

Memoir on the reproduction of the opossum, *Didelphis virginiana* / by Ch.D. Meigs.

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ARTICLE VIII.

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Memoir on the Reproduction of the Opossum. Didelphis Virginiana. By Ch. D. Meigs, M.D.
Read March 19, 1847.

NOTWITHSTANDING Professor Owen has thrown so much light upon the gestation of the marsupiate, by his publication as to that process in the kangaroo, (*macropus major*), I hope a few additional observations that I have had an opportunity to make may be considered as an acceptable contribution to that curious point of natural history and physiology.

It appears to me that both M. Milne Edwards, in his *Elemens de Zoologie*, and M. Pouchet, in his *Zoologie Classique*, continue under great misapprehensions as to the state of the very early marsupial embryo; if, indeed, it deserves any longer to be considered as an embryo, or even as a *foetus*: terms which cannot, physiologically speaking, be rightfully applied to a mammiferous quadruped, enjoying in full force all the attributes of a warm-blooded and respiratory existence.

M. Milne Edwards, at p. 265 of his volume on the mammifères, after mentioning the peculiarities of the urethro-sexual canal and wombs, in the marsupials, adds: "Cette disposition entraine des anomalies extrême dans le mode de reproduction des marsupiaux; les petits ne se developpent pas comme d'ordinaire, dans la poche utérine, mais sont promptement expulsés au dehors, et naissent dans un etat d'imperfection telle qu' on ne peut les comparer qu' des embryons à peine ébauchés. Ce sont des petits corps gelatineux, informes et incapables de mouvement, dont les divers organes ne sont pas encore distincts, et dont l'existence serait impossible si la nature n'avait assuré leur conservation par des moyens particuliers."

M. Pouchet, at p. 262 of the *Zoologie Classique*, Tome I., says, "Le produit de la generation qui en arrivant la (*the pouch*), n'est qu' un simple ovule encore baigné de fluides albumineux, se trouve posé sur les tétines. . . . Ils ne prennent alors de nourriture que par la bouche sans jamais ainsi que l' a émis de Blainville, être en rapport avec la mère au moyen d'un ombilic."

I propose to show that M. Edwards and M. Pouchet are both mistaken in their views as to the state of the marsupial young, and that, instead of being little "corps gelatineux, informes et incapables de mouvements," or in the state of a "simple ovule encore baigné de fluides albumineux," it is in the full enjoyment of a powerful respiratory, circulating,

innervative existence, sustained by a most active gastric and intestinal digestion, in which an enormous liver plays its part as completely as in the largest quadrupeds.

The author of a very interesting article on the mammalia in the British Cyclopædia of Natural History, is under a similar misconception—and Professor Owen himself, who seems never to overlook any thing in his vast domain of scientific observation, appears not to have had opportunities of dissecting the organs of the very young marsupial. These are the considerations which lead me to offer to the society the remarks contained in this paper.

Perhaps it might be deemed that the two letters of Dr. Benjamin Smith Barton, Professor of Therapeutics and Materia Medica in the University of Pennsylvania, afford sufficient information upon this curious creature. But I think that though the letter to M. Roume, of Paris, contains much pleasing information, and the other communication to Reimarus, of Hamburg, is full of interest, the two letters together do not clear up some points in the case, which are disclosed by my recent opportunity to observe them,—and, moreover, Dr. Barton's pamphlets are rare—so much so, that I could not obtain an opportunity to examine them until procured by the kindness of Dr. Benjamin Horner Coates, who sent me his copies for perusal.

The Virginia opossum is so very common an animal in the United States, that one is the more surprised at the rarity of its occurrence in the early stages of its pouch life. I have in vain endeavoured, for many years, to procure a specimen of the earliest embryonal form, which, from the difficulty of obtaining it, is fit to be regarded as a zoological gem. I have, on frequent inquiry, found only here and there a person who had seen the young while very small. No one was able to give me information either as to the rutting season, or the duration of gestation—and it is commonly supposed that the young one grows to the teat by a true vascular anastomosis, and that it is indeed formed there in the pouch, *ab initio*. I have been surprised at the want of curiosity on the subject among the people, and at the total absence of any general opinion concerning the nature of its marsupial life. Many persons living in the country, and who frequently see the animal in the woods and swampy grounds, seem never to have made any inquiries on the subject. Of great numbers to whom I have spoken, I never have met with more than three individuals who had observed the young under two inches in length; and I presume, that of the twenty millions of souls now in the union, there are but few persons who are acquainted with the habits of the animal as to the season of its reproduction, the term of its uterine gestation, and the nature and duration of its marsupial growth. The animal is looked upon as one of the vermin, and hunted, out of a spirit of detestation or contempt.

Some fourteen years ago, I bought, at Camden, opposite to Philadelphia, a female with five young ones; each as large as a half grown rat, and still unweaned. I saw them take the teat, and creep on the mother's back and muzzle, and hold on by means of the prehensile tail, wrapped round her ear, or round her leg. I kept them several weeks in my garden.

In February, 1845, I also procured a female, with two young ones, as large as small kittens, which I sent to M. Flourens, at Paris, where they safely arrived at the Jardin du Roi.

The first named specimens came into my hands about midsummer, while the larger ones, those of 1845, were in the depth of winter. It is probable that the former specimens were weaned in March—and that the latter were nearly a year old, though Dr. Barton thinks they attain full growth in about five months, and he speaks of their weighing eighteen pounds.—Letter to Roume, page 15, note.

I am now in possession of a male and female, for which I am under great obligations to C. W. Sharpless, Esq., who was so good as to cause search to be made for them at his Seat, at Concord, Delaware county, twenty miles south-west from Philadelphia, and to send them to me by a special messenger.

A light snow having fallen on the 18th of February, the tracks of two of the animals were followed to the hollow trunk of a tree, from which they were taken.

I was accustomed, in my youth, to hunt the opossum, as a boyish frolic, and have caught many of them. I never saw two in company, and I believe they are solitary prowlers, except during the season of the copulation.

The fact that they were captured in company, and in the same trunk, leads to the conclusion that they had retired to the concealment for the rut; and this idea is confirmed by the state of the sexual parts of the dam, which were red and very turgid, while the testes of the male were also very heavy and large.

They were taken on the 19th of February, and sent to me on the 27th of the same month. I had them carefully fed, and frequently examined the pouch of the female, in order to discover whether any mammary development might indicate her being in gestation. There was no enlargement of the mammæ on the 27th—not the least—nor was there any on the 28th. I examined the marsupium with care, both by inspection and palpation, on Monday, the 1st of March, and on Tuesday, the 2d; on neither of which occasions could I discover any signs of increase. But on Wednesday, the 3d, the mammæ were visibly and palpably enlarged. They were still larger on Thursday, the 4th, and, on Friday, the 5th, they were hard and swollen. Saturday, the 6th, passed without my inspection, on account of professional engagements, which made my visit to the stable court impossible; but my servant, who had always held her while I examined the pouch, looked into the marsupium, and assured me there was no embryo attached on Saturday.

At 3 o'clock, P. M., on Sunday, the 7th, when I opened the pouch, the young were found at the teats. Here, then, there was a visible preparation made for the reception of the young, in the development of the mammary glands; a fact that serves clearly to refute, if refutation could be necessary, the notion of the Chevalier D'Aboville, cited and scouted by Dr. Barton, that the embryo makes the teat wherever it happens to touch the surface with its mouth. See Prof. Barton's letter to Reimarus, page 10.

The man who had care of her says, that whenever he looked at her, on the Saturday, she was lying on her side, with her nose turned inward between her legs, towards the belly, and she appeared so torpid that he supposed she was sick—the more especially as she scarcely took any notice of his hand when introduced into the box. At all other times she was, and is now, very cross and snarling; and makes a show of defending herself.

It is fair, from the above, to infer, that the uterine gestation terminated on the night of Saturday, the 6th, or on the Sunday forenoon, the 7th of March; sixteen days after the

capture. And now, if we may justly suppose that the fœcundation occurred on or about the 19th of February, we have an inference as to a uterine gestation, of sixteen or seventeen days.

As to the value of this computation I leave naturalists to judge; begging them to bear in mind the extreme rapidity of the mammary development; which commenced on Wednesday, the 3d, and was completed certainly on Sunday, the 7th of March—four days. It seems that so rapid a development of the milk glands ought to be taken as evidence, if not proof, of a rapid uterine gestation.

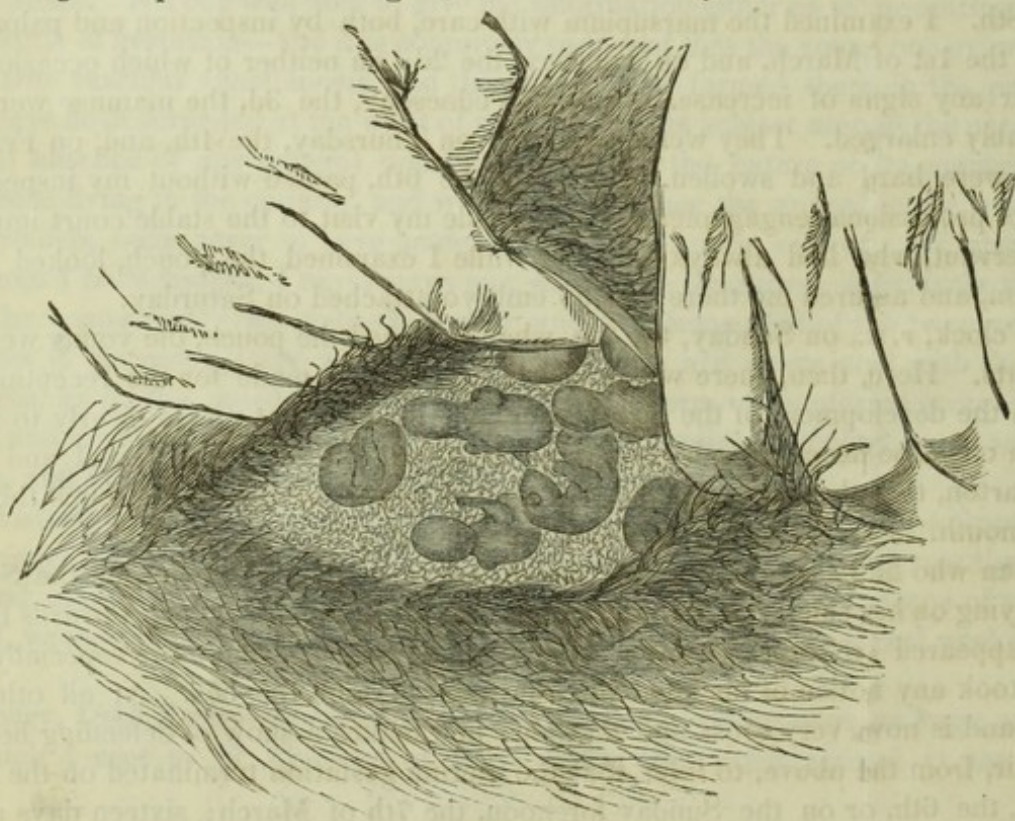
The observation is useful, as settling at least, the question, of one of the reproductive seasons—which is in February, in this instance, and probably in the two formerly mentioned.

Mr. Owen's observation of the gestation of the kangaroo showed, that it came into the pouch on the thirty-ninth day after the sexual congress, which was accurately noted, and which, having been effected thrice in a short space of time, produced only one fœtus.

Mr. Owen does not mention the state of the mammary glands, and seems to have examined only the nipples, which are much less to be depended upon, as signs of gestation, than the glands themselves.

In my opossum I counted thirteen fœtuses, all of them busily engaged in sucking, and freely using their fore-arms, with which they held on to the fur of the pouch—so that to open the sphincter was to see a busy scene of motions.

The figure which I have caused to be made shows pretty well the appearance of the pouch, when held open with two fingers, on the twelfth day.



12th / pouch - gestation

The young laid on the side—the body strongly flexed; and the delicate mamilla was stretched as it extended from the mamma to the porule which constitutes the stomal orifice.

They were of a deep rose tint; so that the interior of the marsupium looked red, from the hue of their bodies.

It was easy to observe, and to count by the watch, the number of respirations per minute, of the young.

Taking one of the young betwixt the finger and thumb, I pulled very strongly at it; so violently that I feared to tear it in two, at the loins. The connexion was so strong that the head came quite out of the marsupium before it at last let go of the teat, which immediately retreated into the pouch.

When the young one let go its hold the teat was cylindrical, and very long. There was no bulb at the end—it was cylindrical all the way up to the mamma.

Mr. Owen describes and figures a bulb at the end of the kangaroo teat.

Upon carefully examining the mouth with a doublet, I found that no blood had followed the avulsion, nor the smallest stain; but I feel quite certain that by jerking one off suddenly the lip would be injured and torn; and I suppose that where blood has followed the separation, in other cases, it was produced by too hasty a violence, lacerating the mouth. The pore is so small that it cannot be well made out without a lens. One only sees a shallow dimple. I made one bleed at the mouth by forcing into it the point of a small camel hair pencil dipped in milk—which shows how tender is the tissue in the early stage of existence.

There was not, and had never been, any mesenteric or placentoidal connexion of the mouth and nipple.

I removed this fœtus at forty minutes past 7 o'clock, P. M., and put it in a watch glass, to show it to my friends Dr. Nourse and Dr. Stockbridge, of Maine, and to Dr. J. F. Meigs of Philadelphia.

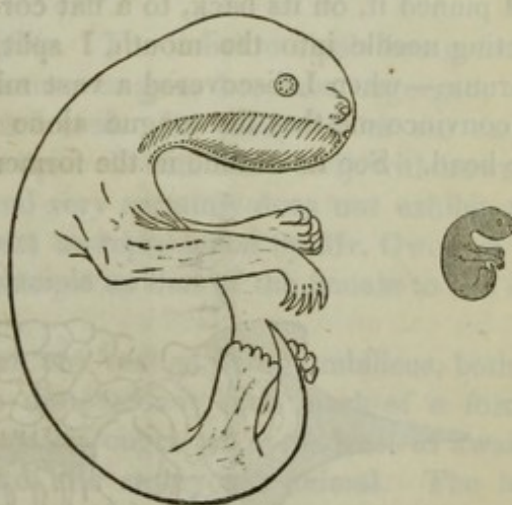
The adjoining figure exhibits the appearance of the young of the size of nature, with one magnified about five diameters.

It was carefully weighed in Mr. Bringham's scale. The weight was just three grains and a half.

In Dr. Barton's specimens the smallest weighed barely one grain; another, barely two grains; and the remaining five, (taken together,) exactly seven grains.—Letter to Roume, page 11. Does this discrepancy indicate that mine were littered on the 5th, and not on the 7th of March?

From the mouth to the end of the tail it was eight-tenths of an inch long.

The fore arm and paw measured one-tenth of an inch in length.



The skin was rose-coloured, and translucent; beneath which could be seen the ribs. No hairs on the skin; which, under the doublet, was wrinkled and very loose.

It moved strongly by means of its fore-arms.

It raised its snout or muzzle off the glass, by the act of extension of its head, and by lifting itself on the fore-paws.

No motions in the hind legs, which are very small; mere buds.

It turned itself over, and moved round the glass in various directions.

It now respired by the two nostrils and by the mouth.

The cartilages of the nostrils seem to be bare, or uncovered, and sit on the anterior face of a conical pit or dimple. It was easy to perceive that the air entered and escaped through all three of the orifices, by the bubbles of milk or mucus resting on the several apertures.

The embryo was dead at ten minutes past nine o'clock; having survived its separation one hour and twenty-nine minutes, during which it carried on a true respiratory, pulmonic life; notwithstanding it had been much handled, and exposed to the cold air of the street.

There were no nails on the hinder toes; those of the fore-paw are faithfully represented in the figure annexed. They were of a red hue.

The iris was very visible, of a faint blue colour; no appearance of any palpebral raphe; the organ of vision quite covered beneath the skin—through which it is seen.

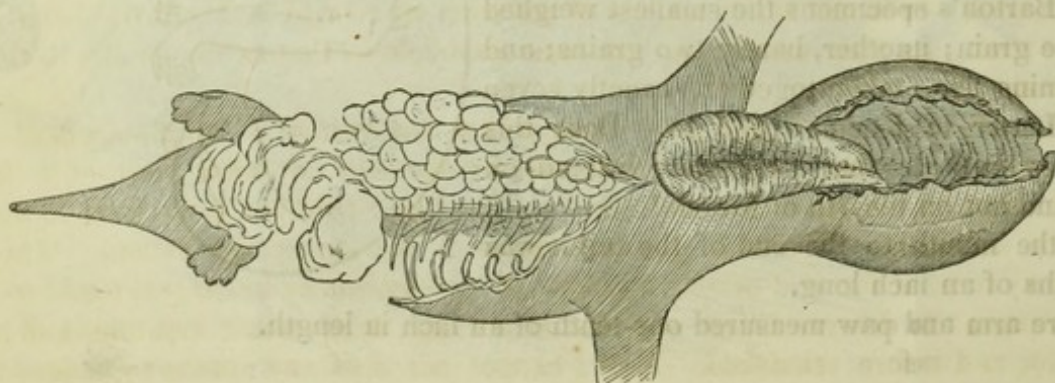
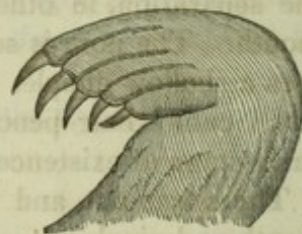
No orifice of an ear—but a whitish-coloured cicatrice or scar, beneath which the organ is hidden.

No raphe of the lips, running towards the angle of the future enormous mouth, or gape.

I have already given the measure of the fore-arm; which possessed the power of pronation and supination very perfectly.

The paws were very prehensile.

I pinned it, on its back, to a flat cork, and completely extended it. Introducing a dissecting needle into the mouth, I split with it the lip, lower jaw, and throat, down to the sternum—when I discovered a vast milk-white tongue—so enormous, in proportion, as to convince me that the tongue alone constituted fully one-third of the entire weight of the head. See its outline in the former figure, and in the one annexed.



The figure may be depended on as correct for the form and proportion of this unique organ, turned downwards to the breast. It was white, as a clot of milk. It was turned up on the margins, so as to make of the tongue a complete groove, for the lodgement of the nipple—the palatine vault being the superior half of a flask-shaped cavity in which the mammilla being once lodged and engorged, by the act of sucking, is permanently detained within—for it is difficult to draw the teat again through the porule, or stomal orifice.

I was led to examine the tongue because I perceived that the animal was possessed of a strong suction power; for I had several times touched the stomal dimple with the smooth, rounded point of a drawing-pencil, and the creature sucked it so strongly that I could draw it round the glass with the point, and even lift it partially off the surface by the pencil.

It is a very curious sample of the adaptation of the development forces of the animal economy to the attainment of a special and transitory end. I find that as the embryos proceed in their organic development, the tongue becomes rapidly smaller in proportion. In the dissected specimen on the table, the tongue, though vast, is much less, relatively, than in the first specimen.

Does this fact, that the embryo of twenty-four hours' marsupial life could attach itself, by suction, to the end of my pencil, throw any light on the manner of its primary adaptation to the nipple, or of its power to find and seize it, while groping within the marsupial cavity?

I wish to be understood as saying, that I could not clearly make out the mouth without a lens, though I could perceive the dimple which led to it.

When I had split the under jaw and turned the tongue downwards, it was easy to see that the palato-glossal cavity was large, and that the nipple once freely drawn into the fauces must become, in a degree, strangulated. The constant suction would prevent it from inflaming or sloughing.

The young animal adheres to the teat both sleeping and waking, and never lets go until the marsupial gestation is at an end.

The mechanism of its adherence is very intelligible. The delicate nipple being drawn within the stomal pore and acted on by the immense tongue, becomes engorged, and cannot be withdrawn, except by such violence as I used. Its escape from the orifice cannot take place suddenly, without lacerating the lips. When it is slowly withdrawn, it becomes gradually disengorged in the process; and very certainly does not exhibit any bulb at the end—or in the whole tractus of the teat; as represented by Mr. Owen in the kangaroo teat. Its attachment is on the same principle as that of the female to the dog in copulation.

I very carefully sought, with a good doublet, for any vestige of an umbilicus, both in this and in later specimens, without being able to discover any such mark of a former placental union. I conceive that the absence of vestigia ought not in the least to awaken any doubt as to the antecedent placental union of the embryonal animal. The less, inasmuch as it is, at the end of the first day of its respiratory existence, found to be so far developed as to deserve being regarded as a living, independent creature, and not as an embryo, as I before remarked. Now I cannot perceive any reason to believe that a

healthy, warm-blooded mammifer can possibly be developed but by means of a placental or placentoidal apparatus—and I repeat that the absence of all traces of it in my specimen ought not to disturb my faith in the invariability of the genetico-generic laws. A mammal is, ipso facto, a placental animal.

Having the animal well secured in a dorsal decubitus, I opened the abdomen with a dissecting needle, taking care not to wound any of the interior structures. There was much fat under the dermal surface. The skin was slightly adherent. The tela cellulosa is extremely delicate in these early stages of existence. I found that the muscles of the tongue and those of the abdomen were readily displaced out of their cellular sheaths, by raising and removing them with the point of a dissecting needle.

I opened the thorax with a delicate scissors, and found the sternum and the ribs very stiff and elastic, cutting like cartilage. I presume no phosphate was as yet deposited, at least in those organs.

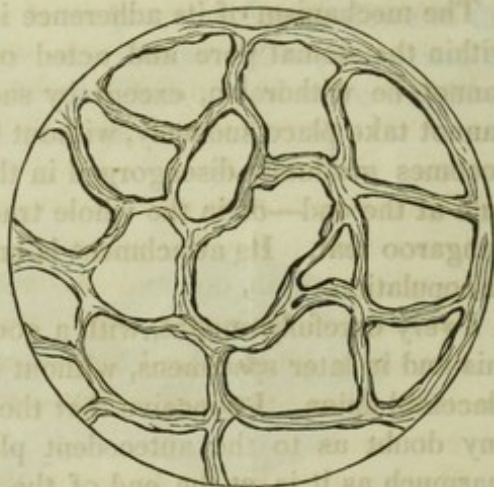
The sides of the abdomen and thorax being cut away, allowed me to inspect, with the lens, a most beautiful and perfect set of organs, as the heart, with its pericardium; the liver; a very large and loaded stomach; and a considerable tractus of intestines, all filled and plump with fulness.

I was much struck with the appearance of the lungs. On each side of the heart I discerned a number of *bubbles*, which, on closer investigation, proved to be spherical air-vessels, or pulmonary vesicles full of air. They rather resembled a bunch of transparent hydatids or grapes, or a collection of fine soap bubbles. I have given a magnified view of these vesicular lungs in the last figure.

I removed some of those of the left side, and placing them on my microscope, viewed them with a power of one hundred and fifty. They were pressed beneath a plate of mica. The figure shows the microscopic appearance of the compressed air-cells. The intervesicular tissue was manifestly organized, and of a brownish tint; not a mere sarcode. I did not see any blood-vessels. I presume the blood had escaped, for I had taken it up with points of blotting-paper, out of the thoracic and abdominal cavities, in order to have a clearer view.

The lungs were *very* large; and the quantity of air contained within them must have been vast, as compared with the wants of aeration for the few drops of the creature's blood.

I am not aware that Mr. Owen and Mr. Edward Queckett have as yet resolved the question whether the swimming bladder of fishes is also a true organ of aeration. Mr. Queckett was making researches on that point in 1845, when I had the pleasure to see him in London; and I sent to him some specimens of the gar-fish of the western rivers, with a view to his inquiries on that very head. If those naturalists have discovered that the swimming bladder is an organ of aeration, then I cannot but think that my marsupial didelph is as amply supplied with



means of oxydating its blood as the most active and powerful dolphin or sturgeon—and I cannot imagine that even the profuse supply of tracheæ in the annelides can exceed in liberality the oxygen endowments of the young opossum of three and a half grains' weight.

Many have doubted whether the young is not attached by a vascular union to the teat—an idea that has been put forth by high authority. Mr. Owen, however, has set that matter in a clear light.

Nevertheless, I resolved to ascertain whether any milk was in the stomach, and therefore removed that organ, and putting it under a compressor to squeeze out the contents, examined them with one of Oberhaueser's instruments, under a high power. The vesicles of the milk were innumerable. Dr. Barton, page 8, in a note, says, "In an opossum weighing only forty-one grains, I have seen the stomach very considerably extended with a white matter, or milk. But the milk that is afforded to the embryos for a few days after their first reception into the marsupium is nearly pellucid or transparent."—Letter to Roume. So that the animal sucks and swallows milk, and fills its intestines, and makes chyle, and has a powerful hæmotosis, and a vast aeration, with muscular and organic innervations, at the end, or sooner, of one day's marsupial life! the weight being three and a half grains.

It is quite apparent that M. Milne Edwards and M. Pouchet are wrong in their opinions as to the forwardness of the vital organs in this early stage; and all my astonishment and doubt as to the state of the development and the means of living in the marsupial didelph are quite at an end—as I find there is nothing in it different from what occurs in the young child at its mother's breast.

Monday, March 8th.—Upon opening the pouch to-day, I observed the young moving their arms and bodies freely, each one busy at its needful work; pulling and even tugging at the nipples. They occasionally slowly extend the body, and then, by a sudden start, or jerk, flex it again, after the manner of a shrimp or cray-fish.

Wednesday, March 10th.—The young considerably larger—all at work.

Saturday, March 13th.—The pouch opened at 5, P.M. Young are much grown and very frisky. I counted twelve of them at the nipples.

Sunday, March 14th, 4 P.M.—I removed a young didelph, which adhered so strongly that the nipple was drawn quite forth of the sac before it let go. On the nipple, again, was no bulb, but it resembled the figure.

The animal now weighs twelve grains in Mr. Bringhurst's scale. Seven days ago it weighed three and a half grains; an increase of about two hundred and fifty per cent.

Its whole length, one and one-tenth inches; when flexed, six-tenths.

No hairs on the rose-coloured skin, which is more wrinkled than before.

At twenty minutes past 7, P.M., which is three and a half hours since I took it off, it breathes thirty-two per minute, by the watch—very regularly—the counts repeated several times.

Sleeps and wakes by turns on the lock of cotton where it lies. External organs and scrotum large.

At 11, P. M. it was still alive and strong, and, I doubt not, might live until morning, or longer. I now suspended it in alcohol, in which fluid it continued to move its body and arms for five minutes, and then died. I sent it to Professor Louis Agassiz, at Boston.

Tuesday, March 16th.—No hairs on the young, which are grown considerably, and quite strong and lively.

Thursday, March 18th, twelfth day.—The figure represents truly the opened marsupium. I removed an embryo, which held on more strongly than the others. Its weight, in Mr. Brinhurst's scale, is 18 grains; which is more than four hundred per cent. of increase.

Flexed .75 of an inch long; extended, from snout to tail, 1.25 inches.

No hairs.

Skin very loose and wrinkled. It seems to me that the development of its derm is much more hasty than that of any other tissue—as if it were the forerunner of the organs, growing more rapidly than they, in order for their accommodation. Nails begin to grow on the hind toes. Intestines visible through the still translucent, rose-coloured skin.

Scrotum large.

Motion of tongue and also of the inchoate lower maxilla visible in sucking; which I noted as it imbibed and swallowed milk from the end of a camel hair pencil moistened with milk. The point of the pencil seen through the translucent cheek within the mouth.

The outer ear of an oval lenticular form, whitish, is still closed, being completely covered with skin.

Globe of the eye seems much larger; no palpebral raphe in the covering skin through which it is seen, and which permits me to see the globe rolling in various directions. The *motores oculorum* muscles are therefore developed to-day.

Fore-arms and paws very strong. He gropes and pinches up the skin of his buttock with his finger-nails, and seizes his tail, which he pulls with his hand. In the pouch he held on to a handful of fur, which he grasped, in order the better to tug at the nipple.

The tail highly prehensile. It wraps itself over the point of a pencil, and suspends him in the air. He can suspend himself by the final twentieth of the organ.

The mouth begins to assume a slit-like form; and is not so dimple-like as at first.

The raphe of the lips extends far back.

I put it in a cup of alcohol. It continued, during its immersion, to move freely and strongly for sixteen minutes, by my watch, and then was apparently dead.

I now adjusted and secured it on the back, for dissection.

There was much fat beneath the skin, on the belly and thorax. ("Fat as a 'possum," is an American saying.)

When I opened the thorax I found the heart beating very evenly; and although I dissected it nearly all the time, so as to remove the sides of the chest, and the abdominal parietes, and opened the throat, and turned and fastened the tongue down with a needle—the heart continued to pulsate until twenty-five minutes past eleven o'clock, one hour and a half after its immersion in the alcohol.

I take this fact as a proof of the powerful vitality of this creature. Such a fact was not wanting to show the liberal endowment of its organic material with life force—

lebenskraft—since, but for such special endowment, its placentoid would not be so early exchanged for its pulmonary and gastric sources of nutrition and oxygenation. Probably all the marsupialata are endowed with extraordinary tenacity of life.

The liver is immense.

The diaphragm strong.

Lungs still vesicular and bubble-like, but less so than in the earliest case. The pulmonary organ is evidently acquiring greater consistence, and a more visceral or parenchymatous character.

Many large sanguiferous red vessels seen on the skin on each side of the neck, ramifying on the head—along the arms; on the sides—and on the dorsal aspect of the tail, with arterioles, or venules branching from them.

The heart in a strong pericardium, more on the left side. Heart and pericardium together near three-twentieths of an inch in length.

Liver very large, of a dark hue, extends far over on the left side; from beneath which half peeps the distended stomach.

Intestines very full, and yellow-tinted, from the yellow gall mixed with the milk of the convolutions. Hence the animal already has a biliary apparatus for abundant secretions of bile. Dr. Thomas Schwann has shown, by his experiments on the dog, that bile being absent, the animal becomes atrophied. How fully is this creature endowed with all the means of nutrition, both of apparatus and elements!

The members of the society have now an opportunity to examine the dissected animal, now on the table, and may see that the representation in my drawing is correct.

The mode of arrangement of the stomach and intestines will be found as in the figure.

The bladder of urine large, and full—very white.

The tongue has become relatively smaller than in the first case.

It is thought very desirable that some proofs should be forthcoming as to the method or machinery by which the young are transferred from the uterine to the marsupial gestation.

I believe this desideratum, if it really be one now,—will never be attained. It is clear that the paw of the dam cannot do it; the vulva cannot touch the orifice of the pouch; the young cannot creep to the pouch. It remains, then, that the lips of the dam are used to place them.

I shall trespass no longer on the patience of members, than by offering the remark, that these researches appear to clear up a lingering doubt and uncertainty as to the nature of the earliest marsupial life. They show it to be a chylopoietic, warm-blooded, oxygenating, innervating, and free-willing life; and that all the means of carrying on an independent life are as fully enjoyed by the marsupial fœtus, as by the young of the elephant at the teat, or the *balæna mysticetus*, which is said, at birth, to be twenty-seven feet in length. If that be so, all mystery as to marsupial life is at an end—save that useless one, of the machinery of adaptation to the nipple.

Whether she merely deposits them inside of the marsupial sphincter, leaving them to find the nipple instinctively—which is probable—or whether she applies them herself—which is an incredible accuracy of contact and perception—no man can ever know, since

her muzzle will always be concealed within the marsupium, while engaged in the work, if she herself does that work. I should think the delicate touch of a watch-maker alone fit to make the adjustment—so small is the stomal porule;—it is much more likely that the young find the nipple in the incessant groping of the point of the oviform head.

Mr. Owen saw his kangaroo put her nose within the pouch, and lick its edges—no one will go farther in this discovery than that distinguished and admirable person has gone.

My observation of this case does not settle the question of the duration of the uterine gestation, though it will approximate it to the sixteenth or seventeenth day. Professor Barton, in his letter to Mons. Roume computes it at from twenty-two to twenty-six days, upon I know not what authority. Mr. Owen has convincingly shown that the kangaroo carries in the womb thirty-nine days, post coitû.

The rutting season here was in February. Professor Barton's didelph, which had five young ones, as large as rats, two-thirds grown, when he bought them, on the 14th of May, brought seven embryos into the marsupium on the 21st of the same month. He says the uterine gestation is between twenty-two and twenty-six days, and that of the pouch about fifty days; at which time they attain the size of a common mouse.—Letter to M. Roume, T. & S. Palmer, Ph., 1806.

Mr. Owen's kangaroo had been giving suck to her young one just before the embryos came into the pouch—which is evidence of a coincidence in the reproductive habits of these two marsupials.

As the five young ones which Dr. Barton procured were as large as mice, and freely running about, they must have been some time detached from the marsupial life. But as he says they are twenty-two days in the womb and fifty in the pouch, and in his specimens, probably at least thirty days out of the sac, we have the inference that the conception took place one hundred days before the 4th of May; we suppose about the 24th of January, and the second conception about the first of May. So that it may be the rutting season extends from January to somewhere in May, say five months.*

I shall endeavour very carefully to determine the duration of the marsupial life, and should the definite facts come into my possession, I shall beg leave to communicate them to the society in a supplementary note to this memoir.

ADDITION.—Tuesday, May 11th—The sphincter marsupii cannot contain all the young in the pouch—the half of two bodies hanging outside. No hair on the young animals. They do not let go the nipple, this sixty-eighth day of marsupial life.

Thursday, May 20th—Young still undetached; eyes still unopened. No reason to suppose they have ever let go. This is the seventy-second day.

Saturday, May 22d—An embryo was crawling on the body of its dam; eyes slightly open. It weighs four hundred and twenty-eight grains; having gained four hundred and twenty-four and a half grains, since the 7th of March, seventy-four days ago.

* A gentleman from Alabama says he has seen the very small marsupial young, in October, in that state.