

that Donny, Dufour, and others made important contributions to the subject. I can find no vestige of a novel idea on the subject of continuity in the essay of Van der Waals. If he has succeeded in extending thermodynamic formulas to fit in with Andrews's discoveries, so far the work is praiseworthy and valuable; but an essay "On Continuity" ought certainly to contain a suitable acknowledgment to the author of the discovery.

J. T. BOTTOMLEY.

Rainbows on Scum.

I HAVE several times noticed "rainbows" on the black scum upon the pond in a park in this town, and have imagined all of them to have been formed on dew deposited upon a film of soot. It is out of the question, however, that yesterday there can have been any dew to produce the phenomenon, as there had been a thick hoar frost on the grass, all melted by the warm sun by 10.30 a.m., at which time there was a very vivid double "rainbow," which seemed exactly like an ordinary bow upon rain, except that there were none of the supernumerary arcs due to diffraction, and that the outer bow was fainter than usual in proportion to the inner one. The pond was thinly frozen over, but, it being a cloudless day, the surface of the ice was by that time covered with water. On closely examining the scum, I found it was composed of floating black particles, I presume of soot (the weather being rather foggy), and to many of these, minute drops were adhering, which varied much in size, the largest being probably $\frac{1}{10}$ of an inch in diameter. It was surprising to find distinct drops upon water, but I suppose it must have been the particles of soot that kept them separate. It seems probable they were a portion of the melted hoar frost; but it is rather curious that in such a situation this can produce a rainbow, seeing that usually melted hoar frost does not do so at all, or at most gives a very slight one; so decidedly is this the case, that one may distinguish in the morning between dew and melted hoar frost by noticing whether a "rainbow" and white anthelion are formed; dew being capable of producing bright ones owing to the roundness of the drops composing it, while hoar frost when it melts usually turns into irregular drops. I may say, however, that this "rainbow" on the pond was far more brilliant than any ordinary dew bow, and therefore it would appear that there is some property in the particles of soot to perfect the roundness of drops adhering to them, and so produce a striking phenomenon even from melted hoar frost.

At 0.30 p.m. I noticed the bow was fainter, but still fairly bright, and I estimated there were about 100 drops to each square inch of the surface of the water; it seems this number of drops, averaging probably not more than 0.003 to 0.005 inch in diameter, is sufficient to produce a pretty bright "rainbow." When I placed my eye close to individual drops I found that supernumerary arcs were visible.

T. W. BACKHOUSE.

Sunderland, February 20.

Wild Swine of Palawan and the Philippines.

DR. A. NEHRING has recently (*Abhandl. Mus. Dresden*, 1889, No. 2, p. 14 *et seq.*) characterized the wild pig of Luzon under the title of *Sus celebensis* var. *philippensis*, and the animal found in the island of Palawan (Paragua) as *Sus barbatus* var. *palavensis*. It would seem that both these local races or species have been already characterized and figured by M. Huet from specimens collected by M. Alfred Marche—the first named as *Sus marchei* (*Le Naturaliste*, 1888, p. 6), and the second as *Sus ahenoarbus* (*op. cit.*, p. 5).

It is interesting to note that the wild pig of Palawan is a representative of the well-marked *Sus barbatus* of Borneo, and not of the wart-faced animal of the Philippines proper.

No specimens of wild pig from the large island of Mindanao appear to have been examined as yet. The following note of the external characteristics of a boar's head brought to me at Zamboanga may therefore be worth being transcribed:—"It was black with a white bar across the snout half-way between the eyes and the nose, with a black spot at the inner corner of the eyes; two tufts of coarse white bristles on the fleshy protuberances on the cheeks on either side, and two singular fleshy black knobs (warts) on the sides of the snout just below the white band."

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A Beautiful Meteor.

ON February 25, about 7.30 p.m., I chanced to see, at Coombe, near Woodstock, Oxfordshire, a globular meteor start from the Pointers, and fall with a slightly northerly inclination. When it was near the horizon, my garden wall hid from my sight the close of its brilliant career. Big as Venus at her brightest, it was substantially of a yellow colour, but shot over with flashes of glowing scarlet.

JOHN HOSKYNs-ABRAHALL.

Coombe, near Woodstock, Oxfordshire.

INFECTIOUS DISEASES, THEIR NATURE, CAUSE, AND MODE OF SPREAD.¹

I.

WE read in Homer that "Phœbus Apollo, offended by mortals, sent a pernicious plague into the camp of the Greeks; the wrathful god with his arrows hit first mules, then dogs, and then also the Greeks themselves, and the funeral pyres burned without end." If we expressed this in less poetical language, but more in conformity with our modern realistic notions, we would say, that the deity of health and cleanliness, having been offended by mortals, sent his poisonous but imperceptible darts or bacilli into them, and caused an epidemic of a fatal disease, communicable to man and animals.

In whatever form we meet with this simile—whether an epidemic be ascribed to a wrathful providence, or to a sorcerer or a witch that put their spells on man or on cattle, thereby causing numbers of them to sicken and to die; whether this happened amongst the nations of old, or amongst the modern Zulus, whether amongst the peasants of Spain or in Italy—we now know that it always means that the offended deity of cleanliness, and the outraged laws of health, avenge themselves on mortals by the invasion of armies of imperceptible enemies, which we do not call arrows, nor sorcerers' or witches' spells or incantations, but microbes.

From Homer's Trojan epidemic among the Greeks to the epidemic in the camp of Cambyses, from the plagues carried and spread by the Crusaders of old to the plagues carried and spread in modern times by pilgrims to and from Mecca, the plagues following the ancient armies and those of more recent times, the plagues attacking a country debilitated by famine or by superstition have been in the past, and will be in the future, due in a great measure to neglect and ignorance, on the part either of individuals or of a whole population, of the principles of the laws of health: and it is chiefly to this neglect, ignorance, and indolence that the spread and visitations of epidemic infectious disorders must be ascribed. It is, therefore, with justice, that these disorders are called preventable diseases, and one cannot imagine a greater contrast than that between the knowledge we possess at the present time of communicable diseases, as to their cause, mode of spread and prevention, and the views of former generations, as to their spontaneous origin.

Although the notion that all epidemic diseases are communicable, *i.e.* spread from one individual to another, is not a new one, since many writers of former generations have had clear ideas about them, yet the actual demonstration of the fact that the different infectious or communicable diseases are due to definite species of microbes, which, having invaded a human or animal organism, are capable therein of multiplying and of causing a particular infectious illness; further, the identification of these living germs in the blood and tissues of an invaded individual, and the recognition of their many and intricate migrations outside the animal body; the study of the microbes in artificial cultures, *i.e.* out-

¹ Lecture delivered at the Royal Institution on Friday, February 20, 1891, by E. Klein, M.D., F.R.S., Lecturer on Physiology at St. Bartholomew's Hospital Medical School.