and the comparison in the Table of the values computed by this formula with those derived from the observations does in fact show a much greater accord. I was, however, further led to infer that the constants in the formula, which I had perceived to vary slowly with the lapse of time at other stations, must at Greenwich also have changed materially in the 17 years (1841–1857), and thus I was finally led to construct the formula

$$v_2 = 6{\cdot}66 - 0{\cdot}123(t-1849) + [0{\cdot}038 - 0{\cdot}001(t-1849)].r, \quad \text{(IV)}$$

which, as the Table shows, suits very well with the observations. For application to longer periods it will still require some further modification, and, in particular, to be augmented by corrections from the term $(t-1849)^2$. In conclusion, I also computed the variations for the years 1858–1862 by all the four formulæ, and have entered them in the Table for future comparison.

January 21, 1864.

Major-General SABINE, President, in the Chair.

The following communications were read :—

I. "A Description of the Pneumogastric and Great Sympathetic Nerves in an Acephalous Fœtus." By Robert James Lee, Esq., B.A. Cantab. Communicated by Robert Lee, M.D. Received November 20, 1863. With Supplement, received January 20, 1864.

(Abstract.)

The author observes that hitherto no account has been given of the origin and distribution of the par vagum or pneumogastric nerve in any instance of a fœtus born with brain entirely or partially wanting. This reason has been thought sufficient for communicating to the Royal Society the description of a dissection of the pneumogastric and sympathetic nerves in a fœtus born at the full period, in which the cerebellum and medulla oblongata were absent. At the time of birth it cried, moved, and for the space of one hour might be said to live. All the thoracic and abdominal viscera were found properly formed, and the upper and lower extremities properly developed. The eyes, nose, and mouth were present. The head, when regarded as a whole, seemed as though the posterior and superior parts had been entirely removed, thus leaving the spinal cord and base of the skull exposed. Some tough cerebral matter, covered only by a dense membrane, was seen in two small masses exposed in the cranium, not continuous with the spinal cord (which terminated abruptly at the base of the cranium and was entirely exposed at this point), but separated from it by a bony prominence arising from the floor of the cranial cavity.

After the removal of the extremities, the abdomen was opened and the viscera of the abdominal cavity removed. The anterior halves of the ribs

were cut away, and the thorax with its contents washed and immersed in alcohol. The dissection was conducted in that liquid, with the assistance of an ordinary lens magnifying six diameters.

The pneumogastric nerve having been traced down the neck and thorax, was found to be distributed in the usual way. Its several ganglia, its communications with the sympathetic, and its branches to the larynx, trachea, bronchi, and œsophagus, appeared in no respect different from what is their usual condition in a perfectly formed fœtus of the same age.

Certain ganglionic enlargements formed on the superior laryngeal and recurrent nerves were likewise seen as they have been described by Dr. Robert Lee. Respecting these two principal branches of the pneumogastric in the neck, the author observes that, if they be separately examined, each will be found to be composed of two portions—one descending, the other ascending—which unite and form a single cord to be again divided into many filaments for the supply of various parts. From this he concludes that the pneumogastric is not derived from the brain; for otherwise we should expect to find branches from it composed only of descending fibres, whereas we find its two chief branches equally made up of fibres from above and from below.

The hypoglossal, glossopharyngeal and communicating branch of the accessory of the eighth pair were disposed as usually.

The sympathetic nerve was also dissected in the neck and thorax, and found to present its usual arrangement; but, besides its commonly recognized ganglia, the author discovered certain other bodies connected with it in the thorax, which he considers to be nervous ganglia, and which he thus describes:—"Just beneath the costal pleura some small stellate bodies are seen lying internal to the ganglia of the sympathetic, and at variable distances from them. Their size is that of a small pea, colour pink, and structure apparently nervous. From the circumference of one of them, fine vessels or nervous tubes are seen to radiate and join in some cases the ganglia of the sympathetic. In the angles of the rays are some pigmentary particles of brown colour, not connected, however, with the central mass. Many of these bodies are found in different parts of the thorax; and there can be no doubt of their nature, from their intimate connexion with the sympathetic."

The dissection of the nerves supplying the stomach, liver, and alimentary canal was completed in those viscera removed, with the heart and lungs, from a fœtus of six months in which neither brain nor spinal cord were present.

The stomach had numerous filaments ramifying on its surface, which could be traced down to the lining membrane. Similarly the liver was found to be pervaded with numerous fibres which followed generally the course of the blood-vessels.

Portions of the intestinal canal of the fœtus first described were examined; so that there is every reason to believe that this fœtus was supplied with nerves in the neck, thorax, and abdomen in the same manner as

one endowed with those parts thought most essential to life, the cerebellum and medulla oblongata.

Since the foregoing paper was communicated, the author has had the opportunity of examining two anencephalous fœtuses which had been preserved for many years in the Museum of St. George's Hospital. In the first specimen examined the bones forming the roof and sides of the cranium were wanting, as well as the greater part of the basis behind the foramen magnum; the brain was absent, and the bony cavity was not formed.

In this instance nerves were seen passing through foramina in the basis of the cranium. There was no spinal canal, though a membrane from which nerves proceeded occupied the position of the spinal cord. At the commencement of this there was a round body of the size of a small bean, of nervous substance, which was exposed most clearly before the preparation was removed from the bottle in which it had been preserved. The connexion was easily seen between this body and the spinal membrane, and nerves proceeded from its under surface in different directions.

There were small pieces of cartilage, apparently portions of vertebræ, found here and there in the spinal region, but there was no sacrum, and the rectum was exposed.

Such were the general appearances presented by this fœtus. In other respects it was well developed. The large venous and arterial vessels were seen to supply appropriate parts.

The pneumogastric nerves were traced by following their branches in the neck upward and downward. That on the left side was seen perforating the floor of the cranium, with a ganglionic enlargement formed on it soon after it issued from the canal, and thence passing downwards to supply the usual organs. The nerve on the right side was not clearly traced through the floor of the cranium; but as there was an opening corresponding to that on the left side, there is no reason to doubt the similarity between the two nerves.

A question which naturally presented itself on perceiving the small round body described above, was whether this might not correspond to the medulla oblongata. That this is not probable appeared from the fact that the pneumogastric nerves left the cranium at a distance of nearly two inches from it, and no connexion could be seen to exist between them and that body. No history has been preserved of this fœtus; so that whether it showed any signs of independent existence cannot be ascertained.

The distribution of the nerves in the thorax presented nothing very abnormal, the various parts being supplied with their proper branches. The sympathetic nerve was of small size on both sides, and its extent greatly diminished.

The second of these dissections bore some resemblance to the fœtus described in the paper, with the exception that there was no trace of cerebral matter whatever. A membrane from which nerves proceeded was all

that was seen. There was a proper canal for the spinal cord, but it had no osseous covering. The deep groove bifurcated at the cranial extremity into grooves of half its size, which took a direction at right angles to that of the former. The left pneumogastric nerve was seen passing through the base of the cranium to the surface, where it appeared to have come from the membrane from which other nerves proceeded. After descending to the cervical region and giving off the recurrent, the principal branch was not continued to the lungs and œsophagus, but directly to the ganglion of the sympathetic in the upper part of the thorax, so that the sympathetic chain of ganglia in the thorax appeared to be simply a continuation of the pneumogastric. To compensate for this absence of nervous supply on the left side, the nervous plexuses on the roots of the lungs were found to be enormously increased on the opposite side. A large branch ascended from the solar plexus and united with the divisions of the right pneumogastric. The splanchnic on this side was large, and was composed of filaments from the upper thoracic ganglia, not merely from those below the sixth. The action of the heart and the functions of the liver, kidneys, and other organs must have continued during the uterine existence of the fœtus.

The author expects to be afforded further means of prosecuting his dissections of the nerves of acephalous monsters, in which case he will communicate the results of his examinations to the Royal Society.

II. "On the Conditions, Extent, and Realization of a Perfect Musical Scale on Instruments with Fixed Tones." By Alexander J. Ellis, B.A., F.C.P.S. Communicated by C. Wheatstone, Esq., F.R.S. Received January 7, 1864.

Euler*, perceiving that the relative pitches of all musical notes might be represented by $2^m \cdot 3^n \cdot 5^p$, formed different "genera musica" by allowing n and p to vary from 0 to fixed limits. His "genus diatonicum hodiernum" (*op. cit.* p. 135) limits n to 3 and p to 2, and consists of 12 tones. These tones and 12 others are contained in his "genus cujus exponens est $2^m \cdot 3^7 \cdot 5^2$," that is, which limits n to 7 and p to 2. He has further (*ib.* p. 161) given a scheme in which each manual of an instrument should represent two sounds, the primary belonging to the first 12 tones, and the secondary to the additional 12. He says (*ib.* p. 162), "Soni secundarii summo rigore ab iisdem clavibus edi nequeunt, quia vero tam parum a primariis discrepant, ad eos exprimendos hæ claves *sine sensibili harmoniæ jactura* tuto adhiberi possunt. Nam *etiamsi ab acutioribus auribus comma seu diaschisma,* quibus intervallis soni secundarii a primariis differunt, *distingui queat,* tamen quia soni secundarii cum primariis *neque*

* Tentamen Novæ Theoriæ Musicæ ex certissimis Harmoniæ principiis dilucide expositæ auctore Leonhardo *Eulero.* Petropoli, 1739.