

## CERTAIN ASPECTS OF THE FACIAL AND TRIGEMINAL NERVES OF THE OX (*BOS TAURUS* L.)

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### ABSTRACT

LE ROUX, J. M. W., 1969. Certain aspects of the facial and trigeminal nerves of the ox (*Bos Taurus* L.). *Onderstepoort J. vet Res.* 36 (2), 303-320, 1969.

The author dissected thirty bovine heads to study the motor and sensory nerve supply to the zygomatic region. The motor and sensory branches to this region are supplied by the auriculopalpebral and auriculotemporal nerves respectively. It is suggested that these branches be named zygomatic branches. The buccal nerve constantly detaches a deep temporal branch, gives rise to glandular branches to the hard and soft palate and sends a communicating branch to the lingual nerve. Connections could be demonstrated between these branches and the otic ganglion and it is suggested that they carry visceral motor components. Observations on the otic and mandibular ganglia, the relations of the pterygoid, masticatory and buccal nerves and the variable course of the chorda tympani are recorded.

### INTRODUCTION

The facial and trigeminal nerves of the ox were described in detail by Schachtschabel in 1908. Subsequent descriptions in textbooks by Martin & Schauder (1938), Ellenberger & Baum (1943), Sisson & Grossman (1955), Dobberstein & Koch (1958), Habel (1964), Koch (1965) and Schwarze (1965) are all based on Schachtschabel's work and contain no additional information on the distribution of these nerves. During the course of routine dissections observations were made on the distribution of the facial and trigeminal nerves which did not correspond to the classical description. It was therefore decided to clarify these aspects by a series of dissections.

### MATERIAL AND METHOD

For the purpose of this study thirty bovine heads were dissected. They were preserved by injecting a 10 per cent formalin solution through the common carotid artery. A small quantity of basic fuchsin was added to the solution to get better contrast between blood vessels and nerves. Dissections were made on the left side only.

#### *N. auriculopalpebralis*

##### *Ramus zygomaticus*

This branch corresponds to the parotid plexus of the auriculopalpebral nerve described by Schachtschabel. This author described a nerve plexus in the parotid salivary gland formed by branches of the auriculopalpebral, dorsal buccal branch of the facial and auriculotemporal nerves. The plexus consisted of delicate nerve fibres which traversed the substance of the gland and extended in the parotid region bounded by the zygomatic arch dorsally and the caudal border of the masseteric muscle rostrally. Branches could be traced to the cutaneous muscle, the parotidoauricular muscle and the skin of this region. Although Schachtschabel could not demonstrate any definite fibres to the parenchyma of the parotid gland he suggested that the plexus corresponded to the parotid plexus of man.

In the present study the author could find no evidence of a nerve plexus in the parotid salivary gland. In the majority of cases (16 out of 30) the auriculopalpebral nerve detached a single branch

(Plates 1, 4, 5 and 6) which ran for a very short distance through the gland to reach the medial aspect of the parotid lymph node (Plate 1). In seven cases this branch was double (Plates 2 and 7) and in seven cases it was represented by two single branches arising from the auriculopalpebral and dorsal buccal branch of the facial nerve respectively (Plate 2). In these cases the branches also converged towards the deep aspect of the parotid lymph node where they subdivided and connected with the auriculotemporal nerve in variable manner.

The branches issuing from the division of the nerve radiated dorsally towards the zygomatic arch (Plates 2, 3 and 5) and rostrally over the caudal border of the masseteric muscle towards the lateral angle of the eye and the infraorbital region (Plates 2, 3, 4 and 5). They were distributed to the temporal part of the frontoscutular muscle, the zygomatico-auricular, orbicularis oculi, malar and zygomatic muscles. The cutaneous muscle covering this region received several twigs. A branch running dorsally along the rostral border of the superficial temporal vein was almost constantly present and joined the palpebral branch of the auriculopalpebral nerve in several cases (Plates 2, 3, 5 and 7). The branch supplying the zygomatic muscle could also be demonstrated regularly (Plates 2, 3, 4, 5, 6 and 7). In a number of cases it was interesting to observe that these nerve branches were rather poorly developed (Plate 6). In those cases they joined and accompanied the branches of the auriculotemporal nerve which appeared to be exceptionally well developed (Plates 7 and 8) and which were destined to the same area of innervation.

Since this branch of the auriculopalpebral nerve is distributed to the musculature in the zygomatic and infraorbital regions, and in view of the fact that in man the corresponding region is supplied by the zygomatic branches of the facial nerve (Larsell, 1953) the author proposes that this nerve in the ox be named *Ramus zygomaticus*.

#### *N. auriculotemporalis*

According to Schachtschabel the auriculotemporal nerve arose from the caudal border of the mandibular nerve and ran through the parotid salivary gland to the caudal border of the mandible where it divided

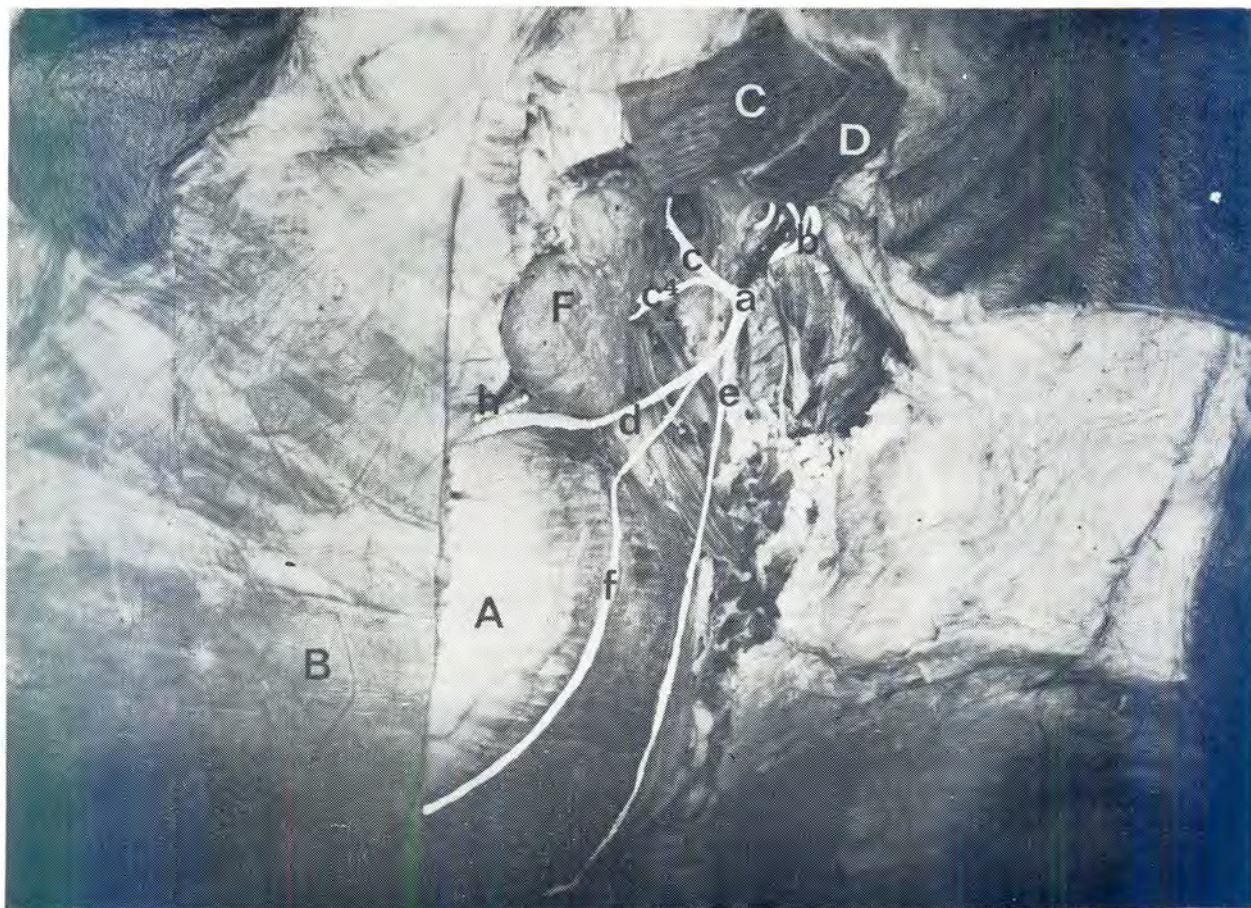


PLATE I.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; B: *M. cutaneus faciei*; C: *M. zygomaticoauricularis*; D: *M. parotidoauricularis*; F: *Ln. parotideus*. a: *N. facialis*; b: *N. auricularis caudalis*; c: *N. auriculopalpebralis*; c': *R. zygomaticus*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; f: *R. intermedius*; h: *N. auriculotemporalis*

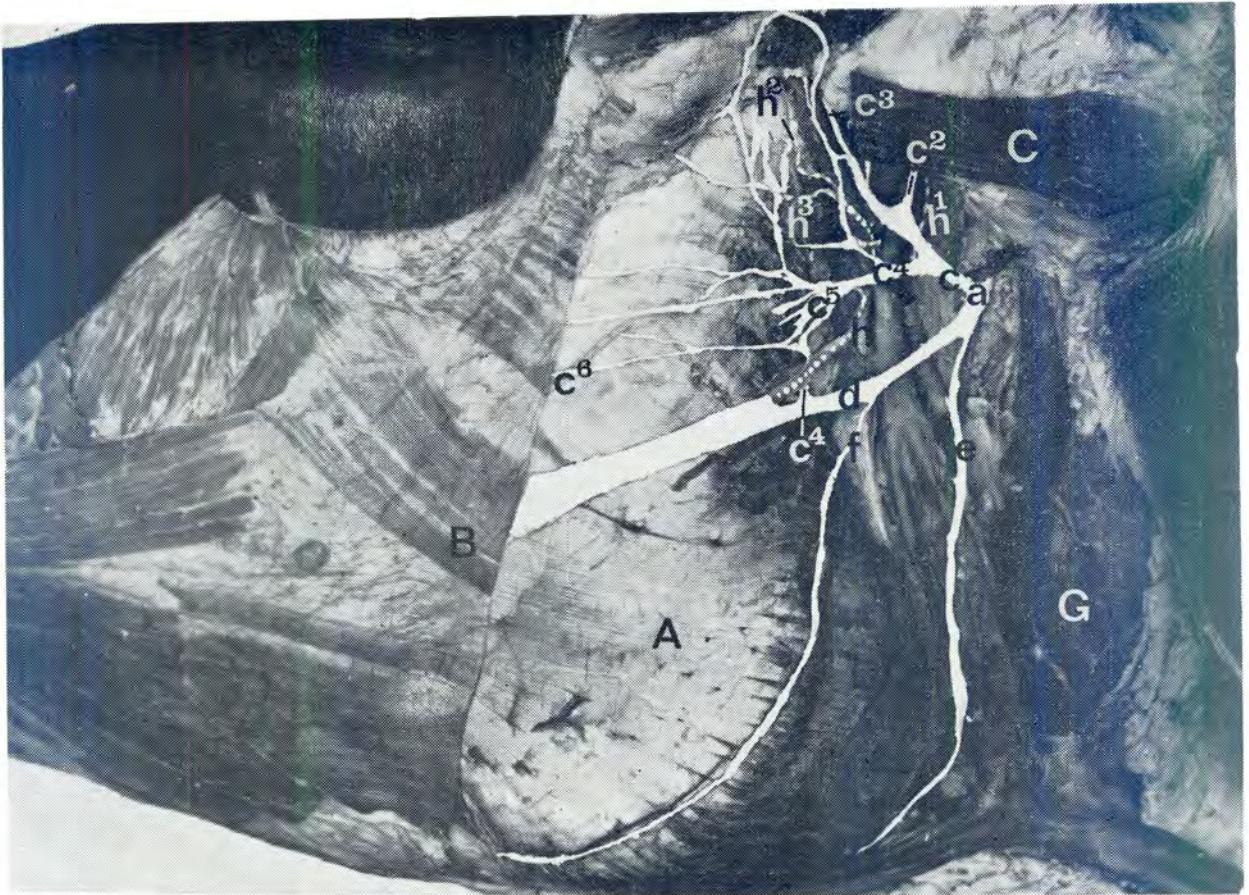


PLATE 2.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; B: *M. cutaneus faciei*; C: *M. zygomaticoauricularis*; G: *Gl. mandibularis*. a: *N. facialis*; c: *N. auriculo-palpebralis*; c<sup>2</sup>: *R. auricularis rostralis*; c<sup>3</sup>: *R. palpebralis*; c<sup>4</sup>, c<sup>4</sup>: *R. zygomaticus*; c<sup>5</sup>: its branches; c<sup>5</sup>: branch to *M. zygomaticus*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; f: *R. intermedius*; h: *N. auriculotemporalis*; h<sup>1</sup>: *N. auricularis rostralis*; h<sup>2</sup>: *R. temporalis*; h<sup>3</sup>: *R. zygomaticus*

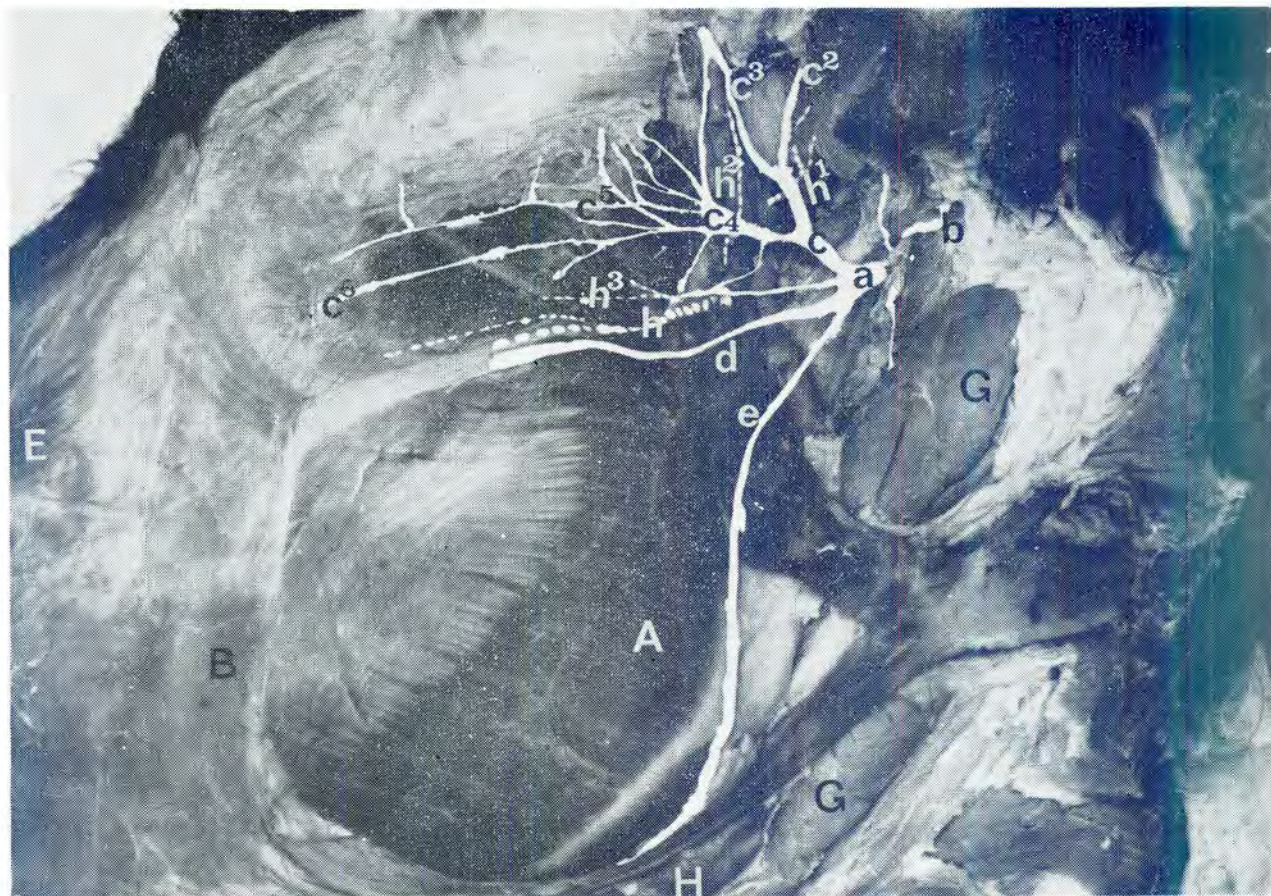


PLATE 3.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; B: *N. cutaneus faciei*; E: *M. zygomaticus*; G, G: *Gl. mandibularis*; H: *Ln. mandibularis*. a: *N. facialis*; b: *N. auricularis caudalis*; c: *N. auriculopalpebralis*; c<sup>2</sup>: *R. auricularis rostralis*; c<sup>3</sup>: *R. palpebralis*; c<sup>4</sup>: *R. zygomaticus*; c<sup>5</sup>: its branches; c<sup>6</sup>: branch to *M. zygomaticus*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; h: *N. auriculotemporalis*; h<sup>1</sup>: *N. auricularis rostralis*; h<sup>2</sup>: *R. temporalis*; h<sup>3</sup>: *R. zygomaticus*

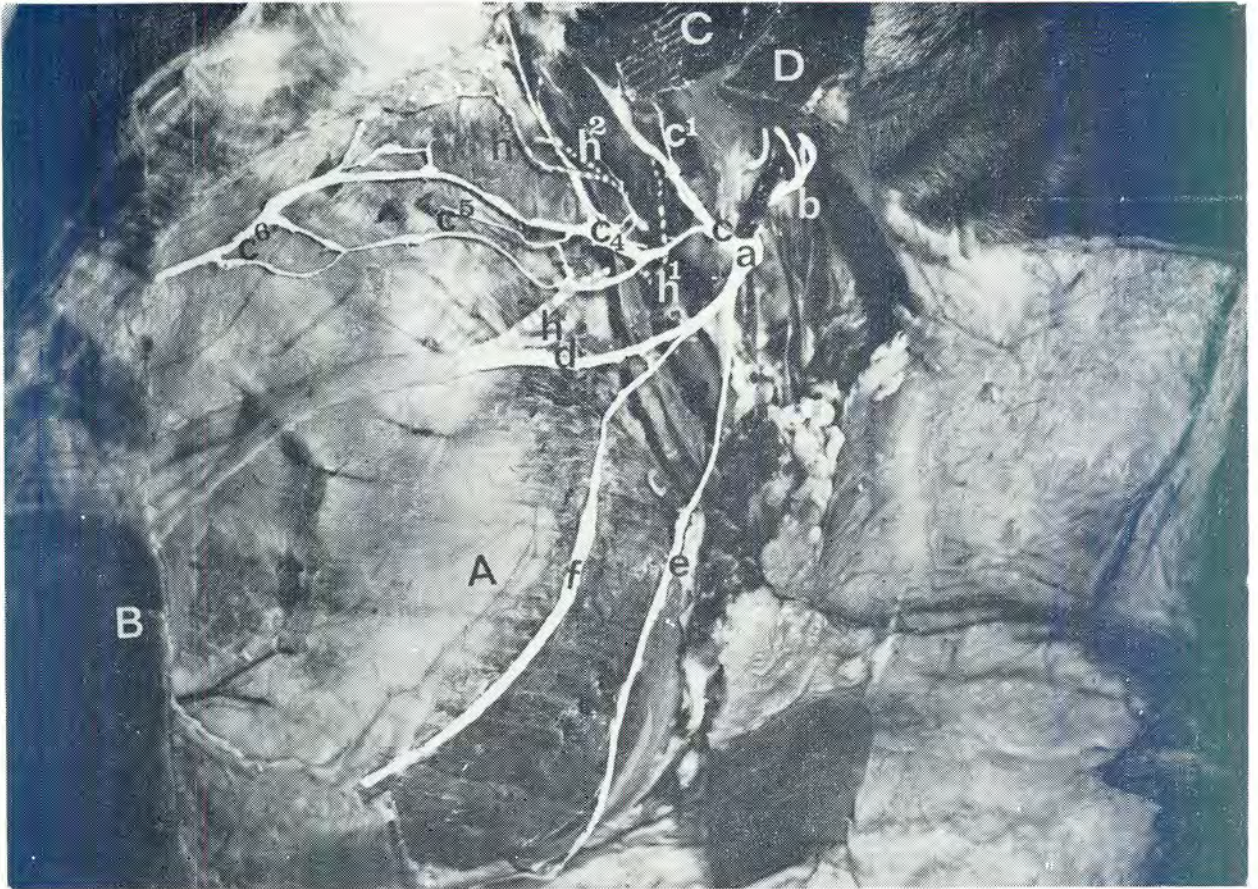


PLATE 4.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; B: *M. cutaneus faciei*; C: *M. zygomaticoauricularis*; D: *M. parotidoauricularis*. a: *N. facialis*; b: *N. auricularis caudalis*; c: *N. auriculopalpebralis*; c<sup>1</sup>: branch to *M. zygomaticoauricularis*; c<sup>2</sup>: *R. zygomaticus*; c<sup>3</sup>: its branches; c<sup>4</sup>: branch to *M. zygomaticus*; c<sup>5</sup>: *R. zygomaticus*; c<sup>6</sup>: branch to *M. zygomaticus*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; f: *R. intermedius*; h: *N. auriculotemporalis*; h<sup>1</sup>: *N. auricularis rostralis*; h<sup>2</sup>: *R. temporalis*; h<sup>3</sup>: *R. zygomaticus*

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PLATE 5.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; B: *M. cutaneus faciei*; C: *M. zygomaticoauricularis*; D: *M. parotidoauricularis*; G: *Gl. mandibularis*. a: *N. facialis*; c: *N. auriculopalpebralis*; c<sup>1</sup>: branch to *M. zygomaticoauricularis*; c<sup>2</sup>: *R. zygomaticus*; c<sup>3</sup>: branch to *M. zygomaticus*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; h: *N. auriculotemporalis*; h<sup>1</sup>: *N. auricularis rostralis*; h<sup>2</sup>, h<sup>3</sup>: *Rr. zygomatici*

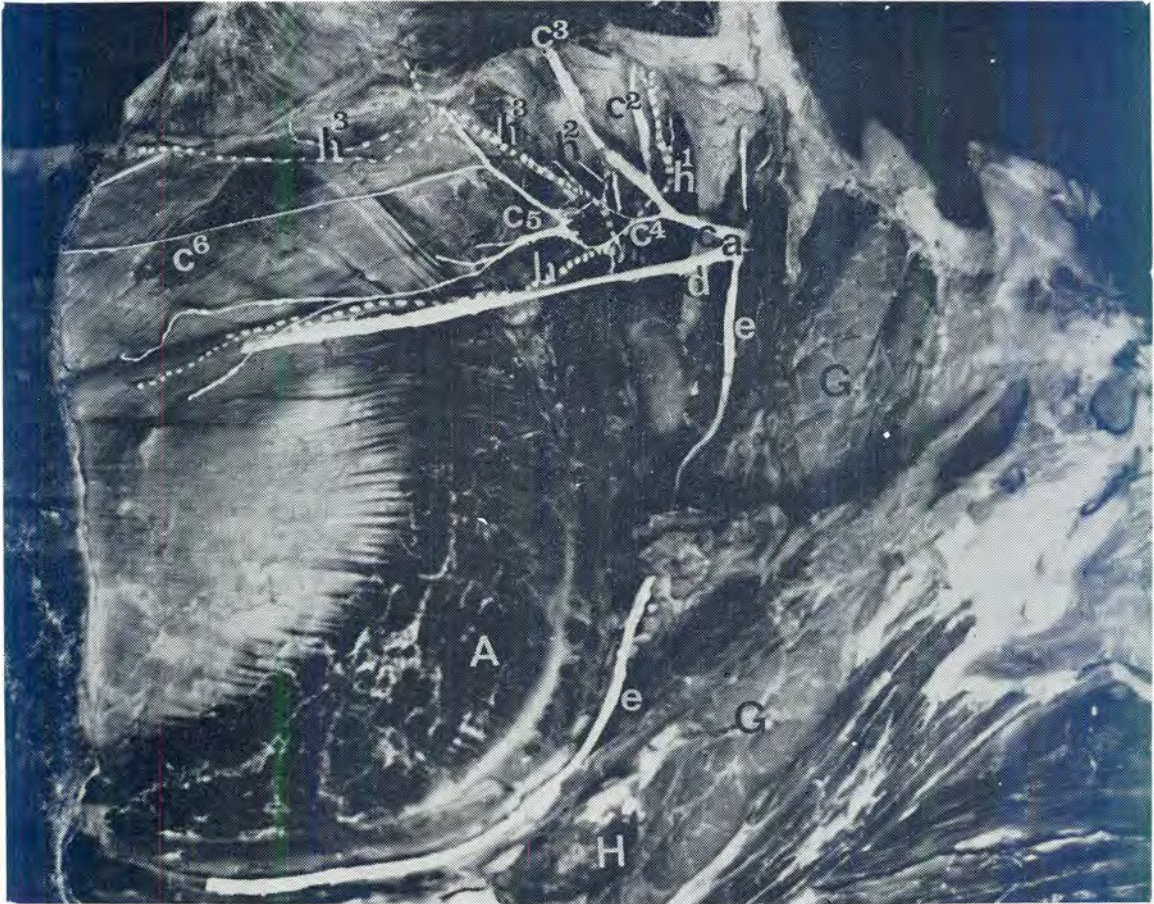


PLATE 6.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; G, G: *Gl. mandibularis*; H: *Ln. mandibularis*. a: *N. facialis*; c: *N. auriculopalpebralis*; c²: *R. auricularis rostralis*; c³: *R. palpebralis*; c⁴: *R. zygomaticus*, c⁵: its branches; c⁶: branch to *M. zygomaticus*; d: *R. buccalis dorsalis*; e, e: *R. buccalis ventralis*; h: *N. auriculotemporalis*; h¹: *N. auricularis rostralis*; h²: *R. temporalis*; h³, h³: *R. zygomaticus*

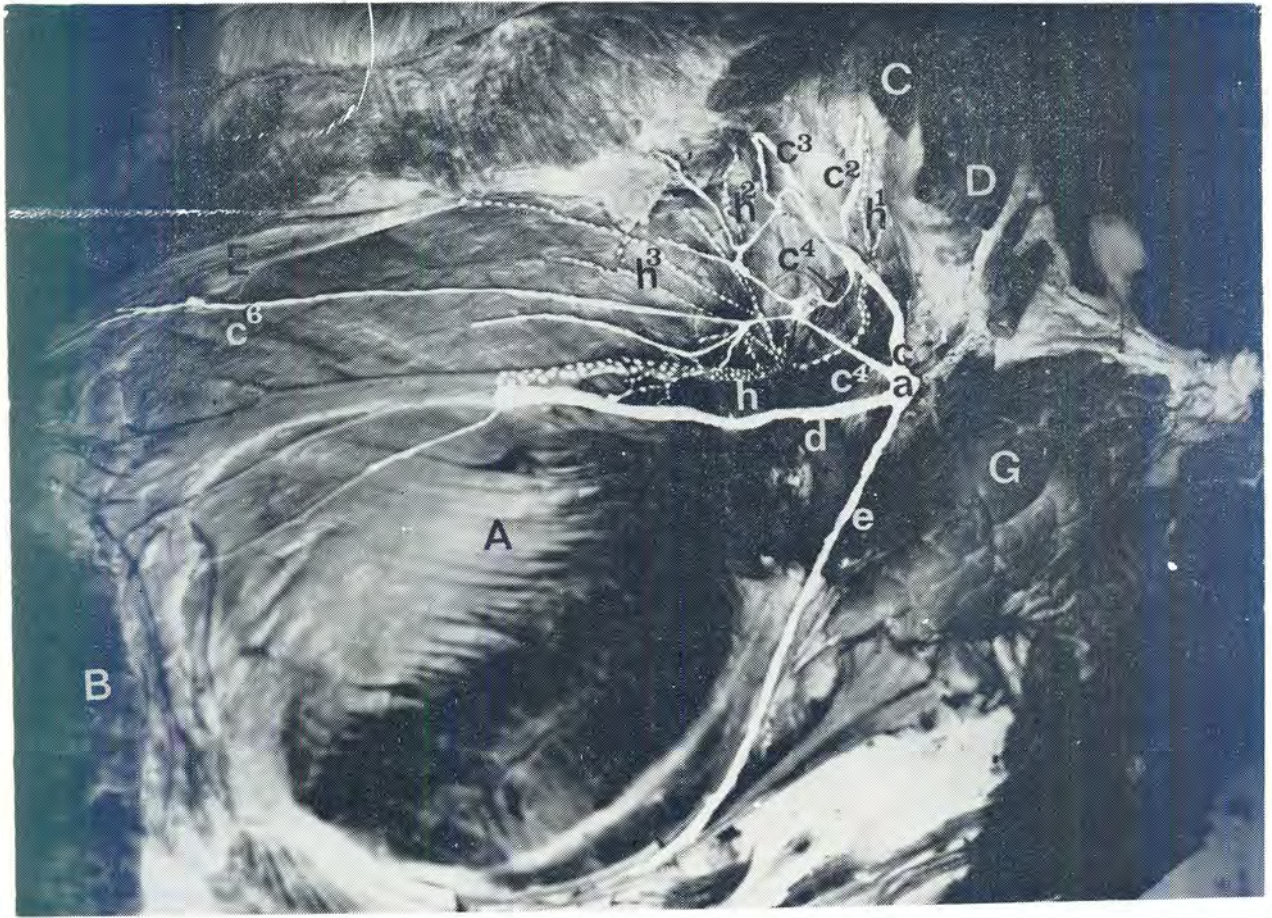


PLATE 7.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. A: *M. masseter*; B: *M. cutaneus faciei*; C: *M. zygomaticoauricularis*; D: *M. parotidoauricularis*; E: *M. zygomaticus*; G: *Gl. mandibularis*. a: *N. facialis*; c: *N. auriculopalpebralis*; c²: *R. auricularis rostralis*; c³: *R. palpebralis*; c⁴, c⁵: *R. zygomaticus*; c⁶: branch to *M. zygomaticus*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; h: *N. auriculotemporalis*; h¹: *N. auricularis rostralis*; h²: *R. temporalis*; h³: *R. zygomaticus*





PLATE 8.—Bovine head, left side, superficial aspect. Parotid salivary gland removed. Auriculotemporal nerve dotted. Connections of the facial nerve severed. A: *M. masseter*; E: *M. zygomaticus*; G: *Gl. mandibularis*. a: *N. facialis*; d: *R. buccalis dorsalis*; e: *R. buccalis ventralis*; f: *R. intermedius*; h, h: *N. auriculotemporalis*; h<sup>1</sup>: *N. auricularis rostralis*; h<sup>2</sup>: *R. temporalis*; h<sup>3</sup>, h<sup>3</sup>: *Rr. zygomatici*

in a dorsal and a ventral branch. The latter emerged at the ventral border of the parotid lymph node and joined the dorsal buccal ramus of the facial nerve on the masseteric muscle. Under cover of the parotid gland the dorsal branch gave rise to branches which joined the auriculopalpebral nerve and its auricular branch, and to small twigs which were distributed to the external acoustic meatus, the skin of the temporal region, the temporomandibular joint and the parotid gland. Habel stated that a large branch of the auriculotemporal nerve emerged with the transverse facial artery and joined the dorsal buccal branch of the facial nerve at the ventral end of the parotid lymph node.

In the present study attention was mainly concentrated on the branches of the auriculotemporal nerve to the zygomatic region. However, the auricular and temporal branches were also exposed. The described division of this nerve in a dorsal and a ventral branch is not justifiable in the ox. From its origin from the common trunk of the lingual and mandibular alveolar nerves the auriculotemporal nerve followed a caudodorsal course for a short distance, turned laterally and traversed the parotid salivary gland to emerge at the rostroventral border of the parotid lymph node accompanied by the masseteric vessels. It joined the dorsal buccal branch of the facial nerve under cover of the lymph node or a short distance rostrally to it on the masseteric muscle (Plate 1). The nerve constantly gave rise to auricular temporal and zygomatic branches.

#### *Nervus auricularis rostralis*

The rostral auricular nerve (Plates 2 to 8) originated independently in the majority of cases (21 out of 30). In eight cases it arose in common with the temporal and some of the zygomatic branches and in one case all the branches of the auriculotemporal nerve formed a common trunk. Following the course of the rostral auricular artery it detached a communicating branch to the rostral auricular branch of the auriculopalpebral nerve, a branch which accompanied the meningeal branch of the rostral auricular artery and one or two branches which were distributed to the muscles and skin of the rostral aspect of the ear and the skin lining the inner surface of the auricular cartilage.

#### *Ramus temporalis*

The temporal branch was given off next by the auriculotemporal nerve. It either ran independently (Plates 4, 7 and 8) to the temporal region along the rostral aspect of the superficial temporal vein or joined the palpebral branch of the auriculopalpebral nerve (Plates 3 and 6). Near its origin the nerve invariably sent one or more communicating twigs to the zygomatic ramus of the auriculopalpebral nerve and gave rise to branches which emerged between the superficial temporal artery and vein (Plates 4 to 8) or between the latter and the caudal border of the masseteric muscle.

#### *Rami zygomatici*

Before the auriculotemporal nerve joined the dorsal buccal branch of the facial nerve it detached one to three branches (Plates 5, 7 and 8) which ran in a rostradorsal direction. Together with the divisions of the temporal branch they constituted the zygomatic branches of the auriculotemporal nerve. These branches were distributed essentially to the

same region as the zygomatic branch of the auriculopalpebral nerve and communicated in a variable manner with its divisions. In a number of cases (10 out of 30) they were exceptionally well developed (Plates 6, 7 and 8), received communicating twigs from the zygomatic branch of the auriculopalpebral nerve and proceeded independently to their destination. Those ones running rostrally below the level of the zygomatic arch accompanied the much reduced transverse facial vessels and corresponded to the transverse facial branch of the horse.

From the series of dissections it appeared very clearly that the sensory and motor nerve branches to the region under discussion followed two distinct patterns: firstly, and in the majority of cases the zygomatic branch of the auriculopalpebral nerve was predominant and incorporated the sensory components of the auriculotemporal nerve; secondly, well developed branches of the auriculotemporal nerve, running independently and incorporating the majority of the motor components of the auriculopalpebral nerve. Since the branches of the auriculotemporal nerve to the zygomatic region were distributed mainly along with the zygomatic branch of the auriculopalpebral nerve, it is suggested that they be named *Rami zygomatici*.

#### *Ramus buccalis ventralis n. facialis*

##### *Ramus intermedius*

This communicating branch was observed by Schachtschabel in seven out of 20 cases (35 per cent). It arose from the dorsal buccal branch of the facial nerve, crossed the lower part of the masseteric muscle and joined the ventral buccal branch at the vascular incisure of the mandible. In the present study this branch was observed in 14 out of 26 cases (53 per cent). In nine cases it arose from the ventral buccal branch and in five cases from the dorsal buccal branch of the facial nerve (Plates 1, 2, 4 and 8). The nerve crossed the lower third of the masseteric muscle covered by the cutaneous muscle and joined the ventral buccal branch at the rostral border of the masseteric muscle. In three cases it communicated with the dorsal buccal branch and in three cases it followed the caudal border of the mandible and joined the ventral buccal branch at the angle of the mandible. In the majority of cases therefore, the intermediate branch proved to be a branch of the ventral buccal division which rejoined the parent trunk.

##### *N. mandibularis*

The mandibular nerve (Plate 11; Fig. 1) corresponded in the main to Schachtschabel's description. At its emergence through the oval foramen it detached the buccal and masticatory nerves and continued across the lateral aspect of the otic ganglion. After giving off the auriculotemporal nerve the remaining trunk divided into the lingual and mandibular alveolar nerves. A few interesting observations in regard to the pterygoid nerves and to the relation of the masticatory and buccal nerves to the lateral pterygoid muscle deserve mentioning.

A caudodorsal, minor portion of the lateral pterygoid muscle was clearly defined (Plates 9, 10 and 12) and separable from the main part of the muscle. It was approximately 1.5 cm broad and 2.5 cm long. It took origin from the ventral surface

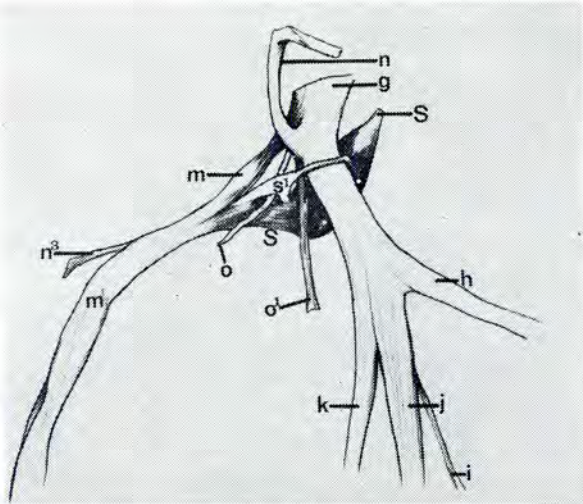


FIG. 1.—Mandibular nerve and otic ganglion (schematic) S,S: *Ggl. oticum*; s<sup>1</sup>: accessory ganglion; g: *N. mandibularis*; h: *N. auriculotemporalis*; i: *N. mylohyoides*; j: *N. alveolaris mandibularis*; k: *N. lingualis*; m, m: *N. buccalis*; n: *N. masticatorius*; n<sup>2</sup>: *R. temporalis profundus*; o: *N. pterygoideus lateralis*; o<sup>1</sup>: *N. pterygoideus medialis*.

of the pterygoid crest of the sphenoid bone and from the dorsolateral border of the orbitorotundate foramen. The fibres ran in a ventrocaudal direction and joined the main part of the muscle near the point of insertion on the condylar process of the mandible. The *N. masticatorius* emerged between the bone and the minor part of the lateral pterygoid muscle whereas the *N. buccalis* emerged between the minor and main parts of the muscle.

The *N. pterygoideus medialis* (Plate 11; Fig. 1) ran across the superficial aspect of the otic ganglion covered by the common trunk for the lingual, mandibular alveolar and auriculotemporal nerves. In several cases it was partially embedded in a groove on the ganglion. The nerve entered the caudal border of the medial pterygoid muscle about 1.5 cm ventrally to the pterygoid process of the sphenoid bone. From Schachtschabel's account the impression is gained that the medial pterygoid nerve frequently runs along with the buccal nerve from which it is detached. This branch actually proved to be the *N. pterygoideus lateralis* (Plate 11; Fig. 1). It either ran independently to the deep aspect of the lateral pterygoid muscle, in which case it usually pierced the otic ganglion, or it accompanied the buccal nerve to be detached where the latter emerged between the two parts of the lateral pterygoid muscle.

#### *N. lingualis*

##### *Ramus communicans cum chorda tympani*

In one case the lingual nerve detached a small communicating branch to the chorda tympani. In this particular case the chorda tympani ran over the lateral aspect of the medial pterygoid muscle ventrally to the lingual nerve and joined the latter at the rostral border of the muscle. The communicating branch arose from the ventral border of the lingual nerve near the angle of divergence between the latter and the mandibular alveolar, ran rostrally for a

short distance between the parent trunk and the chorda tympani and joined the latter.

#### *N. buccalis*

##### *Ramus temporalis profundus*

In the present series attention was focussed on that part of the buccal nerve which extended from the oval foramen to the level of the maxillary tuberosity. At the oval foramen the buccal nerve received a considerable connection from the otic ganglion (Plate 11; Fig. 1), emerged between the two parts of the lateral pterygoid muscle and continued in a rostral direction across the radicles of the maxillary vein accompanied by the buccal artery. Schachtschabel described one case in which the buccal nerve detached a branch to the temporal muscle. The author found a deep temporal branch to be constantly present (Plates 9 to 11). It was given off from the dorsal border of the buccal nerve a short distance after its emergence through the two parts of the lateral pterygoid muscle and divided into two branches as it entered the muscle. In one case it was rather loosely attached to the buccal nerve and could be traced proximally to its origin from the masticatory nerve.

##### *Rami glandulares*

According to Schachtschabel the buccal nerve gave rise to muscular branches to the medial pterygoid muscle along its course to the maxillary tuberosity. This could not be confirmed by the author. However, glandular branches (Plates 9 to 11) were constantly detached from the deep aspect of the nerve. These branches either arose separately or by means of a common stem. When the buccal nerve was raised a branch could be seen to originate approximately at the point where the buccal artery was detached from the maxillary artery. It divided into two to three branches one of which usually accompanied the buccal nerve for a distance rather loosely attached to its deep surface. In several cases two to three or even four branches arose from the deep surface of the buccal nerve. They were all of small size and ran in a rostral direction to the region of the maxillary tuberosity under cover of or slightly ventrally to the parent trunk and across the radicles of the maxillary vein. One branch usually accompanied the buccal artery. These branches could be traced to the dorsal buccal glands and the mucous membrane of the oral vestibule, to the mucous membrane of the hard palate medial to the maxillary tuberosity and to the glands of the soft palate and glossopalatine fold. Since these branches could be traced to the glandular tissue they were thought to be mainly visceral motor fibres. This could actually be confirmed in one particular case (Plate 11) in which they arose from a trunk which was loosely attached to the deep surface of the buccal nerve and which could be traced proximally to its origin from the otic ganglion (Plate 11).

##### *Ramus communicans cum n. linguali*

During the course of the dissections a casual observation revealed the presence of a communicating branch between the buccal and lingual nerves (Plates 9 to 11). A delicate nerve fibre was seen to run across the radicles of the maxillary vein in a ventral or rostroventral direction connecting the buccal and



PLATE 9.—Bovine head, left side, deep aspect. Mandible removed. Chorda tympani dotted. A: *M. masseter*; G, G: *Gl. mandibularis*; I: *M. pterygoideus medialis*; J: *M. pterygoideus lateralis*, J': its minor part. i: *N. mylohyoideus*; j: *N. alveolaris mandibularis*; k: *N. lingualis*; m: *N. buccalis*; m<sup>1</sup>: *Rr. glandulares*; m<sup>2</sup>: *R. communicans cum n. linguali*; n: *N. masticatorius*; n<sup>1</sup>: *R. temporalis profundus*; P: *Chorda tympani*; P<sup>1</sup>: *R. communicans cum n. linguali*



PLATE 10.—Bovine head, left side, deep aspect. Mandible removed. Chorda tympani and glandular branches of the buccal nerve dotted. I: *M. pterygoideus medialis*; J: *M. pterygoideus lateralis*, J<sup>1</sup>: its minor part. a: *N. facialis*; h: *N. auriculo-temporalis*; i: *N. mylohyoideus*; j: *N. alveolaris mandibularis*; k: *N. lingualis*; m: *N. buccalis*; m<sup>1</sup>, m<sup>2</sup>: *Rr. glandulares*; m<sup>2</sup>: *R. communicans cum n. linguali*; n: *N. masticatorius*; n<sup>3</sup>: *R. temporalis profundus*; p: *Chorda tympani*; p<sup>1</sup>: *R. communicans cum n. linguali*



PLATE 11.—Bovine head, left side, deep aspect. Mandible removed. Chorda tympani and the branches of the buccal nerve dotted. Lateral pterygoid muscle removed to expose the otic ganglion. C: *M. zygomaticoauricularis*; D: *M. parotidoauricularis*; G: *Gl. mandibularis*; I: *M. pterygoideus medialis*; S: *Ggl. oticum*. a: *N. facialis*; g: *N. mandibularis*; h: *N. auriculotemporalis*; i: *N. mylohyoideus*; j: *N. alveolaris mandibularis*; k: *N. lingualis*; m: *N. buccalis*; m<sup>1</sup>, m<sup>2</sup>: *Rr. glandulares*; m<sup>3</sup>: *R. communicans cum n. linguali*; m<sup>3</sup>: communicating branches to mandibular alveolar nerve; n: *N. masticatorius*; n<sup>1</sup>: *N. massetericus*; n<sup>2</sup>: *N. temporalis profundus*; n<sup>3</sup>: *R. temporalis profundus*; o: *N. pterygoideus lateralis*; o<sup>1</sup>: *N. pterygoideus medialis*; p: *Chorda tympani*

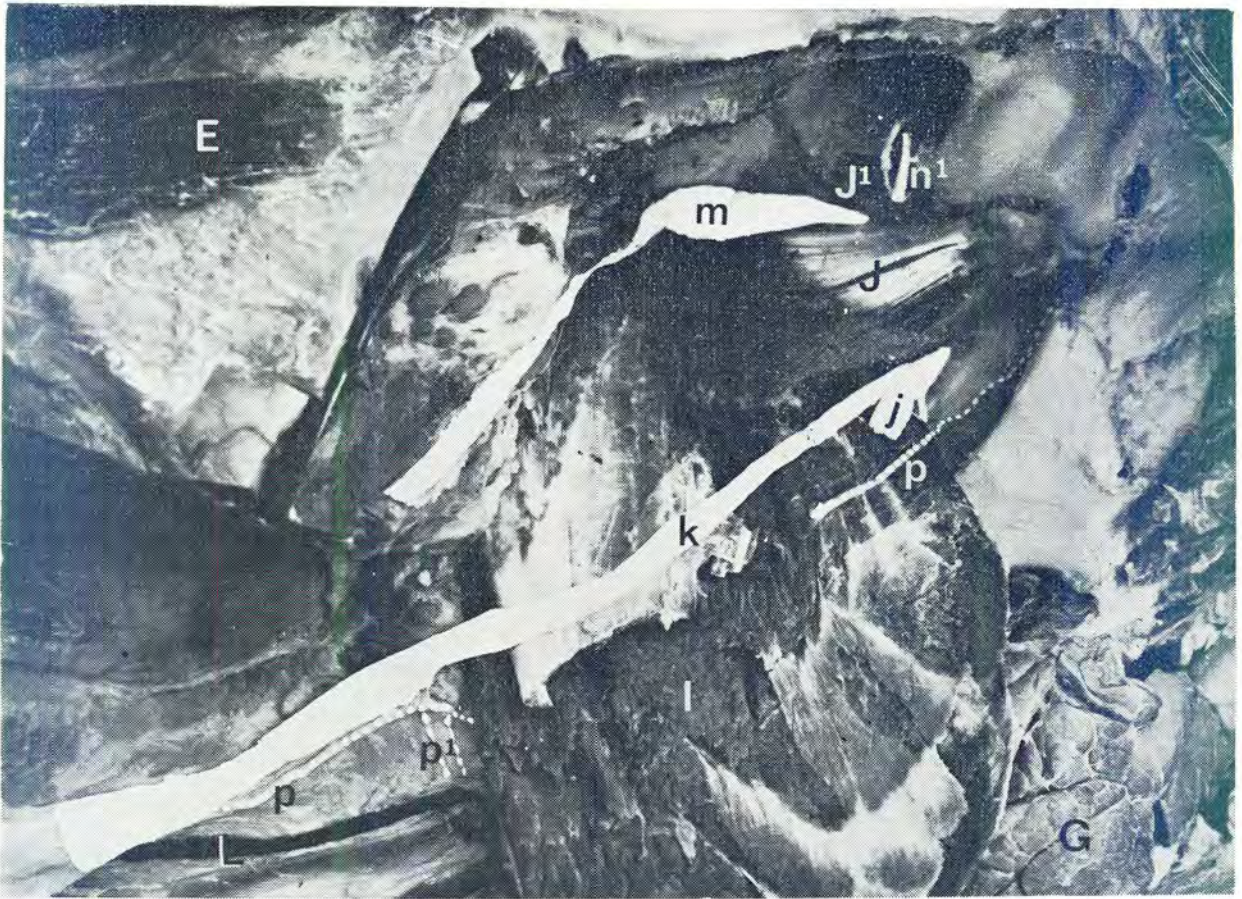


PLATE 12.—Bovine head, left side, deep aspect. Mandible removed. Chorda tympani dotted. E: *M. zygomaticus*; G: *Gl. mandibularis*; I: *M. pterygoideus medialis*; J: *M. pterygoideus lateralis*, J<sup>1</sup>: its minor part; L: *Ductus mandibularis*. j: *N. alveolaris mandibularis*; k: *N. lingualis*; m: *N. buccalis*; n<sup>1</sup>: *N. massetericus*; p, p: *Chorda tympani*; p<sup>1</sup>: *Rr. communicantes cum n. linguali*

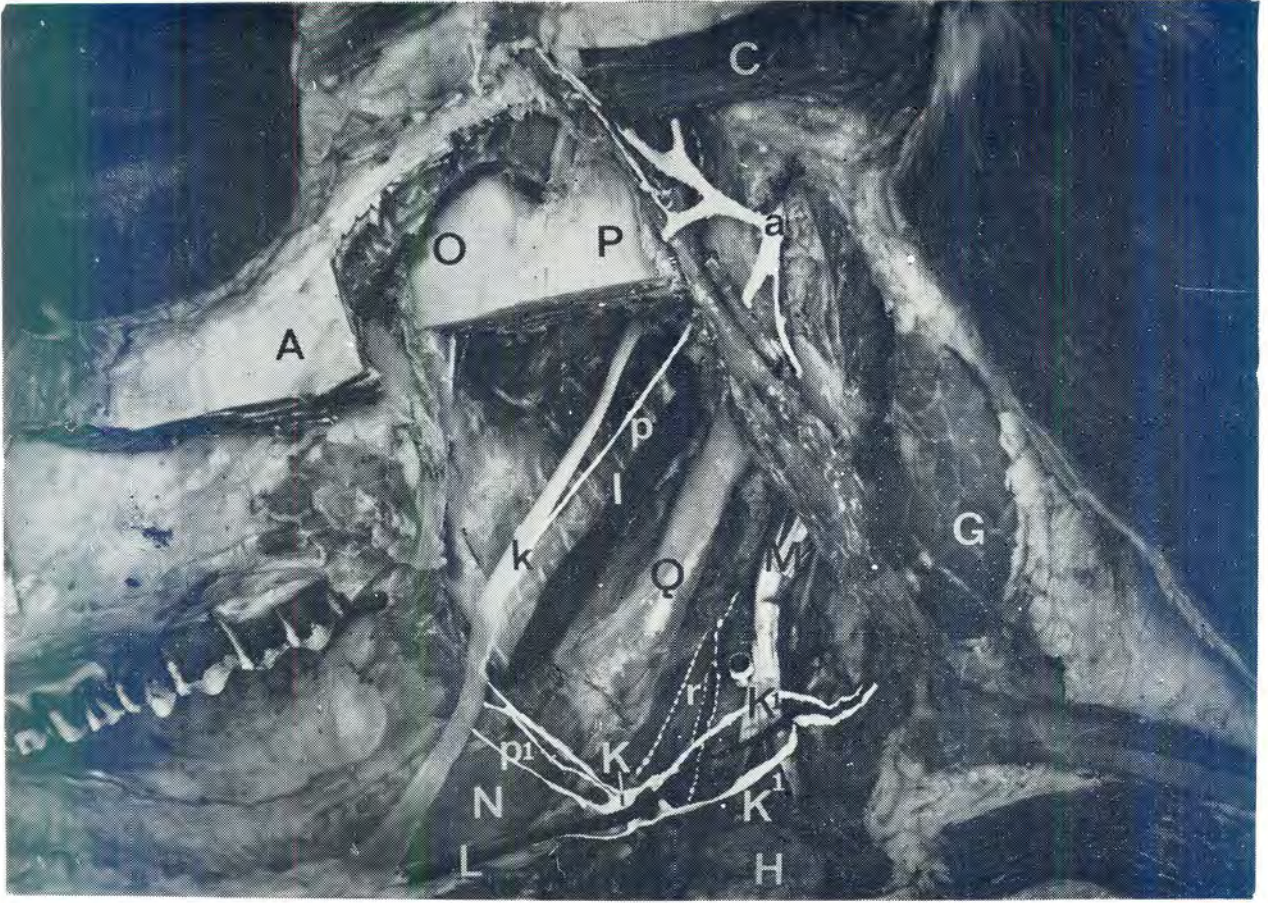


PLATE 13.—Bovine head, left side, deep aspect. Mandible and medial pterygoid muscle partly removed. Sympathetic branches to the mandibular ganglion dotted. A: *M. masseter*; C: *M. zygomaticoauricularis*; G: *Gl. mandibularis*; H: *Ln. mandibularis*; I: *M. pterygoideus medialis*; K: *Ggl. mandibulare*; K<sup>1</sup>, K<sup>2</sup>: extensions of the mandibular ganglion accompanying the mandibular duct; L: *Ductus mandibularis*; M: *M. digastricus*; N: *M. styloglossus*; O: *Proc. coronoides*; P: *Proc. condylaris*; Q: *Stylohyoideum*. a: *N. facialis*; k: *N. lingualis*; p: *Chorda tympani*; p<sup>1</sup>: *Rr. communicantes cum n. linguali*; r: *Rr. sympathici ad ganglion mandibulare*



lingual nerves. In the accompanying photographs the nerves were painted to contrast better against the dark background with the result that they appear larger than normal. The communicating branch can be overlooked easily due to its size and due to the fact that it may run under cover of the venous plexus in this region. It was dissected for in 19 cases and was constantly present. It almost invariably arose as a branch of the first glandular ramus of the buccal nerve and ran to the lingual nerve between or covered by the veins and intimately connected to them. In three cases it ran across the superficial aspect of the veins. In six cases it also connected with the mandibular alveolar nerve. It received a communicating branch from the otic ganglion which ran through the substance of the lateral pterygoid muscle in three cases. In the case illustrated in Plate 11 the communicating branch to the lingual nerve connected with the mandibular alveolar nerve by means of two delicate branches, one arising from the common stem for the glandular rami and one from the communicating branch near its junction with the lingual nerve. As already stated this particular case illustrated the association of the glandular branches with the otic ganglion and the communicating branches presumably also contain visceral motor elements. From the communicating branches delicate twigs could be traced to the connective tissue surrounding the pterygoid and maxillary arteries. Whether they were destined to connect with the external carotid plexus could not be demonstrated with certainty.

#### *Ganglion oticum*

The otic ganglion occupied the floor of the oval foramen and the adjacent part of the pterygoid process of the sphenoid bone. It was large and triangular in shape, the base facing rostroventrally and the apex dorsocaudally. The accompanying schematic drawing (Fig. 1) was made of the ganglion of a full grown animal. In the fixed state the length measured 22 mm, the base 11 mm and the apex 3 mm. It sent a considerable connection, 4.5 mm thick, to the buccal nerve which measured 3.3 mm at the junction. From the caudoventral border of the ganglion a communicating branch arose which rejoined the ganglion at its junction with the buccal nerve. In this way a loop was formed through which the medial pterygoid nerve and the common trunk for the lingual, mandibular alveolar and auriculotemporal nerves emerged. At the junction with the buccal nerve the loop contained a small accessory ganglion which was pierced by the lateral pterygoid nerve in several cases. The loop formation was generally well-developed and in three cases it divided into two limbs which embraced the masticatory nerve before rejoining the ganglion.

#### *Chorda tympani*

The course of the chorda tympani over the lateral aspect of the medial pterygoid muscle was variable (Plates 9 to 13). Variations in this respect were also reported by Schachtschabel and by Petela (1967). In the present series the chorda tympani was seen to run in the substance of the medial pterygoid muscle in five cases (Plate 12). In three of these cases it entered at the caudal border of the muscle, emerged at its rostral border and joined the lingual nerve; in two cases it entered the muscle near its rostral border and after its emergence accompanied the

lingual nerve for a few centimeters before joining it. In eight cases the chorda tympani joined the lingual nerve on the caudal third of the medial pterygoid muscle, in nine cases approximately on the middle of the muscle and in eight cases the junction took place near the rostral border.

#### *Ganglion mandibulare*

The mandibular ganglion was recently described for the first time in the ox by Petela (1967), and a brief summary of the observations made during the present study will suffice. The position of the ganglion could be determined easily by locating the duct of the mandibular salivary gland where it crossed the intermediate tendon of the digastric muscle. Here the duct was bordered on each side by a distinct flattened nerve cord, Ramus glandularis, which issued from the ganglion (Plate 13). Histological examination of these nerve cords revealed the presence of numerous nerve cells so that they could actually be regarded as extensions of the mandibular ganglion along the mandibular duct.

By carefully raising the lingual nerve at the rostral border of the medial pterygoid muscle one to three delicate nerve fibres, Rami communicantes cum n. linguale (Plates 9, 10, 12 and 13) could be seen running ventrally to the ganglion. If the main duct of the mandibular gland was followed rostrally from the intermediate tendon of the digastric muscle it was found to be joined by two ducts which issued from the ventral expanded part of the gland. The ganglion was located on the deep aspect of this junction at the ventral border of the styloglossus muscle (Plate 13). A branch from the ganglion accompanied the mandibular duct rostrally and branches accompanied the ducts to the ventral part of the gland.

Sympathetic branches, Rami sympathici ad ganglion mandibulare, from the external carotid plexus accompanied the branches of the lingual and facial arteries to the ventral part of the mandibular gland and communicated with the ganglion (Plate 13).

The ganglion was irregular in shape and measured approximately  $15 \times 5$  mm. In the majority of cases it was more of the nature of a ganglionated nerve plexus. In specimens preserved with formalin to which basic fuchsin was added the ganglion was stained a reddish colour and could be easily identified.

#### SUMMARY

The branches of the facial and trigeminal nerves to the zygomatic region of the head of the ox are described. This region is supplied by the zygomatic branch of the auriculopalpebral nerve and by zygomatic branches of the auriculotemporal nerve. The zygomatic branch of the auriculopalpebral nerve is usually well developed, carrying the sensory components of the auriculotemporal nerve to this region with it. In many cases, however, the zygomatic branches of the auriculotemporal nerve are distributed independently to this area, carrying the major part of the motor components of the auriculopalpebral nerve with them.

The branches of the buccal nerve are described. In addition to a deep temporal nerve which is incorporated in the nerve, it gives rise to glandular rami to the dorsal buccal glands and to the glands in the soft palate, hard palate and glossopalatine fold. A com-

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municating branch between the buccal and lingual nerves is described. From their connections with the otic ganglion it could be concluded that these branches carry visceral motor components.

The relations of the buccal and masticatory nerves to the lateral pterygoid muscle are described. Observations on the variations in the course of the chorda tympani and on the anatomy of the otic and mandibular ganglia are recorded.

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