conceptual world evolving the perceptive faculty which creates it. An evolution theory which postulates spontaneous generation and human automatonism is natural to the materialist; and hence our contention that, in spite of the general character of the argument in the earlier chapters of the book, certain conclusions are distinctly materialistic.

Again, we are not of those who would bind down all time to Newton's views on matter, force, and motion. That never has been the position of those whom Prof. Pearson delights in nicknaming the Edinburgh school. Only we think a writer should be careful as to what he imputes to Newton. Thomson and Tait say, "We cannot do better, at all events in commencing, than follow Newton somewhat closely": and unless they have misrepresented the teaching of the "Principia," an attack on their version surely amounts to an attack on Newton. Indeed, Prof. Pearson fully realizes this himself, when, on p. 382, he accuses Newton of thinking of "force in the sense of mediæval metaphysics as a cause of change in motion." It was this statement we took exception to. Similarly, we cannot but look upon Prof. Pearson's obvious jeer at Maxwell's language as of the same gratuitous character.

"Matter is, as it were, the plaything of force"—this evidently Prof. Pearson regards as his trump card. Now these words—and note the "as it were"—occur in the discussion of Newton's laws of motion, and are obviously suggested by Newton's own anthropomorphic language. But they can give rise to no misapprehension in the mind of one who is reading Prof. Tait's "Properties of Matter" for profit. In the light of the introductory chapter there is really no room for other than wilful misrepresentation of Prof. Tait's position. Moreover, it is positively astonishing to find an author, who has no slender claims to the title of historian, confessing his ignorance of Prof. Tait's lecture on "Force," delivered before the British Association in 1876, and published in *NATURE*, vol. xiv. (see also "Recent Advances," third edition, and Maxwell's "Life," p. 646). That lecture was, we think, the first popular exposition of the subjectivity of force. The recognition of this truth was, of course, a natural consequence of the remarkable series of discoveries which brought home to the mind that energy was physically as objectively real as matter. We certainly did not need to go all the way to Berlin to learn it. C. G. K.

On the Line Spectra of the Elements.

I OBSERVE from Prof. Range's last letter that on one point I was led into misinterpreting his meaning by his having used the letter *j* in his second formula on p. 100 (*NATURE* of June 2) in a sense different from the only definition that had been given of that symbol, viz. the jot of time—the time that light takes to advance one-tenth of a millimetre in the open æther. The period of time represented by *j* is as determinate as a day or hour. With it, Prof. Range's equation represents one definite discontinuous motion along the sloping sides of the teeth of a particular saw, and this is what I understood by it. I perceive now that he intended *j* to be interpreted in a new sense, and meant the equation to represent uniform motion in a straight line to an indefinite distance.

If all that Prof. Range wishes to point out is that motion along an orbit that extends to infinity must be either wholly incapable of being represented by a Fourier's series, or at least must contain a component of that kind, this is both true and obvious; and the instance he gives (which is, in fact, uniform motion to an unlimited distance along a straight line) is a case in point. But it should be added, no such component of the motion of an electric charge which does not yield to Fourier's theorem can produce any periodic disturbance in the æther: in other words, *it would not contribute anything to the spectrum*. Accordingly, any such part of the motion—for instance, the advance, in common with the rest of the solar system, of the electrons within the molecules of a gas on the earth, at the rate of eight miles a second, towards the constellation Hercules, which is the precise kind of motion that Prof. Range adduces as an instance—has nothing whatever to do with the subject of my memoir, which is an investigation into the cause of double lines in spectra. It should further be added that unlimited motions of any kind have nothing to do with motions going on within molecules, to the investigation of which chapter iv. of my memoir is devoted, and that any discussion of them there would have been out of place.

Hence, to represent as a defect which vitiates my reasoning,

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as Prof. Runge does, that I have omitted in that chapter to refer to the motions which are not resolvable by Fourier's theorem, is, I submit, not legitimate criticism, especially as the matter, beside being irrelevant, is obvious; and I also submit that to say "A plausible suggestion about the movement of the molecules ought to explain more than one of the observed phenomena" (*NATURE*, April 28, p. 607) is not criticism at all. We must use the data furnished by our observation of nature to carry us as far as they will go in the interpretation of nature, and not refuse to employ them to that extent because they do not enable us to get further.

G. JOHNSTONE STONEY.

9 Palmerston Park, Dublin, July 2.

Range of the Sanderling in Winter.

AS my little contribution to the *Records of the Australian Museum* has been honoured by a notice in *NATURE* (*suprà*, pp. 177-78), I must ask leave to qualify two statements therein made. Since I wrote it I have become aware that Dr. Finsch had a specimen of the Sanderling (*Calidris arenaria*) brought to him at Bonham Island, one of the Marshall Group, which lies within the tropics (*Ibis*, 1880, p. 331); and, after the publication of Mr. Everett's list of the birds of Borneo in 1889, that gentleman announced the occurrence of this species at Baram, on the north-east coast of that island (*Ibis*, 1890, p. 465).

ALFRED NEWTON.

Magdalene College, Cambridge, June 25.

Immunity of the African Negro from Yellow Fever.

DR. CREIGHTON will find that on p. 51 of a report dated 1890, "On the Etiology and Prevention of Yellow Fever," Dr. George M. Sternberg (Lieut.-Colonel and Surgeon U.S. Army) makes the following statement:—

"It has been asserted that the negro race has a congenital immunity from yellow fever, but this is a mistake. The susceptibility of the negro is, however, much less than that of the white race. Amongst those attacked the mortality, as a rule, is small."

He will also find the subject discussed on pp. 166-67 of "A Contribution to the Natural History of Scarlatina," by Dr. D. Astley Gresswell (Clarendon Press, 1890). Dr. Gresswell writes thus:—

"The African negro of pure descent was supposed to be insusceptible to the virus of yellow fever and of malaria. It is said, however, that when these affections are prevailing in a virulent form the negro does become infected and manifest such infection. This would suggest that the almost complete immunity in the case of the negro has been acquired. Moreover, the fact that negroes of pure descent are more likely to manifest the symptoms of yellow fever on exposure to the poison after they have passed some years or some generations in more temperate latitudes, in which the disease is not indigenous, suggests that in order to maintain this degree of immunity it is necessary that the negro should continue to live in localities in which the virus exists; in other words, that the individual or the race should be repeatedly subjected to the virus. It may, in fact, be questioned how far, in regard to these diseases in man, susceptibility differs independently of protection acquired by previous subjection to the action of the virus or its products; though natural selection may (as certain facts indicate) have acted more directly. Indeed, it is quite possible that protection acquired by previous infection is much more frequently a cause for benignity or only partial susceptibility in the case of these and other infection-diseases than is generally allowed for."

I do not think I can with advantage add anything to these quotations.

YOUR REVIEWER.

A Solar Halo.

IN connection with the heavy thunderstorms further south, possibly, there was here the most brilliant solar halo on the 29th which I have seen. The wind was easterly all the time, causing sea-fog-like clouds in the morning, which dissipated by degrees about 10, but I did not notice the halo before 10.45, nor after 3.30 or 4 o'clock. It was certainly gone at 5.

Though a complete halo at 11, it was far intenser above and below, the north-west and south-east octant especially. By 1 o'clock this had shifted to the north-east and south-west octants.

Between 11.45 and 12 the south-east octant of the outer halo (red inside) was also visible.

Until 1 o'clock the figure was practically circular, the inner space being remarkably free of colour, the blue of the sky assuming an ashy grey tint. By 2 the figure was elliptical, the long axis horizontal, and the halo *not complete*. The ellipticity increased as the sun sank. Hence the visible part was evidently formed of the *tangent arcs*. No doubt the intense brilliancy near noon was due to these arcs practically coinciding with the ordinary halo, because of the sun's great altitude.

J. EDMUND CLARK.

4 Lorne Terrace, Edinburgh, June 30.

The Electric Current.

DURING the thunderstorm last evening, in the middle of the brilliant flashes which illuminated the south-eastern sky, I noticed the electric current assume the following remarkable form:—

Burlington Fine Arts Club,
17 Savile Row, W., June 29.

EDWARD HAMILTON.

Are the Solpugidæ Poisonous?

AT a recent meeting of the Linnean Society (June 2), I had the honour of exhibiting the jaws, claws, and hairs of a species of *Galeodes* from Tashkend, in order to show certain peculiarities, which perhaps throw light on the question as to whether these animals are poisonous or not.

Murray, in "Economic Entomology," says: "Their bite is said to be venomous, and even dangerous, but proof of this is wanting."

It is, further, always the natives in both the Old and New Worlds where this "spider" occurs who give it its bad reputation, and always the European immigrant or settler who either doubts or even positively denies it.

In spite of the well-known fact of the persistence of groundless errors in the minds of uncivilized peoples, I should still be inclined to think that, in a case of this kind, which is one of raw experience, the natives would probably be in the right.

Dufour, in his monograph of the Algerian species (*Mem. p. à l'Institut de France*, xvii.), after describing a serious case arising from a *Galeodes* bite, having failed to find any poison-glands or apparatus, leaves the mystery to be solved by others.

Croneberg (*Zool. Anzeiger*, 1879) claimed to have discovered the poison gland in a long coiled gland, which he says opens at the tip of a lancet-shaped process at the junction of the palp with its basal or maxillar portion. As far as I can make out, this gland is the homologue of the coxal gland of the other Arachnids. This would not preclude the possibility of its being a poison gland. On the face of it, however, I should not expect to find the opening of the poison gland in this comparatively awkward place. In a creature so armed for attack as *Galeodes*, one would expect the venom to take a more prominent place in the offensive armoury.

Examination, on immersion in clearing media, shows—

(1) That the tips of the jaws are not only traversed by a canal opening to the exterior, but are covered with multitudes of fine pores, which can be traced with a low power through the thick chitin.

(2) The claws are also open at the tip, while the shaft of the claw seems filled with a glandular mass of tissue provided with tracheæ. These claws are terrible weapons of offence; the articulating joint at the end enables them to anchor themselves in the body of the prey.

(3) Around these claws are sharp hairs, which appear, like the claws, to be open at their tips. It is obvious that the tighter the

claws draw themselves into the flesh, the deeper would the pointed hairs at their base penetrate, and, if poisonous, increase the deadly nature of the attack.

(4) Leaving the spines on the limbs, and the long, thin apparently tactile hairs out of account, the hairs on the legs and back are, as a rule, forked at the tip, as has been already described by Dufour. Up to the fork they are hollow, like those round the claws. My suggestion is that these are like buttoned rapiers. They are harmless until the animal is seized. The fork prevents the hair from penetrating until the pressure is great enough to snap off the tip. Small mammals and birds would soon learn not to try to chew up or swallow a *Galeodes*. If this suggestion is correct, the action of the forked hairs may be compared with that of the stinging hairs of the common nettle.

(5) Here and there are long hollow hairs, with the tips swollen out into a thin bubble-like expansion of the chitin. These hairs may be abnormal. I found five or six in all, and chiefly on the palp. They seem to indicate a tendency of fluid to flow down the hairs.

The openings at the tips of the claws are quite in keeping, morphologically, with those at the tips of the hairs. Claws are but highly developed hairs. The jaws, however, are modified joints of limbs. We have, therefore, to interpret the central canal (?) and the pores which open at and around their tips, as the canals which run through the cuticle into the hairs. We find that, as we recede from the tips of the jaws, the open pores cease, and the hairs commence, each with its central canal continued through the cuticle.

As to the nature of the poison which I suggest flows through these apertures, I am inclined to consider it, in the presumed absence of specialized glands, as a product of the hypodermal cells, perhaps even of those which secrete the hairs themselves. At the tips of the jaws, where the hairs have disappeared and only their pores remain, these cells could be specialized for this purpose alone. In the claws there seems to be a mass of cellular tissue, which would also be a derivative of the hypodermis, and may be solely taken up with the secretion of poison.

One other point remains to be mentioned, viz. the mechanism for the movement of the end joint of the claw. Articulated hairs are common among the Polychæte Annelids, but the exact mechanism is not visible. This large claw of *Galeodes* may explain these cases. We should naturally not expect a muscle fibre in a hair. The actual mechanism is very simple. Along one side of the claw the chitin splits, for, say, three-fourths of its proximal length, to form an inner and an outer layer. A very slight differentiation of the flexor muscles of the claw would allow of a few fibres being attached to the inner layer. A pull at the inner strip of chitin bends round the tip of the claw, invaginating a small portion of the outer layer, which thus forms a collar round the base of the joint or "nail" as some call it. The bending of the claw would almost necessarily compress its fluid contents, some of which might escape through the opening at its tip.

Until the question as to the poisonous nature of *Galeodes* has been experimentally settled, these observations seem to have some weight in the affirmative scale.

HENRY BERNARD.

Streatham.

Death from Paraffin, and Members of Parliament.

NOTWITHSTANDING the enormous development which has taken place in recent years in gas and electricity, there can be no doubt that oil lamps light the homes of a larger number of persons throughout the world than any other illuminant. Even in the United Kingdom alone it has been estimated that over 10,000,000 lamps are in use. No wonder, then, that newspaper readers are every now and again startled by the recital of terrible accidents, too often resulting in agonizing death. Mr. Alfred Spencer, of the London County Council, stated at the inquest on the late Lord Romilly that he estimated that there were 300 deaths a year caused in this country by unsafe lamps. Mr. Shean, of the Fire Brigade Association, expressed the opinion that 10 per cent. of fires are caused by paraffin lamps; and Captain Shaw, the former Superintendent of the London Fire Brigade, reported 156 fires in one year caused by the upsetting of lamps in London. Will a friend to humanity in each constituency ask the candidates, whether Liberal or Conservative, to pledge themselves to support a short Act of Parliament compelling every lamp to have affixed to it an automatic extinguisher, as recommended in the reports of Sir Frederick Abel, Mr. Boverton Redwood, and Colonel Majendie, or must we wait until a Bishop or a Royal Princess is burnt to death?

HUMANITY.