fact, the Carboniferous formation in so far as this has been recognized in the interior district of British Columbia, and is the local representative of that formation.

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ON THE NAMES OF CERTAIN NORTH AMERICAN FOSSIL VERTEBRATES.

THE writer, having recently had occasion to examine the literature pertaining to some of the fossil mammals of North America, has made the following notes, which he desires to record :

Hemiganus, a genus established by Professor Cope, had for its type species *H. vultuosus.* The species *H. otariidens* was described later. Dr. J. L. Wortman has, however, shown (Bull. Amer. Mus. Nat. Hist., ix., p. 167) that *H. vultuosus* is a synonym of *Psittacotherium multifragum.* The species *otariidens* is, therefore, left without generic name. I hereby propose WORTMANIA, in recognition of the valuable work which has been done by Dr. Wortman in vertebrate paleontology. The species will be *Wortmania otariidens* (Cope).

A similar case occurs among the camels. The type of the genus *Protolabis* of Cope is *P. heterodontus.* Dr. Wortman's investigation (Bull. Amer. Mus., x., p. 120) have led him to the conclusion that this so-called species is the same as the earlier described *Procamelus robustus.* The type species being removed, the remaining species requires a new generic name. I propose MIOLABIS. The type will be *M. transmontanus* (Cope).

It has also been ascertained by Dr. Wortman that the type of the genus *Systemodon, S. tapirinus,* is really a *Hyracotherium,* in which genus it was formerly placed. The species which have been associated with *tapirinus,* viz, *semihians, primævus* and *protapirinus* are, therefore, without generic name. I offer HOMOGALAX ('ομογάλαξ, a foster brother). As type of this genus I take Dr. Wortman's *Systemodon primævus* (Bull. Amer. Mus., viii., p. 89, fig. 3).

Professor Cope has described from the Pliocene of Louisiana a fossil horse which he calls *Equus intermedius* (Proc. Amer. Phil. Soc., xxxiv., p. 463). This name has, however, been preoccupied for a quaternary horse of Europe. Trouessart (Cat. Mam., 1898, p. 794) quotes it as a synonym of *E. caballus.* The first mention I find of the name is in Rütimeyer (Abhandl. schweiz. pal. Ges., ii., p. 24, 1877). For Professor Cope's *E. intermedius* I propose *Equus eous.*

Interea volucres Pyrois *Eous* et Aethon,
Solis equi, quartusque Phlegon, hinnitibus auras
Flammiferis implent, pedibusque repagula pulsant.
—*Ovid.*

Certain generic names of vertebrates have, without justice, it seems to me, been relegated to synonymy.

In 1881 Professor Cope established a genus of Condylarthra which he called *Protogonia.* Later he correctly concluded that this name had been preoccupied, probably by *Protogonius,* Hübner. He, therefore, proposed to substitute for it *Euprotogonia,* which name first appeared in a paper by Earle (Amer. Nat., 1893, p. 378, foot-note). In a recent paper Dr. Matthew (Bull. Amer. Mus., ix., p. 303) accepts this name. At the same time he shows that those remains which had originally been described by Professor Cope as *Mioclænus floverianus* belong to the earlier described *Euprotogonia puercensis.* But, for this *M. floverianus,* Scott had in 1892 (Proc. Acad. Sci., Phila., p. 299) proposed the genus *Tetraclænodon.* The latter name, therefore, antedates *Euprotogonia* and must replace it.

In the same excellent paper (p. 268) Dr. Matthew adopts Scott's genus *Protochriacus,* founded in 1892, in preference to Cope's *Loxolophus,* proposed in 1885. The reason assigned for this preference is that Professor Cope's ' distinctions, so far as made, were based on error.' I do not believe that the best usage among naturalists at this day favors the rejection of generic names because of errors, real or supposed, in the definitions. It seems to me that *Loxolophus* must be reinstated.

With exceptions, few but important, *Oreodon* has been employed by writers for a well-known genus of Artiodactyles. Flower and Lydekker in their joint work on Mammalia use *Cotylops,* on the assumption that *Oreodon* is preoccupied by *Orodus* of Agassiz, a genus of fossil fishes. Without now discussing this conclusion, I will

recall the fact that there is a still older name which is in all respects available. This is Leidy's *Merycoidodon*, having for its type *M. culbertsoni* (Proc. Acad. Sci., Phila., 1848, p. 47). Professor Cope has rejected the name on the ground that it is a *nomen nudum;* but a generic name is hardly *nudum* when it is supported by a well-defined species and is, moreover, clothed with two pages of description.

Merycodus is another of Dr. Leidy's names which must be restored to its rightful position. This was proposed in 1854 and had for its type species *M. necatus.* On the supposition probably that this name is pre-occupied by Owen's *Merycodon*, it has been ignored. But it is incorrect to assume that any two names ending in *odus* and *odon*, but alike in other respects, clash with each other. As to their forms they are different enough to prevent confusion. As to their derivation, as has been suggested to me by my friend Dr. Leonhard Stejneger, of the U. S. National Museum, they are unlike ; *odus* being the Latinized form of the Greek ὀδούς, while *odon* comes from the Ionic ὀδών. The acceptance of this view will relieve us of the necessity of rejecting, on philological grounds at least, either word of many such couples as *Menodus* and *Menodon*, *Cosmodus* and *Cosmodon*.

O. P. HAY.

THE FUNDAMENTAL LAW OF TEMPERATURE FOR GASEOUS CELESTIAL BODIES.

IT has been long known that an isolated celestial mass of gas rises in temperature as it radiates heat and contracts. Dr. T. J. J. See [*Astronomical Journal*, February 6, 1899 ; *Atlantic Monthly*, April, 1899] points out that the temperature of such a mass of gas is inversely proportional to its radius, provided the mass does not receive accretions of meteoric matter and provided the gas conforms to the laws of Boyle and Charles. When, however, the volume of the gaseous body is very great large quantities of interstellar gases and particles would fall into it and the first condition would fail; and when the gaseous body contracts to small volume it would, perhaps, be far from a perfect gas in its properties, so that the second condition would fail; to say nothing of the probable dissociation and polymerization of the

gaseous constituents due to the great changes of temperature which, no doubt, take place.

The suggestion of Dr. See that nebulous masses are extremely cold is very plausible, in view of his ' new law,' which ' may be assumed to regulate the temperature of every gaseous star in space,' but it is certainly contrary to the indications of the spectroscope ; for nebulæ surely are approximately in thermodynamic equilibrium in their smaller parts, if anything in the universe is; if so, there is no known agency, electrical or other, which can cause them to give off persistently abnormal radiations. Radiations (wave-length) are as intimately associated with temperature as are molecular velocities, although both may be temporarily abnormal in a given substance ; for example, the velocities of the particles of a gas in a vessel may be made to deviate momentarily from Maxwell's law ; a cold substance, such as calcium sulphide, may shine for a while after exposure to sunlight, and a gas in a vacuum tube may remain phosphorescent for a time as the disturbing influence of an electric discharge dies away. But it is hard to think of a certain cubic foot of nebulous matter, surrounded for millions upon millions of miles with similar matter, remote from intense radiant centers, still giving off abornmal radiations after odd millions of years. Of course, such may be the case, but Dr. See's law, in all probability, has nothing so do with nebulæ at all. There is no physical reason why a nebulous mass might not be intensely hot, held together (if, indeed, we must assume it to be a gravitational unit) by the gravitation of refractory nuclei and receiving continually from space as much matter as it throws off, because of the high molecular velocity of its gaseous parts.

Dr. See's derivation of his law of temperature is incomplete and confused. It is based upon the assumption, which should be definitely proven, that the function which expresses the density in terms of the radius coordinate r remains of the same form as the external radius ρ diminishes; and he confuses *pressure per unit surface* and *pressure between given portions of matter.* Assuming the invariance of the density function Dr. See's formula may be derived as follows. Let ρ be the radius of the gaseous