the single egg is transferred by the mother to the temporary marsupium, where the young are hatched, the period from fertilization to hatching being about ten weeks. *Ornithorhynchus*, being an aquatic animal, develops no marsupium, and the eggs are said to be deposited in the burrow which the animal constructs, but upon this point Semon made no observations.

Most of Semon's studies of the development were upon *Echidna*. The Monotreme egg is strictly telolecithal, resembling the eggs of Sauropsids in many points. The four-celled stage shows two vertical cleavages at right angles, the blastomeres being exactly equal. Quite early in development the blastoderm is seen to consist of a layer, one cell in thickness, except near the middle, where a few cells lie deeper. These were called hypoblast by Caldwell in 1887, but Semon regards this apparently two-layered stage as a morula, since he finds that the blastoderm later resumes the one-layered condition which he calls the blastula. In the mode of gastrulation the Monotreme egg suggests the Anamniotic type, the invagination preceding or accompanying the formation of cœnogenetic entoderm, instead of following it as in Sauropsids and Mammals generally.

Late embryos of *Echidna* show external genital knobs, which become enclosed within the cloaca before the time of hatching.

Among observations on the fœtal membranes may be mentioned the persistent union of amnion and serosa (chorion), which is very similar to the condition described in Chelonia by Mitsukuri. During the latter half of the embryonic period the body lies between the allantois on the right and the yolk-sac on the left, the two structures being, for a time, of nearly equal size. The inner walls of the allantois become adherent, obliterating its cavity, except near the middle, while the outer surface, which is very vascular, unites with the chorion and serves undoubtedly as a respiratory organ, as in Sauropsids.

Some very interesting notes on the body temperature are recorded, which show that it bears no direct relation to season, age nor temperature of the external air. Temperatures taken in the cloaca, varied from 26.5° C. to 34° C., so that the Monotremes are in a sense midway between the so-called cold-blooded and warm-blooded animals in regard to body temperature.

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NOTES ON FRENCH GEOGRAPHY.

PAYS DE BRAY.

The even skyline seen in looking across from either side of the *vallée de Bray* between Neufchatel and Bauvais, in northwestern France, is a most marked feature in the landscape. One rides over the even chalk upland to come suddenly upon the crest of an escarpment that descends steeply before him. He there looks across a lowland and sees a similar escarpment ascending upon the farther side, whose elevation above sea-level is about the same as that of the crest upon which he stands. After descending and crossing the different formations with varying structures appropriate to the half dome, cut off on the east by a series of faults which is the main structure of the Pays de Bray, he ascends the other side of the lowland and finds himself again on a Chalk upland exactly like that which he left. One at first sight might suppose that here is the uncovered base of a dome which had been baseleveled and later covered by horizontal Cretaceous beds. The exceedingly level skyline lends countenance to this view, but even a hasty inspection of the region shows that this is not the case.

The production of the even upland is subsequent to the uplift of the half-dome, which once must have risen higher than the present upland. Two reasons for this are

as follows: The Chalk, although nearly horizontal, sympathizes with the arching of the Portland oolites in the Upper Jurassic, the Lower Cretaceous, and the Gault series, which formations make up the half-dome as at present revealed by denudation ; and the Chalk is also faulted with the other Mesozoic rocks.* The second reason for regarding the remarkably even upland of the Chalk as produced by baseleveling after the up-arching and faulting is found in the arrangement of the surrounding streams. The drainage to the southwest of the half-dome, which is the side where the arching is but little broken by faults, likewise shows the influence of the dome form during the initial stages of dissection which followed the uplift of the region. The radiating arrangement of the streams, la Varenne, Cailly, Robec, le Heron, Andelle and Eple indicates initial and consequent courses upon the western side of the half-dome.† Subsequent branches of the Eple and Bethune have discovered the weaker members of the Pays de Bray half-dome. In a word, the whole drainage system of the region between the Seine and the English channel is in accordance with what one would expect to find upon an area including a baseleveled half-dome, slightly elevated and dissected to youth or adolescence in the second cycle. Moreover, the adjustment of the drainage to the structure of the half-dome is so perfect that one cannot believe that the elevated region was a gently sloping coastal plain upon whose surface consequent streams became superposed upon a baseleveled and buried half-dome. The amount of dissection in the present cycle is not sufficient to allow of such perfect adjustment of stream to structure as we find to-day in the Pays de Bray.

* See *Le Pays de Bray*, by Professor A. de Lapparent, Paris, 1879, pp. 11, 116, 141.

† See Neufchatel and Rouen sheets, Nos. 20 and 31, Carte topographique de l' Etat-Major, 1 : 80,000.

BLIND VALLEYS AND SINKS.

IF one goes westward from the Pays de Bray, across the exceedingly level upland to the cliff above the straight shoreline of the English channel, where the coast has been developed to maturity by the vigorous action of the Atlantic waves cutting into the Cretaceous rocks, he will find remnants of drainage systems left upon the edge of the upland. These remnants appear to have been branches of a river that was situated where the English channel now is found. The remnants are evidently cut by flowing streams of water upon the surface of the land, though at present the valleys descend gently toward the cliff and there precipitously pitch into the ocean,* and thus evidently depart from the grade of a normally developed one-cycle stream.

In marked contrast to these evident subaërial remnants are the blind valleys seen upon the surface of the upland between the Pays be Bray and the coast, similar to those described in Austria.† One enters a small valley and follows it down for some distance seeing nothing in its form to lead him to suppose that it is anything but a normal branch of some river system. All at once he comes upon a plain area opening out from the comparatively narrow valley. The plain is a sink, surrounded on all sides by higher land sloping gently toward its center.

A typical young form of sink with three blind valleys beginning to develop, working back slowly from the central hole, is shown by M. Mantel in the plan of Mas Razals.‡ Slightly older forms are figured by the same writer at Aven de Hures, Igue de Baou, Igne de Planagreze and Pouor de Cettinje.§

* See French map 1 : 80,000 ; St. Valery, Abbeville, Yvetot sheets, Nos. 10, 11 and 19.

† Tietze. Jahrb. k. k. geol. Reichsanstalt, XXX., 1880, 738 ; Supan. Kirchhoff's Landerkunde von Europa, 1(2), 1889, 288.

‡ Les Abimes, Paris, 1894, p. 184.

§ Loc. cit., pp. 225, 302, 335, 486.

MM. de la Noë and de Margerie have shown similar forms in eastern France north of Besançon.* The combination of blind valleys and sinks gives various forms; the greater the number of subterranean passages for the water, the greater will be the irregularity of the surface. The simplest type of a blind valley is found where a single valley gently descends on a continuous grade to a flat depression of little or no greater width, under which is the subterranean outlet for the water. The method of formation of the passages below the surface of the Chalk is discussed in the chapter on subterranean water in Mantel's Les Cevennes (Paris, 1890) and in his Les Abimes.

MARAIS DE SAINT GOND.

Map of France, 1: 80,000, sheet 50. Chalons, S. W.

Upon a recent trip up the valley of the Petit Morin, toward the open Champagne, it was observed by the writer that the floor of the valley that trenches the Tertiary upland was aggraded for the whole distance from a point a few miles west of Montmirail (sheet 40) up to the head of the St. Gond marsh. There are places where the valley sides approach each other more closely, leaving a narrower aggraded bed, thus indicating more resistent layers in the Lower Tertiary or Upper Cretaceous strata, and hence harder work for the Petit Morin-Somme-Vaure when it was cutting the valley, now aggraded, before the capture of the headwaters by the Soude.† Professor Davis has shown that the diminished volume of water in the Petit Morin would necessitate aggradation. The smaller amount of water is not able to carry off the same amount of detritus which is still washed down from the same slopes. The soil creeps down, the storms wash much fine detritus from the slopes into the valley bottom, and the small side streams, which now are as able to do the work given them as before the capture of the headwaters of the Petit Morin, also carry much waste into the valley. At the western end of the marsh, near St. Prix, the little side stream entering here from the north has brought in considerable detritus, but this is only one of the minor factors in the production of the Marais de Saint Gond.

The Petit Morin has lost the greater part of its drainage area. It had developed a good-sized adolescent valley, particularly broad east of the hard rocks which form the great Tertiary escarpment of the Paris Basin. Since the loss of its headwaters it has been compelled to aggrade throughout the greatest portion of its course, thus causing many small swamps in the lower narrow valley and a broad marsh, le Marais de Saint Gond, at the upper limit of the beheaded Petit Morin. The present condition is one of unstable equilibrium. The small stream at the elbow of capture of the head waters of the Petit Morin by the Somme-Soude, in the small village of Ecury-le-Repos, will soon cut through the low divide, on account of the steeper grade of the Somme, and will drain the Marais de Saint Gond near the village of Morains.*

THE AGGRADING BAR.

The little wriggling bar staggering blindly along in a broad meandering valley is like a small boy attempting to fill his grandfather's boots. The waste supplied from the sides of the adolescent valley, cut by the ancestor of the present stream, is much too great a load for a little brook. Beneath the recent deposits of the bar, Professor de Lapparent has found, by means of excavations lately made, a deposit of argillaceous green sand, which must have been transported from the basin of the Aire when

*See fig. 1 in Les Formes du Terrain.

†See the Seine, the Meuse and the Moselle, by W. M. Davis, Nat. Geog. Mag., VII., 1896, 197–202.

*See Atlas Cantonal, Département de la Marne, 1: 50,000, sheet No 5, Canton de Vertus.

that stream was a tributary of the Meuse and flowed through the valley now occupied by the beheaded bar.

This geological confirmation of the geographic interpretation of the river captures in this region made by Professor Davis* is interesting on account of the reversal in the order of the observations from those made in the case of the capture at Toul.† That the present upper Moselle formerly joined the Meuse was first argued from the presence of pebbles in the valley of the Meuse which must have come from that of the Moselle above Toul. The strong geographic argument from the form of the valleys later corroborated the geologic evidence. Now we have the geologic added to the geographic evidence for the turning of the Aire by the Aisne from the drainage system of the Meuse to that of the Seine.

One of the sources of the present Bar has been turned by man recently, so that it now increases the water supply of the Briquenay, the reversed portion of the subsequent Aire-Bar. This change of a watercourse for industrial purposes is a continuation of the work begun by nature. The broad aggraded floodplain of the Bar is being taken advantage of this year, and a railway has been constructed along it between Sedan and Vouziers, with a branch running to Buzancy.

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CURRENT NOTES ON PHYSIOGRAPHY.

IS GREEN RIVER ANTECEDENT TO THE UINTA MOUNTAINS?

A RECENT paper by J. D. Irving ('Stratigraphical relations of the Brown's park beds of Utah,' Trans. N. Y. Acad. Sci., XV., 1896, 253–259), says: "It is a fact no longer disputed that these deep cañons in the quartzite by which Green river crosses the Uinta mountains were first established in the softer overlying formations, and that these formations furnished much of the corrosive material by means of which the harder rocks were cut away." It is not clear whether the overlying formations here mentioned were higher members of the Uinta arch or unconformably overlying Tertiaries. If the former, the writer would support Powell's explanation of the antecedent origin of the river; if the latter, he would support Emmons' view that the river is of superposed origin. In either case discussion on the question is hardly closed. Indeed, considering how frequently the Green is referred to as an antecedent river, it is remarkable that so little attention is given to the doubts that have been expressed regarding that manner of origin and to the difficulties that such an origin involves. Two recent text-books on geology credit the antecedent explanation. Tarr says: "In some cases the uplift of mountains appears to have been so slow that rivers have been able to maintain their courses across them as they rose; at least this is the interpretation placed upon some rivers, such as the Green river of Utah, which cuts directly across the high Uinta mountains' (Elementary Geology, 1897, 319). Scott is more cautious: "A famous example of what many authorities believe to be an antecedent stream is the Green river in Wyoming and Utah. Entering from the north, the river cuts its way in a winding course through the great mountain barrier of the Uintas in a remarkable series of cañons. This explanation is not accepted by all the observers who have examined the region; some of them explain the phenomenon by the theory of superimposed drainage" (Introduction to Geology, 1897, 325).

The Green river was unquestionably laked by the uplift of the Uinta range, and to this extent it is a defeated and not an

*Loc. cit., p. 232.

† Loc. cit., p. 228.