO VALENTINI. In the year 1686, that is, thirty-five years after the publication of Highmore's book, Bernardo Valentini, professor at the University of Giessen, described a case of tumefaction and abscess in the cheek, treated by him with emollient remedies, and in which, although according to him caries of the underlying bone did not exist, the separation of a sufficiently large osseous fragment took place. Without doubt the affection of the cheek was derived in this case from some disease of the antrum; however, it would appear that Valentini did not in the least perceive any such casual relation, as he makes no allusion whatever to it.¹

ANTONIO MOLINETTI, professor at the University of Padua, had, however, ten years previously, diagnosticated and cured an affection of the antrum by means of an operation. In his book *Dissertationes anatomico-pathologicae*, published at Venice in 1675, Molinetti relates that in a case of abscess of the maxillary sinus, which caused the patient great suffering, he performed the operation of trepanning the upper maxillary bone anteriorly, after incision of the soft parts overlying it. In a certain way we may, therefore, consider Molinetti as a precursor of William Cowper.

Having spoken of the very important anatomical fact illustrated by Highmore, we will now also speak briefly of those authors who, in the seventeenth century, occupied themselves with the anatomy of the teeth.

¹ Sprengel, op. cit., p. 297.

Their number is sufficiently large; we will, however, only make mention of such as contributed to the development of this branch of science, or who, at least, expressed some opinion worthy of note.

The celebrated anatomist ADRIAN SPIEGEL (1578 to 1625), better known by the Latinized name of *Spigelius*, wrote nothing noteworthy about the teeth, but he appears to have been the first to affirm that the teeth are more firmly fixed in the alveolus, when their roots are curved after the manner of hooks.¹

DIEMERBROECK, a Dutchman, relates several cases of dental anomalies, as for example, of teeth being cut in the palate, and which injured the tongue. The author cites his own case, relating that having had a canine tooth extracted when well advanced in years, it was, nevertheless, succeeded by a new one. He relates, besides, that he had seen in Utrecht a woman, aged fifty-six years, who again cut two incisors after having lost the former ones two years previously. Apart from this, Diemerbroeck tells us nothing of interest or importance regarding the teeth, often repeating old ideas, the falseness of which had already been luminously demonstrated. For instance, he says that the permanent teeth are developed from the roots of the deciduous ones remaining in the alveoli; an unpardonable error for an anatomist of the seventeenth century, for which he was afterward taken to task by Duverney.²

THOMAS BARTHOLIN, whom we have already mentioned, speaks of a tooth which had made all the round of the alveolar border; that is to say, of a dental arch constituted by a single piece; and the Italian anatomist BERNARDO GENGA makes mention of an analogous case.³ It is superfluous to add that these authors allowed themselves to be deceived by false appearances, owing especially to an abundant and uniform deposit of tartar on the surface of the teeth and in their interstices, which gave to the dental arch the appearance of one continuous piece.

RINALDUS FREDERICUS, in his erudite dissertation entitled *De dentium statu naturali et præternaturali*, spoke of the dental system with sufficient thoroughness, if we consider the epoch in which he wrote. He commences his work with a long chapter on the importance and dignity of the teeth (*dignitas dentium*). Among other things, he relates that formerly, in certain parts of India, the teeth were so highly valued as to be offered in sacrifice to the gods. He says, too, on the authority of certain authors, that the ancients were led to believe that the teeth served for the resurrection of the body, from the circumstance of their not showing signs of corruption when found in sarcophagi.

¹ Blandin, *Anatomie du système dentaire*, Paris, 1836, p. 26.

² Blandin, *op. cit.*, p. 27; Portal, *Histoire de l'anatomie et de la chirurgie*, Paris, 1770, vol. iii, p. 495.

³ Blandin, *op. cit.*, p. 26; Portal, *op. cit.*

Discoursing of the genesis of the teeth, Fredericus says that "every tooth is at first enclosed within a follicle, that is, in a frail, skin-like membrane, in the same manner as the grain in the wheat-ear." Taking this comparison as his point of departure,¹ he gives to dentition the name *germination*.

This author says that the teeth of the Ethiopians and of the Indians are generally whiter than those of the northern peoples, but that those of the Indians soon lose their primitive whiteness by reason of the widely diffused habit of chewing betel-nuts.

Fredericus refers to an experiment which, according to him, demonstrates the "sympathetic relations" between the teeth and the ear (whilst in reality it only proves the facility with which sounds may be transmitted through solid bodies). "If, by night," says he, "one holds tightly between one's teeth the end of a stick, stuck upright in the ground, one hears the footsteps of a person approaching from afar much more easily."

Through the researches of three great men, Marcello Malpighi, Friedrich Ruysch, and Antoni van Leeuwenhoeck, an altogether new science arose in the seventeenth century, viz., histology, or the anatomy of the tissues, whose revelations contributed not a little to the development of modern odontology.

MARCELLO MALPIGHI (1628 to 1694), the celebrated Italian anatomist, was the initiator of microscopic observations on the tissues, and is, therefore, justly considered the founder of histology, within the range of which he made most important discoveries.²

FRIEDERICH RUYSCH (1638 to 1731), professor at Amsterdam, rendered his name illustrious particularly by bringing to a high degree of perfection the processes of anatomical preparations and of embalming.³

His magnificent injections, carried out with a method of his own invention, enabled him to trace the most minute vascular ramifications and to demonstrate the existence of capillary vessels in parts where their presence had as yet never been suspected.

Ruysch studied accurately the anatomical constitution of the teeth, and especially their vessels. He called attention to the membrane which lines the maxillary sinus, and discovered in it a number of bloodvessels.

But in addition to his purely anatomical observations, this author also merits our consideration from the point of view of pathology. He confirmed a most important fact to which allusion had already been made by preceding authors, that is, the atrophy of the alveolar parietes as

¹ Totus dens primum inclusus est folliculo seu membrana tenui ac pellucida non secus ac granum in arista.

² Bouillet, Précis d'histoire de la médecine, p. 221.

³ Bouillet, op. cit., p. 222.

following on the extraction or on the falling out of teeth. Ruysch, however, makes the observation that atrophy of the alveolar parietes may also precede the falling out of the teeth, and rather be the cause than an effect of it. In such cases the teeth, before falling out, always become more and more loosened, proportionately to the atrophic process. This pathological condition, against which none of the astringent remedies habitually used are of avail, is mostly considered, says Ruysch, to be owing to scurvy; but, he adds, the accumulation of tartar may also be the cause of it. Substantially, Ruysch affirms the relation existing between the accumulations of tartar and the production of that very frequent disease that was afterward named expulsive periodontitis or alveolar pyorrhea.

This author also relates two cases of polypous affection of the maxillary sinus. In one of these cases, the existence of a polypus in the maxillary sinus was determined by Ruysch while dissecting a corpse. The other case relates to a female patient upon whom two surgeons had performed the extraction of several molar teeth and the extirpation of an epulis believed by them to be of a malignant character. After the operation they cauterized the diseased part to a great depth with a red-hot iron, reaching as far as the maxillary sinus, which remained open, and from which Ruysch afterward extracted with his little finger several polypi.¹

ANTONI VAN LEEUWENHOEK (1632 to 1723), like the preceding author, a Dutchman, was the first maker of powerful microscopes, by means of which he made many important discoveries; among others, that of the tubular structure of the dentine or tooth bone. This discovery he made known and demonstrated in the year 1678, before the Royal Society in London. In his description of the structure of the teeth, Leeuwenhoek says that 600 to 700 of the dentinal tubuli have hardly the consistence of one hair of a beard.²

In the year 1683 he discovered in the tartar scraped from between the teeth a form of microörganism upon which he laid special stress. This observation he embodied in the form of a contribution which was presented to the Royal Society of London on September 14, 1683. This paper is of particular importance, not only because of the careful, objective nature of the description given of the bodies seen by him, but also for the illustrations which accompany it. From a perusal of the text and an inspection of the plates, there remains little room for doubt that the bodies described by Leeuwenhoek were not animalcules, as he believed, but bacteria.³

¹ Friderici Ruyschii observationum anatomico-chirurgicorum, centuria, Amstelodami, 1691; Portal, *op. cit.*, vol. iii.

² Portal, *op. cit.*, vol. iii.

³ A. C. Abbott, *The Principles of Bacteriology*, Philadelphia, 1905, p. 19.

DOMENICO GAGLIARDI, professor of anatomy and of medicine at Rome, published an excellent work on the anatomy of the bones,¹ in which he occupies himself not only with the structure of bones, properly so called, but also with that of the teeth. He considers the enamel to be formed by parallel and contiguous fibers, coated, so to speak, by a concremented juice, *sui generis*, which acquires a much greater consistence than that of the bones. Gagliardi says that by rubbing teeth hard together, or striking them with a steel, he was able to extract sparks from them.²

JEAN DUVERNEY (1648 to 1730), a celebrated French anatomist, wrote a good monograph³ about the teeth. As different anatomists of the sixteenth century had already done, he examined many fetal jaws in order to study in them the formation of the teeth. In relating his observations, he says that he found in every alveolus a mass of soft viscous matter, having the form of the tooth that is to derive from it, and which may be considered as its nucleus. This nucleus is entirely surrounded by a membrane, which the author likens to that which surrounds the fetus, and to which he gives the name of *choroid membrane*. From the surface of the nucleus a gelatinous juice transpires, which, thickening in layers, forms the enamel and the rest of the tooth. The choroid membrane is abundantly furnished with nerves, and with blood and lymph vessels. Into the interior of the teeth penetrate vascular and nervous branches which serve to maintain its vitality. In fetal jaws one finds, besides the germs of the deciduous teeth, also those of the permanent ones. The "choroid membrane" does not follow the tooth when it issues from the alveolus; it remains instead within the latter, forming the peridental membrane.

Duverney says that in old people the root cavity diminishes in so considerable a manner, and the vessels are so compressed that they almost entirely disappear. It is then that a period of decadence begins in the tooth, it is more feebly nourished, wears away more rapidly than hitherto, and becomes shorter.

The author also speaks of senile atrophy of the jaws, especially of the alveolar processes. With regard to this, he observes that if in old age the lower jaw advances beyond the upper, this depends wholly on the disappearance of the alveolar border, which projected more in the upper than in the lower one.

Duverney admits the existence of direct vascular relation between the gums and the teeth; because in the case of diseases of the gums it is rare not to find the teeth altered as well.

From the point of view of the development and nutrition of the teeth,

¹ *Anatome ossium, Romæ*, 1689.

² Portal, vol. iv, p. 111; Blandin, p. 28.

³ Jean Guichard Duverney, *Mémoire sur les dents*, Paris, 1689.

Duverney finds much analogy between the tusks of the elephant, the teeth, properly so called, the feathers of birds, and the hair of mammifera.¹

GOTTFRIED BIDLOO, a Dutch anatomist, expresses the idea that the air contributes, after the eruption of the teeth, to hardening them. He did not, however, give any proof of this opinion of his.²

CLOPTON HAVERS, an Englishman, wrote a book on osteology, by which he acquired great reputation,³ and in which he treats as well of teeth and their structure. This author believes the enamel of the teeth to be of the nature of stone, and the ivory of the nature of bone. The dental roots, which, he says, are precisely of a bony nature, are covered over with a periosteum, which is in close relation with the gums and with the periosteum of the jaw bone. Clopton Havers held that the dental follicle no longer furnishes any nourishment to the enamel from the moment that this has reached its perfect formation. On the other hand, he assures his readers that he has observed, through the microscope, nervous threads which, departing from the bulb of the tooth, traverse the ivory through small canals, arriving thus at the periosteum. By this anatomical disposition the sensibility of the teeth may, according to him, be explained.⁴

Having made this passing allusion to the anatomy of the teeth in the seventeenth century, we will now resume the illustration of those facts relating to the pathological and curative part of the science.

WALTER HARRIS, an Englishman, in a pamphlet on acute infantile maladies,⁵ recommends again, in cases of difficult dentition, the incision of the gums, a curative practice which had already fallen into disuse.⁶

In the authors of that time we find registered a great number of cases of epulis. HIOB VAN MEEKREN speaks of an enormous tumor of the gum that developed in consequence of a traumatic action which had occasioned the loss of a tooth. Before deciding on the extirpation of the tumor, the author thought well to pierce it with a bistoury, to be able to judge whether its ablation might not possibly give rise to a dangerous hemorrhage. The wound having bled but little, he proceeded to operate; but the tumor was so large that it was necessary to remove it in various portions.⁷

The same author refers to a case of a soft epulis, bleeding easily, that

¹ Blandin, *op cit.*; Portal, vol. iii, p. 495.

² Blandin, p. 31.

³ On Some New Observations of the Bones and the Parts Belonging to Them, London, 1691. The accurate description given by Havers of the canals containing the nourishing vessels of the bone has caused these canals to be known, even up to the present day, by the name of "Haversian canals."

⁴ Portal, vol. iv, p. 134; Blandin, p. 31.

⁵ De morbis acutis infantum, London, 1689.

⁶ Sprengel, *Geschichte der Chirurgie*, vol. ii, p. 298.

⁷ Meekren, *Observationes medico-chirurgicæ*, cap. xv, p. 84.

developed after a badly performed dental extraction. It was to be foreseen that the ablation of such a tumor would give rise to an abundant hemorrhage. This was, however, staunched by simply using astringent powders, without having recourse to the actual cautery, which the operator had held in readiness.¹

DANIEL MAJOR, wishing to remove a large epulis by tying it, was obliged, in order to keep the ligature in position, to pass the thread through a circular incision made at the base of the tumor. He first used a thread of silk, afterward a silver one, and tightened the ligature every day until the epulis fell off.²

JOHANN ACOLUTHUS was obliged, in order to extirpate a large epulis, to previously split the labial commissure. After the ablation of the principal mass of the tumor, he destroyed the remaining part of it by application of the red-hot iron.³

One reads of other cases of epulis in Stalpaart van der Wyl, Mercklin, Preuss, Bern, Valentini, etc. This last author even speaks of an epidemic of epulis. However this may be, it is very probable that epulis was much more frequent in past times than it is now, and this probably depended partly on the incongruous modes of treating diseases of the mouth, and partly on the slight attention paid to cleanliness of the teeth.

KORNELIS VAN SOOLINGEN, a celebrated Dutch physician and surgeon, who flourished toward the end of the seventeenth century, speaks contemptuously of dental operations, and especially of extractions. He says that such operations ought to be left to charlatans, used to taking out teeth with the point of the sword, and to doing many other things of like nature! This unjust contempt was at that time widely diffused in the medical class, it resulted, however, substantially, from the great difficulties encountered by doctors and surgeons in general, in performing the operation of extraction, owing to want of practice, and also from the desire to avoid the responsibility of the accidents to which the extraction might give rise; so true is this, that an author of the preceding century, THEODOR ZWINGER (1538 to 1588), a celebrated Swiss doctor and professor at Basle, had declared with great frankness that the extracting of teeth ought to be left to barbers and charlatans, as it might easily occasion unpleasant accidents, such as fractures of the jaw, laceration of the gums, serious hemorrhage, and the like.

In spite of his contempt for practical dentistry, Kornelis van Soolingen takes the treatment of dental affections into attentive consideration. For the stopping of carious teeth, he recommends a mixture similar to that which Rhazes had recommended many centuries before, that is, a cement of mastic and turpentine; because, says he, when the stopping is made

¹ Op. cit., cap. xxviii, p. 120.

² Sprengel, vol. ii, p. 298.

³ Sprengel, loc. cit.

with metallic substances, it is never so perfect as to entirely impede the penetration of moisture.

Great credit is due to Kornelis for having first brought into usage the instrument makers' emery wheels for grinding down sharp edges of teeth, thus initiating the practice of trepanning the teeth with sphere-shaped burs.¹

PAUL WURFBEIN refers to a case of extensive necrosis of the lower jaw, in which a certain Dr. Bürlin having removed the necrotic portion, regeneration of the bone took place.

FRIEDERICH DEKKERS (1648 to 1730) refers a similar case, in which, although quite one-half of the lower jaw had been removed, the bone formed again completely.²

BENJAMIN MARTIN, apothecary to the Prince de Condé, was the author of a pamphlet on the teeth,³ in which he gave a succinct description of these organs and spoke briefly of their diseases. He shows himself decidedly opposed to the use of the file and to the application of false teeth, because, according to him, both of these things may be the cause of great harm. With regard to the file, he says that nothing so easily tends to loosen the teeth as the use of this instrument, not to speak of various other inconveniences, among which is the danger of opening the interior cavity of the tooth.⁴

MATTHIAS GOTTFRIED PURMANN (1648 to 1721), a celebrated surgeon of Breslau, was the first to make mention of models in dental prosthesis. As to the mode in which these models were obtained, some admit as natural that he first took a cast, and formed the model on this; but as Purmann does not hint in the least at such a process, the supposition is altogether gratuitous. Indeed, his description rather excludes any probability that the model was taken from a cast. Here is the literal translation, as nearly as possible, of the passage in which Purmann speaks of artificial teeth and of the mode of applying them.

"The front teeth, or pronouncing teeth, ought, when they are wanting, to be substituted by artificial ones, in order to avoid defects of pronunciation, as well as to obviate deformity of the mouth, and this is carried out in the following manner: One has other teeth made of bone, or of ivory, according to the number, the size, and the proportions of those wanting; for which purpose one may previously have a model executed in wax, reproducing the particular conditions of the teeth and jaws, in order afterward to make and exactly adjust the whole on the pattern of it; then, when the base of these teeth is well fitted on the jaw and small

¹ Soolingen's *Manuale operationi der chirurgie*, Amsterdam, 1684.

² Sprengel, *op. cit.*, p. 300.

³ *Dissertation sur les dents*, à Paris Chez Denys Thierry, MDCLXXIX.

⁴ Portal, *op. cit.*, vol. iii, p. 361.

holes have been made in the artificial teeth and also in the natural ones next to them, one applies the artificial teeth in the existing void and fixes them as neatly as possible with a silver wire by the help of pincers."¹

It would appear that the author is here describing a prosthetic method, which he had never practised himself; and this results from the fact of his advising the perforation of the natural teeth for the passage of the silver wire destined to keep the prosthetic piece in its place. Evidently desiring to describe the mode practised by the specialists of those days for fixing artificial teeth, he erroneously imagines that the metal thread was passed through the holes drilled in the natural teeth; this would have been impossible, first, because of the atrocious pain due to the sensibility of the dentine and of the dental pulp, and then because of the pathological consequences to which the perforation of the teeth would have given rise. We may, therefore, surely hold that Purmann is simply describing, and not even accurately, a prosthetic method already in use among the specialists of that period.

On examination of the passage cited above—which, however, is not so clear as might be desired—it would appear that the models of which the author speaks were most probably quite different from those in use now. It is almost certain that the specialists of those days first made a sketch of the prosthetic part to be constructed, using for the purpose a piece of wax which they partly modelled with the hand and partly carved; and after having tried on this model until it fitted perfectly in the mouth, and was in every way satisfactory, they probably passed it on to a craftsman to make an exact reproduction of it in bone or ivory.

In the year 1632 a little book was published in Naples, having for its title, *Nuova et utilissima prattica di tutto quello ch'al diligente Barbiero s'appartiene; composta per Cintio d'Amato*.² This pamphlet was reprinted in Venice in 1669, and again in Naples in 1671. We here make mention of it, not for any special importance which it really has as regards the development of the dental art, but because of its being most probably the first book in the Italian language in which dental matters are spoken of independently of general medicine and surgery.

TOMMASO ANTONIO RICCIO. The edition of 1671 was published under the supervision of Tommaso Antonio Riccio, who was for many years a disciple of Cintio d'Amato, and who greatly eulogizes his master and praises his work. He expresses himself in the following bombastic

¹ Purmann's *Wundarzenei*, Halberstadt, 1684, Part I, chap. xxxii.

² New and very useful practice of all that which belongs to the diligent barber; composed by Cintio d'Amato.

manner: "This book, the offspring of Master Cintio d'Amato, excellent in the Barber's Art, ought to find a place in the bosom of Eternity; because by reason of its having been twice given to the light, it has proved its worthiness to live forever in the memory of men, gaining for itself, by its excellence, immortal glory before all such as are practised in the Art."

The book—which consists of about one hundred and eighty pages, and is illustrated by several admirable engravings—contains, among other things, two pages of verses, written by various authors, viz., by Cintio d'Amato himself, by Giovan Battista Bergazzano, also a barber, and by others. The greater part of these verses are in praise of the two doctors and *Martyrs in Christ, Cosmos and Damianus, special protectors of the Art and of the author.*

The verses of Cintio d'Amato reveal the possession of a literary and poetic culture above the ordinary, in spite of his being only a master barber. As to his book, it may be considered, for the time in which it was written, as an excellent treatise on so-called minor surgery. The author expounds, in a few chapters, the anatomical notions relating to bleeding; speaks at great length of this operation and of everything concerning it; refers with much detail to all pertaining to the use of leeches, cupping, scarification, cauteries, issues, blistering, primary treatment of the wounded, nursing of the sick, etc.; at the end of the book there is also a long chapter on the embalming of corpses.

As regards the treatment of the teeth and gums the author dedicates six chapters thereto, entitled, respectively: "On the relaxation of the gums" (Chapter XXXVII); "Preparation for strengthening the gums and making the teeth firm" (Chapter XXXVIII); "On tartar and spots on the teeth" (Chapter XXXIX); "Another preparation for whitening and preserving the teeth" (Chapter XL); "Mode of burning hart's horn, very necessary in preparations for the teeth" (Chapter XLVII). "‘Water of salt,’ which makes the teeth white and is also good for ulcers of the gums" (Chapter XLIX).

Evidently Cintio d'Amato treats of dental matters only within extremely restricted limits. He tells us nothing with regard to the treatment of toothache, nothing about caries, about prosthesis, and, what is still more remarkable, he does not allude even in passing to the extraction of teeth. Now, if in a book treating of *all that which appertains to the diligent barber*, the most important dental subjects are passed over in silence, this shows that, contrary to the generally diffused opinion of today, the dental art was not at that time (at least not in Italy) exclusively, or even in great part, in the hands of the barber. Even at that time there must have been dental specialists, and the proof of this may be found in d'Amato's book itself, in the chapter entitled "Necessity and Origin of the Barber's

Art.”¹ The author, after having spoken of the divisions which the practice of the medical art had undergone from the most remote times, and after having alluded to the great number of parts into which Medicine was divided in the time of Galen, adds: “Which may also be seen in our own times, for as many as are the members of the human body, so many are nowadays the various kinds of doctors and of medicines. Some are for the teeth, some are for the ears, some for sexual maladies, others are ordinary doctors, others cure cataracts, others ruptures and stone, some make new ears, lips, noses, and others remedy harelips.”

As, under the generic name of doctors, Cintio d’Amato also comprises surgeons, it results from the above passage that in his time, that is, in the seventeenth century, there were surgeons who dedicated themselves specially to the treatment of the teeth; there were, in fact, dentists; and even admitting that the greater number of these were no better than simple tooth-pullers, this cannot be true of them all indiscriminately. Cintio d’Amato’s book demonstrates in the most vivid manner that even among the barber and phlebotomist class, that is, among the practitioners of minor surgery, there were, at that time, men of considerable culture. This ought to hold good with still greater reason concerning surgeons, whose professional level was certainly superior to that of barbers;² and as dentists belonged to the class of surgeons (whence the denomination still in use of “surgeon-dentist”), it is but natural to admit that besides the ignorant tooth-puller there were even then more or less cultured dentists well capable of treating dental diseases and performing dental operations within the limits permitted by the knowledge of the times.

The six chapters in which Cintio d’Amato speaks of matters referring to the teeth do not contain anything whatever of real importance; notwithstanding this, we will here refer to the beginning of Chapter XXXIX, treating “Of tartar and spots on the teeth,” because it is of some historical interest:

¹ The art of beautifying the human body was comprised by the ancients among the many and various parts of the medical art, under the name of *decorative medicine*. The barbers considered themselves members of the medical class, as practitioners of decorative medicine and in a certain degree also of surgery.

² In a chapter entitled “Of the Excellence and Nobility of the Barber’s Office,” Cintio d’Amato speaks of several barbers of that period, who were in great repute by their writings, or by the high offices with which they were invested, or by honors received from princes and sovereigns. Among the writers, Tiberio Malfi, barber of Montesarchio, deserves mention; he published, in 1626, a book entitled *The Barber*, written in excellent style, and giving proof of solid literary culture, and of much erudition. This work treats of all that concerns the barber’s art (decorative medicine, bleeding, etc.). In it, however, there is absolutely nothing about the treatment of the teeth or their extraction; and this constitutes a valid confirmation of our own opinion, that is, that the dental art was not at that time in any way in the hands of the barbers.



A TOOTH-PULLER AT A PUBLIC PLACE IN HOLLAND

From an engraving of the Seventeenth Century.

"It happens in general that owing to vapors that rise from the stomach, a certain deposit is formed on the teeth, which may be perceived by rubbing them with a rough cloth on waking. One ought, therefore, to rub and clean them every morning, for, if one is not aware of this, or considers it of little account, the teeth become discolored and covered with a thick tartar, which often causes them to decay and to fall out. It is then necessary that the diligent barber should remove the said tartar with the instruments destined for this purpose."

We have seen that the practice of the dental art was for the most part in other hands than in the barber's. Nevertheless, the important operation of the removal of tartar was also carried out by him. If, therefore, even the barbers, who were not in the least the true representatives of the dental art of that period, carried out such an important operation, it may logically be argued from this, in support of what we have said before, that the sphere of action of the true dental specialists of those times (especially of the best among them) was not at all so limited as imagined by those who affirm that in past times dentists properly so called did not exist, but only tooth-pullers.

The barbers, however, having become, in a certain manner, members of the medical class, sought to extend their sphere of action, and it is probable that in a later period than that of Tiberio Malfi and Cintio d'Amato they invaded the whole field of dental activity; for which reason, when the barber's art came down to a very low level, the dental art must have degenerated, too, and have been represented for a certain time only by ignorant barbers and tooth-pullers. Vicissitudes similar to these have occurred in different epochs, not only in various parts of Italy, but also in other countries of Europe.

FLEURIMOND. In 1682 a little book on dental hygiene was published in Paris by a certain Fleurimond, the title of which was: *Moyens de conserver les dents belles et bonnes*. Portal, in his history of anatomy and surgery, makes mention of this pamphlet, and, briefly alluding to certain parts of it, he says: "The author proves by observation that acids act upon the enamel of the teeth. He makes some very just reflections upon dentition. Fleurimond speaks of a tooth powder invented by him, but does not say how compounded."¹

In fact, it seems that this pamphlet was compiled from a commercial point of view, viz., that of making known the special tooth powder invented by the author. The era of advertisement had already begun!

ANTON NUCK (1650 to 1692), a Dutch surgeon and anatomist, who taught most ably in the University of Leyden, devoted great attention to dental surgery and prosthesis. Relative to the extraction of teeth, he

¹ Portal, vol. iii, p. 618.

says that, in order to be able to carry out this most important operation, an exact anatomical knowledge of the alveoli and of the teeth themselves is required. He insists on a principle of capital importance that has only had its full application in the nineteenth century, viz., that the instruments to be used for the extraction of teeth ought to vary according to the tooth to be extracted. For the removal of the incisors, he says, the "goat's foot" should have the preference; the canines ought to be extracted with the common dental forceps, but sometimes, when they are decayed, they may be extracted with greater security with the pelican; for the small molars the straight-branched pelican is to be preferred, for the large molars the curved pelican; as to the extraction of roots or of splinters of bone, this ought to be carried out with the *rostrum corvinum*.

The author counsels never to extract teeth during pregnancy, except under circumstances of the greatest urgency, and especially to avoid the extracting of the upper canines (or eye teeth), this being capable of producing pernicious effect on the visual organs of the fetus!

The best way of obtaining the cessation of a violent toothache without having recourse to extraction is, according to the author, cauterization of the antitragus, an operation which he carried out with a special cauterizing instrument, made to pass through a small tube, the better to localize and to limit the action of the red-hot iron. With regard to this means of cure already recommended by other authors, we may remark that, although it seems ridiculous at first sight, and although no one could be so senseless as to make use of it in our days, nevertheless, for the times of which we are writing, when the curing of toothache was in a great measure effected by indirect means, this remedy might well stand on a level with many others, and was not perhaps altogether inefficacious. It is a sufficiently well-known physiological fact that the application of a strong stimulus in one part of the body may diminish or suppress a painful sensation in another part of the organism. It is an equally well-known fact that it is in no way a matter of indifference, in producing this phenomenon, to what part the stimulus be applied, especially because of the great difference existing in the relations of the several parts of the body with the brain—the centre of sensation. It is, therefore, very possible that the cauterization of the antitragus may really have the effect of causing strong toothache to cease, at least temporarily.

Nuck used a variety of remedies to arrest dental hemorrhage, such as tinder, burnt linen, vitriol, sulphuric acid and the cauterizing iron.

As to the use of the file, far from rejecting it entirely, as does Martin, he holds it necessary in many cases for planing down points and sharp edges of broken teeth, as well as for removing, at least in a measure, the inconvenience and deformed appearance caused by irregular teeth.

He says the file may be used without causing the slightest harm, if one takes care not to approach the inner cavity of the tooth too nearly, and above all not to penetrate right to it, which would give rise to intolerable pain. Such an accident, he adds, may happen much more easily when, instead of using the file, whole pieces of teeth are removed with the excising forceps.

This author acquaints us with a tooth powder, much used in his time, especially by Parisian ladies. The ingredients were powdered cuttle fish, coral powder, cream of tartar, Armenian bole, and powder of red roses.

At that time artificial teeth were generally made of ivory; Nuck, however, observes that it soon becomes yellow by the action of food and drink, and of the saliva itself. He therefore recommends, instead, the use of hippopotamus' tusks, giving the preference to the whitest. According to Nuck, artificial teeth made of hippopotamus' tusks would be capable of preserving their color even for seventy years. In the case of all the teeth of the lower jaw being wanting, the entire dental arch ought to be framed in with a single piece of ivory or tusk of hippopotamus.¹

CARLO MUSITANO, a celebrated Neapolitan doctor (1635 to 1714). According to Carlo Musitano, the real cause of toothache consists in the irritant action of saline or acid particles on the extremely thin membrane that lines the alveoli or on the exquisitely sensitive nerves of the teeth. As he believes, these particles have an angular form, sometimes pointed or even hooked, and they reach the sensitive parts either directly from the outside, through the air, the food or drink (especially when the teeth are already decayed), or else through the blood and other humors, which often, by reason of their deteriorated quality, contain great quantities of such irritant particles.

Among the various influences which may be conducive to toothache, atmospheric conditions ought also to be included; thus, says the author, the inhabitants of the Baltic littorals, and other northern peoples, are very subject to toothache, for the reason that in those regions the air contains, in abundance, saline particles of various kinds which penetrate into the organism by the act of respiration. It is said, on the contrary, that in Egypt, where the air is remarkably mild, the teeth are not subject either to pain or to decay.

Musitano, too, believes in worms in the teeth, but does not admit, as preceding authors had done, that they generate spontaneously. He holds instead that they result from the eggs of flies and other insects, which, together with food, are introduced into the carious cavities and there develop by the heat of the mouth.

¹ Antonii Nuck operationes et experimenta chirurgica, Lugduni Batavorum, 1692.

The treatment of toothache ought to differ according to its causes. If the pain be owing to acidity, one uses medicines adapted for tempering the acids; if it be owing to the action of saline substances, one has recourse to remedies which dissolve them; if to worms, to such remedies as destroy them, and so on. Purgatives and bleeding ought, however, never to be used as remedies against toothache; for, far from doing good, they often do harm. As to the other torments usually inflicted on poor sufferers, they are the punishment of their sins, for God often gives the unrighteous into the hands of doctors! (This language will perhaps appear less strange when the reader comes to know that Carlo Musitano was at one and the same time priest and physician!)

After a lengthy enumeration of medicaments to be used against toothache, which we pass over in silence because already known, the author speaks of two remedies which carry us back absolutely to the days of Pliny! He relates us a fact experienced by himself, that, by touching an aching tooth with the leg of a frog completely cleaned of the flesh, the pain ceases altogether. Also, if the aching tooth be touched with the root of a tooth extracted from the jaw of a corpse, the pain ceases, the tooth becomes as cold as ice, and often, after a certain time, it falls to pieces.

As to worms, the best mode of destroying them is by using bitter substances, such as myrrh, aloes, colocynth, *centaurea minor*, etc., but sometimes the use of sweet substances, such as honey, is a good means of drawing them out of the carious cavities!

Musitano also cites a great number of remedies against the setting on edge of the teeth. Among the best of these he mentions urine applied to the teeth whilst still warm! Alkali in general, and particularly lye, such as is used for washing purposes, are good remedies against the setting on edge of the teeth.

The treatment of loose teeth ought to vary according to whether this pathological condition depends on old age, or on scurvy, on syphilis, on superabundance of humors, etc. Sometimes, especially in old persons, it may be useful to bind the teeth with gold wire, in order to prevent their falling out, but this operation must be very ably performed, otherwise it may give rise to inflammation.

Relative to artificial teeth, Musitano says that they are made of ivory or hippopotamus tusks; of these last he does not speak as of a novelty; we may, therefore, deem it probable that hippopotamus tusks were used in Naples for making artificial teeth even before the Dutchman Anton Nuck (contemporary of Musitano) made mention of them in his writings.

In cases of difficult dentition, the best remedy, according to Musitano, for facilitating the eruption of the teeth consists in friction of the gums, once, or at most twice, with blood drawn fresh from the comb of a cock!

If, however, even this remedy fails to produce the desired effect, it will then be necessary to lance the gum at the point where the tooth is to erupt, or to press it hard with the thumb, that the tooth may the easier come through.

The sole merit of this author (as to what concerns our specialty) consists in his having declared bleeding useless, or even harmful in the treatment of toothache, and, besides, in his having recommended, with great warmth and in most impressive terms, cleanliness of the teeth. What is more beautiful, says he, than a mouth furnished with white teeth, similar to so many pearls? And what is more abominable than black or livid teeth, covered with a fetid deposit or with tartar? Unclean teeth spoil the appearance of the person, and nauseate those who behold them.¹

WILLIAM COWPER (1666 to 1709). Toward the end of the seventeenth century the celebrated English doctor and anatomist, William Cowper, opened up a new field of action to oral surgery by inaugurating the rational treatment of the diseases of the maxillary sinus. In order to empty Highmore's antrum of deposits and to be able to carry out the necessary irrigations, he extracted in most cases the first permanent molar, and then penetrated through its alveolus into the sinus with a pointed instrument.

JAMES DRAKE, also an Englishman and a contemporary of Cowper, operated in the same manner; and it was this author who made known in a book of his² the operative method of Cowper; for which reason the above-mentioned proceeding is sometimes called "the Cowper-Drake operation." A certain time elapsed, however, before it became generally known. Thus, in a book published by JOHANN HOFFMANN in 1713 there is no mention made of this operation, albeit the author refers therein³ to the case of a young girl, one of whose canine teeth having been extracted by him, there ensued a considerable flow of whitish pus from the maxillary sinus. In speaking of this case, Hoffmann stigmatizes many of the surgeons of his time who were not acquainted with the existence of Highmore's antrum, and therefore, in cases of patients whose teeth had fallen out as an effect of syphilis, if they happened to penetrate with the sound into the maxillary sinus, believed this to be an accidental excavation of the bone, produced by caries.

However, the honor of having initiated the rational treatment of diseases of the maxillary sinus is not exclusively due to William Cowper and to James Drake; a large share is also due to the celebrated German

¹ Caroli Musitani opera omnia, pp. 121 to 128, Venetiis, 1738.

² J. Drake, *Anthropologia nova*, London, 1707.

³ J. M. Hoffmann, *Disquisitiones anatomico-pathologicæ*, Altorf, 1713, p. 321.

physician and anatomist, Heinrich Meibom. The mucous membrane of the maxillary sinus was considered by him as the real point of departure of the diseases which occur in this cavity, it being liable to become inflamed and to suppurate, thus giving rise to much pain and to various accidents. Meibom rejects the operation of Molinetti, that is, the trepanning of the cavity from the front, the lesion produced in the soft parts of the face being likely to give rise to unpleasant consequences. "Some, he adds, try the introduction of medicated vapors into the antrum,¹ but the best way is to *open the maxillary sinus by extracting a tooth, as the pus generally makes its way as far as the roots of the teeth.*"² The author says that his father, who was also a physician, had already used the above method with success. He does not speak at all of the artificial opening of the antrum by perforation; but, as is well known, this is not necessary in many cases, so that, even now, the operation is sometimes reduced to procuring the opening of the sinus by the simple extraction of a tooth, as was, in fact, practised by Heinrich Meibom and his father.

Seeing that Heinrich Meibom was born twenty-eight years before William Cowper, and was already known to the scientific world when Cowper was still a child, it is very probable that his operative method, having come to the knowledge of the latter, was only followed up and perfected by him.

CHARLES ST. YVES (1667 to 1733), oculist in Paris, records an interesting case of a secondary affection of the maxillary sinus. The point of departure of the evil was an abscess in the orbit. The suppurative process, after having produced an erosion and the perforation of the orbital plane, had reached by propagation the antrum of Highmore, whence the pus took its way, issuing through the nose. St. Yves had a molar tooth extracted on the affected side (we do not know which side it was), after which, day by day, he made injections of detersive liquids through the orbital fistula, which returned constantly through the alveolus of the extracted tooth. By this means the cure of the patient was obtained.³

CHRISTOPHER SCHELHAMMER (1649 to 1716), who was professor in various German universities, and distinguished himself specially as an anatomist and as an ear doctor, strongly recommends stopping decayed teeth as the best means of causing pain to cease. If, however, the stopping does not hold, by reason of the cavity being too extended, it is then necessary, says Schelhammer, to extract the tooth; this, however, may

¹ Probably through the nose.

² H. Meibomii de abscessum internorma natura et constitutione discursus. Dresdæ et Lipsiæ, 1718, p. 114. (This edition was published after the author's death, which took place in 1700.)

³ St. Yves, Nouveau traité des maladies des yeux, 1722, p. 80.

very well be stopped after extraction, and then replanted, for it will take root again, but no longer be the cause of any pain.¹

PIERRE DIONIS, a celebrated surgeon and anatomist of Paris (died 1718), in his *Anatomie de l'homme*,² admits the possibility of a double dental series, holding the case, however, to be of very rare occurrence.

Another work of his, entitled *Cours d'operations de Chirurgie*, wherein he treats very extensively of diseases of the teeth and mouth, and their surgical cure, is of much more importance in relation to dentistry. He recognizes the high importance of this part of surgery, but expresses the opinion that one of the dental operations, that is the extraction of teeth, ought to be left entirely to the tooth-pullers, not only because they are, by reason of great practice, better qualified to perform it than general surgeons, but also because the output of force required for this tooth-pulling operation renders the hand heavy and tremulous, and, lastly, because, according to him, it always has something of charlatanism about it. (This is a luminous example of how preconceived ideas can influence the minds even of men of the greatest talent.)

Pierre Dionis, like many of the preceding authors, had frequently occasion to observe cases of epulis. He speaks at great length of the treatment of this affection, as well as of parulis, but says nothing on the subject of sufficient importance to be worth recording.

Dental operations, according to Dionis, are of seven kinds:

1. *The opening of the dental arches in the case of spasmodic constriction of the jaws.* This operation, of the greatest importance for nourishing and keeping patients alive, is carried out by means of a lever and of a screw dilator.

2. *The cleaning of the teeth.* For this, as for the other operations, says Dionis, a certain amount of skill is required. The author advises the use of gold instruments if one be called upon to clean the teeth of persons of rank. This appears rather strange in the present levelling times, but Pierre Dionis lived in the days of Louis XIV, whose doctor he was, that is, in a period of unbridled luxury, when the nobles and those in power would have nothing in common with the lower classes.

3. *Operations for the preservation of the teeth.* These, says Dionis, are of the greatest importance, it being necessary to oppose a barrier to the destructive processes of the teeth. Caries, when so situated as to permit of it, ought to be scraped away; for approximal caries one ought to have recourse to the file; in the case of caries of the triturating surfaces, cauterization should be used, by applying a drop of oil of vitriol with a miniature paint brush. Should the caries, however, be in a very advanced

¹ Sprengel, *Geschichte der Chirurgie*, vol. ii, p. 301. Carabelli, *Systematisches, Handbuch der Zahnheilkunde*, vol. i, p. 60.

² This work was published in 1690.

stage, it is better to make use of the cauterizing iron. But in cases of intense and persistent pain there is no other remedy than extraction.

4. *Stopping of the carious cavity.* Dionis does not enumerate this operation among those intended for the preservation of the teeth. At that period, this operation was performed solely with a view to preventing the penetration into and the retention within the carious cavity of alimentary substances, and the disadvantages caused thereby. The carious process, says the author, often ceases altogether, and the pain then generally ceases also. However, as the residual cavity often becomes troublesome in various ways, among others by making the breath offensive, it is better to stop it. For this purpose, gold or silver leaf is generally made use of; but this mode of stopping is not durable, because gold or silver in leaf is apt to become loosened and fall out. It is therefore preferable, says Dionis, to make a stopping with a piece of gold or silver corresponding in size and shape to the cavity.¹ Many, he adds, prefer lead as a stopping, on account of its softness, whilst others simply use wax.

5. *The use of the file.* The indications given by Pierre Dionis for using the file do not differ from those we find in other authors. Dionis warns, however, against using the file to level down a tooth which has become lengthened through the loss of its antagonist, for after a certain time it would again project above the level of the others.

6. *Extraction.* This operation, says Dionis, ought not to be performed too lightly, but only in those cases in which it is really necessary; that is, when a tooth is the cause of insupportable pain and its crown is almost entirely worn away; when nothing remains of a tooth but its root; when a tooth is so loosened in its socket as to leave no hope of its again becoming firm; when supernumerary teeth or irregularly planted teeth give rise to inconvenience or deformity; and lastly, to remove deciduous teeth that have become loosened. The opinion that if the loosened milk teeth be not promptly extracted they cause the permanent teeth to grow irregularly, is, however, considered by Dionis to be a prejudice.

Dionis strongly doubts whether a tooth that has been extracted and replanted can really take root again, as had been affirmed by Dupont, Pomaret, and other authors. This shows that Dionis had had no experience on this point.

7. *The application of artificial teeth.* These teeth, says Dionis, are generally made of ivory, but may also be made of ox bone, which is less liable to turn yellow than ivory. He does not mention the use of hippopotamus tusks, but we learn from him that one Guillemeau made arti-

¹ Here one also verifies the absurdities pronounced by those who, not being dentists, but merely general practitioners or surgeons, still risk speaking on dental subjects.

ficial teeth with a composition of his own invention, which was obtained by fusing together white wax and a small quantity of gum elemi, and then adding ground mastic, powder of white coral and of pearls. This fact is, as everyone can see, most important, for it constitutes the first step toward the manufacture and use of mineral teeth. Dionis tells us that the teeth made of Guillemeau's composition never became yellow, and that it was also very good for stopping decayed teeth.¹ It would seem, therefore, that it could be used as cement is now used.

The Guillemeau of whom Dionis speaks is probably Jacques Guillemeau, the author of a book now no longer to be found, which was translated from the French, first into Dutch, and afterward into German. Crowley, in his *Dental Bibliography*, only quotes the German edition, published at Dresden in 1710, the title of which runs thus: *Der aufrichtige Augen und Zahnarzt*.²

JEAN VERDUC, also a Frenchman, relates a case of the surgeon Carmeline,³ analogous to that of Denis Pomaret, in which a sound tooth which had been extracted by mistake was immediately replanted and took root again, becoming quite firm. However, Verduc does not speak of replantation as a special method of cure, but merely refers to the above case incidentally in speaking of the extraction of teeth. He considers this operation a most dangerous one, and advises not having recourse to it except in cases of utmost necessity. Notwithstanding this, Verduc gives us to understand that teeth were drawn with sufficient ability by most of the operators of the time, and precisely because of this he omits describing the manner of performing the operation. According to Verduc, the drawing of teeth is often of little or no advantage against toothache.⁴ In proof of this assertion he relates the case of a hypochondriac, who little by little had as many as eighteen teeth extracted, without, however, getting the better or the wiser; but as this case does not prove anything at all, one is disposed to think that Verduc, in relating it, had the intention of being humorous.

MONSIEUR DE LAVAUGUYON. To another French surgeon, Monsieur de Lavauguyon, also a contemporary of Dionis, belongs the merit of having declared useless, in the greater number of cases, the practice, at that time general, of separating the gums from the tooth before proceeding

¹ Dionis, *Cours d'opérations de chirurgie*, Paris, 1716, p. 507 and following.

² [The Dresden edition of 1710 of Guillemeau's work contains no reference to the artificial tooth composition as mentioned by Dionis.—E. C. K.]

³ Carmeline was a most able surgeon-dentist. We learn this from a passage in Pierre Fauchard's book (*Le Chirurgien Dentiste*, Préf., p. 13). As we shall see, the author praises him very highly and laments his not having written any book making known the results of his long experience.

⁴ Sprengel, *Geschichte der Chirurgie*, vol. ii, p. 305.

to the extraction of the latter. He says that this is only necessary when a tooth, either because broken or because its crown emerges too little above the gum, offers an insufficient hold for the pelican.¹

Our historical survey has now reached the end of the seventeenth century. Embracing at a glance the whole of this last period of time, we remark, among many facts of minor importance, some events which, in the history of the development of dental art, stand out in strong relief. Such are the replantation of teeth used as a special curative method by Dupont and others; the method of plugging in cases of alveolar hemorrhage, the credit of which is due to Rivière and to Tulp; the description of the maxillary sinus given by Highmore; the rational treatment of affections of the antrum, inaugurated by Meibom, Cowper, and Drake; the researches into the microscopic structure of the teeth, brilliantly initiated by Leeuwenhoek, who discovered the dentinal tubuli; the use of models introduced by Purmann into the workmanship of prosthetic pieces; the employment of hippopotamus' tusks in making artificial teeth, first recommended by Nuck; and the invention of Guillemeau, which was the first step toward the use of mineral teeth.

¹ *Traité complet de opérations de chirurgie*, par Mons. de Lavauguyon, Paris, 1696, p. 644.



LAVRENTIVS
D. MEDICIN. ac CHIRVRG.
Natus Francof.

HEISTERVS
PROF. PVBL. HELMSTAD.
ad. Alton. An. 1683.

J. G. Wiegand Sculp. S. R. S. Berlin 1779

