THE

WORKS

OF

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WITH

NOTES.

EDITED BY

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PLATES.

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EXPLANATION OF PLATES.

PLATE I.

Fig. 1. A representation of the under-side of the upper-jaw, without the teeth. *a a a a a* the outer line of the circle, or what is commonly called the outer plate of the alveolar process. *b b b* the inner line of the circle, commonly called the inner plate. *c c* the ten single sockets, viz. for the incisores, cuspidati, and bicuspides. *d d* the three double sockets for the molary, or triple-fanged teeth; the two first having three sockets, and the last only two.

Fig. 2. A representation of the upper-part of the lower-jaw, showing particularly the sockets of the teeth. *a* the sockets of the ten single-fanged teeth. *b* the sockets of the three double-fanged teeth.

Fig. 3. A sketch of the joint and muscles of the lower-jaw to explain what was said of its motions. *a* the condyle of the lower-jaw. *b* the angle of the lower-jaw. *c* the moveable cartilage of the joint. *d* the eminence before the cavity, or hollow in the temporal bone for the articulation of the lower-jaw. *e* the cavity itself. *f* the meatus auditorius externus. *g* the origin of the digastric muscle. *h* one of the vertebræ of the neck. *i* the last molar tooth. *j* the insertion of the digastric muscle.

PLATE II.

Fig. 1. A front view of the upper- and lower-jaws of an adult, with a full set of teeth. *a a a* the upper-jaw. *b b* the lower-jaw.

Fig. 2. A side view of both jaws in the same state. *a a* the upper-jaw. *b b* the lower-jaw. *c* its ascending process. *d* the root of the coronoid process. *e* the condyle. *f f f f* the fluted alveolar processes.

PLATE III.

Fig. 1. The basis of the upper-jaw, with a full set of teeth, showing the cutting edges and grinding surfaces of the teeth of the upper-jaw. *a a a a* the four incisores. *b b* the two cuspidati. *c c* the four bicuspides. *d d* the six grinders.

Fig. 2. A view from above and behind of the lower-jaw, with a full set of teeth; showing the cutting edges and grinding surfaces of the teeth of that jaw, with the coronoid processes, and condyles for articulation. *a a a a* the four incisores. *b b* the two cuspidati. *c c* the four bicuspides. *d d* the six grinders. *e e* the coronoid processes. *f f* the condyles.

Fig. 3. The moveable cartilage of the joint of the lower-jaw. *a* the cut surface of a longitudinal section of it: the lower and concave surface is what is articulated with the condyle, the upper and convex surface is what is in contact with the temporal bone.

Fig. 4. A side view of the upper- and lower-jaw, in which the outer plate of the alveolar process was

taken off to expose the fangs of the teeth in their sockets. The length of each fang is at once seen with respect to its neighbour, and this kind of articulation pointed out at one view.

PLATE IV.

The bones of the face and part of the head of a very old woman, who had lost her teeth a considerable time before death. The whole alveolar processes are gone in both jaws, which allows of the lower-jaw being raised above two inches higher than what is common in shutting the mouth, before the gums of both jaws can come into contact. By this increased motion of the lower-jaw, the chin is brought more upon a line with the articulation, and therefore projects beyond the upper-jaw considerably.

PLATE V.

Fig. 1. Two views of the sixteen teeth of one side of both jaws, taken out of their sockets to expose the whole of each tooth.

Row 1. The teeth of the upper-jaw, seen from the outside.

Row 2. The same view of the teeth of the lower-jaw: the five single are similar to those of the upper-jaw, but the grinders in this have only two fangs. *a* the incisors. *b* the cuspidati. *c c* the bicuspides. *d d* the two first grinders, having three fangs. *e* the third grinder, or dens sapientiæ, having also three fangs.

Row 3 & 4. A side view of the same teeth, showing that the incisores and cuspidati, in this view, differ from the former view more than the bicuspides or grinders.

Row 3. *a a* the two incisores of the upper-jaw, showing the hollowed inner surface of the body of these teeth. *b* the cuspidatus, showing the same. *c c* the bicuspides, showing the two points at the basis of each. The first of them has a forked fang.

Fig. 1—7. Show the cavities of the teeth in the incisores, cuspidatus, bicuspidatus and molares.

Fig. 8. A molaris of the lower-jaw, with part of its fangs sawed off, to show that the sides of the cavity or canal have grown together, and divided it into two small canals, which are represented by the four dark points.

Fig. 9—10. The cavity in the body of the teeth seen in transverse sections.

Fig. 11—12. Longitudinal sections of the molares to expose the cavities.

Fig. 13. The basis of a molaris whose points were worn down, and the bony part which projected into those points exposed.

Fig. 14. A molaris whose bony part is wholly exposed, and only a circle of enamel left, covering the sides all round.

Fig. 15—16. A lateral view of the enamel of a molaris and bicuspis, cut longitudinally.

Fig. 17. A cuspidatus worn so much down as to expose the whole end of the bony part, a circle only of enamel remaining.

Fig. 18. An incisor slit down its axis, to show the enamel upon the body of the tooth, covering much more of the convex than of the concave part.

Fig. 19. An incisor, showing the same as fig 17.

Fig. 20. A horse's tooth slit down its whole length, to show how the enamel is intermixed with the bony part, and that it passes through the whole length of the tooth. The enamel is represented by the white lines, which are penniform, showing the striated texture of the enamel.

Fig. 21. The grinding surface of a horse's molaris, to show the irregular course of the enamel.

Fig. 22. An incisor a little magnified, slit down its middle, to show that the enamel is striated, and that the striæ are turned towards the centre.

Fig. 23. A grinder in the same state, to show the same circumstances.

Fig. 24. The basis of a molaris broken through, showing that the enamel is striated in this view also, and that the striæ point to the centre. N.B. The teeth must be broken to show these facts.

Fig. 25. An old tooth, whose basis has been worn down below the original termination of the cavity in the body of the tooth, and that end has been filled up, in the same proportion with new matter, to prevent the cavity being exposed. This matter is of a darker colour, as represented in the figure.

Fig. 26. Another tooth in the same state.

PLATE VI.

Fig. 1—10. Show the gradual growth of the two jaws, especially of the alveolar processes.

Fig. 1—2. One side of the lower and of the upper-jaw of a fœtus, about three or four months old. *a a* the groove which is afterwards formed into sockets.

Fig. 3—4. One side of the lower- and of the upper-jaw of a fœtus about six months old, at which age some of the partitions *a a* have shot across near the anterior part, forming distinct cells.

Fig. 5—6. The upper- and lower-joint of a new-born child, showing the last-mentioned circumstance in a more advanced state.

Fig. 7. The lower-jaw of a child seven or eight months old, (in which the two first incisors had cut the gum,) showing the sockets of six teeth. The mouths of the alveoli are observed to be contracted over the teeth, especially those of the grinders, where they have not yet begun to open for the passage of the teeth.

Fig. 8. A sketch of an upper-jaw, where the cuspidatus of that side had been formed high up in the jaw, and therefore never could appear through the gum. *a* the fang of the cuspidatus. *b* its body contained in the upper-jaw and alveolar process.

Fig. 9. A sketch of the upper-jaw of a child, where the cuspidatus was inverted, so that its point was turned up against the jaw, and the growing mouth of its cavity towards the gum. *a* the point of the cuspidatus turned up against the jaw. *b* the open and growing part of the tooth, which should be formed into a fang.

Fig. 10. The outline of the lower-jaw of a child, to show that the condyle is then nearly on a line with the gums.

Fig. 11. One side of the upper- and lower-jaw of a subject about eight or nine years of age, where the incisores and cuspidati of the fœtus were shed, and their successors rising in new sockets; showing likewise the two grinders of the child, with the bicuspides forming underneath. The adult grinder was ready to cut the gum; and the second grinder of the lower-jaw is lodged in the root of the coronoid process, and in the upper-jaw it is in the tubercle.

Fig. 12. Part of the lower-jaw cut through at the symphysis. The incisor of the child is standing in its socket, and the adult incisor forming in a distinct socket underneath.

Fig. 13. Another view of the same piece of the jaw, to show that the bicuspides are formed in distinct sockets of their own, and not in the socket of the grinder which stands above.

PLATE VII.

Fig. 1. The five teeth in the half of each jaw of a fœtus of seven or eight months, showing the progress of ossification from the first incisor to the second grinder.

Fig. 2. The same teeth somewhat further advanced.

Fig. 3. The teeth of a child eight or nine years of age, showing the five temporary teeth in a more advanced state, with the first adult grinder. The adult incisores and one cuspidatus are also begun to be formed.

Fig. 4. The teeth of one side of both jaws, from a child of five or six years of age. B B, C C the temporary teeth almost completely formed. A D seven; viz., four above and three below, of the succeeding teeth, seen at the roots of the first set. E E the bodies of the first adult grinders nearly formed.

Fig. 5. The teeth of one side of both jaws, from a child of seven years of age. This is an age in which there are more teeth formed and forming than at any other time of life. B C, C C the ten temporary teeth complete. A D ten incomplete to succeed them. E E two adult grinders, making twenty-two in this side, and of course forty-four in the whole. *a a a a* the fangs of the temporary teeth, beginning to decay at their points.

Fig. 6. The teeth of a child eight or nine years old; principally to show the progress of the second set, and the beginning and decay of the first set. A A the first incisores of the second or permanent set. B the second incisor. C the cuspidatus. D E the bicuspides. F G the two first molares. *a b* the temporary incisores, the first of which in the upper-jaw is wanting, having been shed. *c* the cuspidati. *d e* the temporary molares.

Fig. 7. The teeth of a youth about eleven or twelve years old, showing the further progress of the one set towards perfection, and of the other in their decay. *a a a a* the incisores of the second set, which had all cut the gum. *b b* the basis of the third molaris, or dens sapientiæ. *c c* the remaining molares of the first set, with decayed fangs. *d d* the two first molares of the second set, so much advanced that they had cut the gums.

PLATE VIII.

Fig. 1—2. The lower- and upper-jaw of a fœtus, from which part of the gum and bony socket is taken off, to expose the membrane which incloses the teeth.

Fig. 3. The lower-jaw of a new-born child, where this inclosing membrane is opened, to show the bodies of the teeth which were covered by it. The blood-vessels which run in its substance are also exposed.

Fig. 4. That part of the jaw and gum which contains the cuspidatus: the whole is a little magnified. The membrane is opened and turned off on each side, and the fore-part is turned down: the upper part of the pulp is covered with its bony shell, which is seen by its want of vessels.

Fig. 5 and 6. The pulp of a cuspidatus, and the pulp of a grinder, magnified. The ossifications are removed to show that the pulps are of the same shape with the teeth which are formed upon them. As far down on the pulp as the vessels are seen, the ossification had advanced; which shows that it is more vascular where the operation of ossification is going on. The lower ragged edges represent the borders of the capsulæ turned down.

Fig. 7. One of the grinders of the lower-jaw, sawed down to expose the two cavities or canals leading to the body of the tooth, where they unite and form a square cavity. In these two canals are

seen two arteries, which run on to the common cavity, and there ramify. The veins are not injected. The whole is magnified. In the body of the tooth may be observed a number of strata, each of which is lost in the circumference of the tooth.

Fig. 8. An incisor prepared and magnified in the same manner, showing the same circumstances in that tooth.

Fig. 9. The production of the permanent rudiment by means of a process given off from the temporary, shown in a lower incisor.

Fig. 10. The rudiments in a more advanced stage; the permanent being now inclosed in its proper socket, though still connected with the temporary.

Fig. 11. The connection between the temporary tooth and the permanent rudiment, as it exists after the former has passed through the gum.

Fig. 12. A view of the lower-jaw, after the whole of the temporary teeth have passed through the gums, showing the relative position of the temporary teeth, and the rudiments of the permanent at this period.

Fig. 13. Shows the formation and cavity of the fangs of the molares. The upper row are those of the lower-jaw, and the lower those of the upper. A A, *a a* is the common cavity in the body of the tooth; which in the second, *a a*, is deeper than in the first. B shows the bony arch thrown over the mouth of the cavity, and dividing that into two openings, which give origin to the two fangs. C D E the progress of these fangs. F a molaris of the upper-jaw, where the mouth of the cavity is a little tucked in, at three different points, from which three ossifications shoot. G shows these ossifications, and the beginning of these fangs. H I K show the gradual growth of these fangs.

Fig. 14. Is a comparative view of the incisors and grinders of the child and adult; for the better understanding of which they are sawed down the middle, showing, in a side view, the gradual increase of these teeth. The uppermost row is of the child, and the lower of the adult. *a b c d* show the gradual growth of the body, fangs and cavity of the incisors of both ages. *e f g* show these circumstances in the grinders.

Fig. 15. 1—7 show the gradual growth of a single tooth, from its formation nearly, to its being almost complete.

Fig. 16. A series of grinders of the child, from their being complete, to their utmost decay. *a* is a grinder of the upper-jaw nearly complete, in which the three fangs are almost formed. *b* has some of its fang absorbed. *c* more. *d* still more. *e* nearly all gone, and *f* the whole of the fangs gone, only the neck and body remaining.

Fig. 17. A series of incisors in the same state. No. 1. a completely formed tooth; 2, the fang somewhat decayed; 3, more so; 4, still more; 5, the fang almost gone; and 6, the whole fang gone, the neck and body only remaining.

Fig. 18. A horse's tooth that was just ready to be shed. The three parts of the tooth, which stand up, inclosed the rising end of the young tooth. This is all that was left of a long tooth.

PLATE IX.

Fig. 1. The penis slit open, showing a stricture in the urethra, about two inches from the glans. The stricture is but slight. A A the cut surface of the corpus spongiosum urethræ. B B the canal of the urethra, in which may be observed the orifices of the lacunæ. C the stricture.

Fig. 2. The penis slit open for about three inches, to show the lacunæ, which become occasionally an obstruction to the passage of the bougie. A A the corpus spongiosum urethræ. B B the internal

surface of the canal of the urethra, pointing to the orifice of two of the lacunæ. C a bristle introduced into a lacuna. D the end of the bougie introduced into the remaining part of the urethra.

PLATE X.

The urethra opened in two different places, one before the stricture, the other behind: the one before is through the body of the penis, the other behind is upon the anterior surface of the membranous part; and a bougie passes from the one opening to the other. A A the crura penis and bulbous part of the urethra, all blended together by inflammation and suppuration, which has taken place in many parts. B B the prostate gland in a diseased state. C C the cut edges of the bladder. D the urethra behind the stricture, very much enlarged; irregular on the surface in consequence of ulceration. E E the cut surfaces of the corpora cavernosa penis. F F the cut surfaces of the corpus spongiosum urethræ. G G a bougie passing from the sound to the unsound part of the urethra. H a small bougie in the new passage.

PLATE XI.

Two canulas for applying caustic to strictures in the urethra.

Fig. 1. A straight silver canula, with the plug projecting beyond the termination of the canula, making a rounded end; at the other end of the wire is a small port-crayon, in which is represented a piece of caustic.

Fig. 2. A flexible canula, for applying caustic to strictures in the bend of the urethra. The wire with the small port-crayon, is pushed out beyond its end.

Fig. 3. A piece of silver wire, with the plug at the end, to be introduced into the canula, as in figure 1.

PLATE XII.

The bladder and penis of a person who died of a mortification of the bladder in consequence of a stricture and stone in the urethra. In this plate not only the stricture is represented, but the thickened coats and fasciculated inner surface of the bladder; as also the small stone, which acted as a valve or plug; beside which, a canula is introduced from the glans down to the stricture, showing the practicability of destroying it with caustic. A A the bladder, cut open, showing its coats a little thickened, and its inner surface fasciculated. B the body of the penis. C C the corpus spongiosum urethræ, cut open through its whole length, exposing the urethra. D the prostate gland divided. E a silver canula introduced into the urethra, through which the caustic is passed on to the stricture. F points out the stricture, with the stone lying above, so as entirely to prevent the passage of the urine.

PLATE XIII.

An enlarged prostate gland, particularly the valvular process, which has increased inwards, into the bladder, in form of a tumour; in consequence of which the water passed with difficulty, which became the cause of the increased thickness of the bladder. A the prostate gland. B the projecting part passing into the cavity of the bladder. C C a bristle in the urethra, to show it is above this tumour. D the cut edge of the bladder, which shows its increased thickness.

PLATE XIV.

A kidney, the ureter, pelvis, and infundibula of which are very considerably enlarged in consequence of a stricture in the urethra. A the substance of the kidney, which has become very thin. B B the infundibula much enlarged. C the pelvis very much enlarged. D the ureter increased more than ten times its natural size.

PLATE XV.

The valvular part of the bladder, so increased as to form a considerable tumour, projecting into the cavity of the bladder. The prostate is also enlarged. This tumour had been the occasion of several severe suppressions of urine, and had often been the cause of a failure in drawing off the water with a catheter, by that instrument, most probably, passing into its substance so deep as to hinder the urine entering its openings. The dark line, passing along the tumour from the urethra, was probably made by this means, but now collapsed. A A the cut surfaces of the prostate gland. B B the inner sides of the prostate gland projecting inwards. C the tumour. D the cavity of the bladder.

PLATE XVI.

In this plate is represented the embryo of the chick in the incubated egg, at three different stages of its formation, beginning with the earliest visible appearance of distinct organization. The preparations from which these figures are taken form part of a complete series, contained in Mr. Hunter's collection of comparative anatomy. They are meant to illustrate two positions laid down in this work, viz. That the blood is formed before the vessels, and when coagulated, the vessels appear to arise; that when new vessels are produced in a part, they are not always elongations from the original ones, but vessels newly formed, which afterwards open a communication with the original.

Fig. 1. In this figure the only parts that are distinctly formed are two blood-vessels; on each side of these is a row of small dots or specks of coagulated blood, which are afterwards to become blood-vessels.

Fig. 2. The formation of the embryo is further advanced, vessels appear to be rising up spontaneously in different parts of the membrane; and the specks, out of which they are produced, are in many parts very evident.

Fig. 3. The number of blood-vessels is very considerably increased; they now form a regular system of vessels, composed of larger trunks, and a vast number of ramifications going off from them[a].

a These figures were selected by Mr. Hunter for their present purpose, from an extensive series of drawings of the embryo of the goose at different stages of development, and of which he left only a general account in manuscript, but no detailed descriptions. The above explanations of the figures were doubtless added by the Editor of the original Edition of the 'Treatise on the Blood';—that they are not from the pen of Mr. Hunter, is evident from the fact of there being upwards of ten figures in the original series, showing as many stages of the development of the embryo, *earlier* than that represented in Fig. 1, but with a visible and distinct organization. After a comparison of these figures with the embryo of the fowl and emeu at corresponding stages of development, I would propose the following explanation of them. At the period represented in Fig. 1, red blood is not formed, but although "the heart is beating, it then contains a transparent fluid before any red globules are formed," as Mr. Hunter has justly observed, (vol. iii. p. 66 of the present Edition). The colourless fluid which circulates at this period, when the chick may be compared with the white-blooded invertebrate animals, is not, however, composed entirely, as Mr. Hunter supposed, of the serum and lymph, but contains many colourless globules, smaller than the red blood-discs of the mature bird, and presenting, under a very high magnifying power, a granular structure like the colourless nuclei of the blood-discs. While, however, the embryo thus exhibits an analogy to the white-blooded animals in the nature of its circulating fluid, it expresses at this, and even at an earlier period, the essential characters of the great division of animals to which it belongs. The row of dots, on each side of the two longitudinal white lines, are the primitive cartilages in which the ossification of

PLATE XVII.

This plate represents a section of the human uterus in the first month after impregnation. The uterus itself is a little enlarged in size, and thickened in its substance; its cavity, everywhere lined with a coagulum of blood, having a smooth internal surface, but adhering firmly to the uterus.

The arteries are injected, to show that it is uncommonly vascular, and vessels are found to be injected in different parts of the coagulum.

The object of this plate is to show the readiness with which vessels are formed in coagulated blood, when attached to a living surface, and its vascularity being to answer useful purposes in the machine; of which this is a remarkable instance, as it is to form the outer membrane of the fœtus, or the connecting medium between it and the uterus.

Fig. 1. A longitudinal section of the uterus, in which the cavity is exposed.

A. The os tincæ projecting into the vagina, of which there is a small portion, to show the length to which the os tincæ projects. B B. The cervix uteri. C C C. The coagulated blood, smooth upon its internal surface, although extremely irregular. D D. The cut surface of the substance of the uterus, which has so intimate a connexion with the coagulum that the one appears to be continued into the other. The laminated appearance is produced by the section of enlarged veins in a collapsed state, which are extremely numerous.

Fig. 2. Is a thin slice of the substance of the uterus and the coagulum adhering to it, dried, and viewed in a microscope, to show the vascularity of the uterus, whose vessels are distinctly seen, continued into the coagulum, and passing about halfway through its substance.

Fig. 3. Is a diagram for the purpose of explaining delusive sensations. (See vol. i. p. 332). A B two portions of the brain. C the seat of the disease, and D the seat of sympathy, which are respectively supplied with the nerves G H, between which passes a communicating nerve F. E the brain.

Fig. 4. Represents an aneurism of the aorta, making its way through the anterior part of the chest. A A the ends of the aorta. B the first sac, which contracted at C, and having proceeded to *d*,

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the vertebræ commences; and the lines themselves are the folds of the serous layer of the germinal membrane, including the rudiments of the spinal chord and brain; the three divisions of which, viz., medulla oblongata, optic lobes, and cerebral hemispheres, are indicated by the dilatations which succeed each other from behind forwards, towards the anterior or upper end of the embryo. The semicircular white line, surrounding the rudimental head, is the fold of the serous layer of the germinal membrane, forming the circumference of the depression in the yolk, into which the head is beginning to sink. This fold afterwards extends downwards over the dorsal aspect of the embryo, and forms the amnios. The concave edge of the fold thus descending, is slightly indicated near the lower dilated part of the embryo at Fig. 3. The projection on the right side of the embryo (which is seen from behind) opposite the second cerebral enlargement, is the *punctum saliens*. There is little doubt that Mr. Hunter intended this figure to represent the stage at which colourless blood is circulated, as described in the passage above quoted. And it may be observed that this most interesting fact in the history of the development of the vertebrate embryo, has been lately reproduced (by MM. Coste and Delpech), and generally received as a recent discovery.

The 2nd figure illustrates the observation, "The globules do not appear to be formed in those parts of the blood already produced, but rather to rise up in the surrounding parts." The outline of the *punctum saliens*, or rudimental heart, is rendered conspicuous by the red blood which it now circulates: the red globules are aggregated in different parts of the *opake area*. In the third figure the zonular, or terminal sinus is formed, and the circulation of red blood is established in the omphalo-mesenteric vessels, distributed over the yet incomplete vitelline sac. It is obvious from Mr. Hunter's own description, that vessels, and the heart itself, preexist in the embryo to the formation of red globules; and I have myself observed, in the surrounding opake area, at the period corresponding to that represented in fig. 1., canals already established before the red colouring matter had made its appearance.—R. Owen.