unclosed in some of us for use? But one is sometimes met with the remark that, if these rudimentary and variable structures are useless, they are at any rate not injurious. But is it so? May they, and do they, not become injurious under disease or accident? There is the male mamma, for instance, which we have sometimes occasion to excise for disease. Whatever may be the law which regulates the evolution of the sexual organs, no "use" theory can account for the presence of that rudimentary organ. But the diverticulum is a possibly injurious structure not merely as a tissue, but in addition, specially, as forming, if I may use the word, a kind of trap, by lodgment or by strangulation. Thus we find that we have, whether we will or no, reached the conclusion that there are parts in the animal body which are not only useless but worse than useless because dangerous.

I do not see any reply to this in my critic's remark that it proves too much for the argument, that, for instance, because some people have died from wounds of the scalp, therefore the head might be dispensed with. For, however much the head may vary among us, it is not a rudimentary structure. No argument can affect the fact that the diverticulum is not only a useless structure, but worse than useless because dangerous. The object of putting it thus emphatically is both to establish and to call attention to the conclusion that there are such things in animal bodies as rudimentary structures, things which are of no use to the animal body which contains them, and which can be understood only by referring to other animal bodies in which they are in full play; and that we must therefore rise to higher conceptions of the mode in which these things are regulated. It was carefully stated in my paper that the consideration of such parts as the diverticulum does not carry us further than to clear away the old argument, but that, on taking a survey of rudimentary structures generally, we are led on to the conclusion that the evolution hypothesis is the more probable one in regard to the mode of origin of animal bodies.

The nature of the diverticulum and its sources of danger are well known to the readers of Meckel, Monro, Lawrence, Rokitanski, and Cruveilhier. I may be allowed to mention that nearly twenty years ago I published (Edin. Med. and Surg. Journal, April 1854) twenty cases of diverticulum, with a drawing of each. In three of these it was the cause of death, and I referred to some other cases in which it caused death as reported by previous writers. Anyone in London who is desirous of seeing a case in which it caused death, may do so by looking into the museum of St. Bartholomew's Hospital. There is, I may mention, a diverticulum, at the usual place, in a subject now being dissected in my anatomical rooms. If my critic will come to Aberdeen I will show him a large collection of them, and also of specimens showing the various positions and conditions of the appendix vermiformis, and, indeed, many other interesting rudimentary structures and variations which, I infer, he has not yet seen.

My critic's objection that such discussions are unnecessary, that the true theory will ultimately prevail from its own intrinsic value, might be urged against all discussion; and I differ from him very much if he thinks that the question does not require to be stirred among and by the teachers of human anatomy in this country. The cause of my little paper, in fact, was my having, not long before, heard a teacher of human anatomy, at a similar meeting, call in question the whole argument from rudimentary structures. I attributed no importance to my paper further than that, in bringing forward the diverticulum, it submitted an illustration for the argument which does not admit of cavil.

Aberdeen, Nov. 22 JOHN STRUTHERS

The Atmospheric Telegraph

WILL you permit one of your subscribers who is interested in the credit of the English telegraphic system, to supplement your article of November 27 by a few remarks?

The distribution of telegraphic messages by means of air was introduced by Mr. Latimer Clark, and had been employed by the Electric Telegraph Company long before it was adopted either in Berlin or Paris.

The *Times* article of November 15 deals with the undertaking of the Pneumatic Despatch Company for the conveyance of parcels and goods, not messages. The writer incidentally mentions the transmission of messages, but scarcely seems to have been aware of the extent of the London message system.

If I might encumber your valuable space by statistics, I could show that the pneumatic system of the Postal Telegraphs, or even that of the Electric Telegraph Company at the time of the transfer of their undertaking to the State, will bear comparison, both as to extent and efficiency, with that of Paris, effective as the latter is.

The system is employed in Manchester, Liverpool, Birmingham, Glasgow, and Dublin. R. S. CULLEY

Engineer-in-Chief of Postal Telegraphs

General Post Office, Nov. 29

SENSATION IN THE SPINAL CORD

THE principle which I endeavoured some years ago to get recognised as the directive principle of research in Nerve Physiology, was that everywhere identity of Tissue carried with it identity of physiological Property, and that similarity in the structure and connections of Organs involved corresponding similarity in Function. Although these premisses were almost truisms, the conclusion drawn—that all nerve-centres must have a *common* Property, and *similar* Functions—was too much opposed to the reigning doctrine, to find general acceptance. Especially was it resisted in its application to the functions of the Spinal Cord; and this because of the two hypotheses current, namely, that Reflex Action did not involve Sensibility, and that the Brain was the sole Organ of the Mind. Following in the track so victoriously opened by Pflüger, I brought forward what seemed to me decisive evidence of the sensational and volitional functions of the Spinal Cord; but this evidence has not been generally deemed conclusive by those whose verdict is authoritative. Neither in Germany nor in England have the majority of physiologists consented to regard the actions determined by tthe Spinal Cord in the absence of the Brain as sensitive actions.

This is not the place to examine the insufficiency of the evidence which is held to exclude sensation from Reflex Action, nor to exhibit the irrationality of the conception of the Brain as the Organ of Mind—which, as I have elsewhere said, is not more acceptable than would be the parallel conception of the Heart as the Organ of Life. The purpose of the present paper is restricted to the examination of the most striking experimental evidence *against* the sensational function of the Spinal Cord, which to my knowledge has hitherto been advanced. I had intended reserving the criticism for its appropriate place in the "Problems of Life and Mind," but an article by Mr. Michael Foster which has just appeared (*Journal of Anatomy and Physiology*, November), on the Effects of rise of Temperature on Reflex Action, induces me to bring the subject before the readers of NATURE, in the hope that some of them may re-investigate it and record their results.

I will merely remark that the microscopic investigations which have recently been made with greatly increased powers and better methods of preparation, have more and more confirmed my assertion of the histological identity of Spinal Cord and Brain. On the other hand the experiments of Goltz (*Functionen der Nervencentren des Frosches*, 1869, p. 128) seem to supply direct evidence against the identity of property; and this evidence cannot be ignored.

Goltz observed that a frog, when placed in water the temperature of which is slowly raised towards boiling, manifests uneasiness as soon as the temperature reaches 25° C., and becomes more and more agitated as the heat increases, vainly struggling to get out, and finally, at 42° C., dies in a state of rigid tetanus. The evidence of feeling being thus manifested when the frog has its brain, what is the case with a brainless frog? It is absolutely the reverse. Quietly the animal sits through all the successions of temperature, never once manifesting uneasiness or pain, never once attempting to escape the impending death. "The spinal soul sleeps, perhaps; it takes no heed of the danger. One must waken it. I touch with acid the skin of its back in that part which is raised above the surface of the water. *Swiftly and surely the hind paw is brought to bear on it, and the acid on the irritated spot is wiped away;* then the leg resumes its comfortable position."