

colour. It always attacks its prey on the wing, swooping down and disabling it when least able to use its effective weapon. It is well known to the Indians, and its specific name among them indicates its habits—*Kukong* (macaw) *pung* (hawk)—in the same manner as the eagle is called *sar pung* or monkey hawk."

There can be no doubt therefore that the macaw is not so free from molestation in Costa Rica as I supposed it to be in Nicaragua. Whilst the statement respecting its immunity from attack will need modification, the argument I founded upon it may still hold good. Birds on the wing could not evade the keen sight of a hawk by any protective colouring, and if when at rest the macaw did not need concealment, natural selection would not work to tone down the colours that sexual selection tended to make more pronounced.

It will gratify all naturalists to learn that some of the results of Prof. Gabb's long and critical study of the miocene molluscan fauna of Santo Domingo and Costa Rica and its relation to the existing species of the Atlantic and Pacific Oceans, will shortly be ready for publication. Much light will be thrown by them on the interesting question of the time of the latest connection of the two oceans through the strait that once separated the northern from the southern continent.

THOMAS BELT

The Cedars, Ealing

"On the Question of Free-Will"

I SHOULD like to call the attention of your readers to what appears an important matter in connection with the above subject, which has attracted considerable attention of late, and which has also its physical bearings. In a recent lecture by Prof. Tyndall, the aspect of compensation and punishment for actions was treated of in connection with the question of free-will, and I think that it cannot but have struck many that the conclusions arrived at as regards this special point were less satisfactory or complete than the otherwise able reasoning of the lecture. What I should like to submit is that this special point is entirely independent of any question of free-will.

The argument is that if the will be *not* free, then reward for a good action, or punishment for a bad action cannot be *deserved*; but are merely *expedient*. I submit that the contrary holds true, quite independently whether the will be free or not. For it seems to me that the great point (that has apparently not been taken into account) is that the expectancy of the reward enters in as an element to *determine the will*. If there were no reward in prospect, the action would not be done. It must therefore be an error to argue that because the will is not free, therefore the reward is not deserved. To withhold the reward would be to reverse the conditions under which the action was willed.

In the same way as regards punishment. A person (say) for his own benefit appropriates to himself a sum of money. The person in appropriating the money contemplates the possible punishment, or takes this eventuality into consideration as an element in determining his will. If, therefore, the punishment were withheld, it would (quite independent of the question of free-will) be an injustice, because the person would derive a benefit without any compensating disadvantage. So in the same way in the previous case of the reward, he would (if the reward were withheld) undergo inconvenience without any compensating advantage. Thus I submit that rewards for good actions and punishments for bad actions have nothing to do with the question of free-will, for these in any case enter as elements in *determining the will*. Therefore punishment for an offence (like reward for a good action) is not merely an *expedient* thing, but in accordance with reason and justice.

Is not the question of free-will in itself rather a quibble? A man's will is dependent on his reason, or *will* may be said to be a special act of reason. Reason, it will be generally admitted, depends on brain structure. Else what are our brains for? Hence *will* depends on brain structure. Can it be said that on that account *will* is not free? For a man to be dominated (if conceivable) by a will independent of his brain structure, he would surely be a slave; for surely brain structure enters into the determination of a man's identity. So long as *will* is subject to brain structure, it is subject to reason, for brain structure is the mechanism of reason (or, at least, a mechanism *necessary* to reason). To have a will not subject to brain structure would be, therefore, to have a will not subject to reason (or a will that runs wild). Can any greater slavery be imagined than to be dominated by an independent will not subject to reason? I say, therefore, that *because* the will is subject to brain structure, *therefore it is free*; this, therefore, in direct opposition to the

opposite party who hold that, for the will to be free, it must not be subject to anything, *i.e.* must run wild independently of the controlling mechanism of brain structure.

The most powerful argument *against* anything is perhaps the argument of an exceedingly competent reasoner *in favour* of a wrong cause. Thus the portion of Sir John Herschel's lecture on "The Origin of Force," in which he supports independent free-will (so termed), constitutes the most powerful argument against it; as, in order to support his conclusions, he is obliged to assume the *creation* of (a small amount of) energy; or, to support independent free-will, he has to touch upon the perfection of the principle of the conservation of energy. It is a known fact that a man, however able, may not be an equally competent reasoner on *all* points. It may be observed that those persons who would maintain an independent free-will would thereby entirely ignore the beautiful mechanism of the brain, and suppose it useless. *Will* subject to brain structure (*i.e.* to the mechanism of reason) *is* surely free, for the emancipation of the will from reason would be anarchy or slavery. If, therefore, we admit that under no conceivable circumstances would we have the will otherwise than subject to reason, then even if we could conceive the will emancipated from brain structure, the will (if consistent with reason) would still be *the same* as when subject to brain structure; for brain structure, being the mechanism of reason, determines the *will*, and makes it consistent with reason. Therefore I contend that the question of free-will is a quibble, or the will subject to and determined by brain structure (the mechanism of reason) *is* perfectly free.

The subject is a difficult one, and I may, no doubt, have said some things that admit of improvement, but I should be glad to have in any way contributed to throw a true light on this interesting question:

P. Q.

London, October 16

Early Observations of the Solar Corona

THE "Astronomical Column" in NATURE, vol. xvi. p. 255, has drawn attention to an observation of the solar corona by Clavius during the total eclipse of 1605. This is, however, by no means the earliest known case in which the corona was remarked. Plutarch already had alluded to the faint light round the eclipsed sun, but the first eclipse, during which the corona appears to have made a strong impression on the observer, seems to have been that of August 31, 1030. On this day a fierce battle took place at Sticklestad, in Norway, between the Christian king Olaf (afterwards the national saint) and his heathen subjects. During the battle the sun was totally eclipsed, and a reddish light appeared round it. Before the eclipse of 1842 had made astronomers familiar with the corona and protuberances, Hansteen had suggested that it might be the zodiacal light which caused the red light in 1030.

Observatory, Birr Castle, Ireland

J. L. E. DREYER

Sense Perception of Electricity

In the very interesting address of Prof. C. von Nägeli at Munich, on "The Limits of Natural Knowledge," of which a first portion is printed by you (NATURE, vol. xvi. p. 531), in illustration of his argument that there may be many forces in nature which we have not the requisite senses to perceive, he instances electricity as an universal element which might well have escaped our cognisance but for its occasional concentrations and disturbances making vivid appeal to two senses that we have—in lightning and thunder. The illustration is an apt and telling one, but is it worth while to note that though we have no sense differentiated to perceive electricity as the eye receives the light-wave and the ear the sound-wave of the circumambient ether (an organ, by the way, which would be useless to us unless we had also the power of self-insulation on the approach of this danger), we *have* a very general physical perception of electrical changes? The remark, for instance, is very common, "I thought it felt like thunder;" and in some this consciousness is quite abnormal. I knew personally one gentleman to whom this sensitiveness was such a constant source of *malaise* that he was medically advised to wear a fine silk vest as an insulator. In his case the success of the experiment was so marked that, according to his own statement, it "made life another thing." It would be interesting to know whether such a peculiarity was transmitted.

HENRY CECIL

Bregner, Bournemouth, October 22