

- II. "On the formation of some of the Subaxial Arches in Man." By GEORGE W. CALLENDER, Assistant Surgeon to, and Lecturer on Anatomy at St. Bartholomew's Hospital. Communicated by J. PAGET, F.R.S. Received February 17, 1871.

(Abstract.)

In the term subaxial arches is included all those which grow out in front of the notochord. The first forms the nasal passages, the second forms chiefly the superior maxilla, the third is the mandibular, the fourth the lingual, the fifth the hyoid, the sixth the laryngeal, whilst the seventh, which is distinguished as the exoccipital arch, forms the shoulder-girdle and the thoracic extremity of either side.

The consideration of the connexion of the first four with the cranial cartilages is for the present deferred; and this communication relates to those arches which grow into the cervical region, and to that period of their growth which lies between the fifth and twelfth weeks of foetal life.

The fourth subaxial arch, the lingual, grows out below the mandibular, and bears upon its anterior extremity the tissue which develops into the tongue. Its connexion with this anterior portion ceases to be recognized at an early period, and about the eleventh week it consists of five portions, (1) cartilage from the base of the skull, (2) a short piece of membrane, (3) a second very small rod of cartilage, these forming about one-half of its length, (4) a long strip of membrane, and (5) a nodule of cartilage within the lesser or anterior horn of the hyoid bone.

The fifth subaxial arch, the hyoid, grows in common with the sixth as a layer of membrane from the basioccipital region. The posterior portion of it forms the middle constrictor muscle; the remainder is cartilaginous, and grows into the greater or posterior horn and the body of the hyoid bone.

The sixth subaxial arch, the laryngeal, begins in membrane which forms the inferior constrictor. Rising up and thickening in the front of the neck, it encloses the pharynx; and its inner layer develops a septum, which separates this tube from the larynx. In front, and between this inner layer and that in which the constrictor is formed, a mass of thick granular tissue becomes cartilage, and here the chief cartilages of the larynx are formed. The details of their formation are referred to.

The thyroid body is developed in this arch, and it serves as a girdle to surround and keep in place the continuation of the air-tube towards the thorax. Its relation to the branchial arches is also referred to.

After mentioning the reason for calling the seventh arch the exoccipital, its growth from the basioccipital and exoccipital cartilage regions is described, with its ending in two processes which grow out as the clavicle and the scapula. The relations of the clavicle to the sternum and first rib are related, as also its change in direction from a nearly vertical to a hori-

zontal position. The curling round of the scapula-rod is described, and the outgrowth from the rod of plates of bone bounded by the acromial, glenoid, and coracoid borders. The relations of the sterno-mastoid, trapezius, and levator anguli scapulæ muscles are referred to. The growth of the glenoid cavity outwards from the acromion and coracoid is noticed at about the eleventh week, at which period the scapula has acquired its chief permanent characters.

*March 23, 1871.*

General Sir EDWARD SABINE, K.C.B., President, in the Chair.

The following communications were read :—

- I. "Experiments on the Successive Polarization of Light, with the description of a new Polarizing Apparatus." By Sir CHARLES WHEATSTONE, F.R.S. Received Feb. 2, 1871.

### I.

The term successive polarization was applied by Biot to denote the effects produced when a ray of polarized light is transmitted through a plate of rock-crystal cut perpendicularly to the axis, or through limited depths of certain liquids. In these cases the plane of polarization is found to be changed on emergence, and differently for each homogeneous ray; so that, when white light is employed, on turning the analyzer round continuously in one direction different colours successively appear, rising or falling in the scale according to the nature of the substance.

If, while the analyzer is turned from left to right, the tints ascend (*i. e.* follow the order R, O, Y, G, B, P, V), the substance is said to exhibit right-handed successive polarization, but if the tints descend, the successive polarization is said to be left-handed.

These phenomena were satisfactorily explained by Fresnel in the following way. The incident polarized ray, instead of resolving itself into two plane-polarized rays at right angles to each other, as in the ordinary cases of dipolarization, resolves itself in these instances into two circularly polarized rays, one right-handed the other left-handed, which are transmitted with different velocities; each homogeneous ray, thus resolved into two opposite circularly polarized pencils, on emergence composes a ray polarized in a single plane, the deviation of which from the primitive plane of polarization depends on the difference of phase of the two circularly polarized rays on emergence.

The rotation of the planes of polarization is from left to right, or from right to left, according to whether the right-handed or left-handed circular rays are transmitted with the greater velocity.

### II.

The term dipolarization, proposed by Dr. Whewell to express the