An Elementary Treatise on Theoretical Mechanics. Part iii. Kinetics. By Alexander Ziwet, Assistant Professor of Mathematics in the University of Michigan. (New York: Macmillan and Co., 1894.)

THE first two parts of this excellent treatise have already been noticed in these columns; this third part keeps up to the same excellence, and we look forward to a sequel, in the absence of any indication that the treatise is yet complete.

We think the author would have done well to have followed the opinion of his American colleague, Prof. T. W. Wright, and to have reserved absolute measurements to the Metric system of units, while using gravitation units only with the British foot and pound. These last units are too insular and provincial ever to be employed in cosmopolitan problems where results have to be translated into absolute measure; and James Thomson's word, *poundal*, is never likely to be of any practical use.

Lagrange's and Hamilton's general dynamical equations are expounded with clearness and elegance; the application of the principle of the Conservation of Areas to the paradoxical motion of a kitten, let fall by his feet a short distance above a table, has excited considerable discussion recently at the Paris Academy of Sciences; this problem would provide the author with an illustration of the methods of generalised coordinates.

The copious list of authorities at the end of the chapters is a valuable feature of the book. G.

LETTERS TO THE EDITOR.

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Destruction of the Seismological Observatory at Tokio, Japan.

I REGRET to say that a letter, which has just arrived from Tokio, informs me that Prof. John Milne has lost all his valuable seismographic instruments, with his library and many manuscripts, through a fire which has occurred at his house and observatory. Prof. Milne wishes me to announce that his address-book has been destroyed, but he will be able to forward vol. iv. of the *Seismological Journal* to those entitled to it, if they will send in their names to him, "care of the *Japan Mail* office, Yokohama." He further wishes me to state that he has 600 damaged copies of the Seismological Society's *Transactions*, and that from these he will be happy to complete sets. Applicants for the copies of the *Transactions* should address Prof. Milne, care of the Geological Society, Burlington House, London, W.

I am sure that scientific men all over the world will feel the deepest sympathy with Prof. Milne in his great and, indeed, irreparable loss. He was preparing to return to Europe when the fire occurred, and he wishes to appeal to all who can furnish him with separate copies of papers relating to earthquake phenomena, to replace, so far as is possible, those he has lost by the destruction of his library. JOHN W. JUDD.

April 1.

On Mersenne's Numbers.

IN 1644 the mathematician Mersenne asserted that out of the 56 primes not < 257, there were only 12 primes, viz. :—

$$q = 1, 2, 3, 5, 7, 13, 17, 19, 31, 67, 127, 257,$$

which, taken as *exponent* (q), make the number $N = (2^q - 1)$ also prime. No proof was published, and even up to now, this statement has only been partially verified: the verification is still one of the difficult problems of higher arithmetic. According to a paper by Mr. W. W. Rouse Ball, in the *Messenger of Mathematics*, vol. xx. p. 34, Mersenne's statement has been verified for the 18 prime values of $q < 60$, and for 14 higher values, and one additional number N has been shown to be prime by Prof. Seelhoff, viz. when $q = 61$. This left 23 cases unverified, viz. 3 supposed to be prime (when $q = 67, 127, 257$), and the remaining 20 supposed to be composite (when $q = 71, 89, 101, 103, 107, 109, 137, 139, 149, 157, 163, 167, 173, 181, 193, 197, 199, 227, 229, 241$).

I have recently discovered the verification of one of the latter, viz. that

$$(2^{197} - 1) \text{ is divisible by } 7487.$$

This can be readily verified directly by the method of Congruences.

It has also been verified by actual division by Mr. R. Tucker (Sec. London Mathematical Society), who has kindly sent me the quotient consisting of 56 figures. The mode of *discovery* of this factor has been communicated to the London Mathematical Society, and will be sent to one of the mathematical journals. ALLAN CUNNINGHAM.

March 23.

Tan-Spots over Dogs' Eyes.

I TRUST you will allow me to point out that the drift of my letter on the above subject in NATURE, vol. l. p. 572, has not been fully apprehended. Hitherto we seem to have no very clear cases in which we can actually trace the operation of "natural selection." I think, when examined, this will be found to be an instance.

The spots appear to have arisen in the dog as comparatively recent permanent markings—for protective purposes—after semi-domestication. As Mr. Worthington G. Smith says, they are not seen among wild animals allied to the dog.

They appear to have arisen since the original Red Dog—be he Dhole, Pariah, or Dingo—became pied, and at times *black*, through domestication. It is only on a black coat that the tan-spots would be conspicuous, and simulate eyes.

Perhaps Mr. A. R. Wallace may throw light on the matter. The spots seem to be the only really permanent marking among dogs, and are now being bred out. S. E. PEAL.

Sibsagar, Asam, February 19.

MR. PEAL'S suggestion appears to be a probable one, and is supported by Mr. Worthington Smith's observations (NATURE, vol. li. p. 57). The spots may have been protective to the animals during sleep, causing them to look as if awake. The reason that they do not occur in wild dogs may be that the latter conceal themselves when sleeping, which the half-domesticated animals were not able to do.

ALFRED R. WALLACE.

THE AGE OF THE EARTH.

SINCE physicists do not seem to be in complete accord on the question of the time which has elapsed since the earth first permanently crusted over, it may perhaps be as well to investigate the evidence to be obtained from a study of stratified deposits.

One of the first to raise a remonstrant voice against the philosophers who demanded practically unlimited time was Sir Archibald Geikie, whose original discussion of the data known regarding the present working of rivers gave us the fraction $\frac{1}{6000}$ as representing the annual rate at which the Mississippi is lowering its basin. The surprise with which this result was received is now almost forgotten, in an unquestioning acceptance. The question of the rate of deposition was next treated by Dr. Haughton, in the year 1880, with his usual mathematical severity. Dr. Haughton, however, preferred to take into consideration six other great rivers besides the Mississippi, and thus obtained the fraction $\frac{1}{3090}$ as representing the average thickness of rock which is annually worn away from the terrestrial surface by the denudation of rivers. But the proportion of sea-bottom to land surface is as 145 : 52, so that if the suspended sediment be spread evenly over the sea-floor, the average rate of accumulation will be $\frac{1}{8616}$ of a foot per annum. The maximum thickness of the stratified series was estimated by Dr. Haughton to be 177,000 feet, and thus if the rate of deposition in the past was on the whole