discrimination: "moreover the entire brain of an insect is white, as are all the ganglia."

On page 226, he says that the outer part of the brain is made up of a "slightly darker, usually pale grayish, white portion"—, where the tissue consists of small ganglion cells, it is naturally . . . . rather darker than in those regions where the tissue consists of the more loosely disposed, large ganglion cells."

So that we have a fundamental contradiction in reference to an alleged fundamental distinction, quite aside from the notorious fact that in the lowest vertebrates the nervous system is as "white" as in insects, and that the convoluted "mushroom" body or "cerebrum" of the ant contains sharply demarcated gray and white substances.

The chapter is accompanied, as stated, by plates of great value, most of these being fac similes of sections prepared by Mr. Norman J. Mason. On the whole, nothing new is added to our knowledge of the adult insectean brain in general, or the locust's in particular, that has not been carefully reported by Floegel, Newton and Michels. But through the great patience and skill of Mr. Mason, Professor Packard has been enabled to study sections from the embryo brain, a subject not yet worked up, owing to the difficulty of preparing the specimens. The most important results obtained is that the nerve-fibres develop from an originally finely granular substance, thus confirming the observations of Schmidt and Hensen for the mammalian embryo.

In view of the loudly trumpeted theory recently revived by Dr. J. J. Mason, after having repeatedly received the *coup de grace* at the hands of Stieda, Meynert and others, that large cells are motor, it is interesting to note that those of the optic ganglion in the locust are among the largest cells in its nervous system. R. C. S.

CORRESPONDENCE.

The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.]

To the Editor of "SCIENCE."

Limax maximas L. A specimen of this slug was brought me May 16. It came through a faucet connected with the water works. Being an introduced species and not frequently found, this fact may be of interest.

Polygala pancifolia, wild. Specimens with pure white flowers have been sent from Lunenburg, Mass., two years in succession. J. H. PILLSBURY.

SPRINGFIELD, *May* 27, 1881.

SPECTRUM ANALYSIS.

At a meeting of the Royal Astronomical Society held on the 13th of May, Mr. Norman Lockyer asked permission to offer the following address. He said:

"The chemical constitution of the heavenly bodies is one that demands some attention from astronomers. Twenty years ago the observations of Kirchoff and Stokes enabled us to get some glimpses into the chemical constitution of the sun. Kirchoff's view was that substances with which we are acquainted exist in the atmosphere of the sun, and that their presence was demonstrated by an exact matching both with respect to wave-length and intensity of the lines of certain chemical elements. Before his time Frauenhofer had noted the coincidence of the bright yellow line of sodium with the D line in the solar spectrum, but Kirchoff showed that also in the case of iron, magnesium, cobalt and several other substances there were coincidences between lines, which went to show that what was true with respect to sodium was true with respect to these other bodies. Nine years ago, we had not merely the opportunity of comparing these bright lines in the spectrum of the sun's atmosphere, as revealed to Frauenhofer, but we had the opportunity of studying the spectra obtained from very small portions of the sun's atmosphere, in regions where we should expect an exceedingly high temperature —namely, in the regions of spots and in the regions of prominences. When we began to examine these spectra, we found that the lines were thickened, and the question appeared much less clear than it did before. Of 460 iron lines recorded by Kirchoff, only three were observed in the prominences, and these were not the lines that were seen thickened in spots; so that a great many fresh questions were raised, and the idea of the decomposition of the iron by the high temperature was forced upon us. I wish to bring before you to night the results of some purely astronomical inquiries, lately undertaken by the Solar Physics Committee with respect to the behavior of the lines in the spectra of spots and prominences. We had before us the admirable work undertaken by Prof. Young in 1872, on the spectra of the prominences; but his observations only lasted for a month, and we felt that we wanted more facts, so what we have been doing at Kensington during the last two and a half years, has been to obtain and tabulate the spectra of a hundred sunspots, and these we have compared with the Italian observations of prominence lines. It was impossible to note and map down the behavior of all the lines in the spot spectra. The Committee, therefore, attempted something which was more modest, and contented themselves with observing twelve lines in the most easily visible part of the spectrum, between F and D (pinned to the blackboard was a diagram with the spectra observed placed one beneath the other, at the top were the iron lines of the Frauenhofer spectrum stated by Angstrom to be coincident with the bright lines of iron). The first point which strikes one on examining this diagram is the enormous number of iron lines, both in the solar spectrum and in the iron spectrum, as mapped by Angstrom, who used an electric arc of thirty or more Bunsen cells. They remind one of a great piano, only a few notes of which are played over and over again in the spot spectra, but always producing a different tune. If you examine the lines individually, you will find that every line has been seen with every other line. One is struck by the marvellous individuality, so to speak, of each. The lines do not go in battalions, or companies, or corporal's files, but in single units. The great importance of obtaining these observations is not so much for the observations themselves, as for the comparison they enable us to make with the observations of the lines in prominences, because the prominences are hotter than the spots. The spots are caused by down-currents where the solar atmosphere is brought down from cooler regions. They are opposed to prominences, which are ejections of heated matter from the interior of the sun. Here (pointing to the diagram) we have arranged the observations of prominences by Tacchini since 1872. What is the result? First of all, you will note a very great simplification; the brightest part of the sun has given the fewest lines. Next, there is not a single line common to the two series. In passing from the iron lines in the spots to the iron lines in the flames we pass from one spectrum to another, and the two spectra are as distinct from one another as the spectrum of magnesium is distinct from the spectrum of chlorine, or any other substance you please. These phenomena are the last we should expect. We can understand that a difference in the quantity of iron vapor present, might make a certain difference in the spectrum; but we are driven to something quite independent of any change corresponding to quantity. We see that as the temperature is increased the simplicity of the spectrum is increased; just as a chemist finds with regard to the substances which he has under his control, the function of temperature is to simplify. Why, then, if this is the result of working with increased temperature here, should not the simplification be due to the breaking