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.