of carbonic acid. It is accompanied by a molecular change which renders the resulting product soluble and diffusible. Assimilation is simply the absorption by the living tissue of the substances thus prepared, one of the chief processes which accompanies it being the reversion, by loss of water, of the glucose to the condition of cellulose, a substance isomeric but not isomorphic with starch. Intussusception, therefore, is a process which can only succeed digestion. No essential difference can, in fact, be maintained between the manner in which animals and plants digest their food. A. W. B.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts. No notice is taken of anonymous communications.*]

Hygroscopic Seeds

I HAVE lately received an interesting letter from Fritz Müller, in St. Catherina, Brazil, on the subject of hygroscopic seeds. He tells me that in the highlands of the Uruguay he has succeeded in discovering more than a dozen grasses, as well as a species of geranium, whose awns are capable of hygroscopic torsion. He has been so kind as to send me specimens of the grass-seeds, and many of them appear to be as beautifully adapted as those of Stipa, Avena, &c., for penetrating the ground in the manner which I have elsewhere described.[1] The most curious among the specimens received are the seeds belonging to the genus Aristida. In one of these the awn is longitudinally divided into three fine tails, six or eight inches in length, each of which twists on its own axis when the seed is dried. These tails project in three directions, and more or less at right angles to the axis of the seed, and Fritz Müller states that they serve to hold it in an upright position with its lower end resting on the ground. The seed is pointed and barbed in the usual manner, and when it is made to rotate by the twisting of the awns, it evidently forms a most effectual boring-instrument, for Fritz Müller found many seeds which had penetrated the hard soil in which the parent plant was growing. Another species of Aristida is interesting to me, because it illustrates the explanation which I gave of the torsion of the awn of Stipa, namely, that each individual cell of which the awn is composed is capable of torsion, and their combined action results in the twisting of the whole awn. Now in this species of Aristida, each of the three tails into which the awn is divided is capable of torsion on its own axis, and as the seed dries they twist up into a perfect three-stranded rope, just as the component cells combine to produce the rope-like twist of the Stipa awn. And as the tails wind together and form the strands, the seed is made to rotate and thus bury itself in the ground.

Down, Beckenham, February 19 FRANCIS DARWIN

Mind and Matter

BUT for illness I would have made an earlier reply to Mr. Duncan's courteously-expressed objections (NATURE, vol. xv., p. 295) to my analysis (NATURE, vol. xv., p. 217) of his very ingenious "solution" (NATURE, vol. xv., p. 78). A general "mistake," and an "essential omission," are the charges against me. The mistake is in "regarding what was intended to solve a problem as intended to prove an alleged fact." "The alleged fact," he adds, "that consciousness depends on nervous organisation, I assumed to be a fact, and undertook to indicate *how* the dependence might be conceived, or regarded, to exist." He says that I clearly understood this "at starting." Where now is it that I "fell into the error?" His first step towards "clearing away difficulties in the way of our *conceiving* the relation of consciousness to matter," is to allege this fact: "It is no more difficult to conceive of matter being subjective than of spirit being subjective." This is a dogmatic statement about our powers of conceiving; no hint of help as to *how* we may conceive. We ordinarily conceive of "spirit"—the "ego," the "subject"—as susceptible to consciousness, or "subjective," because we (the ego) feel we are conscious; but is it "as easy" to conceive of a stone as susceptible to consciousness, *i.e.* subjective? To say *it is*, I called a *petitio principii*, because it assumes that conceivability which has to be established. I used the word "probability" as involving conceivability; for can we intelligibly assume a probability without a conception of what that probability is? But Mr. Duncan contends that his position is "conceivable as a hypothesis, true or false." Unquestionably we may conceive some one stating any hypothesis—a stone feels, fire freezes—but to conceive one doing this is not to have a concept of any part of the operation as hypothesised, however we may attach a meaning to the terms as such. Again, if any hypothesis, true or false, is already conceivable, this fact cannot favour Mr. Duncan.

So far I have not been led "to mistake allegations of the conceivability of a notion for assumptions or intended proofs that the notion is true." To the next position, "How energy is related to matter, is no less mysterious than how subjectivity may be a property of matter," my objection was twofold: first, to the illogical form; second, to the argument itself. Mr. Duncan replies, "The parity of mystery was not intended to establish parity of probability as to facts, but merely parity of conceivability." Now what *is conceivable* in the known case? The *fact* of energy being related to matter. Next, what here is mysterious or *inconceivable?*—the *manner how* these are related. Finally, what is the parallel to establish? Mr. Duncan answers, "Not the parity of probability as to facts, but merely parity of conceivability." But the conceivability of *how* energy is related to matter equals zero, therefore, by parity of reasoning, the conceivability of how subjectivity is related to matter equals zero. I commented, therefore, on all that this argument supplied—a bare shadow of *probability*. My next objection to the position, "Energy may be divided, why not subjectivity?" is strictly categorical, and no flaw has been found in it, nor, intrinsically, in any of my objections, which have now been shown to apply to "conceivability." Of the omission, Mr. Duncan says:—"The essential part of my solution which indicated roughly the *modus* of the connection between matter and consciousness, and which dealt with the great difficulty of the question, How to account for the two aspects of matter, the conscious and the unconscious? has not been touched by Mr. Tupper." Because all this was based on the untenable ground that "subjectivity may be divided," I closed my analysis here; but will conclude with a few remarks on the ingenious and original parallels drawn by Mr. Duncan.

"As energy potential is rest, so subjectivity potential is unconsciousness. As kinetic energy is motion, so active subjectivity is consciousness." Now energy, both to the materialist and his opponent, is a hypothesis, not a phenomenon; and it is not legitimate to support one hypothesis by another.

Again, if subjectivity is defined "susceptibility to consciousness," some sub-definition of "susceptibility" is needed; for if non-innervated matter, as Mr. Duncan admits, is never conscious, then matter *in this form being non-susceptible to consciousness*, is by the definition non-subjective: a conclusion opposed to Mr. Duncan's "all matter is subjective or susceptible to consciousness," his qualification, that non-innervated matter is only "potentially subjective" not availing unless this term mean non-subjective, and leave us with the above contradiction. The expression "all forms of matter may, by innervation, be made susceptible," &c., would indeed carry the conclusion "all matter may be made subjective," but then subjectivity would be an accident, not a property of matter as defined by Mr. Duncan. Lastly, to the phenomenalist who would investigate, and not create, nature, matter, or a fancied common substance for the support of all phenomena, is perhaps the most unwarranted of all assumptions. J. L. TUPPER

Atmospheric Currents

MR. CLEMENT LEY thinks (see his letter in NATURE, vol. xv p. 333) that if the earth's atmosphere contained no watery vapour, the great currents of atmospheric circulation would be quite unlike what they are. I think, on the contrary, it is as certain as the established truths of physical astronomy, that if there were no watery vapour the great currents, though not the storms and other temporary disturbances, would be nearly what they actually are.

All winds belonging to the great currents, though not local winds, form part of a system of circulation between the equatorial and the polar regions, which is caused by the difference of those regions in temperature. Equatorial air is constantly flowing towards the poles, and polar air towards the equator; the equatorial air brings the greater rotatory velocity of the equatorial

[1] *Trans. Linn. Soc.*, vol. i., part 3, p. 149, 1876.