An introductory lecture on dental surgery : delivered at the Metropolitan School of Dental Science, Wednesday, October 12, 1859 / by Robert T. Hulme.

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AN

Introductory Lecture

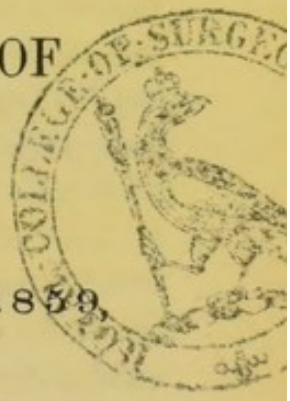
ON

DENTAL SURGERY,

DELIVERED AT

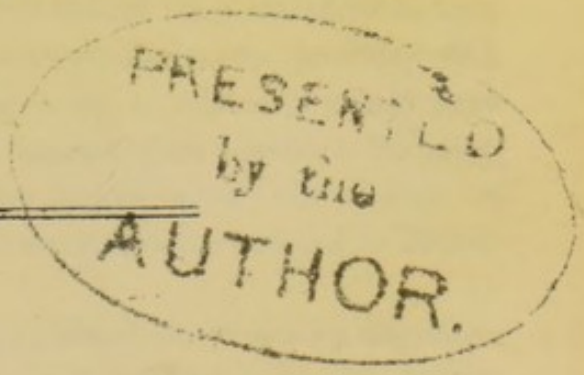
THE METROPOLITAN SCHOOL OF DENTAL SCIENCE,

WEDNESDAY, OCTOBER 12, 1859,



BY

ROBERT T. HULME, M.R.C.S., F.L.S.



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1860.

METROPOLITAN SCHOOL OF DENTAL SCIENCE.

INTRODUCTORY LECTURE ON DENTAL SURGERY.

BY ROBERT T. HULME, M.R.C.S., F.L.S.

GENTLEMEN,—After the able and eloquent address which you have so recently heard from my friend and colleague Dr Richardson, any further introductory remarks might be deemed superfluous. Under ordinary circumstances I should have proceeded at once to the consideration of the immediate subject of my lectures. On the present occasion I feel I may be permitted to deviate from such a course. We are not assembled at the re-opening of the sessional course of a recognized school of medicine, but at the formation of a special school of teaching, having reference to a distinct branch of practice of which the educational requirements have hitherto been entirely neglected. What I would desire, therefore, in the first instance, is to impress upon your minds the necessity of such scientific knowledge as is now offered for your acceptance. I know of no better means of doing this than by pointing out to you the relation in which Dental Surgery has hitherto stood to medical science, and by showing you the influence which the physiological doctrines that have prevailed at different periods have exercised over it.

From the time when Dentists were first established in this country, they have formed a special class of practitioners, distinct alike from the physician, the surgeon, or the apothecary. Under these circumstances it is somewhat remarkable they should have remained so long without forming themselves into a separate community, provided with its representative and superintending body, to whom it would have belonged to watch over the duties and interest of its members. Happily, this opprobrium to our Profession no longer exists; the College of Dentists has been established, and has inaugurated a new era in British dentistry.

So long as the former state of things existed, no provision was made for the systematic and efficient teaching of those who were to practise as dentists—men who, if they have not to do with the issues of life and death, may, nevertheless, materially diminish or add to the comfort or discomfort of those who come under their care. Such has hitherto been the state of the Dental Professsion, that it was a matter of chance what amount of knowledge or ignorance the individual

brought to the practice of dental surgery. It should, however, be borne in mind, that whatever were the shortcomings of the dental practitioner of former years, yet whatever he did accomplish, he had the merit, and at the same time the disadvantage, of having worked out for himself, and of having obtained by his own unaided experience. Do not misunderstand me. I know that, even at the period to which I am alluding, there were many honourable exceptions. I speak now only of the general body. It was little to be wondered at if men who thus made their way without science, in the end came to despise it, and to regard it as an useless incumbrance, what they had not felt the want of others could not require. Hence, this race of practitioners almost left it as a legacy to their successors that science was a matter with which the practical dentist had nothing to do. It is true that practice frequently precedes science, and that we pursue a line of treatment successfully of which the explanation or science is only attained subsequently. It is, however, most desirable that the two should proceed hand in hand together, for it is quite certain that a defective science, and in the present case, that is to say, a defective or erroneous physiology, will retard the progress of even the most practical.

This neglect of a branch of surgery, in which all persons are more or less interested at some period of their lives, may be traced partly to general causes, and partly to special causes. Pre-eminent amongst the first class was the indifference of people themselves with regard to the state of their teeth. This apathy arose in a great measure from the prevailing opinion that little or nothing could be done to remedy the diseases or to prevent the loss of these important organs. How, indeed, could it be otherwise, when the general practitioner, who will always direct the popular opinion in medical science, may be said to have entirely disregarded this branch of practice. The only time the medical man interfered was when the aching tooth was to be removed. Occasionally he might venture to extract a temporary tooth which was impeding the progress of the second set; but even this operation was too frequently delayed until the obstructing tooth had become loose, and, so far as the regularity of those which were coming was concerned, it was a matter of indifference whether the first tooth was removed or not.

It is to certain special causes I wish more particularly to direct your attention, because it is these which show the dependence of dentistry as a science upon the teachings of the physiologist, and that, just in proportion as the latter are true or false, so will the standing of our

Profession be exalted or degraded. I have already enumerated, amongst the general causes, the influence of the medical practitioner over public opinion, as well as his own neglect of dental practice. What was it, then, which guided the judgment of the medical man, and led him to disregard so extensive and useful a field of practice?

Gentlemen, try how I may to avoid the harsh and unpleasant expression, I can find no other which will explain the facts than the words, want of knowledge. Ignorance, that barrier to every kind of progress, has been felt no less in our Profession than in every other department of human learning. It does not follow that this ignorance was wilful on the part of the medical man, or that it was otherwise than a portion of that natural darkness through which man is compelled to work his way, until, aided by science, he can dispel it by the light of truth. The answer, then, to the question I have put, resolves itself into this, that, in consequence of the minute anatomy of the teeth being unknown, there arose an incorrect physiology, and, as a necessary accompaniment, an imperfect pathology of the teeth. It will not, therefore, be altogether a matter of unprofitable inquiry, it we take a rapid glance at some of the opinions which have been held with respect to the organisation of these bodies.

Passing over the fanciful and speculative doctrines which were promulgated by the Grecian writers concerning the teeth, we find Galen, in the second century, maintaining that they are true bones: *in ossium numero dentes habendi sunt, etsi secus nonnulli sophistæ arbitrentur.* This comparison of the Roman anatomist, under various modifications, has been constantly repeated down to the present time. Eustachius, whose work '*De Dentibus,*' appeared in 1563, carefully examined the teeth in the fœtus. He not only described the forms of the first teeth, but also those of their successors, and refuted the opinions of those who stated that the roots of the milk teeth are employed in the formation of the permanent ones. Eustachius seems to have had a clearer perception of the physiology of the teeth than Galen, for he says they are nourished in a different manner from bones, mentioning, amongst other proofs of this, that their fractures cannot be made to unite. After giving a correct description of the number and forms of the teeth, he compares their adhesion to the gums to that of the nails to the skin. *Sicut cutis extremæ unguium parti adherescit, ita gingivæ dentibus adjunctæ sicut.* Scaliger calls the teeth bone *sui generis;* he denies they have any proper sensation, and compares them in this respect to the nails. (1) These comparisons involve two opposite

(1) 'Nasmyth's Historical Introduction,' p. 7.

doctrines, the one regards the teeth as highly organised and vascular bodies, liable to disease and capable of undergoing changes analogous to those which occur in other parts of the body; the other not only places them amongst the unvascular parts, but considers that, once their formation is completed, no structural alteration can take place; that they are not subject to disease, in the proper sense of the term, and that whatever puts on such an appearance is the result of chemical, and not of vital actions.

Leaving the older writers, let us come to Hunter's work on '*The Natural History of the Human Teeth*,' published in 1778. It is impossible to read this remarkable and important work without perceiving that the same conflict was going on in the mind of Hunter with regard to the organisation of the teeth which had already been exhibited in the writings of different authors. In the chapter 'Of the Bony Part of a Tooth,' in which he discusses the question of its vascularity, he observes, "We cannot by injection prove that the bony part of a tooth is vascular: but from some circumstances it would appear that it is so. (1) Yet, after considering the evidence for and against this view, dwelling especially upon his experiments of feeding young animals with madder, he decides the question in the negative. From these experiments," he observes, "it would appear that the teeth are to be considered as extraneous bodies with respect to a circulation through their substance;" nevertheless, Hunter had witnessed certain phenomena in the course of his investigations which appeared to him irreconcilable with the general notion of a non-vascular part, and hence he adds, "but they have most certainly a living principle, by which means they make part of the body, and are capable of uniting with any part of a living body." (2) Hunter here refers to his experiments on the transplanting of teeth, and more especially to that curious and interesting one of inserting a living tooth into the comb of a cock. "But what puts it beyond a doubt is, that a living tooth, when transplanted into some living part of an animal, will retain its life, and the vessels of the animal shall communicate with the tooth, as is shown by the following experiments.

"I took a sound tooth from a person's head, then made a pretty deep wound with a lancet into the thick part of a cock's comb, and pressed the fang of the tooth into this wound, and fastened it with threads passed through other parts of the comb. The cock was killed some months

(1) 'The Natural History of the Human Teeth,' p. 36, London, 1778.

(2) 'Opus cit.,' p. 39.

after, and I injected the head with a very minute injection; the comb was then taken off and put into a weak acid, and the tooth being softened by this means, I slit the comb and tooth into two halves in the long direction of the tooth. I found the vessels of the tooth well injected, and also observed that the external surface of the tooth adhered everywhere to the comb by vessels similar to the union of a tooth with the gum and sockets." (1)

The knowledge which Hunter possessed of the structure and organisation of the teeth did not enable him to reconcile the opposite, and apparently contradictory facts which came before him. Hence the opinions which he expresses in one part of his work do not accord with those which are given in another. The doubt, the conflict, which was going on in Hunter's mind as regards the kind and amount of organisation which the teeth possessed is reflected in his writings. Whatever Hunter saw, he most faithfully recorded; but he was unable to reconcile the opposing facts, simply because he was unacquainted with the minute anatomy of the organs.

Blake, whose work appeared in 1801, does not formally discuss the question of the vascularity of the teeth, but when speaking of the membrane of the pulp he observes: "Though this membrane is so slightly connected with the internal part of the shell, I cannot think Mr Hunter's assertion warrantable when he says 'nor are there any vessels going from one to the other.' He might as well have denied the existence of vessels in the crystalline lens, as it more readily slips out of its capsula than the pulp from its shell." (2)

The writers who appear after Hunter still continue to exhibit the same difference of opinion with regard to the organisation of the teeth.

Mr Fox, the first English dentist who brought to the practice of his profession a thorough knowledge of the principles of surgery, and whose work on the Teeth formed for a long time the standard authority in Dental Science in this country, was an extreme advocate of the similarity of the teeth to bone. "It is very extraordinary," he says, "that Mr Hunter should have considered the teeth as devoid of internal circulation and destitute of the living principle. The structure of the teeth is similar to that of any other bone, and differs only in having a covering which is called enamel, for the exposed surface, and in the bony part being more dense." (3) Regarding the teeth as bones only

(1) 'Opus cit.,' p. 111.

(2) 'An Essay on the Structure and Formation of the Teeth in Man and various Animals,' p.p. 8. Dublin, 1801.

(3) 'Natural History and Diseases of the Teeth,' pt. 1, p. 33. London, 1814.

of a denser nature than ordinary, he refers their diseases to the same causes as those of the rest of the skeleton, and considers the proximate cause of caries to be an inflammation in the bone of the crown of the tooth, which, on account of its peculiar structure, terminates in mortification. (1)

Mr Bell, the first edition of whose work appeared in 1829, still continues to compare the teeth to the rest of the skeleton. According to this writer, the obvious structure, as well as the chemical composition of the teeth would lead to the conclusion that their constitution is similar to that of the bones in general, while further on he observes: "The fang is covered by a periosteum, and the internal cavity also is lined by a highly nervous and vascular membrane; both of these are intimately connected with the bony structure of the tooth. Now, unless we suppose that these membranes are the media by which vessels and nerves are sent to the bony substance of the tooth, and by which, in fact, its vitality is supported, and its connexion with the general system preserved, it will be impossible to assign any purpose which can be answered by their existence." (2) He concludes his general observations on the organisation of the teeth with these words: "Notwithstanding, however, the teeth appear to be, strictly speaking, organised, it must be remembered that they are possessed of a much lower degree of vitality than any other parts of the body. Unless this be granted, neither the results of the experiments" (those of Hunter upon feeding young animals with madder) "already referred to, nor the peculiarities of their diseases, can be accounted for, but grant their organisation, and that this is inferior in degree to that of the other bones, and we shall perceive that the difficulties will be, in a great measure, if not wholly obviated." (3)

These, then, were the opinions of those who were actually engaged in the practice of Dental Surgery, and who were daily witnessing the diseases of the teeth, the course which they ran, and the general influence they exercised over the body. If, however, we turn from the writings of these gentlemen to those of the surgeon and the physiologist, we shall find that the opinions of the latter are directly opposed to those of the persons who were engaged in dental practice.

Sir Charles Bell, when speaking of the teeth, observes: "We are prepared to acquiesce in the opinion of Mr Hunter, that they possess vi-

(1) 'Opus cit.,' pt. 2, p. 12.

(2) 'The Anatomy, Physiology, and Diseases of the Teeth,' p. 11. 2nd Edit. London, 1835.

(3) 'Opus cit.,' p. 17.

tality, while yet they have no vascular action within them." Mr Lawrence, in a note to his translation of Blumbach's *Comparative Anatomy*, observes: "The vascularity of the teeth is a doctrine refuted by every circumstance in the formation, structure, and diseases of these organs." While in Magendie's 'Physiology,' which was long one of the text-books in our Anatomical Schools, the following passage occurs in reference to the diseases of the teeth: "These chemical changes are very improperly called Diseases of the Teeth, because they happen also to artificial teeth." (1) The fact was, these two classes of writers founded their opinions upon different grounds. The physiologist drew his conclusions solely from the structure of the part, and the means which at that time were at his disposal did not enable him to unravel the intricate and beautiful structure of the teeth. All he could discover in the osseous substance of the tooth was the appearance of fibres passing in an undulating manner from the pulp cavity to the external surface. In certain states of disease and in decomposing teeth, the bony matter was seen to break up into a series of concentric laminæ, but the whole appeared of far too dense a nature to allow of a nutrient fluid circulating through it. On the other hand, the dentist, judging from what occurred in disease, and having no idea of any kind of circulation but such as is witnessed in other parts of the body, felt himself constrained to maintain the vascularity of the teeth. Both were partly right, both were partly wrong. The dentist was in error when he declared that the teeth were vascular, even as other parts of the body are vascular, and the physiologist was in error when, like De Blainville, he regarded them as a *partie morte*, and denied that they possessed any kind of circulation whatever. This difference of opinion might have continued until to the present time but for other means of investigation which now came to the aid of the anatomist, endowing him, as it were, with a new sense, and opening to him a field of research as extensive as it was interesting. I need not tell you that this new power was the microscope, an instrument which has become the most powerful auxiliary which man has ever possessed of investigating, not only the minute anatomy of the body, but every other department of organic nature. Purkingie and Retzius, the one in Germany, the other in Denmark, almost simultaneously, and certainly without a knowledge of what the other was doing, applied the microscope to the examination of the teeth. When thin sections of the teeth were submitted to this mode of examination, the dentine—or, as it was

(1) Magendie's 'Physiology,' translated by Milligan, p. 290.

then termed, the ivory of the tooth—was seen to contain a number of delicate tubes ramifying throughout its substance; it was evident that these osseous canals, if they would not permit the red particles of the blood to pass through them, were at least capable of conveying the transuded plasma of the nutrient fluid. In the outer layer of bone which invests the fang, and is commonly called the cement, Purkingie demonstrated the presence of the minute cells with numerous caniculi radiating from them which have since gone by his name, and which correspond to similar corpuscules met with in true bone. If red blood is excluded from the dentine, it is not always so as regards the cement.

In ordinary bone there are certain canals named, after their discoverer, Haversian canals; these contain the blood vessels which are distributed to the interior of the bone, and it is around these canals that the osseous corpuscules are arranged. Similar canals are occasionally found in the cement, and prove that, at least in this part of the tooth, it is possible for the red globules of the blood to circulate. Lastly, the enamel was seen to consist of separate rods of calcareous matter, each invested by a membranous case, the whole of its external surface being covered by a peculiar structureless membrane. The membrane which thus invests the crown of the tooth possesses a remarkable power of resisting the action of chemical agents. According to Kolliker it is not altered by maceration in water, nor is it dissolved by boiling in water, in concentrated acetic, hydrochloric, sulphuric, or nitric acids, nor is it acted upon by the caustic alkalies except by boiling. At length, then, we have obtained the means of reconciling the conflicting opinions which I have previously alluded to. The physiologist finds a well-defined and complex structure which compels him to admit the teeth amongst the living and organised parts of the body. If the dentist is called upon to modify, in some respects, the views which he entertained with regard to the circulation which takes place in the teeth, he is enabled to explain their pathology in a more satisfactory manner than he could do previously, while the principles by which he is guided in practice are no longer empirical, but rest upon a rational and scientific basis.

Thus far we may congratulate ourselves upon the progress which dental science has made during the last few years. The united labours of many original and independent observers have succeeded in unravelling the minute anatomy of the teeth, and a large amount of information has been accumulated in relation to the treatment of their diseases. But, while much has been done, more remains to be accomplished, and for this reason I feel that these lectures must necessarily

be imperfect. Imperfect I mean quite apart from the ability of the teacher, or from that kind of defect which belongs to anything which is undertaken for the first time, but an imperfection arising from the unsettled state of the science and art itself. We have only to look at discussions which have taken place at the monthly meetings of the College to perceive what opposite opinions are entertained upon certain points of practice by the members of our Profession. Hence the teacher has to rely solely upon his own authority, or he is under the necessity of quoting the opinions of others without always knowing the grounds upon which these opinions are based. How many points are there respecting the teeth which still remain undecided, or rest upon insufficient data? Thus, for instance, in the fœtus and the young child, when both sets of teeth are present, does the inferior maxillary artery divide into two branches, or are both sets of teeth supplied by branches from the same trunk? This question is not noticed either in the works on General Anatomy of this country nor in those on Dental Surgery, but the French writers, Serres, Blandin, and others, state that the inferior maxillary artery divides into two branches, one supplying each set of teeth. Again, Mr Hunter first put forth the statement that the anterior portion of the lower jaw, after it is occupied by the ten teeth belonging to the first set, ceases to grow; and that the ten anterior teeth of the second set occupies precisely the same space. It is quite certain that the means which Hunter took of determining this question, namely, that of comparing four different jaws at different ages is not sufficiently exact to determine the question. We find Blake, again, in opposition to Hunter: "It appears," he says, "from my preparations, and experience convinces me, that the space occupied by the temporary teeth would not be sufficient to accommodate the same number of permanent teeth which succeed them, and which on the whole are so much larger, particularly in the upper jaw." (1) Fox, without making any reference to Mr Hunter, inclines to his opinion, but does not state the matter so positively. Thus he observes, "After a child has obtained all the temporary teeth, the jaw in general grows very little in the part which they occupy;" and a little further on, "When the jaw of a child is compared with that of an adult, a very striking difference is observed. That of a child forms nearly the half of a circle, while that of an adult is the half of a long ellipsis. This comparison clearly points out the part in which the jaw receives its greatest increase to be between the second

(1) 'Opus cit.' p. 49.

temporary molaris and the coronoid process; and this lengthened part of the jaw is destined to be the situation of the permanent molares." (1)

Delabarre wonders what could have induced several modern writers to deny that the anterior part of the jaw increases. (2)

Mr Bell states that he has repeatedly compared "the arch of the jaw at seven years of age with the same jaw at twelve or fourteen, and he has no hesitation in saying that the anterior permanent occupy a somewhat larger arch than the temporary one which preceded them had done, and that the view taken by Hunter and Fox is incorrect, though not to the extent which Dr Blake and M. Delabarre have supposed. (3)

M. Oudet (4), who seems to have examined this question more systematically and more carefully than any of his predecessors, having taken casts of the mouths of some twenty children at three years of age, and repeated the operation upon them at different intervals up to six years and a half, declares that there was no change in the length of the arch of the jaw, or in the relation of the teeth to each other during that period. Lastly, Mr Tomes, in his Lectures on Dental Surgery (p. 118), contents himself with repeating the statement of Hunter, but does not adduce any additional evidence upon the point in question. These examples might be greatly multiplied, but sufficient has been brought forward to justify what I have said.

We are all aware that medicine can never become an exact science; the machinery of the human body is too delicate and too complex, the external influences to which it is exposed are too various and too numerous to allow so desirable an end to be accomplished. Nevertheless, we may in some instances approximate to something like exactness. This can only be done by bringing the science of numbers to bear upon the subject; when we can do this we are at least able to assert that, in a given number of cases, a certain proportion of them will run such and such a course, and have a given termination. This application has already been made in some instances, and we are in possession of a limited series of dental statistics. Now, it is precisely upon those points which have been brought under the influence of numbers that we can speak most confidently. If, for instance, we were asked which are the teeth belonging to the second set that are

(1) 'Opus cit.,' p. 47.

(2) Delabarre, 'Traité de la Seconde Dentition,' p. 96. Paris, 1819.

(3) 'Opus cit.,' p. 83.

(4) Oudet, 'Arte Dent.,' p. 114. 'Dictionnaire de Medicine,' 30 vols.

most liable to decay, I presume we should have no hesitation in naming the first molars; and in confirmation of our statement we should refer to the valuable tables which have been published by Mr Tomes and Dr Reid. In Mr Tomes' (1) tables, which contain a record of 3,000 cases of extraction, we find that no less than 1,124 of these operations referred to the first molar of the second set. Dr Reid's tables, which are published in the 'Transactions of the College of Dentists' for 1858 (p. 66), refer only to females between the ages of seven and seventeen. In these tables, out of 741 operations for stopping, as many as 37 were performed upon the first permanent molar. How different is the value of facts thus firmly established, compared with the vague and general assertion of Mr Fox (2), that "the molars are more subject to caries than any of the other teeth," while they directly contradict the assertion of Mr Bell, that "the teeth most liable to mortification are undoubtedly the dentes sapientiæ." (3) The tables collected by Mr Saunders for the purpose of ascertaining whether the teeth were not available to determine a person's age within certain limits, affords another example of the use which may be made of dental statistics. Cuvier had indeed already made a similar application of dental development for the determination of the characters and age of certain skulls which had been found, and which, being of an enormous size, had given rise to the idea that they were the remains of a race of preadamite giants. Cuvier proved that the skulls in question were diseased, and had belonged to children who had died at the epoch of the change of teeth. In one case, so far from being the skull of a giant, the teeth showed it was that of a child six or seven years of age. A similar application of dental development was lately made by Dr Reid in determining the age of the so-termed Aztec Lilliputians. In Dr Reid's interesting paper, published in the 'Transactions of the College of Dentists' for 1857, he shows that, instead of these individuals belonging to a diminutive race of men, the boy was about twelve, and the girl only eight years of age.

I have dwelt at some length on this point, because it seems to me that the value of statistical information can hardly be over-rated, inasmuch as it is by pursuing a similar mode of investigation we must look for the further advancement of our Profession. It is most important that this should be borne in mind at the present time, when endeavours

(1) Tomes' 'Lectures on Dental Surgery and Physiology,' p. 118. London, 1848.

(2) 'Opus cit.,' pt. 2, p. 9.

(3) 'Opus cit.,' p. 135.

are being made to establish an efficient staff of dental officers to the various hospitals and dispensaries, and when there is every prospect of these institutions becoming the arena in which yourselves and others, who will hereafter become members of the Dental Profession, are to learn the principles which will guide you in practice. It is desirable not only that an account of the cases which come under treatment should be kept, but, if possible, that a uniform method of recording them should be adopted. With this object in view I placed myself in communication with the dental officers attached to some of our hospitals and dispensaries, and amongst others with Mr Parker, of Birmingham, who, in the most courteous and obliging manner, forwarded me a copy of the plan which he follows at the Birmingham Dispensary. (1) The same system is used at the Middlesex Hospital, and, with possibly some slight modification, it will be the one adopted at the dispensaries in connection with the Metropolitan School of Dental Science. It is intended not only to keep an account of the operations performed, but also of the actual state of each patient's mouth who may apply for assistance. Properly to fill up such tables would occupy too much of the surgeon's time, but by the appointment of clinical clerks from amongst the students of the school, it may be done with comparatively little trouble, while it would be attended with great advantage to the pupil. In this way a large amount of valuable information might soon be obtained, and when this was done there would no longer be that difference of opinion regarding certain operations which there is at the present time. The relative value of arsenic, of chloride of zinc, or of nitrate of silver as escharotics; the duration of teeth which have been stopped after destruction of the nerve, and whether there is any difference in their duration according to the means which had been employed for that purpose, are some of the questions which might be determined. The opportunity of properly testing new modes of treatment would be afforded us, and it is to be hoped, when this is the case, we shall no longer hear of remedies which are extolled as infallible by some, while they are denounced as useless, or worse than useless, by others.

Thus then, gentlemen, we have taken a rapid retrospect of dental science and of some of the phases through which it has passed. But is there no lesson by which the student may profit from such a history. Surely, unless I have failed in my object, this examination must have shown you that dentistry as a science has advanced just in proportion as the structure of the teeth has become unravelled, and their relation to the rest of the body recognised; that is to say, dentistry has ad-

(1) I desire also to acknowledge a similar act of courtesy on the part of Mr Owen, of Islington.

vanced hand in hand with the sciences of anatomy and physiology. What is true of the science and art, generally will equally apply to the individual; you commence in the workroom,—the first age of dentistry—there you learn your art, and it is possible you may never advance beyond that preliminary stage. If you have no ambition, no desire to step into the foremost ranks of your Profession, well and good; you may continue through life as men behind the time in which you live, representatives of that early period of your Profession which belongs to a by-gone age. Should it, however, be otherwise, then to your art you must add that scientific knowledge which it is now in your power to obtain. How few are the names I have found it necessary to quote to you in comparison with the number of dentists who have lived and died since 1778, when John Hunter's work on the *Natural History of the Human Teeth* laid the first foundation of that higher standing of our Profession which the Council of this College, and other zealous advocates for the advancement of dental science, are now endeavouring to establish. More at that period than in the present day was our Profession divided into a science and an art, the followers of the latter were numerous, while those of the former were few in number, yet it is the names of the few only which have descended to the present day. Art belongs to individual and to his own time, science to all mankind and to all ages. To quote the words of the learned historian of the Inductive Sciences, when speaking of the results of the Great Exhibition, "We see that, in general, art has preceded science. Men have executed great and curious and beautiful works before they had a scientific insight into the principles on which the success of their labours was founded. There were good artificers in brass and iron before the principles of the chemistry of metals were known; there was wine among men before there was a philosophy of vinous fermentation; there were mighty masses raised into the air, cyclopean walls and cromlechs, obelisks and pyramids—probably gigantic Doric pillars and entablatures—before there was a theory of the mechanical powers. The earlier generations did; the later explained that it had been possible to do. Art was the mother of Science: the vigorous and comely mother of a daughter of far loftier and serener beauty." (1) To you, gentlemen, then, I would say reverence the mother, be on terms of friendship with the daughter, gain what you can from the experience of the former, but add thereto the wisdom of the latter.

Oct. 10th, 1859.

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(1) Whewell; Lecture 'On the General Bearings of the Great Exhibition,' p. 7.

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