reprinted, if not annually, at least at short intervals of years, as furnishing one of the most valuable contributions to economic geology.

H. B.

THE LATE DR. ENGELMANN

SO many years have elapsed since Dr. Engelmann, whose death was recently announced in your columns, wrote his academic dissertation "De Antholysi Prodrumus, 1832," that it is no matter for surprise if many among the younger generation of botanists have forgotten this little treatise, or have failed to associate its author with the historian of American conifers and other selected orders. This is the less surprising as, although in Dr. Engelmann's systematic memoirs there are frequent traces of his early morphological studies and of the interest he felt in them, he, so far as I know, wrote no treatise specially devoted to teratology other than the one already mentioned. A few words on this little book may therefore not be unacceptable to those who honour Engelmann's memory. It would be an interesting and not an unprofitable task to trace out the connection between teratology and the modern views of evolution, which is much closer than is generally imagined, albeit the ideas of natural selection and survival of the fittest find no place in the older teratological literature. For such a task I have neither the requisite ability nor the necessary leisure. My object in alluding to the matter is to call to mind the light in which Engelmann considered the subject, influenced as he was by the writings of his great fellow-countryman Goethe, whose views, originally published in 1790, were by no means universally accepted, even in 1832. Schimper and Alexander Braun were among those who appreciated the value of Goethe's theory, and those two learned men and acute morphologists were Engelmann's teachers, and as we learn from himself, exerted great sway over him.

It is curious to contrast the modest pamphlet "De Antholysi Prodrumus," written in Latin, which I at least do not find very easy to construe, with the more elaborate "Éléments de Tératologie Végétale" of Moquin-Tandon, published nearly ten years later (1841). Moquin's work is written in a style which even a foreigner can read with pleasure. Its method, too, is clear and symmetrical, but when we compare the two works from a philosophical point of view, and consider that the one was a mere college essay, while the other was the work of a professed botanist, we must admit that Engelmann's treatise, so far as it goes, affords evidence of deeper insight into the nature and causes of the deviations from the ordinary conformation of plants than does that of Moquin. A few illustrations will suffice to make this clear. Speaking of progressive development, or as he calls it "*evolutionis progressus*," Engelmann says that while it is only obscurely indicated in celestial bodies, and with difficulty studied in animals, "*clarissime apparet in plantis*." Plant-history is for Engelmann the narrative of the progress of evolution—"evolutio *progredivens*"—and variations from the ordinary course are to be accounted for, "*ex nimio motu, et ex nimio impeditone*," or, as we should now say, from excess or from arrest of development.

The main end of a plant is to produce seed, and the morphology of the plant appears to have been considered by Engelmann as the result of a compromise between this tendency (*nusus*) and the progressive development of each individual part. The morphological unit for him, as for Goethe, from whom he derived the notion, was the leaf—"unitas autem in foliis posita est"—and the variations from the leaf-type were, as we have seen, attributed to arrest of development, to reversion (*regressus*), or to progression. But these changes were looked upon then chiefly in relation to the greater or less development

and specialisation of individual parts with little or no reference to their possible genealogical significance as elements in a general pedigree of plants, or at any rate as suggestive of such elements. Hereditary influence, however, was not wholly overlooked; on the contrary, Engelmann speaks of it as "*magni momenti*," and goes on to show how woody plants frequently show, year after year, the same malformations, how perennial plants less frequently do so, and how such repetition is much less frequently observable in annuals and plants propagated wholly by seed. Only "*antholyses epiphytica hereditaria esse possunt*" (§ 69), says our author, by which he means that partial changes are not perpetuated by descent, but only those in which "*omnes plurimive flores morbosi sunt*." It is not necessary to stop to consider what amount of truth there is in this assertion, but it is interesting to see the use then made of the word "epiphyte." Engelmann, influenced by his medical studies, spoke of "local," "epiphytical," "sporadic," "enchoric," and "enchronic" affections; enchoric changes being limited to certain localities, enchronic alterations occurring at definite times. These terms have not been generally adopted, while the signification now attached to the word "epiphyte" is widely different from that which Engelmann intended. He, at least, had not the right of priority in this matter, for Bischoff, in his "Botanische Terminologie" (1830), speaks of epiphytes as external parasites (citing as examples *Cuscuta* and *Viscum*), in contradistinction to entophytes. It would seem from this that in matters of terminology custom overrides priority. But this by the way. Our present concern is with the fact that certain changes, or certain degrees of change, are more likely to be perpetuated than others. Similarly we find Engelmann calling attention to certain "critical" regions of the plant,—spots, that is, more subject than others to teratological change,—the apex of the stem in definite inflorescences for instance (§ 67), a point subsequently dwelt on by Darwin at some length, though he does not seem to have been aware of what Engelmann had previously written on the subject.

Lastly, reference may be made to the assertion made by Engelmann that plants of a high state of relative structural perfection "*structura magis evoluta et typo magis composito*," are specially liable to retrograde metamorphosis. This is a statement that from the nature of things seems so reasonable that it is generally accepted without question. Nevertheless, it is one which requires qualification and further investigation. To take one case which occurs at the moment. Let any observer call to mind the number of instances in which he has seen the carpels the subjects of retrograde metamorphosis, and he will probably find that such changes are far more common in cases where the carpels are free and superior, than in those in which they are in union one with another and with the thalamus, as in the so-called inferior ovaries, which are considered to represent a higher type of structure than do the free carpels.

But the object of this note is not to discuss any particular view that Engelmann may have held, but merely to call attention to his claims as a morphologist, claims which are overlooked by reason of his greater—numerically greater—claims as a systematist.

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SIWALIK CARNIVORA¹

BY the publication of the present memoir on the Siwalik and Narbada Carnivora, Mr. Lydekker completes the second volume of the series of the "Palæontologia Indica" devoted to the Indian Tertiary and Post-Tertiary

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