

below. In front it is closed by the bodies of the vertebræ; but in the skeleton its posterior part is imperfect, being filled up in the recent state by membrane, and protected by the ligamentum nuchæ.

The author then describes the appearance, on dissection, of the membranes of the spinal marrow, and of the mechanism by which its compression in the various and extensive motions of the neck is prevented; he also adverts to the exact correspondence between the extent of motion permitted, and the size and form of the canal in the human spine, and to some pathological consequences connected with such structure.

Drawings of some of the cervical vertebræ in birds, with a description of their different parts, are annexed to this paper.

*Of the Nerves which associate the Muscles of the Chest, in the actions of Breathing, Speaking, and Expression. Being a Continuation of the Paper on the Structure and Functions of the Nerves. By Charles Bell, Esq. Communicated by Sir Humphry Davy, Bart. LL.D. P.R.S. Read May 2, 1822. [Phil. Trans. 1822, p. 284.]*

This paper forms the continuation of that printed in the last volume of the Society's Transactions, by the same author. In the present communication the author proceeds to show that the office of the respiratory apparatus is not confined to the changes produced upon the blood, but that the same actions are employed in subservience to other organs, and that they perform a variety of functions, as in the natural voice in articulate language, and in the expression of passion, as well as in the more familiar acts of smelling, coughing, sneezing, &c.

Having established the proofs of the necessity of a number of remote parts being joined in the performance of these functions, he proceeds to show that there is a distinct class of nerves for this purpose. That these nerves depart from the same column of the spinal marrow, and diverge to all the parts of the frame, which are drawn into consent in the action of respiration.

Proceeding to show the difference betwixt the calm and uniform breathing for the purposes of circulation, and the excited and more irregular actions, as in speaking, singing, coughing, and sneezing, he proves the necessity of certain powerful muscles being brought in as accessories and aids to the common muscles of respiration. He next shows that the respiratory nerves are entirely distributed to these accessory muscles.

After tracing these nerves, and disengaging them from their intricate relation with the other nerves, he proceeds, by comparative anatomy, and by experiments, to show that they are respiratory nerves, and that their division cuts off the parts to which they are respectively distributed from participating in the act of respiration.

He takes occasion to show that authors have attended too exclusively to the par vagum, or eighth pair of nerves, which is only the principal or central nerve of an extensive class of nerves, which

have the same root, and receive their power from the same source ; and that when injured in their common origin, there is a simultaneous cessation of motion in all the apparatus of respiration, that breathing instantly ceases, and with it life.

Touching on Pathology, he assigns reasons for believing that sudden death, when there is no apparent injury of vital organs, is by disorder of this division of the nervous system.

Having distinguished these nerves from the common voluntary and sensible nerves on the one hand, and from the sympathetic system on the other, he proceeds to show that expression is seated in these nerves. That they are not merely the nerves which order the motions of breathing, the nerves of natural and articulate language, but that through them the breast, chest, and face become the organs of expression, whenever the heart is agitated by sentiment or passion ; and that without their instrumentality, the utmost agitation of the spirits in passion would be attended with no outward sign.

*Experiments and Observations on the Newry Pitch-stone, and its Products, and on the Formation of Pumice. By the Right Hon. George Knox, F.R.S. Read May 9, 1822. [Phil. Trans. 1822, p. 313.]*

After describing the geological locality and the external character of the above mineral, and adverting particularly to its oily smell, Mr. Knox proceeds to show, by its chemical analysis, that, exclusive of the constituents of this substance ascertained by Klaproth, it contains a considerable but variable proportion of a peculiar bitumen, separable from it by distillation at high temperatures. The author also succeeded in detecting some volatile principle in the pitch-stone of Meisser, analysed by Klaproth, as also in that of Arran ; but it exists in them in smaller quantities than in the pitch-stone of Newry.

After having separated the water and bitumen from the mineral by heat, Mr. Knox found that by subjecting the residue to a bright red heat, it assumed not merely the appearance, but the properties of pumice ; and he attributes this appearance to the slow escape of the bituminous matter, producing a vesicular structure.

The author details in this paper the process of analysis which he employed for the separation of the constituent parts of this pitch-stone, and adverts to those circumstances in which it appears to differ from the varieties of the mineral previously examined.

*Observations on the Changes the Egg undergoes during Incubation in the common Fowl, illustrated by Microscopical Drawings. By Sir Everard Home, Bart. V.P.R.S. Read May 16, 1822. [Phil. Trans. 1822, p. 339.]*

The molecule from which the future embryo is to be formed, is observed upon the surface of the yolk before it leaves the ovarium. It consists of globules  $\frac{1}{8}, \frac{1}{16}$  of an inch in diameter, surrounded by a mixture of these and larger oval globules, similar to those of the