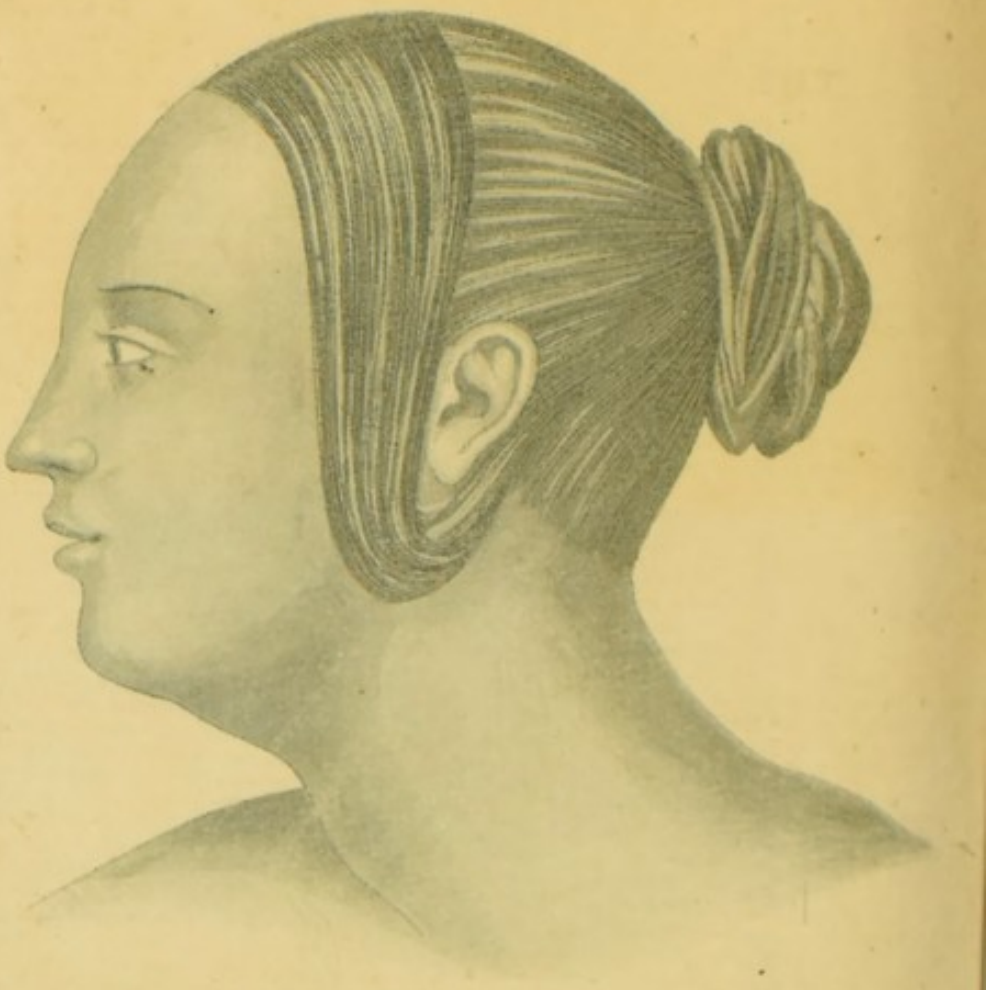
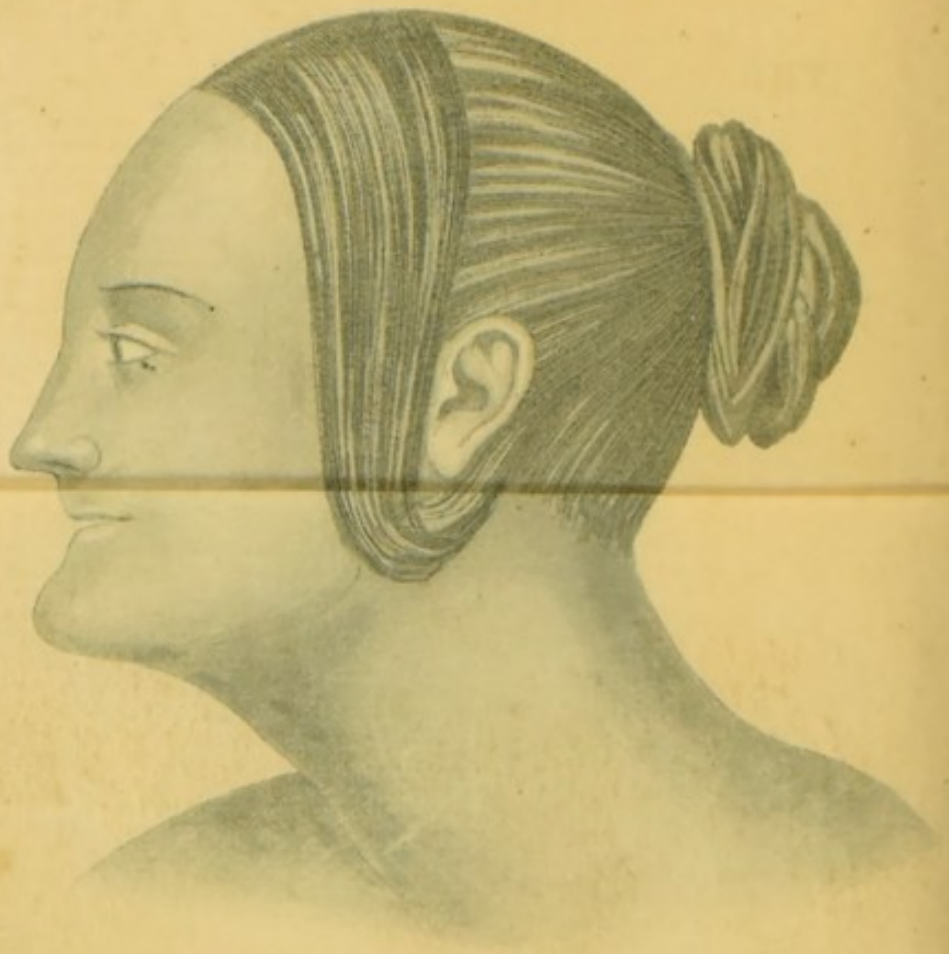
On the loss of teeth; and on the best means of restoring them / by Thomas Howard.

HOWARD ON THE TEETH.



This Plate represents the same Face restored to its original & Youthful appearance by the aid of Artificial Teeth as supplied by

Mr. Thomas Howard



This Plate represents the Face of a Lady deprived of her Teeth, their loss occasioning that close approximation of the nose & chin so Characteristic of Old Age

With the Author's Compliments

ON THE

LOSS OF TEETH;

AND ON

THE BEST MEANS OF RESTORING THEM.

BY

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"Avec de mauvais dents jamais femme n'etoit belle;
Avec de jolis dents jamais femme n'etoit laide."

J. J. ROUSSEAU.

SECOND EDITION.

SIMPKIN, MARSHALL & Co.

LONDON.

1853.

PREFACE.

The want of a concise and familiar treatise on the Teeth, containing information which may be useful to all those who have lost many of their Teeth, suggested the idea of this essay.

There is a degree of delicacy felt generally respecting the teeth, which prevents advice being given even where requisite, and this frequently occurs among intimate friends; in such cases, a recommendation to read this *Treatise* may lead to the most beneficial results.

The author would impress upon all who read, or in any way profit by this work, that it would be an act of kindness to present it to any friend who may require the aid of a Dentist.

CONTENTS.

TOOTH ACHE.

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There are not any of the "ills which flesh is heir to" more excruciating or intolerable, or which so completely incapacitates a person for business or pleasure, as Tooth Ache.

The pain produced by the exposure of the membrane of a tooth to the action of external irritants, is certainly one of the most excruciating to which the human system is liable. The sensation is perfectly *sui generis*, and it is, unfortunately, as unnecessary as it is difficult, to describe it; for few persons who have arrived at adult age, are so happy as to

have escaped its attacks. Scarcely tic douloureux itself is more agonizing for the moment than a darting paroxysm of tooth ache. It is not therefore to be wondered at, that every new remedy which professes to cure it, should for a time be eagerly caught at.

The sympathetic affections to which it gives rise, are exceedingly various and important; though it is only of late years that they have been properly understood, and the attention of medical men directed to their true source. Now, however, that these remote sympathies have excited a degree of interest more commensurate with their importance, so frequently are they found to occur, that practitioners are, on the other hand, in danger of attributing to this cause, diseases which have not the remotest connexion with it. It not unfrequently happens that parts the most remote become the apparent seat of pain, from the exposure of the nerve of a tooth. I have seen this occur not only in the face, over the scalp, in the ear, or underneath the lower jaw, but

down the neck, over the shoulder, and along the whole length of the arm.

It will be readily understood, that irritation in different teeth will be attended by the occurrence of pain referred to, corresponding situations, more or less remote from its true seat. No one of these is so constant and so distinctly marked, as the violent pain in the ear, produced by the exposed nerve of the inferior *dens sapientiæ*. This is so general an occurrence as to constitute in many cases the only criterion of the true seat of pain, where several contiguous teeth are decayed. Cases of true ear-ache, are comparatively rare; and I am convinced that where no actual *disease* of that organ exists, the pain referred to will be found, very generally, to arise from a decayed inferior *dens sapientiæ*; and hence, it often happens that blisters behind the ear, and hot applications to that part, produce only a partial and deceptive relief, the pain returning with increased severity, as soon as the mind ceases to be amused by these ineffectual

attempts at removing it. The only true remedy to be relied upon as a permanent cure, is to have the decayed teeth well stopped at an early stage of decay.

It most frequently happens that the majority of persons who are actively engaged, pay little attention to their teeth, until they become painful.

The evils arising from this neglect, are too frequently, the loss of many, or, in *some cases, all the teeth,* which by an early visit to the Dentist, might have been prevented.

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PRESERVING THE TEETH,

BY

STOPPING OR PLUGGING THEM.

When decay or caries makes its appearance in a tooth, HOWEVER SMALL THE APERTURE MAY BE, IT SHOULD BE FILLED WITH THE WHITE SUCCEDANEUM WITHOUT DELAY. It is a great error to postpone this until the tooth is painful, as the earlier the tooth is stopped,

the more successful will be the result, and the greater number of years will the tooth or teeth be preserved.

The progress of decay is entirely arrested, and the tooth saved, by stopping the hollow with a preparation which excludes the air, and prevents foulness, or the pain and irritation, occasioned by food lodging in it, by the beautiful and useful operation of stopping or plugging teeth, which are greatly injured by caries, they may be preserved for many years, in most instances, *during the remainder of life*, and frequently from ten to twenty teeth may be preserved by this means in the same individual.

I will give the following instance of the efficacy of stopping teeth :—"A gentleman who has been my patient since the age of eight, has just paid me a visit; twenty years have elapsed since I stopped his teeth, yet I found the same old stopping which I had inserted: *I have no hesitation in affirming this to be one of the most important*

and useful operations that can be performed."

The commencement and progress of decay is so insensible, that it may exist many years and even the person himself is often not aware of it, till it has penetrated the very centre of the tooth, having reached the cavity, it there commands attention, on account of the severe tooth-ache it occasions.

Of the various operations required for preserving carious teeth, and arresting all further progress of decay, stopping therefore takes the foremost place.

This operation appears to have been among the first undertaken by those persons who assumed the name of Dentist. It was at all times considered to be a *desideratum* among the Profession, to *Discover a Succedaneum,* which would fill up, permanently, the cavity caused by decay, and *arrest its progress,* and thus preserve the teeth to the latest period of life.

VALUE AND IMPORTANCE OF THE TEETH *

The teeth influence the form and expression of the countenance much more than is generally imagined, and the finest face is disfigured, if the teeth are irregular, and a disagreeable impression is produced.

Where the teeth are good, there is, when speaking, or smiling especially, a fascination present, which prevents further examination of the countenance.

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* The importance of the Teeth is such, that they deserve our utmost attention, as well with regard to the preservation of them when in a healthy state, as to the methods of curing them when diseased. They require this attention, not only for the preservation of themselves, as instruments useful to the body, but also on account of other parts with which they are connected; for diseases in the teeth are apt to produce diseases in the neighbouring parts, not unfrequently of serious consequence.—JOHN HUNTER.

He who pays no attention to his teeth, by this single neglect, betrays vulgar sentiments.—LAVATER.

It is, therefore, evident that much of the beauty of the countenance depends upon a happy and regular disposition of the teeth.

If the countenance of youth and age are compared, the great difference will be found in the alteration of the mouth.

When the Teeth are lost, the nose and chin approximate, the cheeks become hollow and shrunken, the lips thin and contracted, thus giving an appearance of premature old age.

Good teeth are not only indispensable to *personal beauty*, but on their regularity depends perfect articulation.

The most striking cases are those persons about the middle period of life, who have lost their teeth; for however clear and perfect their utterance may have been before their loss, it is impossible to regain it without supplying the deficiency by means of artificial teeth.

The most important use of the teeth is mastication of the food, previous to its being received into the stomach. The distressing

sensations arising from imperfectly masticated food, must immediately convince every one of their importance in the first step towards good digestion, and of the paramount necessity of possessing teeth, either natural or artificial, as the means of retaining health.

How valuable then are regular and sound teeth, contributing so much beauty and expression even to the finest face.

Can more important or urgent reasons be required to enforce an immediate attention to their preservation?

Many persons habitually neglect their teeth, and from having long seen them discoloured, imagine that they are decayed or corroded beyond all recovery; this is frequently a mistaken notion, as by a visit to the dentist that discolouration may be removed without the least injury to the teeth, and they will again appear of their natural colour.

If persons foresaw the consequences of this neglect, they would no doubt act dif-

ferently. The accumulation of tartar very soon produces a gradual loosening of the teeth, which almost imperceptibly, although surely, undermines them, and ends in the successive loss of the whole of them.

To preserve the teeth of a fine pearly whiteness, and retain them firm in their sockets, it is necessary to observe strict cleanliness of the mouth, by the use of proper tooth brushes morning and evening, with tepid water, and occasionally to use tooth powder.

LOOSE TEETH.

This is a state of the teeth which prevails to a great extent, and more generally among persons about the middle period of life; especially those who have resided in India, or other warm climates.

Having devoted much time and study to this particular department of dentistry, I have succeeded in applying *a new principle*, for arresting this very prevalent and most destructive state of the gums and teeth, by which means, teeth that are very loose and apparently likely to fall out of their sockets, may be rendered firm, and retained for many years.

Even if there is only one or two loose teeth in the mouth, immediate attention should be paid to the case, otherwise they will aggravate the disease by increasing materially the irritation, and consequent inflammation, and thereby most certainly cause the loss of many others.

By resorting to proper means, sufficiently early, the teeth and gums may be restored to health.

The principal object is to prevent the disease extending, which if unchecked, it will do through the whole mouth.

CONSIDERATIONS ON THE HUMAN VOICE

IN RELATION TO

DENTAL SURGERY.

I do not intend to enter into a highly scientific consideration of the above subject, but to endeavour to give, as concisely as possible, my experience in relation to it; and by what principles we are governed in our practice: seeing that by former methods, and of the practice of too great a number at the present time, much inconvenience is experienced by a disregard for a proper consideration of the organs of speech, in operations generally upon the teeth.

It would seem that few have any idea of *physiology* of the voice, and still less have they *thought* upon the subject. That we have had great satisfaction by considering well the nature of the defects in the speech,

in operating upon the teeth, and especially in setting artificial teeth, is true; while in the absence of such consideration, much mischief would have resulted. If I can, therefore, succeed in directing the attention of some of the public to this subject, my labors will be rewarded.

That the dental organs are largely concerned in enunciation, all will, I doubt not, agree. What are the first lispings of childhood, but the effects of the imperfect development of the organs of speech, of which the teeth, gums and alveoli, form an important part. Mark their changes from their earliest manifestations, modified by every change to mature development of the system generally, as well as by the organs of speech, up to the full clear and robust development of adult life.

The Larynx is the principal organ, concerned in effecting or producing what is called the voice. But many organs are necessarily concerned with it. The *trachea*, the *lungs*, *diaphragm*, and *abdominal muscles*, below it: the *glottis*, *vellum-palati*, *naries*, *roof of the*

mouth, gums, teeth, lips and *tongue* above or outside of the larynx. No voice can be perfect with either of these organs imperfect, or in an abnormal condition. And it is well for the Dentist, when he discovers that he cannot produce an agreeable voice in setting teeth for a patient, whom he had not known previous to the loss of their teeth, whether any defect complained of depended upon a mal-arrangement of his work, or that of nature's, or of the health and habits of the patient. The dentist ought to be sufficiently familiar with all the organs of speech, and their peculiar functions, to judge which, one or more, it is, that are not properly performing their respective functions. Whether difficulties complained of, depend upon a loss of any or all of the teeth, their mal-arrangement or disease, the imperfect development of the alveolar processes, what sounds are most affected by the loss of either or all of the teeth. As for instance, a loss of the posterior teeth are calculated to affect some sounds more than others. A loss of the front teeth,

superior or inferior, affect different sounds differently: hence a correct idea of the "*articulations*," or articulate sounds of the organs of speech is necessary. For instance, we must know whether it be a *labial*, a *dento-lingual*, or a *guttural* sound that is defective, before a remedy can be applied; and precisely in what way it is deranged and required to be modified.

What we mean by the "*articulations*" is the manner in which the column of air is stopped or restrained by the approximation or contact of the walls or sides of the vocal tube, as the air is impelled through it by the lungs, diaphragm, &c. in effecting enunciation. For instance, the lips must be brought in contact with each other, and then separated suddenly to pronounce the letters B and P. These are labial articulations. The margins of the tongue must be placed in close contact with the gums and necks of the teeth of the superior jaw, and dwell there for an instant, in the same manner as the lips are brought in

contact to stop the column of air in the labial sounds, then suddenly removed, to effect the sounds of the letters T and D. And the root of the tongue and veil of the palate must be brought in contact in like manner, to pronounce the letters K and Q.

Very frequently great defect is produced by a loss of the back teeth, and especially when great absorption of the gums and alveoli take place, simply because the tongue cannot close the tube laterally, but allows the air to escape into the cheeks, producing a very defective enunciation. Similar effects are produced in articulating *te, ne, re* and *le.*

I corrected a marked defect of this nature in the case of a gentleman, in 1843, by setting teeth behind the canines, three on one side and two on the other, by simply joining the stay plates together and forming an even surface with the other teeth. In this way the margins of the tongue could form an air-tight joint, so to speak, along its lateral margins, which prevented completely the escape of the air into the cheeks. He was considered by

his friends a regular stammerer; in fact, in speaking, his cheeks were vibrating like a bellows.

Again, it will be observed, that as the air rushes over the apex of the tongue, the sounds will be modified by the front incisors being very close together or very far apart; hence in filing, very marked changes are sometimes produced in the voice, also by the loss of a single tooth. If the tongue cannot come forward on account of the extreme narrowness of the upper jaw and projecting position of the front teeth, there will be lisping on this sound, and on the articulation of *te*.

Now it is clear, that if any of the teeth are destroyed, and the margins of the gums rendered very uneven, so that the tongue cannot accommodate itself properly to the margins, that all the words in which this articulation occurs will be proportionately defective, hence in setting artificial teeth, either partial or full sets, if care is not taken to restore the natural relations of the mouth generally, and especially the principal relations which are

broken, but little good will be effected, and most commonly mischief will be done.*

* Wolfgang Kemplin, who invented that very ingenious deception, the Automaton Chess-Player, which seems for a time to have puzzled all the philosophers and mathematicians of Europe, constructed a speaking automaton, in which, he ultimately succeeded so far as to make it pronounce several sentences, among the best of which were—"Romanorum imperator semper Augustus;" "Leopoldus secundus;" "Vous êtes mon ami;" "Je vous aime de tout mon cœur." It was some years, however, before he could accomplish more than the simple utterance of the sounds o, ou, and e. Year after year, we are told, was devoted to this machine, but i or u, or any of the consonants, refused to obey his summons. At length, he added, at the open extremity of the vocal tube, an apparatus, similar in action and construction to the *human mouth*, WITH ITS TEETH, when he quickly succeeded in making it not only pronounce the consonants, but words, and even the sentences quoted above. He had previously imitated the tongue and its actions. This fact is interesting, not only as a rare instance of human ingenuity, (for if not the first, it was probably the most perfect instrument of the kind that had then been constructed,) but also as exhibiting in a most striking light the beautiful adaption of parts to their respective functions, and that so perfect are the contrivances in nature for particular ends, that, in order to arrive at anything like an imitation of those functions, we must follow closely the method she employs.

PRESERVATION OF THE TEETH BY MECHANICAL MEANS.

As long as the appearances are preserved by the presence of the front teeth, the loss of the side teeth or grinders, is frequently viewed as a matter of little importance. This is a great error, for it is the presence of the grinders, which keeps the mouth sufficiently open to prevent the front teeth from coming in contact during mastication. When, therefore, the grinders are lost, and their places are not supplied by artificial means, the front teeth soon become either worn away, or loosened, and pushed from their sockets.

Few persons are aware of the cause of losing their front teeth. Some attribute the loss to a local defect in the teeth themselves, and others to constitutional causes. They

seldom or never reflect that the front teeth were not intended, and hence, are not adapted for masticating purposes, which invariably destroy them. The entire process of mastication belongs to the grinders, and the only function which the front teeth are intended to perform is comprised in the word "cutting,' which their name *incisors* implies.

When even a single grinder is lost, the whole of the teeth on that side of the jaw are weakened by the breach which it leaves, and which deprives them of mutual lateral support, and renders them apt to be pushed from their proper perpendicular position, towards the opening, by the opposite teeth. But this is not all; for as soon as a tooth in one jaw loses its masticating opponent in the other, it begins to protrude from its socket, loosen, and ultimately fall out. So that the loss of one tooth, by rendering its opponent in the other jaw useless, amounts to the loss of two.

When the teeth remaining for mastication are too few in number to sustain the force of the jaws, they are soon destroyed, by being

either forced into their sockets, so as to produce disease and absorption, or crushed and broken, occasioning grevious pain, followed by the total loss of such teeth. The front teeth being unprotected, through the loss of the grinders, are soon destroyed in the way before described, and proper mastication being now impossible, derangement of the digestive functions ensues, attended by privation of comfort and loss of health.

Fortunately, the whole of this mischief may be remedied, and the greater part of it prevented, by the timely adoption of artificial teeth. When any of the side teeth are lost, their places should be immediately supplied, by properly constructed artificial teeth, so as to prevent the others from slanting towards the opening left by those which are lost. Artificial teeth, by meeting the natural teeth in the opposite jaw, preserve them by preventing them protruding from their sockets; and mastication being thus restored, health is recovered and preserved. *The artificial teeth,*

by preventing the jaws from shutting too close, preserve the front teeth, which would otherwise be destroyed, by meeting together in the process of mastication.

The object in supplying artificial teeth, has hitherto been too generally confined to mere show, at the expense of the other teeth; whereas, the whole aim should be to preserve the remaining teeth, and restore mastication, which secures comfort and health. When many teeth are lost, all tampering with the remainder, can only increase suffering, and hasten the loss of teeth so tampered with. The operator must be perfectly aware of this; but as the continual suffering produces constant visits, and unmerited fees, to the operator, these unhappy patients are the most profitable to him. Such practitioner, instead of pointing out the proper artist capable of affording the only real relief, strenuously advise their patient dupes *against* the adoption of preservative pieces of artificial teeth; for mere operators, being incapable of supply-

ing this remedy themselves, know that delusion would be dispelled, and their malpractices exposed, if their victims fell into the hands of a competent mechanical artist.

The art of supplying lost teeth, so as satisfactorily to answer all the purposes of natural ones, and at the same time not only without doing injury, but to give support to, and preserve those that remain, was very imperfectly understood until late years.

The very great perfection which this art has now attained, would scarcely be believed by those who are not familiar with the subject.

ARTIFICIAL TEETH.

PHILOSOPHICAL PRINCIPLES ON WHICH ARTIFICIAL TEETH ARE FORMED.

To give entire ease and comfort to the wearer, the artist must be capable of engraving his work to fit the gum so perfectly *air tight*, that it shall adhere and remain securely firm in its place for the purposes of mastication, &c. by the mere force of *capillary attraction*, and the *pressure of the atmosphere.*

The principles have been frequently described, yet few people give credence to them as applied to artificial teeth, although nothing is more just, correct and natural. The common water pump acts on the latter principle, and there is no other on which artificial teeth can be constructed that will not soon destroy the remaining teeth.

In the introduction of anything new in science, there is wanting a corresponding language by which it may be expressed, in order that it may be described on paper so as to be understood by the reader. Capillary attraction and atmospheric pressure may be thus explained.

Capillary attraction is the principle by which a fluid is strongly attracted between closely fitting surfaces, and the closer the surfaces approach each other, the more strongly do they attract the fluid, which thus expels and excludes the air. It is by capillary attraction that water rises into and fills a sponge.

Atmospheric pressure, which was formerly explained by means of the axiom, that *nature abhors a vacuum*, is owing to the weight of the atmosphere, which causes it to bear on all bodies near the surface of the earth with a pressure of about fourteen pounds on each square inch.

On my principle of supplying a deficiency of teeth, the artificial piece being fitted close to the gum, the natural moisture of the mouth

is affected by capillary attraction, the moment the piece is introduced into its place; and the moisture being drawn in, between the piece and the gum, the intervening air is driven out, and being thus excluded, the atmosphere acts with a force in proportion to the extent of the surfaces in contact, in keeping the artificial piece in its place. This force, even on a small piece, is considerable, and on large pieces frequently exceeds thirty pounds; yet even in these cases the wearer feels no pressure beyond secure adhesion. *The piece itself seldom weighs above half an ounce,* and is easily removed, at the pleasure of the wearer, by merely raising one of its extremities with the tongue.

One of the most *familiar instances of the joint effects of capillary attraction* and *atmospheric pressure,* is perhaps that *exhibited by the school boy, with what is called the sucker.* This toy consists of a string passed through the centre of a piece of thick leather soaked in water, which being pressed on a large stone, adheres to it so firmly that the

stone may be lifted up and carried away by it.

Pieces of teeth made of the tusk of hippopotamus, feel in every way congenial to the mouth, and cannot be distinguished by the tongue from the natural gum and teeth; and being fitted in the manner just described, adhering to the *gum* only, afford support to the remaining teeth, which are let into grooves accurately formed in the piece for their reception. This prevents tooth-ache, and other painful sensations, by shielding tender teeth and stumps from change of temperature and extraneous matters. The jarring of the *front teeth* on each other is obviated by the piece preventing the mouth from shutting too close. Mastication and articulation are restored, and the premature appearance of age and deformity completely removed. When a few weeks have familiarized the wearer to the change, he becomes almost unconscious that he uses artificial teeth; and as cheerful spirits return with health and comfortable feeling, happiness "the end and aim of our existence" is restored, and life prolonged and enjoyed, perhaps, ten

or twenty years beyond the period to which it would otherwise be limited.

IT IS THE DUTY OF ALL, AND THE WISH OF THE BENEVOLENT, TO PRESERVE THEIR HEALTH AND PERSONAL APPEARANCE FOR THE SATISFACTION OF THOSE WHO LOVE THEM.

Either partial or entire sets of teeth, scientifically designed, and skilfully adapted, may be worn with the greatest ease and satisfaction; but on the contrary, those that are ill made and unskilfully adapted, are troublesome to the wearer, an impediment to speech and mastication, and even a greater blemish to the countenance than the want of teeth; those *that are well adapted, are, on the contrary, easy, useful and highly ornamental.*

In the construction of artificial teeth, utility and comfort as much as appearance, ought to be considered by the Dentist. The latter refers to the successful imitation of nature, in the form, colour, and proportions of the teeth,

and especially in the shape and expression of the mouth.*

THE ATTENTION OF THOSE WHO REQUIRE ARTIFICIAL TEETH, IS ESPECIALLY DIRECTED TO THE FOLLOWING OBSERVATIONS:

The *extraction* of the few teeth or roots which may remain in the mouth is insisted upon by many Dentists, previously to taking a model of the mouth, for the purpose of preparing artificial teeth.

This is *never necessary*, as by the author's improved method of supplying the loss of teeth, from one to a complete set can be fitted in the mouth, with the greatest accuracy and

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*In consequence of the complete or even partial ruin of the teeth, the face shrinks, the voice loses its harmony, becomes shrill, or is lowered, and the pronunciation, of course, very imperfect. The countenance assumes a different expression, is harsh or morose, the flesh of the cheeks will flag and hang down, and *wrinkles will prematurely furrow the face.*

The mouth and nose also change, the chin seems to be longer; in short every part of the face is discomposed, in a more or less offensive degree, and presents the anticipated sight of painful destruction—JERBAUX.

precision, answering most fully every purpose of articulation and mastication; and so perfectly natural in appearance, as to defy detection by the closest observer, *without extracting any teeth or stumps, or giving any pain.* He, therefore, would strongly urge those who require artificial teeth, *never* to submit to have any tooth or stump extracted for that purpose, as if only one tooth remain or even stumps, they are of essential service in assisting to keep the artificial teeth steady in the mouth, and are of great advantage in many other respects, therefore they *should never be extracted.**

Whenever a partial loss of the double teeth has occurred, painful or uneasy sensations are experienced in the front teeth; these are

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*As some persons are under an apprehension that they must be put to great pain and inconvenience by the removal of teeth and stumps, and other painful operations, before they can be supplied with artificial teeth, I feel it incumbent on me to remove this error, so far as it relates to my system, which requires no removal of teeth or stumps, or any pain or inconvenience whatever, any more than if the article in question were an ordinary piece of dress.

warnings of the destruction about to ensue.

The front teeth separate, afterwards take irregular positions, projecting outwards, or inclining inwards, and soon become loose.

By filling up the spaces left by the lost double teeth, with artificial ones, and lengthening the grinding surfaces of those remaining in the mouth, such defects are obviated.

To effect this, much labour and skill are required, but when accomplished, it restores the mouth to a state equal to the natural one and renders the patient easy and comfortable.

Here are two objects to be obtained:

First—To supply the artificial teeth where every second or third natural one has been extracted, and those that remain are decayed or worn to stumps.

Second—To lengthen the grinding surface of the remaining back teeth, and thus render those decayed teeth or stumps of essential service in supporting and steadying artificial ones.

Ligatures should not be used to fasten artificial teeth; they should be so constructed as to be removed as easy as a glove, and yet be perfectly secure and steady in the mouth; objects which can only be obtained by a Dentist who perfectly understands his profession.

In all cases, by very great accuracy of fitting on the model, and a correct adaptation to the mouth, fastenings with clasps or ligatures are rendered unnecessary.

In cases where there is absorption or loss of substance, a very great change takes place in the appearance and expression of the countenance. It is not the fact that the change in the form of the lower jaw is the result of old age, for it is rather the inevitable result of the total loss of the teeth. Thus we see old persons having preserved them, to have the angle of the jaw nearly acute, and the chin scarcely projecting; whilst we meet with many adults who have lost all their teeth at an EARLY AGE, and who have ne-

vertheless the entire physiognomy of OLD AGE.—*See the Engraving.*

This absorption occurs more or less in all cases; and to ascertain the extent of such loss of substance is very important, previous to supplying artificial teeth; as, by a judicious arrangement of the material, in making good such losses with artificial gum as well as teeth, where the loss is considerable, depends that perfect restoration of the features to their natural symmetry, which the art of Dentistry is capable of giving.

By attention to the above, any degree of fulness of the lips or cheeks can be obtained, without inconvenience to the wearer.

Much has been said with respect to the comparative merits of bone or gold, as the frame for artificial teeth; some Dentists using bone in every case, however inapplicable, others using gold, although, perhaps equally so, in that particular case.

An *invariable adherence* to either plan, deprives the person seeking assistance of those

comforts and great advantages, which the art of a skilful Dentist is capable of affording.

Ivory, or the tusk of the Hippopotamus, soon decomposes, and notwithstanding the greatest care and cleanliness, will not last long.

It is in all cases desirable to place as *little in the mouth as possible,* that the articulation and mastication may be performed with more freedom.

Gold of the finest quality can be used with the greatest advantage, as it may be thin and small in size, and yet possess infinitely more durability than ivory, which, when made thin, is very soon destroyed, and therefore, from the necessity of frequently renewing it, becomes expensive.

The teeth that are usually supplied by Dentists, are either natural or mineral.

Natural teeth have been long employed by the most celebrated Dentists, and with great

success as regards appearance and utility; but with respect to their durability, the time they will last varies according to the constitution of the wearer, notwithstanding their handsome appearance when first placed in the mouth.

Some persons of extreme sensibility and delicacy of feeling, will not wear natural teeth under any circumstances: although there is not any rational objection to their use, as there is not any real difference between them and ivory.

As, however many persons do object to wear them, and their being liable to decompose and become discoloured in so short a time, induced me to bestow much time and study to find a substitute for them, which should combine an equally natural appearance and utility, with *much greater durability*.

The most desirable object is now obtained, by my having invented a *new description of Composition Teeth*, composed of silicious

substances, with a very fine enamel upon them, which admits of every variety of shade and colour, and enables me to match with the greatest nicety, both in *form* and *colour*, any teeth that may remain in the mouth.

They are perfectly *Incorrodible*, and cannot be affected in any way by the saliva, heat of the stomach, or acids of any kind; IN SHORT, THEIR DURABILITY IS UNBOUNDED, AS THEY WILL NEVER DECAY, OR BECOME THE LEAST DISCOLOURED, AND WILL APPEAR AS WELL AFTER TEN YEARS WEAR, AS THEY DO THE FIRST DAY THEY ARE PLACED IN THE MOUTH.

So closely do they resemble nature, that many have been deceived, supposing them to be natural ones.

The author will be happy to show them in every variety, to those who are interested in this subject; WHEN THIS STATEMENT OF THEIR SUPERIORITY OVER ALL OTHERS, WILL BE FOUND TO BE ENTIRELY AND SCRUPULOUSLY CORRECT.

THE ANATOMY AND PHYSIOLOGY OF THE TEETH.

GENERAL VIEW of the STRUCTURE of the TEETH.

The teeth may, in the human subject, be defined as *distinct organs of a bony structure, attached to the maxillary bones, and formed for the purpose of dividing and comminuting the food, preparatory to digestion.*

Each tooth is anatomically divided into the body or crown, and the fang or root. The body must be considered as the essential part —the tooth properly so called—since it performs all the offices for which these organs are produced, as mastication, &c.; the root serves merely for its articulation with that

portion of the maxillary bone in which it lies imbedded. The bodies of the teeth are of various forms according to the particular office which each is destined to perform. The roots also, which are contained within the alveolar processes of the maxillary bone, vary in number, form, size, and relative position, in accordance with the degree of firmness which the various offices of the different teeth require. The part where the body and crown unite, is termed the neck.

There are two distinct substances which enter into the composition of the teeth, essentially differing from each other in structure as well as in chemical composition; the one being organized, the other crystalline. The first, of which the mass of the tooth consists, is true *bone;* the second, which, from its appearance, is called *enamel,* forms only a thin layer over the body of the tooth, to which part it is distinctly restricted.

The bony substance is of an extremely hard, dense structure; and, like other bones

is composed of an earthy and a cartilaginous portion. The earthy matter may be readily dissolved by immersion in dilute mineral acid; and the cartilage which remains, still retains its form, and is found to be more solid and compact than the same substance, as it exists in other bones. The fracture of this bone is shining, and end slightly conchoidal. On a minute examination, and particularly if aided by the application of heat, it is seen to consist of concentric layers, the disposition of which is parallel to the surface of the tooth. It is extremely indestructible; so much so that on opening barrows and other ancient places of sepulture, the teeth are frequently found to have undergone scarcely any perceptible decomposition.

The enamel is an extremely hard, milky white, semitransparent substance, composed almost exclusively of earthy salts, principally phosphate of lime, containing a trace only of animal matter. It is the hardest of all

animal substances, and consists of minute fibrous crystals, resembling in texture the fibrous carbonate or sulphate of lime: they are disposed in a radiated direction with respect to the centre of the tooth; consequently the combined external extremities of the crystals form the surface, and the internal extremities are in contact with the bony substance, so that their sides are parallel with each other. The fibrous structure is very obvious when the enamel is broken, especially in the teeth of large animals, as may be distinctly seen in the grinding tooth of the elephant. The great advantage of such an arrangement of the crystals as that just described, is that in consequence of their united terminations being presented to the action of the food in mastication, the enamel is rendered less liable to injury from the effects of continual friction, and is also much less liable to accidental fracture. The result of an opposite arrangement in the disposition of the crystals is obvious in graminivorous

quadrupeds, in which, from the nature of their food, the teeth are continually wearing down, and a rough grinding surface is constantly required. In these animals, the enamel dips down into the substance of the teeth, and is intermixed with the bone in regular vertical layers, so that the crystals, being placed parallel with the grinding surface of the teeth, instead of perpendicular to it, as in the human subject—their sides instead of their terminations, are exposed to the friction of the food, and consequently the enamel, as well as the bone, undergoes continual abrasion.

The enamel is thickest on those parts of the teeth which are most exposed to friction, as on the horizontal surfaces of the grinders, the edges of the incisors, and the points of the cuspidati; becoming gradually thinner towards the neck, around which part it terminates almost imperceptibly. This distribution of the enamel may be shewn by sawing through the crown of the tooth, and

slightly burning the divided surface, by exposing it to the flame of a spirit lamp; the animal matter of the bone thus becomes blackened, whilst the enamel retains its white appearance.

In the interior of every tooth is a cavity of considerable size, which assumes the general form of the tooth itself, being larger in the crown, and gradually diminishing through the whole length of the root or roots, at the extremity of each of which it terminates in a minute foramen. This cavity is filled with a pulpy substance, which is highly vascular, and exquisitely sensible, and is closely attached to the parietes. The nerves and vessels which supply this structure enter the cavity through the foramen at the extremity of the root.

The roots are, externally, completely invested by periosteum, which terminates at the neck.

THE CHEMICAL COMPOSITION OF THE TEETH.

The analytical processes to which several celebrated chemists have submitted the teeth have afforded results differing in some trifling circumstances from each other. It is a matter of very little practical importance whether the proportion of phosphate of lime to animal matter, or that of carbonate of lime to either, be one or two per cent, greater or less; but as a point of accuracy merely, it may perhaps be desirable that our account should be as nearly correct as possible.

The following is the result given by Berzelius, whose analysis appears to have been more elaborate than that of any other chemist. It will be found to record the occurrence of several substances as exciting in the enamel and bone of the teeth, the presence of which has not been detected by others.

According to this celebrated chemist, the enamel of the adult teeth contains in 100 parts:—

Phosphate of lime.....	85.3
Fluate of lime	3.2
Carbonate of lime	8.
Phosphate of magnesia	1.5
Soda and muriate of soda.....	1.
Animal matter and water	1.
	100.

The bony substance, is stated, by the same authority, to contain;—

Phosphate of lime	62.
Fluate of lime	2.
Carbonate of lime	5.5
Phosphate of magnesia	1.
Soda and muriate of soda	1.5
Gelatine and water	28.
	100.

The following is a tabular view of the results obtained by Mr. Pepys;—

	Bone of Tempy. Teeth.	Bone of Adult Teeth	Roots of Adult Teeth.	Enamel
Phosphate of lime .	62	64	58	78
Carbonate of lime .	6	6	4	6
Cartilage	20	20	28	0
Water and loss . .	12	10	10	16
	100	100	100	100

PHYSIOLOGICAL OBSERVATIONS

ON THE

NATURAL FOOD OF MAN,

DEDUCED FROM THE CHARACTERS OF THE TEETH.

From the foregoing view of the nature and offices of the different classes of the teeth, it appears that their structure and uses are more perfectly equalized in the human subject than in any other animal. It is true, that in some tribes of animals, whose habits require the greatest possible extension of the office of a particular class of teeth, a corresponding development of that class is found to take place, to a much greater degree than in man. Thus, in the *carnivora*, the cuspidati are greatly elongated and strengthened, in order

to enable them to seize their food, and to tear it in pieces; in the *rodentia*, or gnawing animals, as in the beaver for instance, the incisors are remarkably long, and exhibit that extraordinary development which their peculiar habits demand; and, in the graminivorous animals, the *ruminantia* especially, the molares are found to occupy the most conspicuous situation. But, in each of these instances, the other kinds of teeth are found to be proportionately of less importance, and in some cases are actually wanting. In man, on the contrary, every class appears to be equally developed, to a moderate, though a sufficient degree, and to exhibit a perfection of structure, which may be considered as the true type, from which all other forms are mere deviations. It becomes, therefore, a question of some interest, and perhaps of no less difficulty, to what food the structure which has just been demonstrated, is particularly adapted. The opinion which I venture to give has not been hastily formed,

nor without, what appeared to me, sufficient grounds; I advance it, however, with diffidence, and do not profess to consider it as much more than hypothetical.

The endowment of reason, that greatest, best gift of the Creator, appears, if we consider the perfection of human organization, to be particularly, and, in its highest degree, even exclusively, adapted to the conformation and requirements of man. This high and divine endowment should never be lost sight of in our reasonings on the human structure, and the physiology and habits of our species; as it is only with the allowances and modifications, which the possession of a quality so infinitely higher than the instinct of other animals necessarily supposes, that the actual habits of man can be viewed as compatible with his organization. Although these habits,—now essentially arising from, and combined with, a state of civilization, which, in a greater or less degree, must be allowed to exist in every

known tribe of our species,—cannot be considered, in any one instance, as actually and exclusively *natural;* yet we may be led, by a careful examination of the structure of the different organs, and by an analogical comparison of them as they exist in man, with the same organs in those animals which most nearly resemble him in structure but which are still found in a perfectly natural state, to a plausible supposition, at least, of what were originally his natural habits, and which would have still continued so, but for those changes which have arisen from the possession of this very endowment.

With this view of the subject, it is not I think going too far to say that every fact connected with the human organization goes to prove, that man was originally formed a frugivorous animal, and therefore, probably tropical, or nearly so, with regard to his geographical situation. This opinion is principally derived from the formation of

his teeth and digestive organs, as well as from the character of his skin, and the general structure of his limbs. It is not my intention now to go further into the discussion of this subject, than to observe, that if analogy be allowed to have any weight in the argument, it is wholly on that side of the question which I have just taken. Those animals, whose teeth and digestive apparatus most nearly resemble our own, namely, the apes and monkeys, are undoubtedly frugivorous; but, as from their organization, they are necessarily tropical animals, and without the gift of reason, by which they might have overcome the difference of temperature by artificial means, they remain still restricted to their original food, and confined to the very limited climate to which their structure peculiarly adapted them. The reasoning powers of man, on the contrary, have enabled him to set climate at defiance, and have rendered him in all cases, more or less an artificial being. No longer

restrained within that range of temperature to which the delicacy of his frame, no less than the nature of his original nutriment would have confined him, he becomes the denizen of every climate, and the lord of terrestrial creation.

OF MASTICATION.

Mastication, or comminution of the food, preparatory to digestion, is performed by the complication of the various motions just described, and consists of two very distinct actions, namely, biting, or the separation of a portion of food by means of the incisors; and manducation, or the grinding of the food by the molares.

The first of these actions is effected in the following manner;—the mouth being opened by the depression of the lower jaw, the food is placed between the inferior and superior incisors, the edges of which are then brought in contact by the action of the elevators, whilst, at the same time, the condyles are retained forwards on the articular eminences, and as the incisors are relatively longer than the other teeth, this contact of their edges is not accompanied by that of the

surfaces of the molares. The elevators and retractors of the lower jaw are then thrown into strong action, by which the inferior incisors are pressed with great force against the superior; and being at the same moment brought backwards and upwards, the portion of food is separated by exactly a similar action to that of cutting by a pair of shears.

The portion of food being thus separated by the incisors, is then carried by the tongue and the muscles of the lips and cheek, between the upper and lower molares on one side, the jaw being a little depressed for that purpose; whilst, at the same time, a certain degree of lateral motion is given to it, towards that side on which the food is placed, by the condyle of the opposite side being thrown forwards upon its articular eminence. The jaw is then brought forcibly upwards, and the condyle at the same moment replaced in the glenoid cavity; a complicated movement of elevation and partial rotation being thus produced, the latter of which effects the

bruising and laceration of the food. The position of the molares in the alveoli is admirably adapted to assist in this process, and at the same time to give them the greatest possible strength and security. Those of the upper jaw are situated with the crowns standing a little outwards, towards the cheek; whilst the lower ones are placed in a contrary direction, so that their crowns overhang, in some measure, the inner alveolar plate. The consequence of this arrangement is, that when the surfaces of the upper and lower molares are brought into contact, by the double action of elevation and rotation, just described, the direction of that movement is in accordance with the axis of the two rows of teeth applied against each other.

By a repetition of this motion the food is comminuted and reduced to a pulp, and thus prepared for deglutition.

COMPARATIVE VIEW

OF THE

MOTION OF THE LOWER JAW

IN INFANTS AND IN OLD PERSONS.

On examining the jaws of a child before the teeth are produced, considerable deficiency will be observed in the articulation. Instead of the free and extensive motion which the structure just described permits to the adult, the glenoid cavity is found to be circumscribed to little more than the size of the condyle, and the articular eminence is not yet formed; the motion is consequently confined to simple depression and elevation, with scarcely the least approach to rotation. The centre of motion is, in fact, in the condyle.

A consequence almost identical with this, is produced by the state of the mouth in very old persons, though the circumstances pro-

ducing this similarity are essentially different. When the whole of the teeth have been removed, the alveola processes become so completely absorbed, that the face is shortened as Hunter justly observes, by about an inch and a half, that is to say, by nearly or quite, the length of the upper and lower teeth. When therefore, the lower jaw is depressed only so far, as that its base is brought parallel with the upper—that is to say, to the situation at which the teeth, did they still exist, would have met—the mouth is sufficiently opened for the reception of food, and for all other purposes; and it is never necessary to open it so wide as to bring the condyles forwards on the articular eminences; from the same cause also, namely, the loss of the teeth, the mode of grinding the food by alternate lateral motion is not required, and as in the case of the child, it is restricted to depression and elevation. When the mouth of a person in this condition is closed, the chin, describing the segment of a longer circle than the

alveolar processes, whilst they existed, had done, is thrown very much forwards, so as to project far beyond the upper jaw; what little mastication can be performed at this age, is therefore effected by the sides of the jaws, the only part at which they can be brought into contact.

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OF THE FORMATION OF THE ENAMEL.

When the bony shell has extended as far as the neck of the tooth, the external membrane or sac attaches itself closely to this part, though still loosely investing its body. At this time a remarkable alteration takes place in its substance, which becomes thickened, and much more vascular, particularly the inner layer, over the whole internal surface of which the vessels may be seen obviously enlarged, and capable therefore of receiving a much more perfect injection. The object of this change in the condition of the

membrane is to produce the increased supply of blood required for the secretion of the enamel. It is more evident in the permanent than in the temporary teeth, partly from the difference in their size, but doubtless more especially because the demand for the increased determination of blood is greater in the permanent, as the enamel is required to be of much greater proportional thickness.

It now begins to pour out from its internal surface a thickish fluid, which is speedily consolidated into a dark chalky substance, and afterwards becomes white and hardened by more perfect crystalization. This is the enamel. It is first deposited on the points at which ossification had commenced, and by degrees covers, in one continuous layer, the whole crown of the tooth. It appears that in the human subject, and in other animals whose teeth possess but two distinct substances, bone and enamel, the internal lamina alone performs the office of secretion; but in

those which require a third substance, the *crusta petrosa* of Dr. Blake, as the graminivorous quadrupeds, this is supposed by him to be secreted, by the external lamina, after the internal had performed its office of producing the enamel.

OF THE FORMATION

OF THE

PERMANENT TEETH.

The formation of the permanent teeth, although essentially proceeding upon the same general principle, and produced by means of similar structures as those by which the temporary ones are formed, differs in some very remarkable points from that process and forms, if possible, a still more beautiful and interesting illustration, both of the variety and harmony, with which the different formative processes of animal organization are

carried on. The rudiments of the permanent teeth, instead of being original and independent, like those of the temporary, are in fact, derived from them, and remain for a considerable time attached to, and intimately connected with them.

At an early period in the formation of the temporary teeth by a process which reminds us of the gemmiparous reproduction in the lower classes both of animal and vegetable life, the investing sac gives off a small process or bud, containing a portion of the essential rudiments; namely the pulp, covered by its proper membrane. This constitutes the rudiment of the permanent tooth. It commences in a small thickening on one side of the parent sac, which gradually becomes more and more circumscribed, and at length assumes a distinct form, though still connected with it by a peduncle. For a time the new rudiment is contained within the same alveolus with its parent, which excavated by the absorbents for its reception, by a process

as far as I am acquainted, unparalleled in the phenomena of physiology—unless indeed the absorption of the roots of the temporary teeth, may be considered as analogous—and which has not been noticed by any writer on the subject. It is not, as has been believed, in consequence of the pressure of the new rudiment upon the bone, that this absorption, is produced, but by a true process of anticipation: for I have seen, both in the human subject, and more evidently still in the foal, the commencement of this excavation before the new sac was formed, and, consequently, before any pressure could have taken place on the parietes of the socket. The absorption does not, in fact, commence in the smooth surface of the alveolus; but in the cancelli of the bone immediately behind it, where no pressure could operate; and it is only by carefully removing the parietes of the socket, where the excavation is intended to be formed, that the very commencement of the process can be observed. By degrees,

a small recess is thus formed in the parietes of the alveolus, in which the new rudiment is lodged, and this excavation continues to increase with the increasing size of the rudiment, whilst at the same time the maxillary becomes enlarged, and the temporary tooth advancing in its formation, rises in the socket. The new cell is thus gradually separated from the former one, both by being itself more and more deeply excavated in the substance of the bone, and also by the deposition of a bony partition between them; and the rudiment of the permanent tooth is at length shut up in its proper socket. There is not, however, even now, a total disunion between the two teeth, for as the temporary one grows and rises in the jaw, the connecting cord or peduncle elongates; and although the sac from which it is derived, by degrees becomes absorbed, it still remains attached to the neck of the temporary tooth, even, long after the latter has pierced the gum; and this connection between the temporary tooth, the

permanent rudiment, and the gum is thus kept up by means of the cord, through a small opening in the top of the new alveolus, which is seen perforating the alveolar process immediately behind each temporary tooth.

The situation of each permanent rudiment when its corresponding temporary tooth has made its appearance through the gum, is beneath and a little behind the latter, and rather farther from the centre of the jaw. From the preceding statement then it will be readily understood, that the upper part of the new sac, being by means of the cord connected with the gum, assumes, by and by, the same relation to that substance as that which the temporary rudiment, as before described, had originally sustained: whilst from its substance being deeply imbedded in the jaw, the vessels and nerves which had entered into the composition of the new process of pulp, in its first production, probably become so enlarged and modified in their structure as ultimately to form the true dental branches. This is much more probable than to suppose that a new set

of nerves and vessels are given off from the maxillary branches to join the pulps at a distance, through an intervening layer of bone of an indefinite thickness, to supply every new tooth.

We now, therefore, find the new rudiment in a state nearly analogous to that in which the parent tooth was originally placed, and with similar relations to the surrounding parts; the sac above attached to the gum, and the pulp beneath, covered with its proper membrane, connected by its vessels, &c. with the jaws. The foregoing account will convey an accurate idea, according to my views of this curious subject, of the mode in which the permanent teeth are produced; and I shall now enter upon a more detailed account of the progress of both sets, from their first rudimental existence to their perfect development.

OF THE

PROGRESS OF THE PERMANENT TEETH.

It has been already stated that of the permanent teeth, those which are first formed are the anterior molares, the first point of ossification on which may be seen at birth: and at about the age of twelve months or rather less, it will be found to have proceeded to a considerable extent on these teeth, and also on the permanent incisors, and to have commenced on the lower cuspidati, the upper ones being generally two or three months later. About the time when all the temporary teeth have made their appearance, ossification is found on the points of the bicuspides, and the bony shells of the teeth before mentioned have acquired considerable size.

As most of the permanent teeth are larger than those which precede them, and as they

are placed a little behind them during their progress, and consequently confined within the segment of a smaller circle, it is obvious that as they approach more and more nearly to their ultimate size, they must become very much crowded in the jaw. The examination of the maxillary bones in a child of about five years old, will show this fact in a very striking manner. At this period, the jaws being considerably deepened by the development of the alveolar processes, the sockets in which the permanent teeth are lodged, will be found placed beneath those of the temporary, some higher than others, and the bony shells are closely packed in such a manner as to occupy the least possible space. Thus in the upper jaw, the central incisors are situated immediately beneath the nose, the lateral incisors thrown back behind the points of the cuspidati, and the bases of the latter scarcely a quarter of an inch below the orbit : in the lower jaw the cuspidati are placed at the very base of the bone, with only a thin layer beneath them; but the crowding is much less con-

siderable than in the upper jaw, from the smaller comparative size of the incisors.

At from six to seven years of age, the whole of the permanent teeth are more or less ossified, excepting the *dentes sapientiæ;* so that previously to the shedding of any of the temporary teeth, there are at this time no less than forty-eight teeth in the two jaws; namely, twenty deciduous, the whole of which are perfected, and twenty-eight permanent, in different degrees of development, within the bones.

The following is the relative position of the two sets at this period. The permanent central incisor of the lower jaw is placed immediately beneath the temporary, with its point directed a little backwards, behind the partially absorbed roots of the latter. The lateral incisor, not yet so far advanced, is placed deeper in the jaw, and instead of being immediately beneath the temporary, is situated with its point between the roots of this and the cuspidatus. The permanent cuspidatus is still very deeply imbedded in the bone,

with its point rising between the roots of the temporary cuspidatus and the first temporary molaris. The two spreading roots of the latter encompass as it were, within their span, the first bicuspis, and those of the second temporary molaris, in like manner, the second bicuspis. Nearly a similar arrangement is found to exist in the upper jaw, excepting that the teeth are altogether more crowded. The lateral incisor is placed farther back, particularly its point; the cuspidatus is directed more outwards, as well as the bicuspides; circumstances which will hereafter be seen to be of some practical consequence in the treatment of irregularity.

The dentes sapientiæ begin to receive their ossification most commonly at about nine years of age, varying however, in this respect, as much as in the period of their ultimate appearance through the gum.

OF THE SHEDDING OF THE TEMPORARY TEETH.

The change of the temporary teeth for a more numerous set, of a stronger and more durable structure, and of increased power of mastication, is a physiological fact of no small practical importance, when considered as indicative of the necessity of a different species of ailment in childhood, from that required for the support of the system, in a more advanced and perfect state of development. In what that difference would have consisted had man remained in a state of nature, it is not now possible to decide; and were it possible, it would scarcely lead to any practical result in his present artificial mode of existence; but in the view of the thinking and philosophical practitioner, on whom it often devolves to direct in a great measure the

regimen of families, the fact will always appear important, as affording a general guide to his dietetic regulations. The difference in structure between the two sets of teeth, and the ages at which the weaker are exchanged for the more robust, are the two points to which his attention should be principally directed, and upon these may, with some degree of certainty, be founded the most rational and practical rules of diet at this period of life.

The mode in which this change is effected has been, at different times, attempted to be explained according to a variety of theories. Of the erroneous doctrines of the older writers —of the mechanical abrasion of the roots of the temporary teeth, by the friction of those of the permanent, as advanced by Bunon—of the acrid humour, supposed by Bourdet to act as a solvent; and of other fancies equally absurd, it is unnecessary now to speak; for it is useless to controvert what no one will again believe. I shall, therefore, confine myself to an account of the progress of this change,

and of the operation by which it is actually effected.

It has been already stated that the permanent teeth, during their formation are crowded together in the jaw by being placed in a smaller arch than they would occupy if regularly arranged side by side. As the latter, however is their destined situation, we find that, as soon as they have advanced to a certain point in their formation, and can no longer be contained within their own alveoli, absorption takes place in the anterior parietes of those cavities, by which means the teeth are allowed to come, in some measure, forwards. In consequence of this absorption it often happens, that not only the socket of the corresponding temporary tooth, but that of the tooth on each side also is opened to the permanent one. Absorption now commences in the root of the temporary tooth, generally on that part nearest its successor, and this goes on by degrees as the latter advances, until the root is removed; the crown at length falls off, leaving room for the per-

manent tooth to supply its place. The absorption of the root, seldom, if ever, commences at its extremity, but generally at a considerable distance from it, and often near the neck. When a portion of it has been removed, it has somewhat the appearance of being broken, but a little observation will soon enable any one instantly to detect the difference.

It has long been universally supposed that this absorption is produced by pressure of the advancing permanent tooth, first, on the interposed partition of bone, and then on the root of the deciduous tooth; though even the supporters of this opinion are obliged to acknowledge that there are instances in which pressure cannot have occurred, and the roots have still been absorbed. It is certainly unphilosophical to attribute a phenomenon to two distinct causes when one alone is sufficient for its explanation; and as there are instances in which this absorption goes on without the *possible* existence of pressure, it is fair to conclude, that the cause, be it what it may,

which produces the effect in those cases, is sufficient to its production in all others. It often happens that the root of the temporary tooth is wholly absorbed and the crown falls out spontaneously, long before the succeeding tooth has approached the vacant situation; and at other times, when the latter has advanced so far as to make its appearance through the gum, absorption of the former tooth has been so tardy, that it continues to occupy its situation as firmly as ever. Still, as a general rule, the two actions are consentaneous, and this absorption may perhaps be considered as an additional illustration of that law to which I have already alluded, when treating on the reception of a permanent pulp into a new cell: and may, like that, be termed a process of anticipation. In both instances, the existence, though not the pressure, or even the contact, of the new body is necessary to excite the action of the absorbent vessels; and we accordingly find that in those cases, by no means unfrequent, in which the temporary teeth retain their situation in the

mouth, with considerable firmness, until adult age, the corresponding permanent ones have not been formed.

Mons. Delabarre has, with no little confidence, advanced a theory to account for the removal of the temporary teeth which I should scarcely have noticed, but for the general respectability of his work, and a disinclination to suffer an erroneous opinion to pass unrefuted. Having, with his usual acuteness, observed the increased thickness and vascularity of the sac as soon as the crown of the tooth is covered with ossification, which I have already mentioned as preparatory to the secretion of the enamel, he assumes that this change in the state of the membrane, is intended for the purpose of removing the root of the temporary tooth, by being placed in contact with it during its growth. But that this cannot be the case, is proved by the frequent commencement of the absorption, in a part the most remote from the sac of the permanent tooth, and in all cases, by its

action being continued throughout the whole length of the root, to a great part of which, its successor can scarcely be said even to approximate during the process.

For a theory to be true, it must be applicable to exceptions as well as to general rules; and if tried by this test the opinions which I have combatted will, I think be proved to be fallacious.

The change of the temporary for the permanent teeth, commences in the majority of instances, at about seven years of age, though I have occasionally known it to occur as early as five, and as late as eight years and a half. The first permanent molares usually pierce the gum before the loss of the temporary central incisors, and their appearance may be considered as indicative of the approaching change. The following are about the medium periods at which the different permanent teeth are generally cut, but so irregular are they in this respect, that comparatively little dependance can be placed on such a statement. Those of the lower are here indicated

and they most commonly precede the upper by about two or three months:—

Anterior molares	6½ years
Central incisors	7 ...
Lateral incisors	8 ...
Anterior bicuspides	9 ...
Posterior bicuspides	10 ...
Cuspidati	11 - 12 ..
Second molares	12 - 13...
Third molares, or *dentes sapientiæ*	17 - 19...

OF IRREGULARITY.

There is not a subject connected with that branch of practice, of which the present work professes to treat, which has given rise to such gross charlatanism, or to so much gratuitous cruelty, as that which regards the treatment or prevention of irregularity in the permanent teeth. Had I only to lay down the general principles upon which

cases of this kind are to be treated, they would occupy but little space, for they are few and simple; but so universally have the practices obtained, which I shall have occasion to deprecate, (and which must have originated either in the most culpable ignorance, or in motives more disgraceful still than ignorance itself,) that some examination of the directions of former authors appear necessary, in order to remove, as far as possible, the erroneous impressions which have thus been made.

Irregularity, which, in a practical point of view, is only referable to the adult teeth, may be considered as either temporary or permanent. There are two kinds of temporary irregularity:—the first occurs from the want of concert between the absorption of the temporary and the advance of the permanent teeth, by which the latter are forced into an unnatural position, and come through the gum either before or behind the former; the second arises from the difference in size between the temporary and permanent incisors and cuspi-

dati, and is subsequently obviated by the loss of the temporary molares, when succeeded by the bicuspides, which are smaller, and which consequently allow of the necessary increase of room in the front of the mouth. Permanent irregularity originates in the want of exact proportion in the extent of the maxillary arch. and the size of the permanent teeth. That which I have called temporary irregularity also assumes a permanent character, when the irregular teeth have remained so long unattended to, as to have become fixed in their unnatural situation, or are retained in it, by the pressure of the antagonistic teeth in the other jaw. Malformations of the jaw, and the occurrence of supernumerary teeth, are also occasional causes of permanent irregularity.

A favourable prognosis may, with tolerable certainty, be formed of the ultimate regularity of the teeth, as far as it depends upon the relative proportions, between them and the maxillary bones, where the following circum-

stances are found to exist at the period when the second dentition commences. Ist,. If the maxillary arch be well formed, sufficiently expanded, and of a semi-circular form rather than elliptical. 2nd. If the temporary teeth, although broad, are a little separated from each other; especially if, having been originally somewhat crowded, they have been gradually acquiring more room during the last year or two: as this indicates a disposition in the jaws to expand. 3rd. If the first permanent molares appear to be well formed, and of moderate size. 4th. If there be no considerable prominence of the gum behind the temporary teeth, indicating that the permanent ones are advancing in that situation. 5th. If the parents, and family in general, especially those whom the child most resembles, have the maxillary arch broad and well formed, and the teeth regularly arranged. In proportion to the degree in which these circumstances exist, a more or less regular state of the teeth may be anticipated.

THE

DISEASES OF THE TEETH.

OF THE PREDISPOSING AND REMOTE CAUSES OF DENTAL CARIES.

By predisposing or constitutional causes, I mean those which are inherent in the original structure and constitution of the teeth, whether hereditary, or induced by circumstances operating during their formation: and by remote causes, I intend those, which, by producing *subsequent* changes in their condition, render them more liable to be acted upon, by any of the *exciting* causes of the disease.

Hereditary predisposition is amongst the most common and remarkable of the former class. It often happens that this tendency

exists in either the whole, or great part of a family of children, where one of the parents had been similarly affected; and this is true to so great an extent, that I have very commonly seen the same tooth, and even the same part of the tooth, affected in several individuals of the family, and at about the same age. In other instances, where there are many children, amongst whom, there exists a distinct division into two portions, some resembling the father, and others the mother, in features and constitution, I have observed a corresponding difference in the teeth, both as it regards their form and texture, and their tendency to decay.

The whole list of infantile diseases, operating during the formation of the permanent teeth, are to be considered as so many causes predisposing to caries: as the irritation excited by the first dentition for instance, and all the various morbid actions consequent upon it. Not the diseases alone of this period, but some of the remedies also which are employed for their cure, exert a most injurious influence

upon the future constitution of the teeth. *The immoderate use of mercury in early infancy, produces more, perhaps, than any other similar cause, that universal tendency to decay, which in many instances, destroys almost every tooth at an early age.* It is certainly, not unimportant to bear this fact in mind, in the administration of this 'sovereign remedy,' this panacea, as many appear to consider it, in infantile diseases.

A strumous constitution is very often accompanied by early and general decay of the teeth. I will instance one case, which however, possesses no claim of peculiarity for its selection. It but too much resembles many others, that every practitioner must be acquainted with.

"A young lady, seventeen years of age, possessing that remarkable transparency of skin, and delicacy of features, which too often indicate incipient consumption, consulted me respecting the state of her teeth.

The enamel, where it remained, was of that beautiful pearly whiteness and transparency which characterize teeth of a weak and frail texture; but there was not a single tooth, either in the upper or lower jaw, which was not to a greater or less degree, the subject of caries. Not one even of the inferior incisors, so seldom attacked by disease, had escaped its ravages."

That morbid affections of the constitution, occurring during the formation of the teeth, produce in them a predisposition to decay, receives a strong confirmation from the fact that in the greater number of cases they become diseased in pairs; for in whatever changes the constitution may suffer at that period, the teeth, then in the progress of their formation, would naturally participate; and would be rendered more or less liable to disease, in proportion to the injury thus inflicted on them. Upon the period, therefore at which these constitutional disorders take place, it will, to a certain degree, depend

which teeth shall be most predisposed to decay.

Amongst the *remote* causes, or those which produce a deleterious *change* in the constitution of the teeth subsequent to their formation, one of the most extensive in its effects is the use of mercury.

To the profuse administration of this remedy in tropical diseases, we may, I think, in a great measure, attribute the injury which a residence in hot climates so frequently inflicts on the teeth. It must not, however, be considered as the exclusive, or even the principal source of this evil; for fevers of every kind, dyspepsia, and in short, every severe or long continued constitutional disorder, must be classed amongst the most remote causes of dental caries.

OF THE EXCITING CAUSES OF

DENTAL CARIES.

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From the view which has been taken of the nature and proximate cause of this disease, it is evident, that whatever has a tendency to produce inflammation in the teeth, may become an exciting cause of it; probably the most frequent of these is any sudden or considerable change of temperature; whether the effect of exposure to a cold atmosphere, or of taking very hot or very cold substances into the mouth. As a general rule it may be observed, that whatever is placed in contact with

the teeth, either so much higher or lower than the natural temperature of the body, as to produce pain, may probably prove to be the exciting cause of the disease; thus drinking very hot fluids on one hand, and, on the other, taking ice, without the precaution of preventing it lying in contact with the teeth, are, I am convinced, fertile sources of disease in these organs. When the extremely dense solid structure of the teeth is considered, it will not appear wonderful that this result should occur from change of temperature in a part, the unyielding nature of which precludes the possibility of expansion and contraction, not only in the vessels of its substance, but also in the membrane filling its cavity.

The teeth most liable to mortification, are, undoubtedly the dentes sapientiæ; and I have even known many instances in which, when they first made their appearance through the gum, they were already in a state of partial decay. This probably arises from their being

formed at a later period of life than the other teeth, when the constitution is doubtless in a less favorable state for the production of newly formed parts, than during early infancy, when the process of new formation is going on with rapidity in every part of the system. The first molares are also frequently decayed at an early age; so much so that it is often necessary to remove these teeth, in consequence of severe suffering from tooth-ache, even before many others of the permanent set are perfected. The cuspidati, both superior and inferior, are comparatively seldom the subjects of disease; and the inferior inciors still more rarely.

Every part of the crown appears to be equally liable to caries. In the molares it attacks alike the centre of the masticating surface, the side in contact with the next tooth, and the outer and inner surfaces: the incisors are often carious at the point of contact, and now and then the superior lateral incisors become first decayed at the centre of the posterior surfaces.

It is generally supposed that there are two distinct kinds of dental caries, as it assumes very different appearances in different individuals; being sometimes quite white, at others brown or blackish. These varieties, however, for they are nothing more, depend upon the constitution of the teeth, and the circumstances under which decay has commenced. If the teeth were originally of a delicate texture, formed under a weakly or scrofulous state of the constitution, the progress of the caries is generally very rapid, and the decayed part becomes soft and of a whitish colour; but if they possess a more dense and firm structure, and were formed in a healthy state of the system, the decay, when it does occur, is much more tardy in its advance, and the affected portion is always of a dark brown or blackish hue. The cause of this difference appears to be, that, in the former case, its progress is so rapid, that the decomposition is imperfect, and no change of colour therefore takes place;—in the latter its advance is so slow as to allow of a more

complete decomposition, and the decaying substance consequently becomes more or less darkened.

Whatever tends to irritate and inflame the gum, must in a greater or less degree produce a corresponding irritation in the teeth, from the close connection which subsists between them; and hence the accumulation of tartar, portions of food remaining between the teeth, or any similar circumstance, may possibly become an exciting cause of caries; and this, not only by means of inflammation propagated through the gum, but also by the exposure of the necks of the teeth to external agents, in consequence of the absorption of the gum and alveolar processes. The necessity of keeping the teeth in a constant state of cleanliness, and freedom from all extraneous substances, is one of the best means of preventing the occurrence of caries from the causes just mentioned.

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