Figs. 5, 6, 7, 8, and 9. Schematic sections of imperforation of the Rectum and of its abnormal terminations: (*r*), Rectum; (*n*), Nates-fold; (*a*), Anal-invagination; (*b*), Bladder; (*v*), Vagina.
Fig. 10. Schematic delineation of an Ectopia of the Bladder, according to Foerster.
Figs. 11, 12, 13, and 14. Schematic representation of Hydroceles.
Fig. 11. Hydrocele canalis vaginalis testiculi *aperta*.
" 12. Hydrocele fundi canalis vaginalis testiculi *clausa*.
" 13. Hydrocele colli canalis vaginalis testiculi *aperta*.
" 14. Hydrocele colli canalis vaginalis testiculi *clausa*.
(*a*), Piece of the Peritonæum viewed from within; (*b*), Open canalis vaginalis; (*c*), Testicle; (*d*), Dropsical distension of a portion of the Inguinal Canal.

PLATE IV.

Figs. 1–3. Bothriocephalus latus.
Fig. 1. Head, natural size.
Fig. 2. Magnified head with long neck.
Fig. 3. Single pieces. The sexual opening is seen in the centre of each joint.
Figs. 4–7. Tænia solium.
Fig. 4. Head, natural size.
Figs. 5 and 6. Magnified Head, seen from the side and from above.
Fig. 7. Joints. The sexual opening is seen at the side.
Figs. 8–9. Ascaris lumbricoides, Round-worm.
Fig. 8. A ruptured female of natural size, with prolapsed intestines. The brownish-colored pouch is the alimentary canal, the white coils are the ovaries.
Fig. 9. The curved tail of the male with double prongs, magnified.
Figs. 10–13. Oxyuris vermicularis, Thread-worm.
Figs. 10 and 11. Female, natural size and magnified.
Figs. 12 and 13. Male, magnified and of natural size.
Figs. 14 and 15. Tricocephalus dispar, Whip-worm, natural size.
Fig. 14. Female. Fig. 15. Male.

PLATE V.

Figs. 1 and 2. Schematic section of (1) normal, and (2) rachitic infantile thorax.
(1.) Sternum. (2.) Costal Cartilages. (3.) Ribs. (4.) Ribs divided by the section. (5.) Intercostal spaces. (6.) Fifth dorsal vertabra. (7.) Heart. (8.) Bulbous, rachitic hypertrophy.

PLATE VI.

Fig. 1. Rachitic costal ends, according to Virchow.
Fig. 2. Sections of the same.
Fig. 3. Section of a rachitic femur.
Figs. 1, 2, 3. (*a*), bluish layer of large cancellous bony extuberance; (*b*), Goblet-shaped tumefaction of the young bones; (*c*), Dentated wave-line between the cartilage and bone.
Fig. 4. Rachitic Skull. Craniotabes, according to Elsaesser. On the light-colored places the calcareous salts have disappeared, dura mater and pericranium are in contact with each other.

PART I.

INTRODUCTORY REMARKS.

J. Costamoeta

CHAPTER I.

ANATOMO-PHYSIOLOGICAL REMARKS UPON THE INFANTILE ORGANISM.

A. Respiration and Circulation.—The first act of the new-born is to inspire. Immediately after birth the muscles of inspiration contract, and the air finds its way for the first time into the pulmonary vesicles. The increase in volume of the lungs consequent upon this act gives rise on the one hand to an outward enlargement of the thorax, but on the other to a compression of those internal organs of the chest in juxtaposition with the lungs, *i. e.*, heart, large blood-vessels, and thymus gland, and also to a depression of the diaphragm, whereby a palpable pressure is necessarily exerted upon the abdominal viscera. This sudden change in volume of both thoracic and abdominal viscera, in connection with other physiological alterations, leads doubtless to alterations in the circulation of the different organs, and the following fœtal circulation, in fact, becomes established immediately or soon after birth.

(1.) *The Ductus Venosus Arantii* (Plate I., Fig. 2).—The umbilical vein arising from the placenta (Pl. I., Fig. 5), after its entrance through the umbilical ring, runs between the peritonæum and transversalis muscle to the liver, and through the fossa longitudinalis anterior sinistra backward to the left end of the fossa transversa. Here it divides into two branches, of which one, the larger, communicates with the portal vein, and the smaller, the *ductus venosus Arantii*, leads into the inf. vena cava (Pl. I., Fig. 3). The duct. ven. Arantii, therefore, connects the vena cava ascendens with the umbilical vein, but this connection, as well as that with the portal vein, ceases as soon as the placenta is expelled from the uterus, and the blood in the umbilical vein has become stagnant, and the first inspiration taken place.

(2.) *The Ductus Arteriosus Botalii* (Pl. I., Fig. 2) is, in the fœtus, a communicating canal between the pulmonary artery and the aorta. It arises at the point where the pulmonary artery divides into the two branches, then runs obliquely upward toward the lower border of the arch of the aorta, and joins the latter at a point opposite to where the left subclavian artery dips into it from above. It serves to arrest the blood in its course toward the lungs, and to conduct it from the right side of the heart directly into the great current again. The nearer the end of gestation arrives the smaller this vessel becomes, while the two branches of the pulmonary artery grow larger; the broader, however, this vessel is, so much the narrower is that portion of the aorta which lies between it and the heart. And now the lungs, dilated by the inspiratory muscles, not only draw in air, but also blood from the vessels; not only the *air-vessels*, but also the *blood*-conducting system of vessels, become distended. A stronger and faster blood-current passes from the pulmonary artery toward the lungs; the artery sends no more blood through the fœtal passage communicating with the aorta (*the ductus Botalii*), and the latter is so quickly obliterated, that in a child twenty-four to thirty-six hours old it is scarcely large enough to admit a probe.

(3.) *The Foramen Ovale.*—In the fœtus the auricular septum contains an opening (for. ovale), corresponding to the fossa ovalis in the adult. In this opening a semilunar membranous valve (valvula foraminis ovalis) is found, the upper border of which is free. In the fœtus this valve closes the foramen very imperfectly, so that a portion of the blood passes directly from the right into the left auricle, and thence, without permeating the lungs, into the general circulation. The nearer the end of gestation arrives, therefore, the smaller this foramen becomes, and the stronger and firmer the valve. After birth, the lungs are suddenly converted into a suction-apparatus, they therefore require a larger quantity of blood for their supply; the right ventricle also becomes distended, and thus the blood-stream is diverted from the foramen ovale. Although the border of the valve usually remains free for some months, still it is so well developed that it accurately closes the foramen. In children over eight to ten months of age, this border of the valve is generally found united with the corresponding border of the foramen ovale.

(4.) *The Umbilical Arteries* (art. umbilicales, Pl. I., Fig. 4).—Having spoken of the umbilical vein in connection with the closure of the duct. ven. Arantii, there only remains to describe the obliteration of the umbilical arteries. The two arteries originate from the corresponding arter. hypogastrica, are thicker than all its other branches, and pass upward along the bladder. They embrace the urachus and with it run upward between the abdominal muscles and peritonæum to the umbilicus. Passing through the umbilical ring, they run spirally in the cord, and reach the placenta, in which they divide and subdivide. As soon as the connection between the uterus and placenta has ceased, thrombi form in the umbilical arteries, reaching almost to their origin from the hypogastrica. These arteries remain pervious for a short distance from their point of origin, and here give off several arter. vesicales; in the female, in addition the arter. uterinæ. The remaining portion, between the arter. vesic. and the ring, ultimately becomes obliterated and converted into a fine white cord.

Together with these *mechanical* alterations, still more important *chemical* processes take place from the entrance of air into the lungs. Through the alternate action of air and blood, and the interchange of gases, which the walls of the capillaries lying against the pulmonary alveoli and the walls of the alveoli themselves have to transmit in two opposite directions, both air and blood are so altered, that the former becomes irrespirable, the latter arterial and thus qualified for nutrition. The new-born has now both arterial and venous blood.

Mention must be made here of an organ that solely belongs to the infantile organism, the *thymus gland.* The thymus is distinguished for great variation in size, weight, consistency, and form.

Embedded in the anterior mediastinum, it is sometimes confined to the space between the upper part of the pericardium and the roots of the large vessels, measuring in width barely half an inch, but sometimes reaching from the thyroid gland down to the diaphragm, and then measuring more than two and a half inches in width. Its principal arteries, according to *Jendrassic*, are branches derived directly from the large blood-vessels upon which it lies. According to the same author, to whom we are indebted for most of our knowledge concerning this enigmatical organ, the thymus is composed of two, often very unequal, parts, which are united by a membrane formed of several delicate laminæ, in which most of the principal vessels terminate. The form of such a thymus moiety most frequently met with is an oblong, the upper third sometimes thin and rounded, while the rest is more flattened and broader; a larger or smaller portion often curves upward like a horn from the lower end over the outer border of the gland. When the thymus deviates from this form, each half has the shape of thin cord-like stripes, or when of large size is divided into several rounded lobules, intimately united by a thin parenchymatous structure, lying near or upon each other.

In all instances the anterior surface facing the sternum is convex, the posterior slightly concave. The outer and lower borders are thin, often hem-like; the inner is blunter, provided with deep fissures, in which, as in a hilum, the blood-vessels dip.

At first the thymus is solid, firm, and granular, but in time becomes converted into a softer mass, in which many cavities may be found containing a fluid that almost always reacts acid. The softening progresses from the central axis, where the principal veins terminate in an extensive deposit of connective tissue toward the periphery. The gland grows constantly flatter, its cavities approach one another more closely, so that no more of a glandular parenchyma can be seen, and at the time of commencing puberty it has, as a rule, completely disappeared. Exceptionally, however, it may be found in adults, and sometimes even of decided dimension and weight. In tuberculous children it is found infiltrated with tubercular deposit. Carcinoma of the anterior mediastinum, which in children occurs comparatively more frequently than in adults, most probably has its starting-point in the thymus gland. The numerously-repeated statements, that in syphilitic children abscesses are to be found in the thymus, are, according to *Jendrassic*, based upon an erroneous supposition, for, in most instances, the supposed abscesses are nothing more than the cavities that are regularly developed in the retrograde metamorphosis of the gland, and are also found in children who are perfectly free from syphilis.

B. Secretions.—All the mucous membranes, which in the fœtal state produced but a slight amount of secretion, commence after birth to secrete their peculiar fluids. The mouth and nasal cavities become moist and lubricated, the latter often very imperfectly, so that it frequently becomes necessary to remove the dried mucous crusts. The salivary glands, it is true, also secrete a fluid, which, however, has not, as yet, the same perfect chemical properties as in the adult, for it is only able to very slowly convert starch into sugar. The stomach likewise begins to secrete a fluid, which dissolves the caseine contained in the milk of the mother. The liver, which fills up the greater part of the abdominal cavity, secretes a light-brown bile, which gives to the fæces, after the dark-brown meconium has been evacuated, an orange-yellow color.

The generally prevailing opinion, that the *meconium* is a mixture of bile, intestinal mucus, and intestinal epithelium, has been proven by *Foerster's* investigations to be incorrect. It consists rather of flat scales, which possess all the characteristics of flat epithelium, and consequently could not have originated in the intestinal canal, resembling in their entity those of the vernix caseosa: and, in addition, of fine hairs, in the same quantity as in the latter, fat-globules of various sizes—evidently cutaneous fat (Hauttalg, smegma cutaneum) peculiar to the vernix caseosa—crystals of cholesterine (which may partly originate in the bile, or may be retrograde products of the vernix caseosa), and irregular brownish and yellowish lumps and flakes, which give to the meconium its dark color, and without doubt the coloring matter of the bile. It is therefore evident, that the meconium, excepting the last-mentioned substances, which originate in the bile, consists principally of *vernix caseosa;* and from this it may be inferred that the fœtus from time to time has swallowed a tolerably large quantity of amnion containing the vernix caseosa in suspension, the water of which is quickly absorbed by the stomach, for none is ever found in it, but the hairs and scales pass through the whole intestinal tract as indigestible substances.

After birth the intestines secrete a certain amount of mucus, an excessiveness or deficiency of which will give rise to diarrhœa or constipation, the first and most frequent diseases to which the nursling is subject.

Quite a severe task is imposed upon the kidneys immediately after birth. In the first few days children drink but very little, the blood consequently can part with only a very small quantity of water, and thus it happens that the uric acid salts, the result of the great metamorphosis of the tissues, quickly accumulate in the urinary tubules, remain undissolved there, and from this too highly concentrated solution the product that has been called the *uric acid infarction* of the new-born is deposited. The uric acid concretions are yellowish-red or pink-red casts of the pyramids near the papillæ. Generally they appear for the first time on the second day after birth, and last from five to twelve days, but I have also found them in children more than four weeks old. As this condition has been said to exist in the still-born, in very exceptional cases it is true, and, since a considerable number of children who die between the second and fourteenth days do not exhibit it, no very great medico-legal value can therefore be placed upon it. It is frequently found as a carmine red powder in the diapers of the new-born, an occurrence that has also been noticed by some observing midwives. Microscopic examination reveals minute columns composed of cylindrical, amorphous, urate of ammonia, and epithelium cells, with here and there solitary rhomboid uric acid crystals. On the days this powder is found in the diapers, the children are usually restless, cry on micturition, and have an inflamed meatus. Although its origin and excretion must be regarded as physiological, nevertheless it cannot be denied that kidney gravel, so frequent in children, as well as the occurrence of urinary calculi in childhood, has some connection with it.

The skin, which during fœtal life was continuously of the temperature of the maternal blood, with the act of delivery becomes a colder medium, for now it is subject to the impressions of the air, light, and changes of temperature, and also assumes the function of secretion. At birth it has a uniform red color, which, however, between the second and sixth day, changes to a yellowish and then into the ordinary rosy-red tint. The yellowish color is often erroneously regarded as icteric. New-born children are covered almost all over the body, with the exception of the palms of the hands and soles of the feet, with fine, soft, often tolerably long hairs (lanugo), which fall out in the first weeks of life. So, too, the strong hairs upon the head with which children sometimes come into the world, fall out in the first weeks of life, and are only slowly replaced by a fine, generally light-colored growth of hair. Feeble children, of slow development, and those devoid of solid adipose tissue, retain these first hairs much longer than those which develop rapidly. In the first weeks of life the sweat-glands perform their function but very imperfectly; it is almost impossible to bring a child, under four weeks old, into such a state of transpiration that the perspiration will gather in drops.

On the other hand, from the beginning of the second month up to the end of the first year, the secretion of the sebaceous glands of the scalp in almost all children is increased in amount, forming seborrhœa capillitii, which should be classed with the physiological conditions. This seborrhœa capillitii develops very gradually; at first, the scalp looks as if it had been smeared with tallow or cerate; upon this hard skin dust and dirt become adherent, and, with the lardaceous secretion of the skin, dry into grayish-white or yellowish, and, subsequently, into brown and even black scabs, which crumble easily between the fingers, become detached, and leave the scalp in a healthy, uninjured state, and not even congested. It is not attended by any itching, moisture, or cutaneous infiltration. By a diligent application of olive-oil, and washing the head with soap and water, this formation of scabs may be arrested without any danger to health. In many places, in Munich for instance, the midwives have accused this affection of being a *noli me tangere*. It is but seldom possible to persuade the mothers to try the just-described method of treatment, most of them leaving the brown scabs untouched till the end of the first year, when the seborrhœa ceases spontaneously, and the scabs, by the constant growth of the hair, are separated more and more from the scalp, and finally dry up and crumble

away. Afterward, no simple seborrhœa capillitii ever occurs in children.

C. THE GENERAL GROWTH OF CHILDREN, AND OF SPECIAL PARTS OF THEIR BODIES.—The child grows most rapidly in the first weeks of life; in the first year, from six to seven inches. From the fourth or fifth year up to the sixteenth, its growth is tolerably regular, and amounts yearly to two inches, more or less. From the sixteenth to the seventeenth year, the body increases only one and a half inches; in the two succeeding years only one inch. Most persons grow only to the end of the twentieth year, but in some growth is only completed at the end of the twenty-fifth year. Imperfect nutrition, and too hot and too cold a climate, hinder growth. Acute febrile diseases interfere in no way with it; on the contrary, they accelerate it most decidedly, and this is especially true of the acute exanthemata. In an acute febrile disease of a few weeks' duration, children often grow a half or one inch, while in the physiological state this would take three or six months time. Indeed, they even appear to have grown more than that amount, on account of the great emaciation that ensues. Diseases of the bones, rachitis, and scrofulous affections, retard the growth. When children grow too rapidly, they become emaciated, weak, pale, and inert. In about one and a half to two months the child begins to hold the head erect and to turn it voluntarily, especially toward the light. Not till the seventh or eighth month does it learn to sit, and still later in the ninth and tenth the functions of the lower extremities are developed, the child beginning to stand, and several weeks thereafter to walk.

The growth of all parts of the body does not always progress uniformly; often the head grows more than the other portions, and the extremities more than the trunk and head; most frequently the thorax, in consequence of our defective physical rearing, is much retarded in development as to its breadth.

Sometimes it is of importance to accurately decide the dimensions of the bones of the skull, and the following points of measurement have therefore been agreed upon: (1.) *The largest periphery of the head.* For this the measurement is taken from the tuberosity of the occipital bone to the greatest prominence of the frontal bone. In marked chronic hydrocephalus the occipital bone is more horizontal, and the largest periphery, therefore, strikes above the tuberosity of the occiput. (2.) *The measurement from one ear to the other.* It runs from the upper part of attachment of the auricula over the greater fontanel to a point opposite. (3.) *The measurement from the occiput to the root of the nose,* is from the occipital protuberance over the top of the head to the glabella. These three measures may be taken with some strips of paper, or still better, with a tape measure divided into half and quarter inches. The diameters must be measured with a compass. The transverse diameter has its terminal points at the protuberances of the two parietal bones, the longitudina' diameter at the lesser fontanel and the greatest protuberance in the centre of the forehead.

A thorough knowledge of the greater fontanel and its physiological closure is of great importance to the physician. The fontanels are conditional upon the development of the skull. The angles of the bones of the skull will necessarily have to be the last formed, as the process of ossification of the fœtal skull progresses from several points of ossification, which, by the addition of ossific matter to their peripheries, grow uniformly in every direction. But since the cranial bones at first have a roundish contour, there will remain, when the several plates of bone come together, a space between them, which will have as many margins as bony plates. These openings, covered only by a membranous tissue, are called fontanels. Now, since the parietal bone in its developed state has four angles, a fontanel would have to form at each of these in the embryonic state, but as the upper angles of both parietal bones lock together, so that their fontanels coalesce, only six fontanels can be produced, of which the frontal and occipital are single, but the anterior and posterior parietal fontanels, on the contrary, are disposed in pairs.

In a child at full term, only the large four-cornered frontal fontanel exists, the square of which forms a rhombus, with unequally inwardly-curved borders. It originates from the union of the two frontal and the two parietal bones; the angle formed by the union of the frontal bones being sharper than that formed by the union of the two parietal. The greater fontanel seldom closes completely before the end of the second year. *The enlargement of this fontanel till after the ninth month of life* is a very remarkable occurrence, to which *Elsaesser* first called the attention of the profession. To ascertain its size, *Elsaesser* chose a method by which probably a more precise and at least more relatively definite determination of its square space is arrived at, while at the same time it supplies a briefer expression. He measured the distance of two parallel sides, lying opposite each other, from their centres outward, the distance of the two other parallel sides was then similarly ascertained, the two numbers resulting therefrom were then added together, and the half of that was accepted as the diameter of the fontanel. This method furnishes more exact results than when the measurement is taken from one *corner* to the opposite one. In the latter case the result is wholly unreliable, because the

angles often extend tolerably far into the sutures in the form of very narrow fissures, whereby the boundary from which the measures are to be taken is always subject to arbitrariness.

The relative sizes of the anterior fontanel were in the trimesters as follows:

Trimesters.	No. of Children.	Average Diameter of the Fontanel in French lines.
1 to 3 months.	10	9 60
4 to 6 "	15	11.93
7 to 9 "	7	13.90
10 to 12 "	13	11.88
1 to 12 months,	45	11.60
In this period the fontanel is always open.		
13 to 15 months.	9	7.77

Of these nine children the fontanel is closed in 3, in one 5, in the rest 10 to 15 lines wide.

16 to 18 months: eight children. In 4 the fontanel is closed; in the rest 2, 3, 9, and 10 lines wide.

19 to 21 months: five children. In 2 closed; in the rest, 5, 12, and 12 lines wide.

22 to 24 months: seven children. In 5 closed; in the rest 9 and 15 lines wide.

From this it follows—

1. That the anterior fontanel, during the first year of life, is smallest in the new-born, and in the course of the first trimesters.

2. That it then *increases in size* up to the third trimester; and,

3. It does not decrease again till the fourth.

The question which instantly strikes one here, "How is this enlargement of the circumference of the greater fontanel to be explained?" may be answered, according to *Elsaesser*, in the following mechanical way: The greater fontanel forms a square, with its angles directed forward and backward, right and left. Through the angles two bony fissures of the skull run, a transverse (the coronal suture) and a longitudinal one (sagittal and frontal). Now, if we suppose that the surface-growth of the bones of the skull occurs in this wise, that on their borders new layers of bony substance are constantly formed, the relative bones will be driven asunder by the newly-formed epiphysis on the borders of each suture. Now, if this happens to the *fissures terminating at the fontanels*, then they will necessarily grow larger in every direction, if their borders do not also grow at the same time. The borders, however, of the fontanels do indeed grow, but only in the same proportion as the margins of the sutures, and this suffices to explain the mechanical enlargement of the fontanel. If we think but a little further, that if only one of the above-named principal sutures—the transverse for example—receives new additions of matter, the other, the longitudinal, remains unaltered, supposing, still further, that on each border of the transverse suture material is added in a certain period of time, amounting to the breadth of one French line, then the fontanel at the expiration of this period will in this case have its old diameter again, although the borders have grown by one line within that same period of time. Thus, then, a uniform growth of all the borders of the bones has been presupposed, the diameter of the fontanel remaining unaltered, if only one suture passed through it, or if no addition of substance whatever took place. But the latter occurs in the longitudinal suture in the same proportion as in the transverse. And since, in the growth of the borders of the transverse suture by one line, the borders of the fontanel must also grow by one line if its diameter should remain the same, then the same results in the longitudinal suture, if, uniformly with the transverse suture, it grows by one line in breadth; or, in other words, if the diameter of the fontanel is to remain unaltered during the time in which the borders of the transverse and longitudinal sutures grow by one line, it must increase by *double the quantity*, namely, by two lines. This, however, does not take place, the fontanel growing in about the same proportion as the margins of the sutures (thus, in the presumed period of time merely by one, not by two lines), and it must, therefore, constantly increase in circumference. This is also actually the case. To whom the preceding explanation should not be distinct enough, let him take the trouble to cut out from paper four times the two contours, Pl. II., Figs. 1 and 2, and then to set them together with the blunt angles in such a manner that the fine lines *a* and *a'* of each figure will form a square.

Fig. 2 represents an accurate drawing of one of the bones of the skull which has participated in the formation of the greater fontanel, the plate of bone having increased in a given time by one line all around from its original size, as in Fig. 1.

So long as the borders of the sutures continue to grow in the same proportion as the borders of the fontanels, the steady enlargement of the fontanel naturally will continue. But a period arrives when the borders of the sutures become ossified, forming *seams*, in a more limited sense, and the entire head at the same time enlarges at a slower rate. The result of this is, that the bony margins cannot further separate or be displaced, and that the unchecked continued growth of the ununited fontanel-borders has for its object the gradual diminution of the fontanel. The period of the simultaneous formation of the sutures, and the diminution of the fontanel, in healthy children, occurs about the ninth month. The fontanel does not, however, become completely closed till after the fifteenth month.

The enlargement of the greater fontanel in the first three trimesters is, therefore, neither pathological, nor rachitic, but a physiological condition.

The purpose of the greater fontanel is considered in a one-sided manner, from its negative point of view only, deficiency of firm ossified covering, while its form, position, increase of size, taken in connection with the whole development of the child, show an actual, positive purpose.

The skull and spinal column together form a firm, unyielding casing around the brain and spinal cord, so that the contents of the skull and the spinal canal can neither increase nor diminish in volume. Now in the first year of life, when the brain grows rapidly and is more predisposed to congestion than subsequently, an absolute fixation of the skull would not allow this physiological growth, consequently the greater fontanel exists as an elastic point, acting very much in the manner of a safety-valve.

While in congestion of the brain, and hydrocephalus, it bulges and arches outwardly, and thus lessens the pressure of the plethoric vessels or hydrocephalic effusion upon the brain, in cerebral anæmia and atrophy of the brain it arches inwardly and forms a depression on the top of the skull.

The brain grows most rapidly in the first months of life; at birth, it weighs less than one pound; in the second year nearly one and a half pounds. In the new-born, the cerebral substance is soft, almost homogeneous, and is not well defined into gray and white, or cortical and medullary substance. In the first year the dura mater is always, in the second quite frequently, firmly adherent to the calvarium, so that, in opening the skull, the dura mater has to be removed simultaneously with the calvarium. It therefore seems superfluous to describe this phenomenon as peculiar in the autopsy of every child under one year of age, as is the case in most reports of autopsies, in which also a special amount of stress is laid upon it.

THE ERUPTION OF THE TEETH.

The formation of the teeth, according to *Hyrtl*, begins as early as the first third of embryonic life. In the sixth week of pregnancy, according to *Goodsir*, narrow little grooves form at the future site of the maxilla between the barely-recognized lips and the rudimentary arch of the jaw. The margins of these grooves increase to ridges, by which the fissures are converted into excavations or inlets. At the bottom of these inlets little roots spring up, between which the curved ridges dip down and form cells for the roots. Every cell communicates with the mouth by an opening which, through the convergence of its borders, subsequently becomes closed. Thus the dental sac originates, and in its depth the dental papilla is implanted. The dental papilla serves as a nucleus for the deposit of the tooth-substance (cementum), the enamel being formed by the enamel germ, which crowns and envelops the head of the papilla, and into which the latter grows. In this manner the dental sacs of the first twenty teeth are developed, their ossification following in the fifth month of intra-uterine life. The sacs for the *permanent* teeth sprout on the posterior walls of the deciduous dental sacs, probably with hollow communications. By increasing growth they become cut off from these, but still hang to them by a thread-like attachment (gubernaculum dentis). All the sacs of the milk and permanent teeth are present in the maxilla of the new-born. The deciduous teeth in time grow upward toward the alveolar borders of the jaw, which is closed by cartilage. The cause of this upward growth is the successive development of the dental root. The cartilage of the gum and the upper wall of the dental sac disappear simultaneously. And the lateral walls of the dental sac become the periosteum of the dental root. Sometimes the cartilage disappears before the crown of the tooth has reached the upper surface; the erupting tooth then lies freely exposed in a shallow depression of the gum; often, however, it cannot be seen, but only felt, and is discovered by striking upon it with a spoon-handle—an experiment which may give much pleasure to the parents who are impatiently waiting for the appearance of the first tooth.

Attended by increased secretion and redness of the mucous membrane of the mouth, and various other symptoms to be treated of in the special part, the eruption of the first milk teeth begins. In the majority of healthy children the twenty deciduous teeth appear in the following five groups:

GROUP I.—Between the fourth and seventh months of life the two lower middle incisors appear almost simultaneously, whereupon a pause of three to nine weeks ensues.

GROUP II.—Between the eighth and tenth months of life the four upper incisors appear, following shortly upon each other. At first the two central, then the two lateral. The second pause amounts to from six to twelve weeks.

GROUP III.—Between the twelfth and fifteenth months of life six teeth appear at once, namely, the four first molares and the two lower lateral incisors; generally the molares in the upper maxilla first, next the lower incisors, and lastly, the molares of the lower jaw. A pause until the eighteenth month now ensues.

GROUP IV.—Between the eighteenth and twenty-fourth months of life the canine teeth cut through (the upper ones are called eye-teeth). Again a pause until the thirtieth month.

GROUP V.—Between the thirtieth and thirty-sixth months, the second four molares finally make their appearance.

This concludes the first dentition. The child has now twenty milk-teeth. In the fifth or sixth year of life the first molares cut through, and with them the second dentition begins. The arteries of the deciduous teeth become obliterated and their nerves disappear, and as they are thus deprived of their vitality they become loose by the enlargement of the alveoli and finally fall out without previously becoming carious. As the infantile maxilla is not large enough to allow the permanent teeth to be developed in a single row, the permanent canine is therefore compelled to grow in front of the external incisor and first molar, and to this remarkable situation of the canine tooth is also frequently due its faulty position after it has cut through. The *partition wall* which separates the alveoli of the permanent teeth from those of the milk-teeth is after awhile absorbed. In order that the first may follow the latter, and that they may not grow amiss, the constricted cord between each milk-tooth and the corresponding permanent tooth is again transformed into an open passage. The milk-teeth fall out again in about the same order as they appear. In the twelfth year the fourth molar appears, and finally between the sixteenth and twenty-fourth year the fifth molar, also called *wisdom-tooth*, the crown of which does not begin to ossify till the tenth year.

Although it cannot be maintained that all healthy children cut their teeth in the above-described order and time, yet this much is certain, that those children who follow this order suffer the least from the difficulties and sequelæ of dentition. Under the irregularities of physiological dentition the following observations in particular may be made. (1.) Irregularity in time: Children sometimes come into the world with teeth, as Louis XIV. and Mirabeau, without subsequently having a quicker general development. (2.) Irregularity in succession: Occasionally the upper incisors appear before the lower, and in such cases the lateral generally before the central; very rarely do the canine appear before the molares.