

ART. X. COMPARATIVE ANATOMY AND PATHOLOGY OF THE HUMAN TEETH. BY A. C. COGSWELL, D. D. S.

(Read April 8, 1872.)

TEETH are the prime organs of mastication, so essential for the proper trituration of food both in man as well as animals. In man they have a secondary relation subservient to beauty and speech, while with animals we find them used and adapted for seizing, tearing, dividing, pounding or grinding the food, as well as formidable weapons of offence and defence, aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, as well as carrying materials for building. Teeth are always intimately related to the food and habits of the animal, and consequently highly interesting to the *physiologist*, important to the *naturalist* in the classification of animals, and as zoological characters, are enhanced, by the durability of their tissues, being often the only remains discoverable in the deposits of former periods of the earth's history. Our purpose is not to go into a strict classification of these organs, but merely to name some facts in relation to the peculiar formation, modes of attachment, and singular growth and appearance in many animals, comparing their density and indestructibility to those of man.

In the Dental system of the fishes we find their number, form, structure, substance, situation, or modes of attachment, present a greater and more striking series of varieties than of any other class of animals. The lancelet, sturgeon, and paddle fish are *edentulous*, until the number vary and are multiplied in many fish, progressively, finding the mouths of many crowded with countless teeth. The moveability of the teeth of some fish is peculiar, as in the shark, and the singular fish called the *angler*—their base being tied by ligaments to the jaw, but they have no power of erecting or depressing the teeth at will. In the wolf fish, "*Anarrhicas lupus*," the powerful crushing teeth, made blunt by use, with the roof of the mouth almost covered, presents a subject of interest to the *anatomist*. The muscles of these fish have enormous power, from the constant exercise in crushing lobsters, whelks and other shell fish on which they live.

The system of shedding and renewing is peculiar to the fish, also in the Gangetic Crocodile called "Garrhiel," if at any time one of the teeth be removed, it will be found hollow at its base, and partly absorbed, presenting the appearance of a child's deciduous tooth, when partly absorbed, and at the base of this, a new germ of the successive tooth. The rodents also present this wonderful development of tooth structure, where the canine teeth are wanting. The incisors two in number in each jaw are always growing, never ceasing, while the animal lives, requiring constant exercise and abrasion to maintain the normal form, and serviceable proportions, as with the rat and rabbit.

If in either of these an upper incisor is lost, or distorted union of a broken jaw, rendering articulation imperfect, the incisors continue to grow, until they project like the tusks of an elephant, and following their curve the points sometimes return to their head, penetrate the skull, and cause death. I saw the skull of a beaver in the Philadelphia Dental College Museum, the tooth of which presented the above appearance, having grown out of all proportion, causing no doubt the death of the animal.

Higher in the scale we find in the genus *Elephas* the larger and complex molars, never more than one or two partially in place and use on each side, at any given time, for this progress of formation and destruction, of shedding and replacement is constantly going on, the molars or grinders succeeding one another from *behind* forward.

Another peculiar and complex condition of the dental system is presented by the *poisonous* serpents, in which teeth are associated with the tube or duct of a poison-bag and gland.

These teeth are called *poison-fangs*; they are confined to the upper maxillary, only one (if more in number) contain the poison fang, the tooth presents a curved appearance, on its sides are grooves connecting with the poison-bag, and on the animal seizing its prey the poison is forced into the wound along the groove in the tooth, causing death as soon as the poison is diffused through the system by absorption.

Beside means of offence and defence in some animals the long *tusks* serve as weapons of attack, and as instruments in aid of

climbing the floes and hummocks of ice, like the walrus, while the beaver use their teeth also for the purpose of cutting down trees and carrying them in their teeth to build their dams. (Beautifully illustrated by Dr. Gilpin at the last Institute meeting.) The teeth of carnivora and granivora, or such animals as live on flesh, and those who subsist on grain or a mixed diet, the organs of mastication assist to make the distinction, not only in their number but in their density and mode of articulation, having special forms for special uses.

The *names* also indicate their use as in man: the front teeth from being commonly adapted to effect the first coarse division of the food, have been called cutters or incisors,—the back teeth which complete its comminution, grinders or molars, and the large conical teeth situated behind the incisors, nearer the masseter muscle are called the canine, or holders, tearers, or laniaries, such as we find in the dog and that class of animals; while the two between the laniaries and the first molars are the bicuspid or double cuspids. In the use of the teeth we find a difference between the granivorous and carnivorous animals: while with flesh eating animals or carnivorous there is only an up and down motion of the jaw, with well developed cuspid teeth, while with granivorous animals a lateral motion, and a *deficiency* of the cuspid teeth (in many cases) as in the horse, sheep, cow, &c.

In *man* the jaws are short and the crowns of the teeth are of *equal* length; no *vacant* spaces in the dental series of either jaw, and the teeth derive their *additional fixity* by their close and mutual pressure; and from these facts, and others, finding also the density of the teeth *harder* than all others, present in this aspect the *highest order of human organization*. The *structure* of the teeth vary from the lowest class to the highest, taking the fish (as the sperm whale) they have no true enamel, while the elephant, walrus, narwhal, consists of *modified dentine* called *ivory*. In the hippopotamus it is said the substance is hard enough to strike fire. This is not an uncommon occurrence in excavating the human tooth, as I have often seen the steel instrument coming suddenly in contact with the enamel, cause a spark of fire to fly off like steel and flint coming in contact. Comparative analysis of the enamel of

the teeth of the pike, ox, and lion with those of *man* give a large percentage in favor of the latter, the phosphate of lime being greatly in advance of the other.

	MAN.	LION.	PIKE.	Ox.
Dentine—	66.72	60.03	59.57
Enamel—	89.82	83.33	63.98	81.86

In man we find a difference in favor $5\frac{67}{100}$ of the phosphate of lime or enamel over the lion, while many teeth are composed only of dentine and cement, like the great sperm whale, the cement taking the place of enamel. The human tooth at first sight appears to be composed only of dentine and enamel, but their *crowns* from the gums are covered with enamel, while the roots are covered with a cement or *crusta petrosa*. The internal structure of the teeth are *nourished* and *supplied* (of man) from the principal nerves running through the central portion of the teeth, thus we have a longitudinal section of a cuspid tooth with various modifications, *tooth structure, nerve* and its *filaments*. The three different substances so readily seen in the chart are these three disposed according to the *purposes* required of them.

First, we have the cementum or *crusta petrosa*; second, the dentine, (known as ivory in the tusk of the elephant), and third, *enamel*.

The first, cementum or *crusta petrosa*, corresponds in most especial particulars with bone, possessing its characteristic *lacunæ* or small cavities, and being traversed by small medullary canals; this is the first covering of the young teeth, and covers the *fang* of the tooth which enters the alveolar process of the jaw.

The dentine or ivory consists of a firmer substance, in which *inorganic* or mineral matter predominates *less* than the enamel. This is traversed by a vast number of *very fine tubuli*, (as seen on the chart,) which commence at the pulp cavity and radiate toward the surface.

The size of these are immeasurably small, so much so that they cannot receive blood, but no doubt like *canaliculi* of bone, imbibe *fluid* from the pulp cavity, thus aiding in the nutrition of the tooth. These *tubuli* when deprived of enamel covering become *highly sensitive*, and are the small *telegraph wires*, giving warn-

ing of approaching danger to the pulp and nerve, which is the *life* of the tooth.

The third portion is the enamel composed of *solid prisms* of fibres about 15600ths of an inch in diameter, arranged side by side, closely adherent to each other; their length corresponds with the thickness of the layer which they form; these two surfaces present the ends of the prism usually more or less hexagonal, and in its perfect state contains an *extremely minute quantity* of animal matter.

The pulp cavity is in the centre of the tooth; this contains the *nerves* and blood vessels, branching off from the chamber of the tooth, supplying each root or fang, and thus connecting through the apex or apical foramen, (almost as fine as the point of a fine cambric needle,) with the facial nerve receive their supply, which give the teeth life and sensation, and enables these organs when wounded or diseased often times to take on a healthy action, and forming on which is frequently found secondary dentine, properly called osteo dentine, or a new growth of tooth structure, as may sometimes be found on the grinding surface of the superior or inferior central incisors, where the articulation is such as to have caused the direct contact of both upper and under, on the cutting edges, and by rapid wearing away of the dentine, after the loss of the enamel, endangering encroachment upon the pulp and nerve; and for the protection of this a wise provision, if sufficient time be given, is the formation of this secondary dentine.

This growth of osteo-dentine is well illustrated by Professor Owen in speaking of the skull and teeth of the elephant, as follows:

“The musket-balls and other substances or foreign bodies which are occasionally found in ivory, are immediately surrounded by osteo-dentine in greater or less quantity. It has been a matter of wonder often how such bodies should become completely imbedded in the substance of the tusk, sometimes without any visible aperture, or how leaden bullets may have become lodged in the solid centre of a very large tusk without having been flattened. The explanation is as follows: A musket ball, aimed at the head of an elephant, may penetrate the thin bony socket and the thinner ivory parities of the wide conical pulp-cavity, occupying the inserted base of the tusk;

if the projectile force be there spent, the ball will gravitate to the opposite and lower side of the pulp cavity.

“ The presence of the foreign body exciting inflammation of the pulp, an irregular course of calcification ensues, which results in the deposition around the ball of a certain thickness of osteo-dentine. The pulp then resuming its healthy state and functions, coats the surface of the osteo-dentine inclosing the ball, together with the rest of the conical cavity into which the mass projects, with layers of normal ivory.

“ The portions of the cement-forming capsule surrounding the base of the tusk, and the part of the pulp which were perforated by the ball in its passage, are soon replaced by the active reparative power of these highly vascular bodies.

“ The hole formed by the ball in the base of the tusk is then more or less completely filled up by a thick coat of cement from without and of osteo-dentine from within.

“ By the continued progress of growth, the ball so inclosed is carried forward, in the course indicated toward the middle of the tooth. Should the ball have penetrated the base of the tusk of a young elephant, it may be carried forward by the uninterrupted growth and wear of the tusk, until that base has become the apex, and be finally exposed and discharged by the continual abrasion to which the apex of the tooth is subjected.”

To illustrate this more fully if a molar tooth with a superficial cavity, highly sensitive from inflamed tubuli, be carefully filled with a suitable material, preferring that least acted upon by thermal change, and allow the same to remain three months at least, it will be found on removal that the sensibility and pain no longer exists, and in excavating and carefully examining a firm hard layer of *new dentine* will be found covering and protecting what was almost too sensitive and painful to bear, this may be considered as *renewing of tooth structure*, and a supply of waste material as well as protection against unnatural abrasion.

In the composition of the teeth, we have *organic* and *inorganic* or earthy matter, the density varying chiefly as the earthy matter contained in each.

Chemical analyses give the following as one result taking the incisors of man. In one hundred parts—

	CEMENTUM.	DENTINE.	ENAMEL.
Organic Matter—	29.27	28.70	3.59
Earthy Matter—	70.73	71.30	96.41
	<hr/>	<hr/>	<hr/>
	100.00	100.00	100.00

These differ, however, as to the result occasionally, according to the organic constituents, and as the teeth have been divided into six degrees of density in man, this difference is owing wholly to the presence of earthy matter. Thus in children who have been sickly and delicate, fed on improper unwholesome diet, a deficiency of the bone forming material given in the food, and in those who also inherit weak animal constitutions, from either or both parents, may be found teeth of the poorest organization, chemically deficient of the average earthy matter, the enamel varying little above dentine, enamel roots imperfectly formed, and a chalky calcareous appearance readily acted upon by the vitiated saliva of the mouth and chemical acids; these vehicles dissolve and destroy the organic material, leaving only the gelatinous portions of the teeth to gradually waste away: whereas, if the enamel was perfectly formed, it would resist these chemical changes, and subserve the purpose of the Creator for all the wants of our physical organization.

In comparing in ordinary bone the earthy matter, inorganic, or phosphate of lime so familiarly known as bone earth, we find it constitutes only 54 parts of the 100, while in the enamel of the human teeth, it is nearly 90 in the 100 parts, the enamel being almost a mineral in substance, having only $3\frac{59}{100}$ parts of animal matter in the 100.

If for experiment we collect the several classes of human teeth from that of the lowest per centage of inorganic material, calling that No. 6, and ranging up to No. 1 the most perfect and dense enamel 96 per cent of lime, place these in sulphuric acid and water, equal parts, the result will prove after 24 hours which class of teeth will resist the acid the longest, and in proportion to the density of the enamel, so the dissolving of lime salts, leaving as the result, the entire loss of the enamel, forming a white sediment,

while only the skeleton or organic remains of the teeth are left. No. 6 of the lowest structure is deprived of its enamel; 1st, owing to its deficiency, proving that the loss of these organs vary from two reasons, viz: from the action of the chemical agents upon low formed teeth. 2nd, the deficiency of earthy constituents in the early formation of these organs. While the teeth of animals are made to subserve their purpose during life, by the peculiar process of shedding and replacement, well may we ask why it is that those of the highest class of organization in man should be so early lost; that premature decay causes so many edentulous males and females before the age of 20, and often as early as 12 and 18, the period of full bloom and vigor, when all the physical powers require to be in the fullest enjoyment of health, and activity? But it is a fact that among the people of British North America, and especially in the United States, where scrofulous diseases are transmissible, the offspring of such parents invariably suffer from their injurious influences, and if this taint passes through the blood it is not to be wondered that thousands fill up the bills of mortality of that fatal disease, "scrofulous consumption;" and if while those who live are only improperly fed, have little outdoor exercise, excessive excitement, irregular rest, and are at best almost *walking skeletons*, what can be expected otherwise than an imperfect organization of every part of the human body; while not only among the higher classes and wealthier, but among the lowliest, many partake of the deleterious domestic compounds and luxuries, which contain at best slight nourishment, which, if suitable for invalids, are entirely unfit for those who are already possessed of weak and delicate constitutions. Under these circumstances what can we expect, with our hothouse, modern-improved mode of living, breathing the indoor carbonized and sulphuretted atmosphere, in place of the oxygenated atmosphere, the one only gift God has given to stimulate and purify our blood? It is not at all strange then that the constant abuse and violation of nature's laws should so rapidly fix upon us "all the ills that flesh is heir to." Therefore the loss of the human teeth, like the worn out videttes of a beaten army, give early tokens of functional or organic disease. It is the immutable principle of nature to proceed in every step of her operations by

degrees ; and finding causes for defects, let us endeavour to remedy if possible these deficiencies. How true are the words of Shakespeare :—

“If all design begun on earth below
Fail in the promised largeness, checks and disorders,
Grow in our veins of action higher reared,
As knots—by the conflux of meeting sap—
Infect the sound pine and divert his grain,
Tortive and errant, from his course of growth.”

Is there a possibility of assisting in any way to overcome this deficiency in the physical organization? If so is it not the duty of every parent and guardian to look at natural causes and effects? If the soil is not supplied with proper fertilizers it *cannot* yield its full return. So with the animal economy : it avails itself of the nutrition required by the peculiar vital principle, acting within and upon each constitution. It appropriates no more and no less than the vital principle stimulating the organs will permit, and, if an insufficiency of *bone forming material* be not taken into the system by the food, *imperfect developement must be and is the result* in the human organization.

We will also find that so long as the constitutions of men differ from each other, so will there be the same great variety in the physical character and pathological condition of the dentive organs. The blood which is the fluid source from which the teeth, bones, tendons, muscles, nerves, life, hair, membranes, in fact the whole organized body are metamorphosed, so wonderfully adapted for each that the mind fails to comprehend how these arrangements are performed. Still we recognize the fact that blood is the life of man, pure or impure.

It has been a subject of some discussion for some time, whether the administering of phosphates in various forms as extracts, acts in the same way upon the physical organization as food containing the same.

We all will admit, however, it is far preferable to take food as medicine when made palatable than in some of the compounds often administered, either homeopathic or allopathic. While many may be palatable, still the fact of one being *food* and the other *medicine*, acts at least upon the *imagination* if not upon the *body*. The in-

sufficiency of bone forming material to children is the cause, no doubt, why in so many cases we find such imperfect development of the teeth, as well as the bones, of the youth in these days compared to giants in their days, and whose teeth, 'tis said, *never were diseased*, and the enamel of which, as I shall shortly give several instances recorded, had remained centuries in a perfect state.

The substances most essential as bone producing in the young, we shall quote from Carpenter's Physiology:—

“The phos. of lime is contained more or less abundantly, in most articles generally used as food, and where they are deficient or *removed by any means*, the animal suffers in consequence, if not supplied in any other way; contained largely in the seeds of many plants especially the grasses, also in flour, oatmeal, corn, &c. Now if this *bone earth*, so often called, be removed by sieving, as is the case in wheat flour and many other cereal grains, what is to supply the system in place of it? This property *must* be in the blood to feed the growing parts, or else a sure deficiency of the enamel. The fact that insufficient coarse unbolted cereals are now consumed, that the outside of wheat, oats and other grains ground and used as food has been thrown away is, no doubt, one reason why the present generation have so imperfectly formed teeth.”

Professor Johnson's practical observations on the above gives in 1000 lbs of whole grain, 170 lbs bone and salt.

Fine flour,	60	“	“	“
Bran	700	“	“	“

Here is a difference between fine flour, ordinarily used for domestic purposes of 530 lbs more in 1000 lbs of bone material, also shewing the whole grain is one half more. A Mr. Betz says, the weight of the bran or outer coating would, in the common superfine flour, constitute the offal to be about $5\frac{1}{2}$ lbs to the barrel of flour, while the ordinary weight of offal is from 65 to 70 lbs to each barrel of flour. Now if we estimate the earthy constituents to be $\frac{2}{3}$ of the offal of bran we must consider there is an actual loss at least, in every barrel of fine flour used, of 40 lbs. Now to estimate a child's consuming say a half barrel, annually, of flour, we find it has been deprived of 20 lbs. of the earthy substance required to form the bones and teeth.

What better proof of the value and perfect formation of the bone and teeth do we require than among Scotchmen. A fact worth remembering to those on this continent, is, that the Scotch oatmeal *contains the bran*, while the oatmeal used in England is deprived of it, and as for the Americans what little *they do use* requires to be well sifted, well buttered, and then taken in *homeopathic doses*. The Scotchman thought it better to bless the Duke of Argyle than to resort to professional skill to remedy defects.

The *indestructibility* of the enamel of human teeth (compared with all others) if *properly formed*, except by the action of disease during life, or from the force of fire when the body has been burned, may be substantiated from the following: Dr. William Buckland the great geologist, speaks of the teeth found in the cave at Kirkdale, Yorkshire, in 1821, among which were those of the elephant, rhinoceros, hippopotamus, bear, tiger, hyena, and sixteen other mammalia, the enamel of the teeth of these lower animals, were almost always in bad condition, while the human teeth found were the reverse. Dr. Buckland believes that if ever an *antediluvian* man were discovered, the fact of his being man would be ascertained by his teeth. Archdeacon Tache in a communication to the London Times quotes a passage from a friend and brother clergyman in Wiltshire as follows:—

“I have in my collection a part of a jaw bone, and two teeth in situ, which belonged to one of the soldiers of the Tenth Legion, and a tooth that once did good service among the molars of our good King Alfred’s stalwart warriors, in that time when he finally routed the Danes between 849 and 900, some 900 years ago at least.” The soldier was not one who believed in *carefully preserving* these organs, like an Irish woman who after having had a molar removed and on being anxious to take it with her, was asked by the dentist why she was so careful in preserving it? answered, “*Sure*, sir, do you think I want to be hunting round resurrection day for my teeth.”

The teeth of mummies generally have been found in a perfect state. Mr. Pettigrew, librarian to His Royal Highness the Duke of Sussex, and a celebrated surgeon, famous for the great number of Egyptian mummies he had unrolled, admired the perfect preserva-

tion of the enamel, and found the teeth invariably in an excellent condition, the discoloration from the vehicles used in embalming, generally disappears on exposure to the air. Shelden McKenzie, D. C. L. of Philadelphia, in a paper read before the Philadelphia Odontographical Society, relates the following among his travels: "Near the harbour of Holyhead (in Wales) and within view of the Stack lighthouse, is an overhanging cliff called Capal-na-Carrig, which in the Celtic language means the Chapel on the Rock. Tradition reports that a Druidical temple once stood on or near this precipice. It is very much exposed to the weather, and portions of the soil fall into the sea frequently; after a storm visiting Holyhead in 1837 I found on the summit of this cliff an immense number of human bones, protruding through the sandy soil, and at almost every step, with my walking stick, exposed a skull or some large bones. The bodies lay north and south, and not east and west, according to the christian practice of placing them. From what could be ascertained, at some very remote period there had been a battle on the island, and the dead had been buried where I found the bones. From these I collected several hundred human teeth in a perfect state of preservation."

The disinterment of the remains of William Rufus, who was shot by Walter Tyrrel, is another instance of the indestructibility of the enamel of the human teeth—from his coffin were taken nine teeth, perfect, having been entombed 768 years.

We will glance briefly at some of the principal causes of the loss of the human teeth, both in those imperfectly formed, as well as those of perfect structure.

Among the causes of premature loss of the human teeth, next to the chemical action of the vitiated condition of the saliva, is the presence of a foreign body attacking generally the six under front teeth, and the superior molars on each side. This deposit is *salivary calculus* or tartar; a low form of animalculæ form gradually, and after years of accumulation, force the gums away from these teeth, produce inflammation, suppuration, and ultimate looseness, and entire displacement and loss.

Thorough cleanliness and the free use of coarse food and meats, acting on and around the necks of the organs, would prevent this

accumulation. No better example need be given than in examining the mouth of any one who from diseased organs on one side of the mouth, use only the opposite, allowing the teeth not used to become frequently entirely encrusted and covered with this substance. Among the vegetarians of Japan it is said this disease is very marked, as the food they chiefly subsist on is rice, beans, sweet potatoes; but since foreigners have resided there the natives eat meat. In the streets of the capital, there are numerous stands kept by the wayside merchants, who supply the passers by with this new foreign notion called beef-stew. Dr. Elliott, who resides there, states that it is rare to find an elderly person with teeth, and as for the daughters of Japan the practice and horrible custom of blacking the teeth, after marriage, destroys their beauty.

In the study of the pathological condition of the teeth, we are also to discover if possible, wherein the harmony of demand and supply has been interfered with, causing a premature loss of these organs. In a healthy and normal condition of the human system, we find if proper food be taken into the system, the teeth will not only be perfectly formed, but healthily preserved, provided ordinary care and cleanliness be exercised.

Cleanliness cannot be too largely written in letters of gold, not only to the young, but to those of all ages. For in the carnivora we discover that not only the foul mucous covering of the tongue, but the tartar of the teeth, consists of the *dead* remains of millions of infusorial animalculæ. Leuenhoek long ago discovered this foul mucous, while Mandel made known the chemical decomposition found in the human mouth, so called *tartar*. By dissolving a portion of this in water and placing it under a microscope, the delicate scales are observable.

If these organs which the Creator has given to all, so useful and necessary, and which should be as hard as adamant, are so readily and frequently lost, is there not something radically wrong in the present system of living, and the want of the proper care of the teeth?

It is most especially deplorable among the females of this country, and in fact continent, that descendants of European parents,

should be so afflicted with caries of the teeth and the decay of parts formed of substances which enter into the composition of some of our hardest minerals. Many females, ere they attain a marriageable age, are obliged to resort to professional skill, replacing the natural with the mineral, or enamel of the artists' formation. This ought not to be, God made all mankind alike, in no portion of the earth are nations found who lose their hands, feet, or tongue, and no cause why the inhabitants should lose their teeth. It is not so in olden countries, from whence the progenitors of the present race have come, nor is it so in the West India Islands. So excellent is the structure of the teeth in savage nations, that some tribes in Africa file all the front teeth, so that they shall be separated and form sharp points, the better to tear the uncooked animal food. The ancient Welsh took better care of their teeth by cleansing, than many in our day of civilization. They used as a primitive way a stick of green hazel to rub the teeth, and abstained particularly from *hot* food of every kind, and in the fifteenth century Richard the Third granted a pension to one Matthew Flint for the purpose of caring for the teeth of the poor of London.

Art and professional skill combined may assist to restore what the ravages of disease may have destroyed, but unless constitutional weakness of these organs be overcome, the deficiency supplied in early life by the lime salts or earthy constituents, care and cleanliness in after years, it will be impossible for the rising generation to be less liable to the loss of the teeth, than those of the present.

Among the remote causes also of dental decay, I am firmly of the opinion from a large number of observations, that the present condition of the teeth of the father or mother at the moment of conception, will nearly always be represented to a greater or less extent in the offspring, and the teeth of the child during gestation are affected for good or evil by the degrees of health possessed by the dental organs of the mother; therefore if such be the case, the greater necessity of administering more of those nutritive elements which give strength to the *osseous* system, and perfect calcification to the teeth.

That parents should insist on it that their children not only eat nourishing food, but also that it shall be *hard*, requiring consider-

able effort in mastication. If a muscle suffers for the want of action, requiring its fibres to be put in daily use, so too will the teeth—they require work. The mastication of hard substances gives the periosteum of the roots a healthy stimulus, consequently a healthy nutrition follows.

One more fact and I have done. Dental Irregularities are certainly more frequently among children of the present day than formerly; this no doubt is also hereditary, to some extent, the parents having lost in early years the molar teeth that first erupted, called the six year olders. These are the first to be removed. In examining the mouths of 100 patients over 25 years of age, more than 75 per cent had lost these same teeth in early life. The principal teeth removed from children are these same large molar teeth, the reasons given when asked why allowed to go so far, is invariably that parents are under the impression that these are the first teeth, and if lost will be renewed, hence when these are lost at so early a period of life, the alveolan ridge contracts, and the arch becoming narrow prevents the proper development and articulation of the remainder, producing as the result crowded dentures, and surely early decay. This from my observations I find more frequently in the city than in the country, this may be also owing to the more luxurious habit of city children over those living in the country.

It is said of the celebrated Æsop, who gave us so many fables, that his master on going out with some friends on a hunting excursion, gave him directions to prepare dinner of the very *best* his larder afforded. On returning from the chase a dinner was found served up entirely of *tongue*.

On another occasion he was ordered to prepare a dinner of the *worst* his master's larder afforded. And again also a dinner was served entirely of tongue. Æsop being called upon for an explanation of the singular transaction, said that he had obeyed his master's injunction in the first instance, inasmuch as the tongue was designed for universal application, and when properly controlled and directed it was capable of conferring the greatest amount of good, and therefore was the best thing in the world. On the other hand, when not controlled and directed aright, it was susceptible of

becoming an instrument for the accomplishment of the greatest amount of evil, and was therefore the *worst* thing in the world.

So in conclusion, the teeth like Æsop's tongues, occupying the same tenement, if *properly cared for and directed* aright, so that they be neither *irregular or defective*, may carry us to that period of life which Shakespeare calls the *seventh age*—Sans teeth, sans eyes, sans taste, sans every thing; but when not cared for and directed aright become instruments of slow torture and agonizing pain. until patience ceases to be a virtue, one by one they are removed or prematurely lost, suddenly transferring youth into old age.

I have endeavoured to show, from these few imperfect observations, that special agents affect these organs both in their construction as well as destruction; that a remedial treatment is desirable and possible; that the remedy lies to a great extent within the power of each individual; that the disease may be prevented, a healthy condition preserved, life prolonged, and instead of premature loss, they will continue as the Creator designed they should, co-extensive with other members of the body, endowed ordinarily with the same degree of perfection as other constituents which make up the human physical organization.

ART. XI. ON THE GEOLOGY OF THE IRON DEPOSITS OF PICTOU COUNTY. BY REV. D. HONEYMAN, D. C. L., F. G. S., &c., *Director of the Provincial Museum.*

(*Read April 8, 1872.*)

ABSTRACT:

In the Appendix to Reports on the Pictou Coal Field, *Report of Progress of the Canadian Survey from 1866 to 1869, page 408*, Mr. Hartley says: "Several deposits of Specular ore were examined. These all occurred in a range of metamorphic rocks lying ten or twelve miles to the south of the Coal Field. Of the age of their formation I cannot speak with certainty, but it is probably Upper Silurian. The rocks consist of quartzites of light