

ART. XXIII.—*Successional relations of the species in the French Old-Tertiary*; by OTTO MEYER, Ph.D.

IN a former article* I have shown that in the American Old-Tertiary formation many species can be traced along through the succeeding strata, and that the similar succeeding forms are apparently connected by descent. In the second part of this article† I said that the same phenomenon is manifest also in the French Old Tertiary formation. The following table may illustrate this. For the principles which have guided me in making out this genealogy, I refer to this Journal, vol. xxix, p. 458. In preparing it I have used only the material in my own collection, and for this reason the table is very incomplete. Naturalists with more material from French localities than I have may complete it and perhaps correct it in some points. In comparisons like these I think it best to avoid the use of descriptions and figures.

The determinations of the species enumerated in the table were made by Mr. Cossmann, in Paris; and I have adhered to his determinations, even where I am of different opinion; in many cases I would not make specific differences where they are made by Deshayes. My purpose here is only to call attention to the fact that evolution is illustrated also by the species of the French Old-Tertiary. Mr. Cossmann is now occupied with a revision of the species of Deshayes.

	LOWER EOCENE.	MIDDLE EOCENE.	UPPER EOCENE.	OLIGOCENE.
		<i>Lamellitranchiata.</i>		
1		<i>Ostrea flabellula Lam.</i>	<i>Ostrea cubitus Desh.</i>	
2	<i>Ostrea angusta Desh.</i>	<i>Ostrea cyathula Lam.</i>	<i>Ostrea cucullaris Lam.</i>	
3	<i>Anomia primæva Desh.</i>	<i>Anomia tenuistriata Desh.</i>		
4	<i>Arca modioliformis Desh.</i>	<i>Arca modioliformis Desh.</i>	<i>Arca Rigaultiana Desh.</i>	
5		<i>Arca condita Desh.</i>	<i>Arca planicosta Desh.</i>	
6	<i>Pectunculus polymorphus Desh.</i>	<i>Pectunculus pulvinatus Lam.</i>		
7	<i>Pectunculus terebratularis Lam.</i>			<i>Pectunculus obovatus Lam.</i>
8	<i>Limopsis lentiformis Desh.</i>	<i>Limopsis granulata Lam.</i>		
9		sp. <i>Trigonocœlia deltoidea Lam.</i>	<i>Trigonocœlia media Desh.</i>	
10		<i>Nucula Parisiensis Desh.</i>	<i>Nucula lunulata Nyst.</i>	
11	<i>Cardita planicosta Lam.</i>	<i>Cardita planicosta Lam.</i>		
12	<i>Cardita Prevosti Desh.</i>	<i>Cardita asperula Desh.</i>		
13	<i>Cardita imbricata Lam.</i>	<i>Cardita imbricata Lam.</i>	<i>Cardita propinqua Desh.</i>	
14		<i>Crassatella compressa Desh.</i>	<i>Crassatella rostralis Desh.</i>	

* This Journal, xxix, 457-468, 1885.

† Ibid. xxx, 66.

	LOWER EOCENE.	MIDDLE EOCENE.	UPPER EOCENE.	OLIGOCENE.
15	<i>Lucina discors</i> <i>Desh.</i>		<i>Lucina Ermenonvillensis</i> <i>d' Orb.</i>	
16	<i>Lucina proxima</i> <i>Desh.</i>	<i>Lucina Saxorum</i> <i>Lam.</i>		
17		<i>Lucina elegans</i> <i>Deffr.</i>	<i>Lucina elegans</i> <i>Deffr.</i>	
18	<i>Diplodonta duplicata</i> <i>Desh.</i>		<i>Diplodonta elliptica</i> <i>Desh.</i>	
19		<i>Cardium obliquum</i> <i>Lam.</i>	<i>Cardium Bouei</i> <i>Desh.</i>	
20	<i>Cardium hybridum</i> <i>Desh.</i>	<i>Cardium porulosum</i> <i>Lam.</i>		
21		<i>Cardium granulosum</i> <i>Lam.</i>		<i>Cardium scobinula</i> * <i>Mer.</i>
22	<i>Cytherea proxima</i> <i>Desh.</i>		<i>Cytherea striatula</i> <i>Desh.</i>	
23	<i>Cytherea fastidiosa</i> <i>Desh.</i>			<i>Cytherea incrasata</i> <i>Sow.</i>
24		<i>Cytherea semisulcata</i> <i>Lam.†</i>	<i>Cytherea polita</i> <i>Lam.†</i>	
25		<i>Cytherea analoga</i> <i>Desh.</i>	<i>Cytherea cuneata</i> <i>Desh.</i>	
26	<i>Tellina pseudorostralis</i> <i>d' Orb.</i>	<i>Tellina rostralis</i> <i>Lam.</i>		
27		<i>Tellina donacialis</i> <i>Lam.</i>	<i>Tellina parilis</i> <i>Desh.</i>	
28	<i>Tellina decorata</i> <i>Watel.</i>		<i>Tellina symmetrica</i> <i>Desh.</i>	
29	<i>Mactra Levesquei</i> <i>d' Orb.</i>	<i>Mactra semisulcata</i> <i>Lam.</i>		
30	<i>Corbula gallicula</i> <i>Desh.</i>	<i>Corbula gallica</i> <i>Desh.</i>		
31	<i>Corbula striatula</i> <i>Desh.</i>	<i>Corbula Lamarcki</i> <i>Desh.</i>		
32	<i>Corbula muricina</i> <i>Lévesg.</i>	<i>Corbula minuta</i> <i>Desh.</i>		
33	<i>Corbulomya seminulum</i> <i>Desh.</i>		<i>Corbulomya complanata</i> <i>Sow.</i>	
		<i>Glossophora.</i>		
34	<i>Delphinula turbinata</i> <i>Desh.</i>	<i>Delphinula turbinoides</i> <i>Lam.</i>	<i>Delphinula turbinoides</i> <i>Lam.</i>	
35	<i>Bifrontia Laudunensis</i> <i>Desh.</i>	<i>Bifrontia serrata</i> <i>Desh.</i>		
36	<i>Turritella Dixoni</i> <i>Desh.</i>	<i>Turritella carinifera</i> <i>Desh.</i>	<i>Turritella copiosa</i> <i>Desh.</i>	
37	<i>Calyptræa Suessoniensis</i> <i>Desh.</i>	<i>Calyptræa lamellosa</i> <i>Desh.</i>		<i>Calyptræa labelata</i> <i>Desh.</i>
38		<i>Hipponix elegans</i> <i>Desh.</i>	<i>Hipponyx patelloides</i> <i>Desh.</i>	
39	<i>Natica semipatula</i> <i>Desh.</i>	<i>Natica patula</i> <i>Desh.</i>		
40	<i>Natica intermedia</i> <i>Desh.</i>	<i>Natica depressa</i> <i>Desh.</i>		
41		<i>Natica abscondita</i> <i>Desh.</i>	<i>Natica abscondita</i> <i>Desh.</i>	
42		<i>Natica epiglottina</i> <i>Lam.</i>	<i>Natica Noë</i> <i>d' Orb.</i>	
43	<i>Natica separata</i> <i>Desh.</i>	<i>Natica semiclausula</i> <i>Desh.</i>		
44		<i>Natica acuta</i> <i>Desh.</i>	<i>Natica ponderosa</i> <i>Desh.</i>	
45	<i>Diastoma varicosum</i> <i>Desh.</i>	<i>Diastoma costellatum</i> <i>Lam.</i>	<i>Diastoma interruptum</i> <i>Desh.</i>	
46		<i>Pyramidella terebellata</i> <i>Fér.</i>	<i>Pyramidella inaspecta</i> <i>Desh.</i>	
47	<i>Odostomia turbonilloides</i> <i>Desh.</i>	<i>Odostomia turbonilloides</i> <i>Desh.</i>		<i>Odostomia obesula</i> <i>Desh.</i>
48	<i>Turbonilla polygyrata</i> <i>Desh.</i>	<i>Turbonilla fragilis</i> <i>Desh.</i>		
49		<i>Pseudomelania hordana</i> <i>Lam. sp.</i>	<i>Pseudomelania hordana</i> <i>Lam. sp.</i>	
50		<i>Pseudomelania lactea</i> <i>Lam.</i>		<i>Pseudomelania semidecussata</i> <i>Lam.</i>

* Compare the specimens of the Mayence Basin.

† If these two species occur near each other, they must have a very near common ancestor.

	LOWER EOCENE.	MIDDLE EOCENE.	UPPER EOCENE.	OLIGOCENE.
51	<i>Cerithium breviculum</i> <i>Desh.</i>			<i>Cerithium Boblayi</i> <i>Desh.</i>
52		<i>Cerithium echidnoides</i> <i>Lam.</i>	<i>Cerithium pleurotomoides</i> <i>Lam.</i> <i>Cerithium Bouei</i> <i>Desh.</i>	
53	<i>Cerithium subacutum</i> <i>d' Orb.</i>			
54	<i>Cerithium involutum</i> <i>Lam.</i>	<i>Cerithium conoideum</i> <i>Lam.</i>	<i>Cerithium Cordieri</i> <i>Desh.</i>	
55	<i>Cerithium plicatulum</i> <i>Desh.</i>			<i>Cerithium limula</i> <i>Desh.</i>
56	<i>Cerithium deceptor</i> <i>Desh.</i>	<i>Cerithium perforatum</i> <i>Lam.</i>		
57	<i>Cerithium turbinatum</i> <i>Desh.</i>	<i>Cerithium interruptum</i> <i>Lam.</i>		
58			<i>Cerithium mixtum</i> <i>Desh.</i>	<i>Cerithium con-</i> <i>junctum</i> <i>Desh.</i>
59		<i>Rostellaria fissurella</i> <i>Lam.</i>	<i>Rostellaria lubrica</i> <i>Sow.</i>	
60			<i>Buccinum sabrandei</i> <i>d' Orb.</i>	<i>Buccinum Gottardi</i> <i>Nyst.</i>
61		<i>Marginella crassula</i> <i>Desh.</i>	<i>Marginella Edwardsi</i> <i>Desh.</i>	
62		<i>Marginella ovulata</i> <i>Lam.</i>		<i>Marginella Stamps-</i> <i>pinensis</i> <i>St.-M.</i>
63		<i>Mitra cancellina</i> <i>Lam.</i>		<i>Mitra perminuta</i> <i>Braun.</i>
64		<i>Voluta spinosa</i> <i>Lam.</i>	<i>Voluta depauperata</i> <i>Desh.</i>	
65		<i>Oliva nitidula</i> <i>Desh.</i>	<i>Oliva Baumontiana</i> <i>Lam.</i>	
66		<i>Ancillaria buccinoides</i> <i>Lam.</i>	<i>Ancillaria obesula</i> <i>Desh.</i>	
67	<i>Ringicula minor</i> <i>Desh.</i>	<i>Ringicula ringens</i> <i>Lam. sp.</i>	<i>Ringicula ringens</i> <i>Lam.</i> (var. Meyer.)	