On the comparative merits of Dr. Bellingeri's and Sir C. Bell's writings and opinions on the functions of the fifth and seventh pairs of cerebral nerves / by G. Negri.

ON THE

COMPARATIVE MERITS

OF

DR. BELLINGERI'S AND SIR C. BELL'S

WRITINGS AND OPINIONS

ON THE

FUNCTIONS OF THE FIFTH AND SEVENTH PAIRS OF CEREBRAL NERVES.

By G. NEGRI, M.D.

MEMBER OF THE MEDICO-CHIRURGICAL SOCIETY OF BOLOGNA.

"Io parlo per ver dire,
Non per odio d'altrui nè per disprezzo."

PETRARCA.

I speak but for truth's sake,
And not through hate of any, or contempt.

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MR. ALEXANDER SHAW'S ARTICLE

ON

SIR C. BELL'S DISCOVERIES IN THE NERVOUS SYSTEM,

Published in the MEDICAL GAZETTE, *July* 19, 1834, *and referred to in the following pages.*

THE following extracts from a paper in the Edinburgh Medical and Surgical Journal, which has just been published, will at once shew the object of the communication in which they are contained, and the spirit which animates the writer. M. Bellingeri, of Turin, is the author whose Inaugural Dissertation is the subject of the critical analysis. The passages stand thus:—

"We propose, in giving some account of the inquiries of the learned foreigner whose writings are enumerated at the head of this article, to consider the doctrines taught on the fifth and seventh nerves by that physician, several years before the time at which Sir Charles Bell published; and to see to what extent they agree or differ from those inculcated by the latter author. It is a remarkable fact that five years, at least, before Sir Charles Bell communicated to the Royal Society of London his peculiar doctrines on the uses of the fifth and seventh pair of nerves, Bellingeri had published a most minute and elaborate view of the anatomical distribution and physiological uses of these nerves, and on many of the most important points of the latter department had anticipated the British physiologist. That this circumstance has not been known to English physiologists at an earlier period, is not wonderful, when we consider how indifferent the profession at large is to the elaborate and elegant productions of the anatomists and physiologists of the Transalpine Peninsula," &c.—P. 114.

"We have no doubt that every one who peruses the dissertation with attention, will be satisfied that the Italian has given a much more clear and connected view of the anatomical and physiological history of these two nerves (the fifth and the portio dura of the seventh) than any one of the writers who have yet attempted the task."—Page 136. Again, the reviewer continues—

"It must be rather mortifying for Sir Charles Bell to find, that while, on the one hand, Magendie lays claim to his discovery of the different functions of the anterior and posterior roots of the spinal nerves, and concedes to him the merit of distinguishing the sensiferous faculty of the larger portion of the fifth pair, and the motiferous faculty of the small portion, and (of ascertaining the functions of) the seventh pair; on the other, the just claims of Bellingeri deprive him even of any title to the latter discoveries. The only parallel situation which we can remember is that of the old Abbot, who, when told that some person had before said all that he was now saying, addressed his remembrancer in the following characteristic language:—'Pereant illi qui ante nos nostra dixerunt.'"

LET me proceed at once to examine the nature of this alleged anticipation of the discoveries for which, it would appear, Sir Charles Bell has obtained so much misplaced and undeserved celebrity.

The fundamental principle which pervades every sentence of Sir Charles Bell's works, is this (and it was announced in the unpublished tract referred to by the reviewer, printed in 1811)—that a single nerve cannot bestow both motion and sensation. The former endowment infers a nervous influence propagated out-

wardly from the brain to the moving parts; while the latter infers an influence conveyed in a directly opposite course—that is, from the sentient surface inwards to the sensorium. These two properties, he concluded, were incapable of existing together in the same nerve; whenever they are combined, it is a sign that the nerve is compound—that it originates by two distinct roots from the brain or spinal marrow.

Founding on this principle, Sir Charles Bell announced what were the functions of the two principal nerves of the face and head—the fifth, and the portio dura of the seventh. The fifth pair arises from the brain by two distinct roots, each possessing a peculiar anatomical character; one having a ganglion formed upon it, while the other has not. In accordance with the principle above stated, he said that this is a double nerve: in virtue of its two distinct roots, it possesses two separate functions; it is at once the nerve of sensation to all the head, and the motor nerve of the muscles of mastication. The portio dura, however, is of a totally different character from the fifth; it has only one root, and has no ganglion near its origin. This nerve has, accordingly, but one function—it is a motor nerve; it can carry a mandate only outwards to the muscles; it has no power of carrying a sensation inwards. These opinions received the fullest and most unquestionable confirmation from experiments upon living animals, performed by Sir Charles Bell himself, and also by his zealous assistant in all these pursuits, the late Mr. John Shaw. For example: when those branches of the fifth which are derived from one of the roots simply—viz. from the large portion—were cut across in the living animal, the surface was immediately deprived of sensation, while the parts continued to enjoy their power of motion as perfectly as before the experiment was made; that is to say, only one nervous endowment of the part was lost by cutting through the nerve. When, however, the branches of the third division of the fifth—viz. those composed of the two roots joined together, and which are distributed to the muscles of the jaws, as well as sent to the skin—were divided with the knife, the animal was at once deprived of two distinct functions: not only did it lose the sensibility of the parts to which the particular branches were distributed, but the muscles of the jaws ceased, from that instant, to contract. Thus it was indisputably shewn that the larger portion of the fifth was endowed with sensation solely, and had no power of stimulating the muscles; while the smaller portion conferred motion on the muscles engaged in mastication.

In reference to the portio dura, again, the experiments upon it were equally satisfactory: when its principal trunk was cut across, the muscles to which it is distributed immediately lost all power of motion; but the sensibility of the surface was not in the slightest degree diminished. It thus became evident that the portio dura was simply a motor nerve, and had no share in contributing to the sensibility of the surfaces on which it is distributed.

But it is not to be supposed that this principle—that a single root bestows only one function—rested altogether upon the experiments on the nerves of the face. It was not with these nerves that Sir Charles Bell began his investigations. It is well known that he commenced by experimenting on the spinal nerves. It was after having ascertained by experiments (first made so far back as 1811, and repeated in March, 1821) that the two roots of these spinal nerves possess distinct endowments, that he was led to examine the functions of the fifth pair, and to classify it with the spinal nerves.

When we speak, therefore, of the validity of the proofs by which he established that the fifth pair is a double nerve—"the nerve of sensation and mastication"—we must not omit to take into consideration the experiments on the spinal nerves which corroborated his conclusions. Again, when speaking of the portio dura, a single nerve, which he said was endowed only with one property, viz. that of motion, we are not to forget his experiments on other nerves, which he likewise succeeded in shewing, when they had only one root, possessed only the power of motion, and did not bestow sensation. If we consult the several essays written by Mr. John Shaw, on the first promulgation of these views, we shall find that numerous experiments and observations had been made to confirm this principle, besides those on the two nerves in question, decisive as they must be allowed to be.

Let us now examine what were the opinions advanced by M. Bellingeri, by which, it is alleged, these subsequent inquiries of Sir Charles Bell were made so useless and nugatory.

The confident tone of the reviewer, in the assertions which we have extracted, would lead us to expect the most complete coincidence in the statements of the two physiologists; that they agreed in the general principle—that they pursued the same method in conducting their inquiries, viz. first, by examining the anatomy, and then by performing experiments—and that the results of their combined observations and experiments were the same.

The reader will find, on the contrary, in Bellingeri, a direct opposition to the principle which I have stated—a totally different mode of pursuing the investigation—a single clashing of opinions and statements with those of Sir Charles Bell; and he will inquire in vain for any single point of harmony or concurrence on which to make out a case of anticipation.

In the first place, the Italian physiologist differs from Sir Charles Bell with regard to the functions of the principal root of the fifth pair—that is, the ganglionic root. Is this difference of a trivial kind? It is, on the contrary, upon a point the most essentially important of any that could be proposed by a person drawing a parallel on such a subject. Sir Charles Bell affirms that this larger root is dedicated entirely to one single office, viz. that of *sensation*. M. Bellingeri, on the other hand, pretends that, besides conferring sensation and numerous other qualities usually assigned to nerves, *it regulates the actions of the muscles of the face;* he terms it the nerve of "physiognomical expression." I have already mentioned that Sir Charles Bell related experiments to corroborate what he stated. *M. Bellingeri has not been at the pains to make a single experiment!* but he narrates a case which, he says, illustrates his proposition. The patient had complete paralysis of the muscles of one side of the face—that is, the frontal muscles, those of the nostril and of the lips, were deprived of motion: in short, all the muscles, except the masseter and temporal, were paralytic. Now this, M. Bellingeri presents as an example of an affection "of those muscles in which the large portion of the fifth is distributed." It is superfluous to say, that this was an undoubted case of disease of the portio dura*; yet this explanation is not once hinted at. The comments of the reviewer immediately following this notable illustration of the functions of the ganglionic root of the fifth pair, are worth extracting. "The particulars of this case, and the explanations, which were published, as we have stated, in 1818, shew, we conceive, most satisfactorily, that Bellingeri understood perfectly the distinctive physiological properties of the two divisions of the fifth pair, several years before the theory of the influence of these parts was explained by Sir Charles Bell. To us, also, it appears that the explanation given by Bellingeri is much clearer, more precise, and more methodical, more logical, and less embarrassed with irrelevant statements, than we any where find it in the writings of Sir Charles Bell."—P. 125.

I presume that the writer, in mentioning "irrelevant statements," alludes to the *experiments* on the nerves of living animals which accompanied Sir Charles Bell's explanation, none of which embarrassed that of M. Bellingeri! Or does he refer to the frequent statements made by Sir Charles Bell, in confirmation of his views, respecting the similarity between the two roots of the spinal nerves, and the two roots of the fifth pair? Does he mean to say, that the experiments on the spinal nerves, which established that the posterior roots are endowed with sensation only, do not corroborate those made subsequently upon the cor-

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* "Here Mr. Shaw has fallen into the very error which he declaims against in M. Bellingeri. Had this case been purely paralysis of the muscles, then Mr. Shaw might, with some plausibility, have set it down for an affection of the portio dura; but, in addition to that symptom, we find the following: 'The irritation from pungent snuff was less in the right nostril, and there was a scanty flow of tears from the right eye; but when the snuff was drawn into the left nostril, the irritation was more violent, and there was a more profuse discharge of tears; and when the nostrils were irritated by extraneous bodies, sneezing followed if the left was touched, but none if the right. Taste was much impaired and injured on the right side of the tongue, and touch was very much blunted in the integuments of that side of the face.' Now, these symptoms, added to the former, present a very different view of the case; and, in my judgment, prove it to be an undoubted affection of the fifth." These are the sensible remarks laid down by Mr. John Walker in his article "On the Functions of the Fifth Pair, and the Portio Dura," published in the London Medical Gazette, for August 16, 1834, and to which the attention of the reader is directed at page 5th of my critical remarks on this point.

responding root of the fifth pair. If M. Bellingeri had, like Sir Charles Bell, first experimented on the posterior roots of the spinal nerves, and ascertained that they are dedicated to sensation only, having no influence over the muscles, should he not have escaped the fatal blunder of making the analogous root of the fifth pair preside over the actions of the muscles of the face? As it has happened, however, this lucky foreigner, neither making experiments on the fifth pair, nor on the spinal nerves, nor hitting upon the true functions of the nerve in question, but keeping all things in their pristine confusion, has gained the unqualified applause of this reviewer; nay, he is held up as one injuriously dealt with by the whole profession!

In the second place, the Italian physiologist differs from our English physiologist in regard to the functions of the portio dura. The opposition here too, like that in the former instance, is just of such a nature as to present the widest breach between these physiologists that could be imagined by any one resolved to put them in absolute contrast. Bellingeri conceives that the portio dura is a compound nerve; that it is endowed with both *motion* and *sensation*. I have shewn that Sir Charles Bell describes it to be a nerve of *motion only*, and altogether devoid of any property of sensation. The words of the reviewer, however, are—"he (Bellingeri) infers, that it is reasonable to think that the voluntary motion of the muscles of the face, and the animal sense of *touch*, depend on the influence of the seventh."—P. 124. In another part he says,—"Bellingeri next proceeds, in his second chapter, to adduce such evidence as may show that the seventh pair of nerves, or facial, presides over the animal functions of the head, face, and neck; that is to say, over *sensation* and motion, as animal or voluntary faculties."—P. 133. In the same page he gives the portio dura the name "musculo-cutaneous;" and he refers to it as being sometimes the seat of *neuralgia*. We are told that the Italian made experiments on the portio dura in rabbits: and let us see what were the results:—"Complete palsy of the eyelids and upper and lower lips ensued, *and the sensibility of the face appeared very much impaired, for, on plucking out hairs by the roots, it gave no signs of sensibility or pain.*"—P. 134.

It remains only to speak of the lesser root of the fifth, or that which passes the ganglion, and unites itself with the third division of the nerve, to supply the muscles of the jaw, and the angle of the mouth. Here we have at length to acknowledge some coincidence in the views of the "transalpine" and "tramontane" physiologists. Sir Charles Bell, proceeding on the previously-ascertained fact, that the ganglionic root of the fifth resembles the posterior roots of the spinal nerves, in structure as well as function, concluded that the other root, which has no ganglion, corresponded with the anterior roots of the spinal nerves, likewise having no ganglions; and that it conferred motion on the muscles of the jaw. The accuracy of this deduction from the anatomy was demonstrated by the experiments upon the third division of the fifth, performed by Mr. John Shaw. Now, although Bellingeri made no experiments of any kind upon any part of the fifth, yet it is to be conceded that he was acquainted with the true physiological character of the lesser root. But he was indebted for this knowledge to one of his countrymen! He only repeated the assertion of another Italian in a neighbouring school,—I mean Paletta. It was this anatomist who first suggested (1784) that the anterior portion of the fifth pair, which he termed nervus crotaphitico-buccinatorius, and showed was distributed exclusively to the muscles of the jaws, must be a nerve of motion. He pointed it out to be the nerve which is affected in *trismus*. Neither has Sir Charles Bell omitted to give the credit due to Paletta for this observation. He has referred to his Dissertation in several parts of his last work on the Nervous System, and of the last edition of the System of Anatomy; yet this *liberality* (as I presume we must term it) the reviewer abstains from mentioning. But so little impression did this near approach of Paletta to the discovery of the true functions of the roots of the fifth pair make on our countrymen, or assist the learned gentlemen who contribute to the Edinburgh Journal, in advancing the subject, that I believe Sir Charles Bell himself was the first person in this country who called attention to it.

Before leaving this point, it is justice to Paletta to say, that there is a wide difference between Bellingeri and him as to their claims for confidence in them as

physiologists. Paletta, having made the observation referred to, modestly declined expressing any opinion as to the probable functions of the large root of the fifth: he professed to be unable to give a satisfactory explanation of its uses: its anatomical structure, its ganglion, and its distribution to the muscles, as well as to the cavities of the head and integuments, puzzled him. Bellingeri, on the other hand, recklessly made a bold guess at what its functions might be; he failed in his conjecture: he pronounced it to be at once the nerve of motion and of sensation, when it is known to be simply a nerve of sensation: he has thus thrown a cloud of error over his only correct statement. We admire Paletta for his philosophical caution and forbearance, as well as for being the originator of the idea. We must decline placing confidence in any assertion of Bellingeri.

Let us now reflect on the amount of the proofs which the reviewer has brought forward, of the coincidence in the opinions of Sir Charles Bell and Bellingeri. The English physiologist maintains that a nerve consisting of a single root can possess only one of the two functions, sensation or motion; that it cannot have these incongruous properties combined. Does Bellingeri subscribe to this fundamental principle of the whole discoveries? In each of the two nerves, which are the subjects of his Dissertation, he contradicts this principle in the most decided manner. The large root of the fifth he represents as conferring both motion and sensation, and he affirms the same thing with regard to the portio dura! The only thing in common established between these two authors is simply this:—they both composed papers in which the names portio dura and fifth pair occur! Fluellen, with "his figures and comparisons," could have devised a far better parallel!

And here I must be allowed to ask, why has the reviewer confined his remarks exclusively to the fifth pair and the seventh? Why has he refrained from mentioning the opinions that Bellingeri holds respecting the functions of the *spinal nerves?* Is he ignorant that his favourite author composed an elaborate dissertation expressly dedicated to the subject of the spinal nerves? We find the title of the treatise placed at the head of the article as one of those to be analyzed! The date affixed to it shows that it was written two years subsequent to the announcement of Sir Charles Bell's discoveries, and five years after the author's own first dissertation. It must, therefore, be supposed to present Bellingeri's matured opinions on the distinct functions of the nerves, and perhaps also certain improvements suggested by Sir Charles Bell's inquiries: at all events, from the resemblance between the spinal nerves and the fifth pair, we might have obtained a correct insight into his views concerning this nerve, by ascertaining what he said, at that comparatively late period, of the spinal nerves. But the reviewer abstains from noticing the dissertation of 1823; he places its title at the head of his article, and yet refuses to bring its contents to light!* I can at once explain the reason of his reluctance to drag his admired foreigner into the broad day. In speaking of the spinal nerves, Bellingeri maintains that both the anterior roots and the posterior roots are endowed with motion! and the difference between them is—let the reader mark—that the anterior roots control the actions of *flexion and abduction*, while the posterior control the actions of *extension and adduction!* It would not have answered the purposes of the reviewer to have stated this. But has he honestly performed his duty in concealing it? Is such concealment doing justice to the subject of which he treats? Are his eulogiums on the foreign author bestowed to encourage the prosecution of just and correct views of physiology?

The reviewer, in concluding, says, with admirable taste, and in a manner that exhibits the "animus" with which the whole is written, "It must be rather mortifying to Sir Charles Bell to find that, being deprived by Bellingeri of any title to the discovery of the fifth pair and portio dura, *Magendie lays claim to his discovery of the different functions of the anterior and posterior roots of the spinal nerves.*" It must, indeed, be a matter of disappointment to every well constituted mind, that the important inquiries into the nervous system should be disturbed by the introduction of such impertinent and irritating remarks; especially when they proceed from an anonymous writer like the reviewer, so wonderfully ignorant of

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* This was done in the most extensive manner, in a long and elaborate article, by the same reviewer, in the subsequent number, for October last, of that quarterly review.

the subject on which he treats. He does not even know what is the nature of Magendie's opinions concerning the roots of the spinal nerves—how diametrically they are *opposed* to those of Sir Charles Bell! The French physiologist does not lay claim to any discoveries of Sir Charles Bell. What Magendie claims, is the merit (if such it be) of adopting a view of the functions of the roots of the spinal nerves *directly hostile* to that maintained by our English physiologist. He makes no pretensions as to priority of engaging in the investigation of the functions of the spinal nerves, which the reviewer would lead us to suppose. This is a ground which he has long abandoned. It is not on a question of rival claims for the same discovery that these physiologists are divided: the point is, whether one opinion, originally set forth and still supported by Sir Charles Bell, or another which has been placed in opposition to it by M. Magendie, is the correct one. There is no harmony between them in their views: whoever upholds the opinion of the one must desert that of the other.

What Sir Charles Bell's particular views concerning the roots of the spinal nerves are, I have already had occasion to state, while speaking of the roots of the fifth pair. His opinion is, that the posterior root, which has the ganglion formed upon it, is for sensation, and exercises no power at all over the muscles; that the anterior root, which has no ganglion on it, but resembles in this respect the ninth, &c. is for motion alone, and has nothing whatever to do with sensation. This account of their properties is in accordance with the principle to which I have had to refer—that no nerve in the body which has a single root is endowed with motion and sensation conjointly. But what does Magendie maintain? In controversion of this distinct announcement, he has insisted, (and he has not spared life in endeavouring to support his view by experiments), that the two roots do not respectively possess this simple character; he pretends that *both sensation and motion* reside in each of the two different roots. Whether he takes the anterior root without the ganglion, or the posterior root with the ganglion, he maintains that he finds it combines both these qualities in it; that it possesses the power of conveying sensations inwards to the sensorium, at the same time that it is engaged in issuing mandates of the will outwards to the muscles. This is the singularity of opinion for which M. Magendie is distinguished. Since, therefore, he maintains a view, the direct tendency of which is to subvert the truth of the principle which runs through the whole course of Sir Charles Bell's investigations, how can it be said that he claims that gentleman's discoveries? How can the reviewer excuse himself for the offensive insinuation contained in the last sentences of his paper—that the discovery appropriated by Sir Charles Bell might, perhaps, if the question were sifted, be found in justice to belong to Magendie?

Having shewn how groundless the assertions are which the reviewer has with so much boldness sent forth, and how devoid he is of all knowledge of the opinions of the gentlemen whose claims he pretends to adjudicate, it is not for me to hazard a conjecture whether such futile attempts to depreciate what he has done, or such palpable indications of a desire to hurt him in the eyes of the profession, will "mortify" Sir Charles Bell. The public—the intelligent public—especially the medical public, will not fail to look upon these exhibitions in their true light. In the history of the reception of his discoveries, they will recognize the usual fortune which accompanies signal improvements in science: first, the facts on which the discovery rests are denied—then some one seeks to appropriate the discovery to himself—and, finally, when there remains neither doubt as to the facts, nor hesitation, in all well-informed persons, as to the merit of the observations, it is said that the discovery was made long ago. Then it is that, with a pretended liberality, some expression is tortured to a new meaning, and some author whom the profession is accused of having long neglected is brought forward into notice. There are men who find it an inexpressible relief to praise those who are removed by distance or by death, if by this they can save themselves from the necessity of acknowledging merit nearer home.

ON THE COMPARATIVE MERITS

OF

BELLINGERI'S AND SIR C. BELL'S WRITINGS,

&c. &c. &c.

"Amicus Plato, sed magis amica veritas."

No one is more desirous than I am of giving to Sir Charles Bell all the credit he justly deserves for what he has done on the subject of the nervous system. I really believe that, after having read his "Idea of a New Anatomy of the Brain, submitted for the observations of his friends," printed in 1811, although merely for private circulation amongst them, nobody in this country, where he publicly professed the principles therein exposed, can deny to Sir Charles Bell the merit of having opened and traced a new path, leading to the most important inquiries on such an intricate subject as that of the nervous system.

Still it is certain that Sir Charles Bell's "*unpublished tract*" was not, nor is now, known on the Continent, or at any rate in Italy, where Bellingeri's *Dissertatio* (parts 2d and 3d of which contain the Anatomy and Physiology of the Fifth and Seventh Pairs of Cerebral Nerves) was published in 1818, and sent in the following year, 1819, by the author, to the Royal Society of London, where, I have good reason to believe, it remained untouched till last winter.

On the contrary, Sir Charles Bell's first memoir "On the Nerves," &c. was read to the Royal Society the 12th of July, 1821, and printed in the second part of the Philosophical Transactions of the same year. The fifth pair is there considered, in common with those of the spine, as a symmetrical nerve, with double origin, and a ganglion on one of its roots, and endowed with both voluntary motion and sensibility.—(See Philosophical Transactions, 1821, page 404.) "If the fifth nerve, and the portio dura of the seventh (says the author), be both exposed on the face of a living animal, there will not remain the slightest doubt in the mind of the experimenter which of these nerves bestows sensibility. If the nerve of this original class be divided, the skin and common substance is deprived of sensibility; but if a nerve not of this class be divided, it in no measure deprives the parts of their sensibility to external impression."—(*Id.* p. 405)

Then, when speaking of the trigeminus, or fifth pair, the author goes on saying, "In all animals that have a stomach, with palpi or tentacula to embrace their food, the rudiments of this nerve may be perceived;" "it is the nerve of taste, and of the salivary glands, of the muscles of the face and jaws, and common sensibility." "A ganglion is formed upon it, near its origin, though some of its filaments pass on without entering into the ganglion. Before passing out of the skull, the nerve splits into three great divisions, which are sent to the face, jaws, and tongue: its branches go minutely into the skin, and enter into all the muscles, and they are especially profuse to the muscles which move the lips upon the teeth." (pp. 409, 410.)

In conclusion, when speaking of the functions of the trigeminus, as illustrated by his experiments, the author says,—"We have seen that when the fifth nerve, the nerve of mastication and sensation, was cut in an ass, the animal could no longer gather his food."

From these quotations it is evident that Sir Charles Bell considered the fifth pair a mixed nerve of sense and

voluntary motion, distributed to the face generally, both for *mastication* and *sensation;* but still he never mentioned the smaller portion of the fifth as a peculiar nerve, merely for the voluntary muscular action of the lower jaw, although as such it had been beautifully described by Paletta as far back as the year 1784, and by him called, from its anatomical distribution, *nervus crotaphiticus et buccinatorius;* and which Bellingeri, from its physiology, distinguished it by the name of *nervus masticatorius.*

On the 28th of May, 1829, Sir Charles Bell's last memoir "On the Nerves of the Face," was read before the Royal Society, and printed in their Transactions for the same year. There the author says,—"Confident in the accuracy of my deductions from the anatomy of the fifth nerve, I had attributed to one of its branches a function which belongs to another branch of the same nerve."—(See Sir Charles Bell's last work on the Nervous System, page 94.) In this paper only we meet, for the first time, with an article on the motor, or manducatory portion of the fifth nerve, of which he says,—"Since the publication of my first paper this inquiry has assumed importance, although the principal facts of the anatomy were known to Wrisberg, Santorini, Paletta*, Prochaska, and Soëmmerring; *but in no author is the anatomy of the motor portion of the nerve traced with sufficient minuteness, or regard to the distinct uses of the muscular and sensitive divisions,*" (p. 100.) And farther on:—"The form of the fifth, and its resemblance to the spinal nerves, had struck some of the best continental anatomists; *but as they made no distinctions in the functions of the roots of the spinal nerves, so neither did they imagine any difference in the roots of the fifth nerve, and therefore no consequence resulted from having observed this resemblance. This part of anatomy, together with the whole minute relations of the nerves, was a dead letter, and led to no inference.*" (See p. 103.)

Now Bellingeri gave the most minute and distinct anatomy both of the ganglionic and motor portions of the fifth†, in the second part of his *Dissertatio*, (which is entirely on the anatomy of the nerves of the face), with an interesting tabular form of their respective origins, and distribution from *branch to branches down to the last fibrillæ;* and from the exclusive distribution of *part* of its smaller portion, he called it, as already mentioned, *nervus masticatorius.*

But with the view of giving a more correct idea of Bellingeri's opinions on this particular subject, I shall bring before the public some quotations from his Latin *Dissertatio*, Part III. Art. ii.; the title of which is, "Usus portionis minoris quinti paris." (See p. 176.)

"Portio minor quinti paris diversam omnino originem, iter, et structuram habet a majori ipsius portione, et per proprios surculos in musculos temporalem, massetericum, buccinatorium, pterygoïdeos externum, et internum, orbicularem insuper labiorum, elevatorem anguli oris, et triangularem menti inseritur. Hanc minorem portionem dixit Paletta, voluntarios exequi motus, et sympathice, vel idiopathice in trismo affici.

"Voluntarie certe et nostro arbitrio movemus musculos cunctos, in quibus inseritur portio minor. Hunc vero voluntarium musculorum motum *a sola minori quinti portione pendêre*, non a septimo, vel faciali nervo, qui alicubi cum ramis ipsius consociatur, demonstratum fuit ex eo quod in carnea substantia musculi temporalis, et in musculis pterygoïdeis præsertim, soli immittantur minoris quinti portionis rami absque ullis nervi facialis propaginibus, et tamen isti musculi voluntatis obediunt imperio. . . . . Spectat igitur portio minor ad nervos vitæ animalis, *et quidem ad nervos motorios; nullibi enim sensibus præest, et habita ratione ipsius officii,* NERVUS MASTICATORIUS esset dicendus. Patet igitur, *quam merito Paletta*, anatomicis ductus rationibus *spectataque diversa origine, structura, et itinere*, dixerit nervum crotaphiticum, et buccinatorium distinctos a quinto pari nervos constituere, namque et physiologicus ipsorum usus demonstrat, a majori quinti portione differre ipsammet portionem minorem." (p. 177.)

"Verum demonstrato, prout sategimus, minorem hanc portionem per se voluntarios exequi motus, inquirendum remanet, cur *in quibusdam circumstantiis* involuntarie, vel ab instinctu moveat musculos, in quibus inseritur. Hoc pa-

* This is the first time, and the only place in this paper, where we met with this celebrated anatomist's name —See Mr. A. Shaw's article, in the Med. Gaz. July 19th. p. 563.

† See Part II. of the Edinburgh Medical and Surgical Journal, July 1, 1834.

riter anatomes explicatur adjumento; vidimus porro in præcedenti dissertatione (*he means the second part, which contains the anatomy of this nerve*), minorem quinti portionem in suo e foramine ovato egressu intime ut plurimum per plexum ganglioformem cum maxillari inferiori connecti, insuper et fere omnes ramos portionis minoris accipere radices, aut filamenta a ramis maxillaris inferioris; igitur portio minor in propriis ramificationibus est nervus compositus *ex propriis filamentis, et a filamentis maxillaris inferioris:* nihil mirum inde, *si voluntarios ut plurimum*, et modo etiam involuntarios exequatur motus, quos tamen producit *non per propria filamenta*, sed per ea, *quæ a maxillari inferiori proveniunt*, quem organicæ vitæ præesse, et involuntarios perficere motus, ex superius dictis, constare dijudico." (See pp. 177 and 178.)

"Sunt igitur musculi, qui mixtos exequuntur motus, modo voluntarios, modo involuntarios, sunt et nervi, sed isti *vel constant e diversorum nervorum filamentis in unicum fasciculum collectis, vel filamenta unicum nervum constituentia diversam habent in encephalo originem.*" (p. 178.)

Here ends the article in Bellingeri's work on the Minor Portion of the Fifth Pair of Cerebral Nerves, and so I shall also conclude my first article, leaving the other parts of this question for a future period.

Bellingeri's Opinions on the Ganglionic Portions of the Fifth Pair of Cerebral Nerves.

What Sir Charles Bell's opinions were, in 1821, on the functions of the fifth pair of cerebral nerves, have been stated in my first article. He gave, in his fourth paper, read before the Royal Society on June 19th, 1823, the following definition:—

"The fifth is the universal nerve of sensation to the head and face, to the skin, to the surface of the eye, the cavities of the nose, the mouth and tongue, and the manducatory nerve." (See Bell's last work, p. 217.) How those opinions were altered, in 1829, with regard to the smaller branch of the same nerve, has also been said.

What Bellingeri's *real opinions* were, in 1818, on the use of the smaller portion of the fifth pair of nerves, I hope has been satisfactorily proved by his own words. It is for him a nerve of voluntary motion, possessing no sensation: in certain circumstances it acts also as a nerve of involuntary motion, or of instinctive action; but this property is bestowed on it by the intermixture with the inferior maxillary branch of the ganglionic portion, and then it is to be considered as a compound nerve: both this last and the smaller portions of the fifth take their origin from distinct parts in the encephalon.

Now I must come to what Mr. Alexander Shaw very properly considers the most important point of this question—viz. to the larger or ganglionic portion of the fifth nerve. With the view, however, of soon satisfying Mr. Shaw, let me bring forward at once just the two concluding sentences in Part III. of Bellingeri's Dissertatio, of the first chapter, of which the title is, "Portionis majoris quinti paris *usus, consensus, influxus.*" (p. 119.)

"Statuam igitur," says he at last, "*quintum par nervorum esse sentientem, et motorium vitæ organicæ in capite.* Quæ de quinto pari generatim diximus de ipsius portione majori tantum intelligenda." (p. 175.)

Bellingeri's so called *Dissertatio Inauguralis*, contains, properly speaking, six distinct ones; the different subjects of which are the following:—I. *Ex Physica: De Physico-chemicis albuminis proprietatibus.*—II. *Ex Anatome: De nervis faciei.*—III. *Ex Physiologia: Quinti, et septimi nervorum paris functiones.*—IV. *Ex Medicina Theorica: De Neuralgiæ faciei.*—V. *Ex Praxi. Cura Neuralgia faciei.*—VI. *Ex Materia Medica. Specimen de remediis nervinis.* It is evident, therefore, that the leading subject of the author was principally the general pathology and treatment of the *Neuralgia Facialis*, and that he had very judiciously prefaced his remarks by the anatomy and physiology of those parts and organs which, from their morbid condition, were to be restored to their natural state.

Both the anatomical and physiological parts leave nothing to be desired in point of clear and minute exposition, as well as of information taken from the most celebrated authors who have distinguished themselves on this subject. The opinions and authorities of Eustachius, Faloppius, Willis, Vieussens, Santorini, Winslow, Haller, Meckel, Hirsch, Wrisberg, Cotunnio, Scarpa,

Soëmmerring, Bichat, Malacarne, and others, are brought forwards when necessary to settle some disputed point; and with such a degree of ingenuity, without pretension, which is indeed highly creditable to the author.

He does not, then, come forward as a discoverer of new things, but modestly exposes the ingenious deductions of his patient and extensive inquiries on the structure, distribution, connexions, and functions of those parts which make the subject of his work. Of the correctness of my assertion, every one may have a convincing proof, from the very beginning of the already-mentioned chapter.

§. I. " Disputatissimam aggressurus partem, omnino certa non proferam, satis, si quæ probabili magis conjectura, assequi licet, afferam. Vidimus porro in præcedenti dissertatione, quintum par multiplicibus in partibus inseri, quarum omnino varii sunt usus. Sunt, quæ sensui obediunt voluntario, sunt quæ involuntarie, vel antomatice moventur partes, sunt tandem, quæ secretionibus dicantur; omnes denique partes vitam vivunt organicam. Sed quasnam exequitur actiones quintum par? Definituri, antea consulamus auctores.

§. II. Galenus jam tradidit, nervum quinti paris, quem sub nomine tertiæ conjugationis designat, sensui tactus, et motus voluntario dicatum esse, in super et ramos qui in toto ore distribuuntur gustui inservire."—*(De usu partium*, lib. ix. et xi.)

" Willis docuit, sensibus famulari quintum par, tactus scilicet, et gustus; motus etiam, sed involuntarios, vel ab instinctu perficere, asseruit; sympathice, quoque, et pathetice affici, atque moveri: actionibus etiam involuntariis (sive organicis functionibus) dicatum esse ramum lacrymalem ophthalmici, aperte innuit, visui quodammodo, et olfactui inservire; sanguinis circulationem in facie immutare*."—pp. 119, 120, *(Cerebri Anatomes*, cap. xvii.; *Nervor. Descript. et Usus*, cap. xxii.)

And so on, with Vieussens, Meckel, Soëmmerring, Bichat, Gall, and Boyer.

§ III. " Multiplicatas igitur admodum, diversique ordinis exequitur functiones, secundum memoratos auctores, quintum par. Partium vero, in quibus inseritur, vitæ organicæ præ primis conferre par quintum, nobis ratio suadere videtur.

§ IV. " Et primum quidem, argumento ex anatome ducto, peculiaris ipsius structura, quæ cum nervis vitæ organicæ quammaxime convenit, intertexta filamentorum dispositio, gangliorum ubique præsentia: [Præter plexum semilunarem, ganglioformem dictum, convenit ad efformandum ganglion ophthalmicum, ganglia quoque ciliaria a Reil descripta; ganglion in sinu frontali a Wrisbergio indicatum efficit; ganglion spheno-palatinum, et ganglion maxillare a Meckel inventa.] mire repetitæ ipsius anastomoses, ramorum interdum volumen adauctum, ut in ipso quinti trunco in ciliaribus, in nasali externo cum Boyer, et in palatino posteriori cum Scarpa in anatomis vidimus, quod similitudinem cum intercostali constituit; constans cum arteriis associatio, quod ex Bichât spectabilem sistit nervorum vitæ organicæ characterem, prolatæ opinioni favent. *Fortasse et ex ipsius origine duci argumentum potest; fere enim ex integro ortum trahere videtur a corporibus olivaribus, quæ merito uti ganglia habentur.*" [" In ea sum opinione, ut credam, *nervea filamenta quæ a corporibus olivaribus ortum ducunt, unice vitæ organicæ famulari.* Revera oritur ex ipsis maxima ex parte imprimis *nervus pneumo-gastricus, glosso-pharyngeus, trifacialis: aliqua etiam filamenta accipiunt sextum, et septimum par*, undecimum etiam*, *vel magnus hypoglossus.* Porro nervi priores unice vitæ organicæ famulantur; *posteriores vero, plus minusve, aliquibus tantum in partibus.*"] —Pp. 121, 122.

§ V. " Majoris momenti sunt argumenta, quæ physiologia suppeditat. Revera quam distribuitur iridis, glandulæ lacrymali, pituitariæ narium membranæ late expansæ, sinibus maxillaribus, sphenoidalibus, frontalibus, dentibus, internis aurium partibus, glandulis salivaribus cunctis, glandulisque mucosis, glandulis tonsillaribus, pharyngi, et periostio, non nisi vitæ organicæ munera adimplet. *Verum quidem est, et musculis voluntatis imperio subjacentibus prospicere, et tegumentis;* sed animadvertamus velim, *non ibi solas existere quinti paris propagines, sed alias statim accedere:* sane, dum su-

* See Mr. Joseph Swan's article, in the Med. Gaz. July 19, 1834.

* He adopts Soemmerring's classification of the cerebral nerves.

pra, et infra orbitam egreditur, ad tempora, et in regione malarum, prope foramen menti, *nonne statim filamenta septimi paris superveniunt, et intma anastomosi conjuncta cum ramis quinti, unicum fere cum ipsis nervum constituunt?* Si igitur ubi solæ sunt quinti paris ramificationes, uti in ramo lacrymali, nasali, dentalibus, et palatinis, ibi sola est organica vita, *nonne probabile redditur, quum in musculis, et integumentis frontis, labiorum, nasi, et oris, universæque faciei distribuitur*, ipsorum tantum vitæ organicæ famulari, *animalem vero vitam, motum scilicet voluntarium, et sensum animalem, ab adjunctis nervis pendêre?* Profecto quum sensum organis distribuitur quintum par, *quod organici est*, ab ipso dependet, *quod vero animalis*, a peculiaribus nervis ipsis organis prospicientibus.....Physiologia igitur, organicæ vitæ inservire quintum par suadet."—P. 124.

§ VI. "Tandem quintum par organicæ imprimis vitæ dicatum esse, comprobant ipsæmet observationes pathologicæ. Re quidem vera in neuralgia faciei rami infraorbitalis instituitur sectio neque inde musculorum subsequitur paralysis. Huc etiam facit fortasse observatio monstri a Lawrence descripti, in quo encephalum fere ex integro deficiebat..... Hoc antem monstrum veram animalem vitam non vixisse, sed potius organicam...."

§ VII. "Dum interim statuimus vitæ organicæ *præcipue famulari* quintum par, patet profecto, *et animalem vitam consequenter*, ex ipso dependêre: læso enim *organico partium existendi modo, et animales ipsarum necessario præpediuntur functiones.* Hoc pacto sequentem explicamus pathologicam observationem."—Pp. 125, 126.

Here he relates, in support of this statement, a case by Bellingeri, considered as one of paralysis of the ganglionic portion of the fifth, but by Mr. Alexander Shaw declared "*an undoubted* case of disease of the portio dura." After the very able manner in which Mr. John Walker has answered him, I do not consider it necessary to say any thing more on this particular subject*.

§ VII. "Verum neque tantum solæ partium organicæ præest quintum par, sed *et affectionibus patheticis, sympathicis, involuntariis experimendi inservit.* Animi pathemata præprimis per ramificationes quinti paris mire in faciem depinguntur."—Page 126.

After having given a beautiful description of the effect of the different passions on the change of physiognomy, he says—

"Esse porro productiones quinti paris, non autem septimi, quæ diversimode ab animi pathematibus *afficiuntur*; inde dignoscitur, quod in variis animi passionibus *non soli afficiuntur musculi, sed et vasa sanguinea, et glandulæ quam plurimæ, multæque partes, quæ dumtaxat a quinto, nullos vero a septimo nervos accipiunt.*" . . . (p. 127.) "Quintum igitur tantumodo est par, non vero septimum, quod involuntaria animi pathemata exprimit. [Quarti præcipue, quinti, et sexti paris nervi, pneumogastricus, et intercostalis, sunt, qui influxum pathematum animi sentiunt, et manifestant; isti vero *aliqua*, vel *maxima ex parte a cerebelli productionibus exoriuntur;* putarem inde, posse quadantenus conjecturari, *cerebellum, præ aliis encephali partibus, organum, et sedem esse animi pathematum.*"] pp. 127, 128.

"Sympathice præ primis moventur quinti paris propagines. Sympathias vero . . . . in *proprias* quinti paris, et *communes* cum aliis nervis hic loci distinguo."

The proper sympathies are very clearly explained by the numerous connexions of the fifth with other nerves. The common, or passive sympathies, are explained in the same manner, through the connexions which the fifth has, by means of the great sympathetic, with every part of the body, and with the brain, through its conjunction with the sixth. Then he says—

"Jure, meritoque Wrisbergius quintum par inter *sympathicos nervos* recensuit, et sympathicum medium dixit." Bellingeri's opinion is, that "nervus intercostalis sympathicus magnus est dicendus, sympathicus medius pneumogastricus, parvus sympathicus trifacialis, et *sympathicus minimus facialis dicendus.*" p. 143.

Here it is remarkable what he says on this subject.

§ XVII. "Putarem sympathias in animales, et organicas esse distinguendas; priores quidem a cerebro, non vero secundæ dependent. Animalis fere semper est sympathia, quæ facit, ut per olfactum, visum, auditum, alimentorum,

* See Mr. John Walker's article in the Med. Gaz. for August 16, 1834.

vel veneris excitentur desideria; hæ cum animi peragantur conscientia, et voluntatis imperio præpediri possunt. Organica sympathia est, quæ a cerebro inconsulto, et invito perficitur; renum adest calculus, movetur ventriculus, et vomitu premitur, inscius est animus, reluctaretur si datum esset. . . . . Organicas igitur sympathias a nervorum anastomosibus, plexibus, et gangliis ut plurimum pendêre arbitrarer." p. 145.

§ XIX. " Non denegandum interea ad nonnullas partium sympathias per nervos explicandas, ad ipsorum communem originem sive in medulla oblongata, sive spinali necessario esse confugiendum. Punctum vero in encephalo, ubi perficiuntur sympathiæ organicæ, nobis statui posse videtur in corporibus olivaribus; revera ex ipsis exoriri videntur maxima ex parte præcipui nervi sympatici vitæ organicæ, intercostalis nimirum, pneumo-gastricus, et trifacialis; quod magis comprobaret, corpora olivaria vitæ organicæ dictata esse; atque ita ratio redderetur, quommodo sympathiæ organicæ perficerentur, cum encephali concursu, absque ulla tamen animi conscientia.

" Sunt igitur sympathiæ, quæ a cerebro, sunt quæ a spinali, vel oblongata medulla dependent, sunt quæ etiam per simplices nervorum anastomoses, plexus, et ganglia fiunt, et explicantur. Animales vero sympathias cerebro intercedente fieri credam; organicas, et per simplices anastomoses, plexus, et ganglia absolvi posse contendo, quæ quidem non in nervis vitæ animalis, sed tantum in nervis vitæ organicæ perficiuntur. Hinc cum tot, tantusque quinto pari peragi sympathias demonstravimus, vidimus quoque in ipsius anatome, suos omnes ramos inter se, et cum vicinis nervis ubique anastomosibus jungi, ita ut intimus sit omnium fere filamentorum connexus, et circulum quodammodo præseferant; multiplices quoque, et insignes instituit plexus, gangliisque frequenter obsidetur quintum par." p. 147.

Here I must end my second article, leaving the remaining part, on the ganglionic portion of the fifth pair of nerves, for the following week.

Bellingeri's Opinions on the Functions of the Ganglionic Portion of the Fifth.—Part II.

In the preceding article we have seen that the ganglionic portion of the fifth, according to Bellingeri's opinion, exerts, in the first place, a direct influence over the organic life of those parts and organs which receive branches from it. Moreover, by its connexions with the other nerves of the face, and by its distribution round the smallest arteries, it serves principally to depict over the face the physiognomical expression of the different passions; when, by its anatomical relations, through the sympathetic nerves, with all parts of the body, the numerous branches of the ganglionic portion of the fifth may be also sympathetically called into action.

Although these statements may appear reasonable enough to those who read and understood the anatomical and physiological arguments brought forward by Bellingeri, still they did not satisfy Mr. Alexander Shaw, who was quite astonished to learn that the *Italian physiologist* had termed the fifth " the nerve of *physiognomical expression.*"—(See Med. Gaz., July 19, p. 501.)

Sir Charles Bell, when defining the seventh pair of nerves, in his fourth paper already mentioned, says,—" The seventh is the auditory nerve, and the division of it called *portio dura* is the motor nerve of the face,..... and that on which the expression of the face depends." — (See last work, p. 217.) Therefore, according to Mr. Shaw's doctrine, Bellingeri must be wrong; and has then committed, says he, " the fatal blunder of making the *sensitive* root of the fifth pair preside over the actions of the muscles of the face." (See Med. Gaz., July 19th, p. 502.)

When Mr. Alexander Shaw is speaking of the seventh, he informs us that " this nerve has *but one function;* it is a motor nerve; it can carry a mandate *only outwards* to the muscles; it has *no power of carrying a sensation inwards.*"—(Med. Gaz., July 19th, p. 560.) Moreover, " *It...has no share in contributing to the sensibility of the surfaces on which it is distributed.*"—(Id. p. 561.)

Now I should like to know, if the seventh have no sensation or power to carry any impression from without inwards, how is it to be considered the nerve of expression of the face?

Looking at Dr. Johnson's definition of the two words, *sympathy—sympathetic*, I found one to be, " *mutual sensibility;*" the other, " *having mutual sensation; feeling in consequence of*

what another feels." Then, how are they to be applied to the seventh, which has no sensation, rather than to the fifth, which is the nerve of feeling of the face? How the lachrymal gland may be put into violent action by sympathetic impression from the seventh, if it merely receive its nerves from the lachrymal branch of the fifth? Is it then so extraordinary, if the principal nerve of feeling of the face, and of reciprocal connexion with all its parts and organs, be called by the Italian physiologist "the nerve of physiognomical expression?" Who then made "the fatal blunder?"

Leaving time for Mr. Alexander Shaw to give us an answer, I shall now proceed with Bellingeri's exposition:—

§ XX. Involuntariis præesse actionibus par quintum hucusque demonstrare adgressi sumus, partium scilicet organicæ vitæ, patheticis, et sympathicis affectionibus; sed et multiplicibus inseritur in partibus motu donatis, in cunctis scilicet faciei musculis, in musculis palati, et superioris pharyngis, in musculis linguæ, et maxillæ inferioris, in nonnullis capitis musculis; nasi denique, et aurium; in iride tandem, et in internæ auris musculis. Quanam ratione hosce moveat, inquirendum remanet. (p. 148.)

§ XXI. Physiologi partiuntur motus in voluntarios, involuntarios, et mixtos; qui autem proficiscuntur motus a quinto pari, involuntarios esse, crederem; quod ut comprobem, a demonstratis incipiam. Et primo quidem involuntarius fere penitus est iridis motus in humana specie. Sed nervos iridi quintum largitur, tertium quoque per ganglio prius efformato. Perraro equidem, sed aliquando a voluntate dependens observatus est iridis motus quibusdam in individuis; ita in Fontana vidit Mascagni. Sed jam in anatome animadvertimus, et interdum nervos ciliares nullos a quinto, sed unice a tertio pari fuisse progenitos; defuisse et semel ganglion ophthalmicum Gunzius asseruit. An physiologicus inde motus iridis, a generali lege recedens, cum peculiari conveniret anatomica ciliarium nervorum constructione? An quando tantummodo a tertio pari nervi ciliares procedunt, iridis motus ganglii deficientiæ iisdem in individuis debetur? Putarem, namque in avium quibusdam speciebus, psytaco, et noctua, in rajis etiam iris voluntatis obedit imperio, quod clariss. Sprengel ganglii ophthalmici defectui tribuendum esse, subdubie proponit. (p. 149.)

Pupula autem a luce in statu salutis non directe propria actione movetur, sed sympathice a consensu cum nervo optico. Sed non semper sympathice ab optico movetur iris, interdum citra optici influxum movetur; cæci fuerunt a vitio nervi optici, in quibus pupilla lucis movebatur actione. Involuntarius autem iridis motus, præsertim a quinto, non autem a tertio pari fovetur, quod in reliquis suis propaginibus voluntatis obedit imperio. Revera Whytt animadvertit in amaurosi unius oculi, ipsius pupulam a vario lucis gradu neque constringi, neque dilatari; moveri tamen ipsam, si lux in oppositum agat oculum. Hyoscyamo ventriculo excepto, mydriasis suboritur, sive integer sit visus, sive cataracta, sive amaurosi detineatur oculus. Utroque tamen in casu sympathicus iridis motus neque ab optico producitur, neque a tertio, sed a quinto perficitur.

Sed non omnimode involuntarius est iridis motus, aliquatenus etiam, leviter quidem, subjacet voluntati; id et innuere visus est Whytt. Hinc, quum attente objectum conspicimus, vel voluntatis imperio sub hac animi contentione movetur iris, vel major ad motum inducitur aptitudo; hoc autem a filamentis tertii paris peragi putarem, qui in cæteris propaginibus fere ex integro a voluntate dependet; hinc admirandum naturæ consilium, quum enim duplicis ordinis motus in iride perficeretur, et nervis ipsam ditavit, duplici e fontis petitis. (p. 151.)

§ XXII. Constructionis, et functionis æqualitas postulat, ut de nervis auris interiora ingredientibus, et auditui famulantibus dicamus. Sicuti involuntarie pupula a luce, ita et a sonoris aëris undulationibus musculi internæ auris præter voluntatis influxum fere semper moventur . . . . Musculi autem internæ auris suas nervosas propagines a quinto una cum septimo accipiunt . . . . Sicuti enim iris in oculo a quinto, et tertio pari simul nervis ditatur, ita et a quinto, et septimo musculi auditui suppetias ferunt. Sicuti iris maxima ex parte citra voluntatem movetur, ita et musculi internæ auris: sicuti iris, pariter et isti musculi sympathice ab intercostali afficiuntur; commode autem hæc sympathia explicatur per ramum petrosum nervi vidiani, qui alio ramo carotideo ad intercostalem efformandum concurrit . . . . Involun-

tarius igitur maxima ex parte, et aliquatenus voluntarius est musculorum internæ auris motus, et natura etiam quintum, et septimum par in aure copulata est, musculorumque nervos duplici e fonte desumsit.—P. 153.

§ XXIII. Modo ad ramos palatinos deveniemus, qui in uvula, velo pendulo palati, et pharynge superiori distribuuntur, et musculis circumflexo palati, et elevatori palati mobilis, sicuti, et superiori pharyngis parti prospiciunt; ibi solæ sunt quinti paris propagines, ipsorumque motus ab animalis nutu nullomodo dependent. Moventur quidem in deglutitione, quæ licet prima fronte a voluntate omnino perfici videatur, attamen, quæ a posteriori oris cavo perficitur, solummodo ab alimentorum, vel salivæ inducitur stimulo; hinc ore penitus vacuo, et ipso adnotante Magendie, deglutitio impossibilis, vel nulla. (See Precis Elémentaire de Physiologie, t. ii. p. 66.)—P. 153.

Here I shall omit to transcribe what Bellingeri states about the lingual branch of the fifth, as I shall return to this subject on another occasion.

§ XXIV. P. 156. Jam vero ad maxillarem inferiorem gradum facimus, quem vidimus in anatome ramos tribuere musculo mylo-hyoïdeo, ventri anteriori digastrici, omnibusque muculis in mento, ipsiusque viciniis existentibus: aperit inde maxillam inferiorem, et concurrit ad oris occlusionem, et diductionem; famulatur quapropter alimentorum sumptioni, masticationi, atque deglutitioni, qui certe motus quandoque involuntarii a solo instinctu peraguntur, namque et in infante exercentur. Involuntariis autem destinari actionibus comprobant reliqua ipsius filamenta, quæ dentibus, glandulisque labialibus inseruntur. Quum porro et voluntarie moveantur omnes musculi menti, hinc vix e proprio foramine egresso maxillari inferiori, ibi traducta septimi paris filamenta multimode connectuntur, omnibusque cum ramis conjunguntur."—P. 157.

§ XXV. Infraorbitalis rami propagines eamdem sequuntur rationem; quum enim in musculis palpebræ inferioris, labii superioris, oris, et nasi insumuntur, vel nullommodo, ut sunt musculi nasi ut plurimum, vel dumtaxat involuntarie cunctos movent. Præsunt et ipsi nonnulli ciborum assumtioni, et masticationi, alii oculos tuentur, et ex parte claudunt, narium musculi quandoque in hominum morbis, et sub cursu in ipso, et in equo præprimis, respirationem coadjuvant, qui certe omnes involuntarii, vel mixti sunt motus. Sed quum et obediant voluntatis actioni, hinc ubique in omnibus hisce musculis filamenta septimi paris cum quinto natura commiscuit. Eadem omnino dicenda sunt de ramis nervi frontalis, infratrochlearis nasalis, deque filamentis nonnullis lacrymalis, qui in musculis occipito-frontali, superciliari, pyramidali nasi, orbiculari palpebrarum, et levatori palpebræ superioris finem habent. Demonstravimus superius sympathice, et pathetice moveri, ac affici frontalis, infratrochlearis, et lacrymalis propagines. Involuntarie autem moventur in palpebrarum motibus, hinc nobis fere insciis palpebris nictamur dum vigiles sumus, oculos, ingruente somno, claudimus, aperimusque expergefacti, hæc omnia exercet et infans. Verum quum frontis, nasi, et superioris palpebræ musculi jubente voluntate diversimode moveantur, septimi, et tertii paris propagines ipsis alicubi natura est elargita, et præcipue in exterioribus musculorum frontis, et orbicularis palpebrarum stratis quinti, et septimi paris anastomoses fieri, in anatome observavimus.

Quintum denique par omnes hosce involuntarios motus absolvere, comprobat observatio monstri a Lawrence descripti, et superius relata, in quo *deficiente septimo pari, et præsente quinto*, ciborum assumtio, suctus, masticatio, et deglutitio perfecta est. Sed non tantum involuntarie agunt variæ maxillaris superioris, et inferioris divisiones in ciborum sumptione, et masticatione, verum et in voce, et diversis vocis modulationibus suam opem conferunt; plorat inde non solum, sed et ejulatus emittit, et clamitat infans, os diducit, distorquet, circumagitat linguam, tremit ipsa, et labia.—P. 158.

§. XXVI. Secretionibus quoque, et multiplicibus, quæ certe organicæ vitæ munera sunt, omnibus in facie præest quintum par; ipsius influxu lacrymas glandula lacrymalis secernit, humor meibomianus a palpebrarum glandulis plorat, mucum pituitaria narium membrana separat, salivam glandula sublingualis, maxillaris, atque parotis, lubricum mucum mucosæ glandulæ palati, totiusque oris, buccarum, linguæ, et labiorum, tonsillæ ipsæ quinti actione proprium exequuntur officium, cerumen

in auribus a quinti secernitur auxilio. Vidimus quoque sanguinis circulationem in facie a quinto recte dirigi, modo accelerari, retardari, impediri, aut perverti; hinc, cur constanter comitetur arterias, ut summa cum patientia, et labore de omnibus quinti ramis demonstravit Wrisbergius. Organicas inde usque adhuc ostendimus quintum par exequi functiones.—P. 159.

§. XXVII. Hisce porro constitutis, inquirere pergimus, an, et quommodo quintum par sensibus tactus, olfactus, et gustus inserviat.

This will be the subject of the next article.

Bellingeri's Opinions on the Functions of the Ganglionic Portion of the Fifth.—Part III.

At the conclusion of the preceding article, we left Bellingeri when he was just going to take into consideration what share the ganglionic portion of the fifth has over the sense of tact of the face, and over those of smell and taste: to this interesting part of our subject I shall at once proceed.

Sensus communis tactus undequaque per faciem, et late per totam externam corporis superficiem diffusus. Obscurus est in capillata capitis regione, exquisitissimus in tunica oculi adnata, membrana pituitaria proprio donatur tactu, est et in palato, dentes carere videntur, sed tactus peculiarem habent speciem, labia delicatulo admodum fruuntur tactu, lingua, et exquisito non solum tactu, sed et gustu pollet, genæ, et frons suum possident non mediocrem tactum, habent tempora, et externa auris, levem quidem in statu salutis, acutissimus tamen aurium sensus est sub morbo. Sed memoratis in partibus tactus a quinto, an a septimo perficitur?—(P. 159.)

Cui ut respondeam, inprimis animadverto cum clar. Magendie, distinctionem esse ponendam in sensu tactus, communem scilicet omnibus animantibus, et per omnem externam hominis superficiem extensum, quo corporum contactum, et temperiei potiores modificationes dignoscimus;.....tactum communem latine indicabimus, quem non ad animales proprie dictos sensus referimus, sed ad sensum communem, vel organicum a Sprengel dictum. Est alia tactus species, qua corporum minimas modificationes asperitatis, levigationis, consistentiæ, ponderis, voluminis, temperiei dignoscimus; hæc cæteris animantibus fere ex integro denegata, quibusdam tantum in partibus homini concessa;.....tactum humanum, vel animalem latino nomine designabimus. Insuper tactum in *physiologicum*, et *pathologicum* distinguimus; primus nobis corporum modificationes tangibiles denotat, et voluntatem in exercitio parit, secundus ingratam excitat sensationem, doloremque producit; per morbum autem omnes dolent humani corporis partes.—(P. 160.)

Communem igitur tactum a quinto dirigi ultro concedam; sensus enim iste non ad animales stricte vocatos refertur, namque et absque cerebri perficitur conscientia, quemadmodum in dormiente homine, in infante, in delirio hysterico quandoque, in insectis etiam, vermibusque, qui cerebrum carent. [Ut melius intelligantur, quæ ante dicta, et inferius dicenda sunt, distinctionem ponendam esse mihi videtur inter vitam sensiferam, atque animalem. Sensifera vita et per solos nervos perficitur absque cerebro, ut patet in animalibus acephalis, atque in monstro a Fauvel descripto, quod encephalo, et spinali medulla deficiente, nulla tamen, licet obscura, dedit sensuum indicia. Animalis vero vita proprie dicta, quæ intimam ponit externarum rerum perceptionem, absque cerebri concursu perfici nequit.] Hæc autem tactus species omni nervo demandata, et æque ab iis, qui secretionibus, ac qui motibus inserviunt perficitur; ad hanc speciem referimus albugineæ oculi, et pituitariæ nasi tactum, quæ licet ab externeis corporibus acutissime sentiant, nullam tamen cerebro gratam, et tantum dolorificam transmittunt sensationem; quapropter non cum animali, sed potius cum organica vita relationem servat. Si quis vero contendat verum animalem esse tactum in oculi externo, animadvertam, non solas ibi esse quinti paris propagines, sed et plura e tertio pari filamenta in oculi membranis insumi; ita etiam in interna narium inferiorum parte non sola quinti, sed et septimi filamenta accedunt.

Peculiaris vero tactus, quem humanum, vel animalem distinctionis ergo vocavimus, existit et in facie; sed an a quinto dependet? Animadverto in primis, plus minusve acutum existere in fronte, genis, auribus, labiis, mento et lingua: sed ibi non solæ sunt quinti

paris propagines, septimi productiones ubique natura deduxit, et ubi exquisitior est tactus, ibi majores, multiplicatæque septimi sunt divisiones. Quot non instituit natura anastomoses inter filamenta septimi paris, et ramum subcutaneum malarum quinti; quantæ non sunt auricularis quinti cum septimo, et cum cervicalibus conjunctiones; desunt ne fortasse septimi cum quinto communicationes in fronte, et naso? Quot non conspicimus repetitas anastomoses inter ramos infraorbitalis, et mentalis maxillaris inferioris cum faciali? Et inde mirari jam desinamus, si labia tam delicato prædita sint sensu. Lingua non a quinto tantum, sed et ab hypoglosso, atque a ramo nervi facialis, etiam in tota sua substantia, recipit filamenta. Quapropter, si ubi sola sunt quinti paris filamenta, dubius, aut imperfectus est *animalis* tactus, ubi et septimi accedunt propagines exquisitus tactus occurrit, a septimo *animalem tactum* perfici, dubium adhuc erit asserere?—P. 162.

§ XXVIII. Modo quid præstent in naribus nasales quinti rami remanet investigandum. Nos edocet anatomes, omnibus in animalibus vertebratis nares duplici nervo ditari, cetaceis quibusdam exceptis, in quibus deficit primum par, ut de delphino cum Cuvier tradidit Jacopi. Spectabiles nervos primum elargitur par, et neque in omnibus naribus, sed tantum ad superiores, et usque ad medias nares omnibus pariter in animalibus distribuitur, estque nervus iste, qui excipiendis odoribus, et ad cerebrum deducendis inprimis inservit; communi igitur physiologicorum, anatomicorumque consensu olfactorius nervus vocatus. Alii, copiosioresque narium nervi a quinto diversis in punctis suboriuntur, et late per omnem pituitariam membranam undequaque distribuuntur. Exoriuntur porro a ramo nasali, a ganglio spheno-palatino, ipsiusque ramis palatino, et vidiano. Jamvero hæ quinti productiones tantum *aliquatenus olfactui conducunt*, ut sunt verba exactissimi Willis, qui in nervorum physiologia nulli secundus*. 162. (Cereb. Anatom. cap. xvii. p. 329.) Verum puto, distinctionem esse ponendam inter olfactum animalem, et naturalem, vel ab instinctu. Animalis igitur olfactus, quo sensu corporum odores dignoscimus, percipimus, comparamus, a primo pari regitur; hinc, quum grate aliquid olfacere cupimus, vel odorem quemcumque distinguere volumus, vehementer ore clauso, perque nares inspiramus, ut odori halitus sursum ascendant, et usque ad productiones primi paris adveniant.....163. Contra naturalis olfactus, vel ab instinctu, et a quinto perficitur ..... Per hanc autem olfactus speciem homo, brutaque præsertim animalia, noxia a convenientibus distinguunt alimenta, vitæ infestas persentiunt emanationes, et bruta præsertim veneris alliciuntur voluptatibus.....Multa etiam a quinto ad nares in homine deduxit filamenta, et miro prorsus ordine disposuit natura. Cur autem surculos a nasali ortos voluit, cur inricato tramite per ossa rursus ad cerebrum alios traduxit, ad nares deinde egressuros, cur alios a ganglio spheno-palatino, alios a ramo vidiano, alios a palatinis deduxit? Miranda prorsus naturæ dispositio. Fortasse, quæ a nasali ophthalmici natura derivavit filamenta, nullis voluit implexa gangliis, reducia ad cerebrum revocavit, ut et per hosce nervos aliqua odorum ad cerebrum traduceretur sensatio; vel potius, ut sympathiam inter nares, et oculos constituerent: e ganglio enascentes fecit alios, ut præcipue pituitariæ membranæ vitæ organicæ, et muci secretioni congrue cum aliis organis inservirent: a palatinis alios subortos voluit, et nasopalatinum instituit, ut inter olfactum, gustum, et deglutitionis organa intimus intercederet consensus: a vidiano alios progenuit, ut odores in cor, ventriculum, intestina, et genitalia organa recto fere agerent tramite, et mutua esset nasalium, et intercostalis multiplex demonstrata sympathia.

166. Anamalis olfactus nervum natura in penetralibus abscondit, cumque minus frequenter ipso utamur, neque tam extenditur, ut naturalis olfactus organum, et tantummodo diductæ, et amplæ alæ nasi animali olfactui inserviunt colligendis odoribus, sicuti externa auris sonoras colligit vibrationes. Olfactus naturalis animalibus præstat utilitatem non tantum in alimentorum delectu, sed et in respiratione qualitates aëris examinat, qui continuum est vitæ pabulum; inde ore non tantum, sed et naribus aërem attrahimus; nares quapropter ventriculi, et pulmonum custodes, atque tutela.—P. 166.

* See Mr. Swan's article, Medical Gazette, July 19, 1834.

§ XXIX. Ad gustum tandem deveniamus disputatissimum sensum: quæstio præcipue, an lingualis quinti, an hypoglossus gustui inserviat. Utrinque magni nominis pugnant anctores. Prima nervorum istorum physiologia rudimenta a Galeno tradita jam aperte constituunt, nervum hypoglossum, quem sub nomine septimæ conjugationis designavit Galenus, motorium esse; tertiam vero ipsius conjugationem, quæ cum quinto respondet, gustui omnino præesse *. Willis, Vieussens, Haller, Meckel omnino Galeni amplexati, rationibus tuiti sunt opinionem. Scarpa inter cæteros agmen ducit, qui, argumentis ex anatome, physiologia, et pathologia desumtis, Galeni asserta confirmare omni animo studuit.....Nervum magnum hypoglossum ex *filamentis partim sentientibus, partim motoriis constare*, tradidit Albinus. (Vid. Tissot, Traité des Nerf. t. i. p. 157.)—P. 167.

§ XXX. In tanta rerum ambage quid statuendam? Lucem ex anatome imprimis, et physiologia mutuabimus. Et primo quidem animadverto, in linguam multiplices sese insumere nervos, ex quatuor nervorum paribus desumtos; scilicet media fere ex parte nervus glosso-pharyngeus, spectabili sui parte nervus magnus hypoglossus, vel undecimum par; fere ex integro tandem lingualis quinti ramus distribuitur, postquam sibi insertam accepit chordam tympani, e nervo faciali, vel septimo pari advenientem.—P. 168.

§. XXXI. Porro nervus glosso-pharyngeus licet, ut cum Portal concedamus (Anatom. Medical. tom. iv. p. 521), propria nonnulla filamenta usque ad linguæ papillas cum aliis nervis distribuat attamen nullommodo gustui ipsum inservire, demonstrant copiosa ipsius stamina, quæ in linguæ basim pone foramen cæcum in papillis calyciformibus insumuntur, ubi nullum absolvi gustum in confesso est apud omnes: insupervidimus paullo ante, *gangliosum esse* nervum, et linguæ et pharyngis *motibus involuntariis* præesse, demonstrare adgressi sumus. Non igitur nervus gustatorius.—P. 168.

§. XXXII. Inter hypoglossum vero, atque lingualem magis ipsamet anatomes dubios nos esse voluit; . . . . vidimus superius, hypoglossum sese inserere in linguæ, et laryngis musculis voluntati subjacentibus, nervus igitur *motorius*, et quidem *animalis est, vel voluntarius*. Sed an et gustui animali famulatur? Comparata præsertim anatomes id denegat. Revera in piscibus, testantibus Dumeril, et Cuvier, deest nervus hypoglossus, deest et loquela.—P. 169.

§. XXXIII. 170. Superest igitur ramus lingualis, quem ex insigni surculo a quinto pari, atque ab ita dicta chorda tympani nervi facialis constare in anatomicis diximus. Multo magis ardua res est disquirere, an lingualis gustui præsit per filamenta a quinto procedentia, an per filamenta, quæ a nervo faciali suppeditantur per chordam tympani: sed attentis cæterorum ramorum quinti, et septimi paris structura, insertionibus, et usibus, lux fortasse affulgere poterit.

Profecto lingualis nervus intertextam præsefert filamentorum structuram, ganglion maxillare efformat, prospicit glandulis maxillaribus, sublingualibus, tonsillis, dat pharyngi ramum, distribuitur tandem omnibus linguæ partibus, muscularibus, membranaceis, glandulosis; in hisce omnibus partibus quam maximas adimplet functiones, quæ ad solam vitam organicam spectant, quas quidem functiones pendere a linguali, quatenus est quinti propago, facile assequemur, si animadvertemus, in cæteris suis divisionibus quintum par vitæ tantum organicæ famulari, et ganglia efformare, et peculiarem præseferre descriptam in anatomicis structuram. Sed et cum in lingua animalis sit sensus exquisitissimus, scilicet gustus, ipsum a distincto nervo pendêre putarem. Hic autem nervus, meo quidem judicio, est ita dicta chorda tympani. Revera usquedum probare adgressi sumus, iis in partibus, ubi distribuitur quintum par, et vita animalis adest, non ab ipso, sed a superaccedentibus nervis eam pendêre, et præcipue nervum facialem sensum, et motum animalem tribuere partibus, in quibus inseritur. Igitur et sensus gustus animalis, et ex parte voluntarius linguæ motus a septimi paris propagine, chorda scilicet tympani dependet. Hæc est, quæ lingualem comitatur, et unicum fasciculum cum ipso constituit.—P. 170.

Suadet et ipsamet reliquorum organorum sensuum structura, hanc esse lingualis quinti, et lingualis facialis physiologicam explicationem; profecto in visu, auditu, et olfactu, quod ad vitam organicam spectat, præcipue a quinto dependet, quod vero animalis vitæ est, ab accidentibus nervis perficitur; igitur

* De Loc. Affect. lib. iv. cap. 2, et De Us. part. Lib. ix. et xi.

et animalis gustus a ramo facialis, qui cum linguali connectitur, in lingua absolvitur.—P. 171.

[Ingenue fatemur tamen, collatis pathologicis nostris observationibus quinti, et septimi paris, quæ inferius aducenda, admodum opinionem nostram de usu lingualis quinti paris, et lingualis nervi facialis infirmari posse; læso namque quinto, læsus et gustus; morbose affecto septimo, gustus superstes, et integer: verumtamen a quinti affectione lædebatur et vita organica linguæ, quod vitium præsens fuisse, patet in naribus; nil mirum inde si gustus etiam imminutus: in pathologica observatione nervi facialis paralysis tantum erat quoad motum, superstite sensu tactus in facie, et gustus in lingua; quam frequenter vero occurrit paralysis quoad motum integro sensu in parte paralytica; insuper in hoc casu tactus illæsus erat, illæsus et gustus.]—P. 171.

§. XXXIV. Interim dum hæc assero, non omnino ausim denegare, lingualem quinti aliquatenus gustui famulari. Sed quod de olfactu, et tactui dixi, ita et gustum in naturalem, vel ab instinctu, atque animalem distinguo. Naturalis autem gustus ad sensum organicum accedit, ut merito animadvertit Sprengel. (Op. cit. tom. ii. p. 465.) Naturali gustu infans lac sugit, bruta vescuntur, nocua ab innoxiis distinguunt alimenta, vermes, et zoophita ipsa proprio non carent gustu. Porro naturalem hunc gustum a quinto regi dijudicamus; revera ipsomet in homine, licet obscurus sit, imperfectus, et a quibusdam Physiologis denegatus, aliquis tamen gustus est, ubi solæ fere sunt quinti paris propagines, uti in palato, velo pendulo, gingivis, buccis, et labiorum interno. Tradidit inde nobis Lecat, quod lingua naturaliter deficiente, vel per morbum, diversi nihilominus aliquando distinguebantur gustus. (Traité des Sens 1. p. 224.) Quæ quidem observatio dum ostendit, et a ramis quinti aliqua ex parte gustum absolvi, demonstrat etiam, perfectum animalem gustum a faciali perfici; ubi enim ipsius desunt filamenta, vel pauca sunt, confusus, et obscurus sensus est gustus.....171. — Præterea in naturali gustu quodammodo affici quintum par, comprobant nonnulla physiologica phœnomena; inde enim intelligimus, cur quinto in gustu affecto, quemadmodum a jucundis alimentis fauces ad deglutionem, ventriculus ipsis accipiendis invitatur, ita a nauseosis, et ingratis constringuntur musculi faucium et, pharyngis, ventriculus ad vomitum sollicitatur; cur etiam ab adore, vel animi pathematibus gustus, et deglutitionis organa per quinti propagines diversimode afficiuntur."—P. 173.

" Naturalis insuper gustus ad vitam organicam refertur, per ipsum enim animantia propriæ prospiciunt conservationi; conveniens erat igitur ordini naturæ, ut quodammodo hic sensus a quinto pari penderet, quod ubique organicæ vitæ famulari hucusque demonstrare adgressi sumus. Quam vero gustus ad vitam organicam spectet, præcipue a cerebelli influxu, juxta Willisii sententiam, dependet."—(Cer. Anatom. cap. xvii. p. 328.) " Quod quodantenus comprobatur observatione Malacarne in maniaco, cui gustus penitus deerat, et cerebellum morbose erat constructum, constabat enim tantum ex tercentum, et viginti quatuor laminis."—(Nevro-encefalotomia, p. 7.)—P. 173.

" Quum igitur firmiter teneamus, organicam linguæ vitam a quinto pendêre, patet, morbose ipso affecto, animalem gustum vel depravari, uti in morbis, vel destrui, aut lædi, sicuti in pathologica quinti adducta observatione vidimus. In coryza quoque, licet membrana pituitaria acutissime ab attactu sentiat, nullus tamen olfactus; vitiatis nervis ciliariis jam cœcitas, vel visus depravatio subsequitur; surditas quandoque, aut falsus auditus a vitio musculorum internæ auris.—P. 174.

" XXXV. Verumtamen in lingua duo distincti animales sunt sensus, gustus nimirum, et exquisitissimus tactus. An ab ipsismet nerveis filamentis ambo dependent? Morbi contrarium docere videntur; perit scilicet omnino gustus quandoque, integro superstite tactu. Natura in linguæ apice duos constituit papillarum ordines, fungiformes nimirum, et conicas, quæ, sicuti animadvertit Sprengel, maximam habent cum digitorum papillis convenientiam. An igitur fungiformes præsertim gustui, an conicæ tactui præprimis dicatæ? An animalis gustus a faciali, linguæ vero exquisitus tactus ab hypoglosso? Non longe absum ut credam; *natura enim tangentes nervos in reliquis corporis patribus cum motoriis consociavit.*"—P. 174.

" XXXVI. Quidquid de hoc sit, certum est, in lingua multiplices existere nervos a quatuor nervorum paribus desumptos; et duo quidem vitæ præsertim

organicæ dicati videntur, glosso-pharyngeus nimirum, atque lingualis quinti, reliqui duo vitæ ipsius animali præsertim prospiciunt, ramus scilicet lingualis facialis, et hypoglossus. Glosso-pharyngeus autem motibus involuntariis præcipue inservit, parum sensui organico; lingualis vero quinti sensui præcipue organico paucos involuntarios absolvit motus, ramus lingualis facialis gustui ex dicti præsertim, hypoglossus maxime motui voluntario dicatus. Sunt igitur in lingua nervi organicæ vitæ distincti a nervis vitæ animalis; non tam vero aperte nervi sentientes utriusque vitæ a motoriis distinguuntur.—175.

"XXXVII. Ex hucusque dictis quoad sensus consequitur, distinctionem esse ponendam inter tactum, olfactum, et gustum organicum, atque animalem. Sensus isti, quatenus ab instinctu dependent, ad vitam organicam referuntur; hinc nulli animantium generi denegati, et perfecti ab ipso fere ortu tributi; per hosce enim sensus, plus minusve evolutos, animalia propriæ prospiciunt, et tuentur existentiam; et sensus isti etiam per nervos solæ organicæ vitæ famulantes perficiuntur, ut patet in vermibus, et in monstro a Fauvel, et Mery descripto; animalis vero tactus, olfactus, et gustus a distinctis exercetur nervis, qui suam transmittunt cerebro sensationem. Consequens porro erat naturæ instituto, ut naturales, vel organici sensus, et a nervis vitæ organicæ perficerentur; animales contra distincta nervorum classis absolveret. Igitur in nostro casu quintum par sensibus naturalibus præest, vel organicis; animales vero sensus, qui iisdem in organis, ubi distribuitur quintum, insunt, a superadditis nervis dependent. *Statuam igitur, quintum par nervum esse sentientem, et motorium vitæ organicæ in capite. Quæ de quinto pari generatim diximus, de ipsius portione majori tantum intelligenda.*"

I must leave a few remarks which I have to make on this subject for the next article.

Concluding Remarks on the Physiology of the Fifth Pair of Cerebral Nerves.

With the last article has been brought to a conclusion the relation of Bellingeri's doctrine on the complete physiology of the fifth pair of cerebral nerves. In doing this, I endeavoured impartially to select the most important parts, leaving out only those which I considered either of little or of no material importance to the fundamental principle of the subject; and, with the view of avoiding any misrepresentation on my part, I thought it better to give Bellingeri's opinions in the original language.

Now it remains for the impartial and enlightened part of the English medical profession to judge of their real merits, and of that of the question in general. They will now also be able to see more clearly if Mr. Alexander Shaw was in any way justified in advancing, against Bellingeri and his doctrine on the fifth, the following hazardous statements:—"Bellingeri ..... *recklessly made a bold guess* at what its functions (of the ganglionic portion) ought to be; he failed in his conjecture: *he pronounced it to be at once the nerve of motion and of sensation:* he has thus thrown a cloud of error over his only correct statement (viz. of having called the smaller portion a nerve of motion). We admire Paletta for his philosophical caution and forbearance, as well as for being the originator of the idea. *We must decline placing confidence in any assertion of Bellingeri.—This lucky foreigner—neither making experiments on the fifth pair, nor on the spinal nerves, nor hitting upon the true functions of the nerve in question*, but keeping all things in their pristine confusion—has gained the *unqualified applause* of his reviewer; nay, he is held up as one injuriously dealt with by the whole profession *."

I do not know, indeed, how Mr. Alexander Shaw can venture to insist so much on the experiments of Sir Charles Bell, performed, more particularly, on the fifth, and find such great fault because "Mr. Bellingeri," as he says, "*has not been at the pains to make a single experiment.*†"

Were it not generally known at present, and even by Sir Charles Bell himself candidly admitted, that the first conclusions drawn from them were not entirely correct, I should be sorry to enter here on such a delicate subject. It was, in fact, from the experiment on the very same infra-orbital branch of the fifth that Sir Charles Bell was princi-

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* See Mr. A. Shaw's Article. † Id.

pally led into error in ascribing to it both a power of motion and sensation; when Bellengeri, on the contrary, brought forward as a pathological argument, to prove that the ganglionic portion of the fifth was not a nerve of motion, the division of the same branch performed in instances of *neuralgia facialis*, which was not followed by paralysis of the muscles of the face.

But, after all, the best answer I can give to Mr. A. Shaw is in Sir Charles Bell's own words:—"Experiments," says he, "may take a colour from the preconceived idea, but accurate investigation of the structure will not deceive us."—(Last work, p. 133.) "Experiments have never been the means of discovery; and a survey of what has been attempted of late in physiology will prove that opening of living animals has done more to perpetuate error than to confirm the just views taken from the study of anatomy and natural motions."—(P. 218.) "I have had recourse to experiments, not to form my own opinions, but to impress them upon others."—(Id.) "I feel a hesitation when I reason upon any other ground than on the facts of anatomy."—(Id. p. 237.)

These were Sir Charles Bell's opinions on the subject of experiments, brought forward at different times after the presentation of his first paper to the Royal Society in 1821, and evidently expressing the important result of his own experience.

It is only to be regretted that Sir Charles Bell had not, at a former period, directed his particular attention to the minute anatomy of the fifth nerve. Had he not had his mind so much engaged with his favourite theory of the respiratory nerves, and not been satisfied merely with the analogy of the spinal nerves, and the fifth, by its double origin and ganglion, he would never have, as he stated in his last paper, read before the Royal Society in May 1829, "attributed to one of its branches a function which belongs to another branch of the same nerve."—(Last work, p. 94.) Of this very branch he had said before, in his first paper in 1821: "I am unable to decide whether or not the muscular branches of the fifth nerve go exclusively to the muscles of the jaws, and not at all to those of the cheeks."—Ibid. p. 82.

It is, in fact, only in his last paper, already mentioned, and after the lapse of nine years from the first, that Sir Charles Bell gave a short description of the smaller or muscular portion of the fifth, together with a plate, which merely shews its appearance in the face and its principal ramifications to the different muscles of the jaws; and just forty-five years after Paletta had published his classical work on the *Nervus Crotaphiticus et Buccinatorius*, with plates only to be compared to those of Scarpa, and had called it *a nerve of voluntary motion.*

[This imperfect knowledge of the anatomy of the smaller portion of the fifth nerve is not surprising, since we see that Mr. Mayo also, in 1829, in the second edition of his Outlines of Physiology, had stated, p. 335—"In pursuing this subject, I was led to observe, that there were muscles which received no branches from any nerve but the fifth; these muscles are the masseter, the temporal, the two pterygoids, and the circumflexus palati.....After some careful dissection, *in the greater part of which I afterwards found that I had been anticipated by Paletta*, I made out that the smaller fasciculus of the fifth is entirely consumed upon the supply of the muscles I have named." This impartial author has thus for the first time given credit to Paletta, more explicitly than any other in this country, for his careful inquiries on the minute anatomy of this part of the fifth nerve.]

What were the consequences of neglecting this important inquiry on the minute anatomical distribution of the fifth, may be known better by the candid statements that Sir Charles Bell made in his last paper. "Conceiving (says he) that there must be such an accordance (*between the motions of the lower jaw and the cheeks in mastication*), and contemplating the roots of the fifth pair, and their distinct functions, I had *imagined* that this office was performed by the branches of the second division of the fifth: but finding that the connexion between the motor root and the superior maxillary nerve proved to be only by cellular texture, and considering the affirmation of M. Magendie and those who followed him—that the infra-orbital branch had no influence upon the lips—I prosecuted with more interest the *ramus buccinalis labialis*."—(Last work, p. 104.) This curious fact (*of the fifth being not only the nerve of*

sensibility to the head and face, but a muscular nerve to the muscles of the jaws active in mastication), originally drawn from anatomy (*I should rather say from analogy*), and now confirmed by it, had nearly been obscured by experiment: since the external branches of the fifth nerve, those most exposed to the experimenter, are not muscular."—(Ibid. p. 107.) "I am bound to acknowledge here the correction by M. Magendie, in regard to the office of the suborbital division of this nerve, since it has given occasion to the revisal of the anatomy."—(Ibid.)

Nor had a more diligent attention been paid to the minute anatomy of the larger portion of the same nerve; since we found, in Sir Charles Bell's fifth paper, read before the Royal Society, in February 1826, the following statements: —"For a time I believed that the fifth nerve, which is the sensitive nerve of the head and face, did not terminate in the substance of the muscles, but only passed through them to the skin."—(*Id.* p. 228.)

"Still dissection did not authorise that conclusion. I traced the sensitive nerves into the substance of the muscles: I found that the fifth pair was distributed more profusely to the muscles than to the skin; and that, estimating all the nerves given to the muscles, the greater portion belonged to the fifth, or sensitive nerve, and smaller portion to the seventh, or motor nerve. On referring to the best authorities, as Meckel, and my excellent preceptor Monro, the extremities of the fifth were described by them as going into the muscles; so that of this fact there cannot be a doubt." —(*Id.* p. 229.)

Bellingeri, then, had not performed any experiments on the fifth, probably because, by its intricate distribution and connexions with other nerves, he might have been induced to draw erroneous deductions from them; he had not paid, at that time, a particular attention, or performed any experiment, on the spinal nerves, because the principal object of his inquiries was to establish the general pathology and therapeutic of the *Neuralgia facialis*. Instead of that, he had first most minutely studied the anatomy of all the nerves of the face; and of the fifth, in particular, he has given to the public, in 1818, one of the most complete and elaborate monographs, both in point of anatomy and erudition, of that important nerve of the face. Of all of them he has searched their *real original roots into the most recondite parts of the encephalon;* and from this source, and from their distribution to the different parts and organs of the face, as well as from their functions, both in a state of health and disease, he has *attempted* to establish their peculiar physiological power. In doing this he has always proceeded with that degree of philosophical caution, which is characteristic of men of learning; being satisfied of having, in his attempt, at least arrived at probability, if not certainty.

Having thus concluded with these remarks the physiology of the fifth pair of cerebral nerves, I shall in my next article proceed to the not less interesting subject of the seventh pair of nerves.

ON THE

PHYSIOLOGY OF THE SEVENTH PAIR OF CEREBRAL NERVES.

PART I.

If the comparative view of what has been published at different periods by Dr. Charles Bellingeri, in Italy, and Sir Charles Bell, in England, on the physiology of the fifth pair of cerebral nerves, has excited a certain degree of interest amongst those members of the medical profession who more particularly direct their attention to physiology, I feel confident that what I am going to relate on the physiology of the seventh, will not be found of less importance.

It will, however, appear quite evident to every one, both from what has been already published on the fifth, as well as from what we shall see on the seventh, how highly improper it is for any body to enter into critical arguments against an author's opinions without having first read his works, or, if read, without understanding well the contents of them.

Mr. Alexander Shaw begins his criticism on Bellingeri's opinions on the physiology of the seventh, with the following sentences: "In the second place, the Italian physiologist differs from our English physiologist in regard to the functions of the *portio dura*. The opinion here too, like that in the former instance, is just

of such a nature as to present the widest breach between these two physiologists that could be imagined by any one resolved to put them in absolute contrast. Bellingeri *conceives* that the *portio dura* is *a compound nerve;* that it is endowed with both *motion and sensation. I have shewn* that Sir Charles Bell describes it to be a *nerve of motion only, and altogether devoid of any property of sensation**."

Sir Charles Bell, when comparing the symmetrical system of nerves with that of the respiratory nerves, in his first paper, read in July 1821, says, "If the nerves be exposed in a living animal, those of this class (the former) exhibit the *highest degree of sensibility;* while, on the contrary, nerves not of this original class or system *are comparatively so little sensible*, as to be immediately distinguished; insomuch, that the quiescence of the animal *suggests a doubt* whether they be sensible in any degree whatever†." And when speaking of the nerves of respiration, in his paper read in May 1822, he says, "In page 25, we have traced the nervous system in the lower animals, and we have seen that the regular ganglionic system of animals of the lower class is sufficient for motion and sensibility. But that call which gives occasion to inspiration is quite unlike pain from external impression, as the act it excites is unlike voluntary motion. It is an instinctive impulse; powerful in the moment of birth as at any after period, which calls the respiratory muscles into action; and the motion it produces is of that instinctive or automatic kind which is perfect from the beginning."—"*A new sense*, and a new concatenation of motions, require *a new nerve*, a distinct centre, or origin, and a new apparatus of muscles‡." And more particularly of the *portio dura*, in the second part of the paper on the nerves of the orbit, he says, "The respiratory nerve of the face performs two offices, one of which is voluntary, as in moving the cheeks and lips in speech; and the other involuntary, as in moving the nostrils in breathing during sleep, or insensibility§."

Thus it is evident that Sir Charles Bell had not *originally* considered the *portio dura*, together with the other nerves, so called, of respiration, entirely deprived of sensibility. He ascribed to them a power both of involuntary and voluntary motion; and for this *new sense* of action, considered necessary a *new kind of nerve*, distinct from those of common motion and sensation. In what this *new sense* consisted, or by what means the power of involuntary motion was exclusively bestowed on those muscles, which, although under a partial control of the will, also act independently of it, was never stated by the English physiologist.

In relating, however, some experiments on the respiratory nerves, he gives the following statements regarding the respiratory nerves of the face and neck, in his paper read May 2, 1822:— "When apparent death had taken place, the ass was so far reanimated by artificial breathing, that the act of respiration recommenced; these muscles on the face and neck were restored to activity, and become subject to regular and successive contractions, as in excited respiration, whilst the chest remained at rest. These actions continued for a short time, and then ceased; but upon artificial respiration being again produced, the same results followed. This was repeated several times; the animal remaining *insensible during these experiments, and incapable of voluntary motion**."

"Upon stimulating the nerves after the death of this animal, it was observed that the class of respiratory nerves retained their power of exciting their respective muscles into action, long after *the other nerves had ceased to exert any power;* they were evidently of that class which retain their life the longest†."

Now, if, according to Sir Charles Bell, "a pure or single nerve has the influence propagated along *it in one direction only, and not backwards and forwards*,‡" how could these involuntary actions of the respiratory nerves of the face and neck have been reanimated by artificial respiration, after the animal had lost all the *other powers of motion and sensation*, if not by admitting the combination of these two powers joined together in the nerves of respiration?

The Italian physiologist, when speaking of involuntary muscular action, never ascribes it (as one would be in-

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* See Mr. A. Shaw's Article.
† Sir Charles Bell's last work, p. 63.
‡ Ibid, p. 119. § Ibid. p. 210.

* Ibid, p. 141. † Ibid. p. 142.
‡ Ibid. p. 232.

duced to believe, from the incorrect statements of Mr. A. Shaw) to a simple nerve. In mentioning the involuntary actions of different muscles of the face, we have seen them distinctly attributed either to the intermixture of the muscular branches of the fifth with others of its ganglionic portion, or to anastomosis of the latter with filaments from the seventh. In endeavouring to explain the involuntary actions of the muscles of the internal organ of hearing, he refers them to the junction of the ganglionic portion of the fifth with other filaments from the seventh, when the involuntary motions of the iris are explained by the combination of two distinct nervous powers, from the third pair, and the ophthalmic branch of the fifth, which constituting a *new organic centre of action, partially independent of the will* (the ophthalmic ganglion), becomes thus the moderator of that delicate dioptric apparatus. Moreover, if any voluntary motion may be ascribed, or has been observed in the iris, this has been distinctly referred to the mere influence of the third and not of the fifth.

Still Mr. A. Shaw, when speaking of the supposed coincidence of opinions of Sir Charles Bell and Bellingeri, says,—"The English physiologist maintains that a nerve consisting of a single root can possess only one of the two functions, sensation or motion; that it cannot have these incongruous properties combined. Does Bellingeri subscribe to this fundamental principle of the whole discoveries? In each of the two nerves, which are the subject of his dissertation, *he contradicts this principle in the most decided manner.* The large root of the fifth *he represents as conferring both motion and sensation;* and he affirms the same thing with regard to the portio dura! *The only thing in common established between these two authors is simply this: they both composed papers in which the names portio dura and fifth pair occur!* Fluellen, *with 'his figures and comparisons,' could have devised a far better parallel* !*"

Having already shewn how far Mr. A. Shaw's statements are *correct* in regard to the ganglionic portion of the fifth, let us proceed with our parallel between these two authors' opinions on the seventh.

* Med. Gaz. July 19, p. 563.

Sir Charles Bell, in his first paper, read in July 1821, says: "The respiratory nerve of the face, being that which is called *portio dura* of the seventh.....goes off from the lateral part of the *medulla oblongata*, and escaping through the temporal bone, spreads wide to the face. All those motions of the nostrils, lips, or face generally, which accord with the motions of the chest in respiration, depend solely on this nerve. By the division of this nerve, the face is deprived of its consent with the lungs, and all expression of emotion*."

"The respiratory nerve of the face arises from the superior and lateral part of the *medulla oblongata*, close to the *crus cerebri*, and exactly where the *crus cerebelli* joins the *medulla oblongata*. The other respiratory nerves... arise in a line with the roots of this nerve†."

"The nerves on which the associated actions of voluntary and excited respiration depend, arise very nearly together. Their origins are not in a bundle, or fasciculus, but in a line or series, and from a distinct column of the spinal marrow. Behind the *corpus olivare*, and anterior to that process which descends from the *cerebellum*, called sometimes the *corpus restiforme*, a convex strip of medullary matter may be observed; and this convexity, or *fasciculus*, or *virga*, may be traced down the spinal marrow, between the *sulci*, which gives its rise to the anterior and posterior roots of the spinal nerves. From this tract of medullary matter, on the side of the *medulla oblongata*, arise in succession, from above downwards, the *portio dura* of the seventh nerve, the *glosso-pharyngeus* nerve, the nerve of the *par vagum*, the *nervus ad par vagum accessorius*, and, as I *imagine*, the phrenic, and the external respiratory nerves‡."

The characteristic distinctions of these nerves, according to Sir Charles Bell, are the following:—"*They do not arise by double roots; they have no ganglions on their origins;* they come off from the *medulla oblongata* and the upper part of the spinal marrow§."

Bellingeri, in his anatomical disser-

* Last work, p. 65.
† Id. p. 70.
‡ See paper read in May 1822, "Origins of the respiratory nerves," p. 129.
§ Last work, p. 64.

tation, cap. ii. *De septimo nervorum pari, sive de nervo faciali*, describes its origin as follows:—

§ LVI. p. 100.—" Originem habet iste nervus, *sicuti mihi datum fuit observare una cum cel. anatomes Professore Rolando, et Chirurgiæ Doctore Gallo incisore anatomico*, præ primis a fasciis medullaribus Malacarne. Scilicet vidimus fasciculum medullarem unum in utroque latere, crassitie quartum par æmulantem, qui a latere externo fasciæ medullaris prodibat, et quidem circa mediam ipsius fasciæ longitudinalem; fasciculus autem hic, arcu facto sursum concavo, extremitatem inferiorem corporis olivaris circumambiebat, et nobis visum aliquam cum ipso connexionem habere; ascendebat dein fasciculus iste, eamdem propemodum crassitiem servans, ad latus externum corporis olivaris, et paullo ab ipso remote, sed supra corpus restiforme, et cum ipso manifestum habebat connexum; circa medium corporis restiformis visum nobis est conjungi cum filamento medullari a quarto ventriculo adveniente; dein ad basim corporis restiformis perventus, occurrebat trunco nervi nunc octavi paris, scilicet acustici, et simul cum ipso per foveam quadrilateram Malacarne* pone prominentiam anularem substantiam encephali relinquens, a pia matre circumdabatur, et sic nervosum truncum constituebat. Hæc in cadavere hominis adulti, cujus cerebrum bonæ erat consistentiæ, *et ipse vidi, videruntque alii*, et mirati, et delectati sumus. Nec tamen constans in omnibus cadaveribus similis est structura; sæpius non fasciculum, sed filamenta expansa in sua origine profert; interdum non infra, sed supra corpus olivare prodeunt.

" Observata a nobis nervi facialis origo perfecte convenit cum ipsius descriptione, quam tradidit Girardi una cum Santorino; inquit enim, ' Nempe eam (duram portionem) supra processum arciformem† ac nonnihil supra corpora olivaria ab interiori, et inferiori anularis protuberantiæ parte, qua scilicet dimissis cerebelli pedunculis copulatur, emergere, ut hæc dura portio cruribus cerebelli prorsus respondent.' "

§ LVII. p. 103.—" *Duplici quoque portione constat nervus facialis, majore una, et laterali, minore alia, atque interna, a Wrisbergio primum detecta, atque accurate descripta.* Portio major initio tæniolam representat, quæ dein fibrosa redditur, et encephali substantiam relinquens, cingitur pia matre, et teretem præsefert nervum. Minor vero portio duobus, vel tribus constat filamentis, quorum radices tenuissimæ partim a substantia pontis in ea fovea (quadrilatera Malacarne), quæ media est inter facialem, et acusticum, prodeunt, partim vero a sede, quæ est prope originem glosso-pharyngei, emergunt. *Descriptionem hujusce portionis a Scarpa desumsimus, qui utramque facialis portionem in propria origine nitida, et eleganti icone delineatam exhibuit*.*

" Istorum filamentorum partem ex ipsa protuberantia annulari exoriri docuit Soëmmerringius; jamque Vieussenius in universum de nervo faciali dixerat: ' Et processui annulari, qui medullares quasdam fibrillas ipsis (portioni scilicet molli, et duræ) impertitur, utrinque adhærescunt.' *Minor vero portio locatur inter portionem majorem facialis, et nervum acusticum*, ejusque fibræ ad anteriora procedendo, in unum, vel duos nervos collectæ confluunt. Tandem minor portio ad majorem accedit, et intime cum ipsa conjungitur; interdum vero portio minor cum majori non coit, nisi in canali auditivo interno, et tunc videtur in cranio partem nervi acustici constituere. Ingressa canalem auditivum internum, ab acustico recedit, et constanter intime cum faciali conjungitur, et cum ipso per aquæductum Fallopii e cranio egreditur, et per faciem distribuitur."

" Duplici quapropter etiam oritur origine nervus facialis, habet inde Cuvier, portione quadam enascitur sub laminæ forma, alia vero portione fibrosi adspectus†. Quæ quidem duplex origo magis spectabilis est in vitulo; *communi enim radici additur alia procedens a ganglio considerabili in posteriori parte nervi vagi posito*, quodque cum nervo magno sympathico communicat. *Origo ex isto ganglio fit per duo, aut tria filamenta, quæ conjuncta multum crassescunt‡.*

" *Vidi et ipse cum Chirurgiæ doctore Riberi* in cadavere fœminæ filamentum

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* Struttura del Cervelletto Umano, p. 91.

† Processus arciformis nomine Santorini designat fibras obliquas, quæ extremitatem inferiorem corporum olivarium circumambiunt.—Vid. tab. ii. lit. n, u, ejusque descriptionem, p 25.

* Disquisit. Anatom. de Audit. et Olfacto. p. 52. tab. viii. fig. 5. lit. a, d, c.

† Leçons d'Anat Compar. t. ii. p. 146.

‡ Vid. Cuvier, op. cit. tom. ii. p. 227.

crassum, et teres, e media laterali, et paullo superiori parte *corporis olivaris procedens*, et sese nervo faciali adsocians, quem in duos fasciculos manifeste divisum conspecimus.

" Triplex ita esset nervi facialis origo, scilicet et a fasciis medullaribus, et a corporibus restiformibus, atque olivaribus; fortasse et a ponte varolii."

I shall proceed, in my next article, with the physiology of the seventh nerve.

ON THE

PHYSIOLOGY OF THE SEVENTH PAIR OF CEREBRAL NERVES.

PART II.

HAVING quoted from Bellingeri's Dissertatio the anatomical description of the true origin of the seventh pair, I shall now proceed to give what he published in 1818 on its physiology.

CAP. II. — *Septimi Paris, vel Nervi Facialis physiologia.*

§ XL. p. 178. " Quæ de septimi paris usu dicturi sumus, ex iis, quæ hucusque de quinto fusius fortasse nimis fari absolvimus, abunde elucescunt. Ipsius physiologicam prius trademus historiam; placet autem imprimis a Rhaze inchoare, ipsiusmet verba afferendo; præclare enim dixit ipse: '*Quintum autem par est* (unico septimi paris nomine jampridem indicatum), *per cujus unam partem audiendi fit sensus, et per aliam moventur musculi, qui faciem movent**.'— Willis dixit, hunc nervum quosdam exequi motus, præcipue patheticos; sympathice affici ab acustico, et perficere sympathias, quæ intercedunt inter acusticum, aurem externam, palpebras, et organa vocis, laryngem scilicet, linguam, et labia: magis motibus, quam sensibus præesse; inservire tamen auditui; inquit enim: '*alter* (nervus facialis) *requisita quædam, quo actus iste* (auditus) *melius perficitur, suppeditat*†" Winslow nervum facialem sympathicum parvum vocavit."— And so on with Meckel, Soëmmerring, Gall, Bichât, and Boyer.

§ XLI. p. 180. " Præprimis *animalibus functionibus* in capite, facie, et collo, *sensui scilicet animali, et motui voluntario* præesse nervum facialem, *ipsamet nobis suggerit anatomica structura.* Profecto *nullibi fere ipse efformat ganglia**; communem cum aliis nervis vitæ animalis præfert structuram; insignibus tantummodo plexibus, frequentibusque anastomosibus institutis; in cute, et musculis fere unice inseritur; nervus igitur *cutaneo-muscularis capitis, et colli* dicendus. Fortasse et ab ipsius etiam origine desumi argumentum potest; revera orientem vidimus maxima ex parte a fasciis medullaribus, et corporibus restiformibus, filamentisque nonnullis a corporibus olivaribus. *Quum igitur præcipue a productionibus cerebri, et cerebelli exoriatur, deducimus sensui, et motui animali inservire.*

§ XLII. " Physiologia quoque, animalibus præsertim functionibus nervum facialem dicatum esse, suadet. Profecto, quum in cute capitis, faciei, et colli distribuitur, animalem sensum perficere; quum vero in musculis omnibus externi capitis, et externarum aurium, in cunctis fere faciei musculis, temporali excepto, in stylo-hyoïdeo, et digastrico posteriori, musculoque colli-cutaneo insumitur, animalem motum absolvere, ex iis, quæ diximus de quinto, probabile admodum redditur. Ex officio quapropter sentiens, et motor animalis esset dicendus. Quid vero præstet in aurium interno, atque parotide, inferius inquirendum.

§ XLIII. " Pathologica mihi est septimi paris observatio. Decumbebat vir in nosocomio Divi Joannis, eximii Professoris Geri curæ commissus, cui a longo tempore tumor inflammatorius erat pone aurem dexteram, et supra processum mastoideum, et infra extensus, ita ut nervum facialem in proprio exitu e foramine stylo-mastoideo comprimeret, sicuti et cel. Professoris, et Chirurgiæ Doctorum Gallo, et Riberi opinio certa videbatur. Interim in ipso ægrotante universa fere musculorum dexteri lateris faciei observabatur paralysis, et oris in sinistram partem distortio. Perfecta scilicet erat paralysis musculi frontalis, supraciliaris, orbicularis palpebrarum, elevatoris alæ nasi, et labii superioris, canini, zygomatici, orbicularis labiorum in dextra parte, triangularis, et quadrati menti, et colli-cutanei. Integer erat

* Lib. i. De re Medica, cap. iv.
† Cereb. Anat. cap. xvii. Nervorum descriptio, et usus, cap. xxii.

* In aure interna gangliolum efficit ab Ehren-Ritter descriptum; Scarpa quoque cum Meckelio scripsit, levia ganglia in facie cum filamentis quinti, et in collo cum intercostali efformare.— De Nervor. Gangl. pp. 78 et 79.

motus, aut levissime læsus, musculorum temporalis, masseterici, buccinatorii, pterygoideorum; de digastrico nullum ferre judicium potuimus. Globi oculi, et palpebræ superioris motus erat liber; læsus tamen aliquantisper visus in oculo dextero; lingua pariter cum aliqua difficultate movebatur, gustus nihilominus utroque in linguæ latere æque superstes, ut experimento sumus assecuti; pariter sensus tactus integer in facie, auditus quammaxime imminutus in dextra aure, sed apertus erat abscessus in aure externa. Periit post menses duos circiter. Inventum pus in cavo tympani effusum, in aquæductu Fallopii contentum, et facialem in ipsius transitu comprimens; nil puris post mortem, nec inflammationis vestigia circa foramen stylo-mastoideum; recentis vero inflammationis, et suppurationis indicia in dextro cerebelli lobo, integra, atque illæsa quinti paris stamina, et truncus.

" Etiam quotiescumque neuralgia corripitur nervus facialis, spastica fere semper, et convulsiva occurrit musculorum faciei, et colli affectio, ut ex sequenti dissertatione constabit.

§ XLIV. " Et comparata anatomes physiologicum septimi paris usum multo magis ostendit. Nervus facialis, animadvertente Cuvier, in avibus exilis omnino est, eo quod labiis careant hæc animalia, musculari etiam ore, et fere etiam facie; hinc, quum nulla sit sensilitas, et pauca mobilitas, minimus est nervus*. Contra nervus quinti paris sat evolutus in avibus observatur† Vidi et ipse in cuniculis, minimos esse ramos nervi facialis; grandiores vero, spectabilesque infraorbitalis quinti propagines; sed in similibus bestiis paucæ animales in facie peraguntur functiones, organicæ vero multo plures.

§ XLV. " Experimento tandem in cuniculis constituto comprobavimus, septimum par sensui, et motui animali inservire. Secavimus scilicet septimum par in suo prope parotidem transitu, et paralysis subsecuta est musculorum palpebrarum, labii superioris, atque inferioris in eodem latere; secto in utraque parte septimo pari eodem propemodum in loco, integra fuit palpebrarum paralysis, labii etiam superioris, atque inferioris: movebat tamen adhuc aures externas, inferiorem diducebat maxillam; linguam ex ore ferebat cuniculus; ad modum læsus in facie videbatur tactus, distractis enim pilis, nulla dabat sensilitatis indicia.

§ XLVI. " Quum igitur vitæ animali inserviat septimum par, sensum animalem in facie, motumque perficit voluntarium. Porro quum sensui animali famuletur in facie, hinc ubique in capite, facie, et collo septimi paris propagines cum quinti ramis in cute disperduntur; atque ibi cæpiosiores, vel magis superficiales existunt, ubi exquisitior est animalis tactus; ita frequentes septimum par instituit anastomoses cum subcutaneis malarum quinti; insignes sunt surculi facialis ad labia, et in tota colli cute numerosi existunt, et exquisitum ei sensuum tribuunt, unde quam facile titillatio hisce in partibus percipitur. Et per chordam tympani, vel ipsius ramum lingualem gustui præesse, superius diximus.

§ XLVII. " Verum imprimis voluntarios fere cunctos exequitur motus in facie septimum par; movet scilicet musculos frontis, orbicularem palpebrarum; evidenter etiam quosdam musculos nasi, obscure alios in homine, conspicue omnes nasi musculos in quibusdam animalium speciebus, in cuniculis ad exemplum; insuper musculos labiorum, buccinatorem, et masseterem; musculos etiam omnes externæ auris, nisi in homine, saltem in compluribus animalibus; musculum quoque occipitalem, et tandem stylo-hyoideum, mylo-hyoideum, et ventrem posteriorem digastrici, atque colli-cutaneum, qui omnes musculi obediunt voluntatis imperio. Per ipsius vero ramum lingualem non tantum gustui, sed et linguæ voluntario motui confert, quod confirmatur ex nostra adducta observatione, in qua aliquatenus voluntarium linguæ motum præpeditum fuisse vidimus.

§ XLVIII. " Neque tantum sensus, et voluntarios exequitur motus, verum et animales perficit sympathias quamplurimas. Animales porro sympathias voco, quæ ex animali pendent sensilitate, atque contractilitate, cerebro intercedente, et animo conscio peraguntur, ipsoque reluctante præpediri possunt. Multiplices autem sunt sympathiæ, quæ inter sensum auditus aurem externam, palpebras, linguam, labia, laryngem, caput, et artus, per facialem, ipsiusque cum aliis nervis anastomoses perficiuntur. Quæ quidem sympathiæ inter acusticum, et facialem melius explicantur, si surculus a Meckelio, et Bertino descriptus constaus esset, qui auris inte-

* Op. cit. t. ii. p. 228.
† Id. p. 215.

riora ingreditur, et partem acustici nervi videtur constituere. Sympathia porro inter auditum, et externam aurem manifesta est in brutis, quæ voluntarie aures movent; sono enim insolito percepto, aures attollunt, et ad excubias veluti disponunt. Manifestus est in homine consensus auditus cum palpebris, a leviori enim sono palpebras aperimus, et nictationem compescimus; a vehementiori, et repentino fragore fere inscii palpebras claudimus, apertas tamen si volumus, assueti, vel admoniti, servare possumus. Est consensus cum organis vocis internis, externisque, larynge scilicet, lingua, et labiis; hinc ingentiori audito sono, clamitant intrepidæ belluæ, horribilesque emittunt ejulatus; silent contra, mutaque evadunt timida animalia; sub grato etiam sono, et dum auscultamus, vocem compescimus; per auditum etiam vocis dirigimus modulationes. Hinc, cum tanta sit inter vocem, et auditum sympathia, videmus etiam septimum par cum laryngeo nervi vagi anastomosim inire. Ex simili etiam anastomosi intelligimus, cur vox et voluntatis imperio obediat; vox enim actio est quandoque voluntaria, et quandoque ab instinctu, vix enatus puerulus jam clamitat. Quatenus voluntaria a ramo nervi facialis, quatenus ab instinctu a ramo laryngeo pneumogastrici dependet. Cum lingua quantus non est auris consensus? Ita per auditum edocemur apte verba proferre, surdusque homo mutus etiam est: auris vero, et linguæ sympathia optime explicatur per chordam tympani, quæ maxima ex parte est facialis propago in lingualem inserta. Non solum vero consensus est inter auditum, et linguam, sed et cum labiis, et musculis oris; agunt propterea isti in voce, loquela, cantu, omnesque vocales litteras, atque labiales, hoc etiam nervi influxu, pronuntiamus.

" Cum toto etiam capite, musculisque caput moventibus auris consensus est; hinc sub leviori sono, et dum attentas præbemus aures, caput inclinamus, et versus sonum appropinquamus; sub graviori vero veluti ab instinctu amovemus, atque avertimus caput. Quæ quidem animales sympathiæ, quæ prævio sensu, et subsequente motu peraguntur, per nervi facialis anastomoses cum accessorio Willisii, et cum cervicalibus optime explicantur.....Cum cervicalibus quoque instituta septimi anastomosi, auris cum artubus inferioribus aliquatenus patet consensus; inde sono militum dirigitur gressus, saltatores exequuntur choreas. Artuum inde etiam, totiusque corporis cum facie intelligitur animalis consensus; a blanda cutis vellicatione, præsertim in plantis pedum, et in vola manuum, risus suboritur. Per hasce cum cervicalibus conjunctiones suum, et cum diaphragmate fovet consensum, movetur inde diaphragma in vario vocis tono, loquela, et cantu præsertim.

§ XLIX. " Animales non tantum perficit sympathias, sed et simulata exprimit animi pathemata, quæ unice in vario musculorum faciei, oculorum, et capitis motu, totiusque corporis positione, vocis mutationibus, et loquelæ expressionibus consistunt. Ita iram, amorem, lætitiam, tristitiam, humilitatem, superbiam, gravitatem ex parte, vel ex toto fingimus, quod in mimicis frequens, et hoc etiam nervo præsertim scurriliter ludunt, risumque movent. Namque risus et ab hoc nervo producitur, cumque sit multus facialis cum acustico consensus, hinc per auditum præprimis ad risum movemur, per animalem etiam tactum frequenter, et interdum per visum ridendi enascitur fere necessitas. Per olfactum vero, per gustum, et communem tactum nunquam risus producitur. Animus semper vel activo, vel passivo modo afficitur in risu; hinc soli fere homini concessa ridendi facultas.

§ L. " Neque memoratos tantum producit motus septimum par, sed et quum loquelæ, et masticationi inserviat, agit consequenter et in voce, atque deglutitionis organa. Per ramum scilicet stylohyoideum, mediantibus musculis stylohyoideo, et mylo hyoideo, laryngem attollit in deglutitione, et voce; per digastricum vero deprimit maxillam inferiorem in masticatione, in cantu, atque ejulatu. Cum porro musculi isti involuntarie etiam moveantur, ut patet in infantis deglutitione, voce, atque oscitatione, hinc et glosso-pharyngei filamenta et in hosce musculos distribuuntur, atque insigni anastomosi glosso-pharyngeus, atque facialis nervus inter se copulantur, ut quod voluntarii, et involuntarii est in deglutitione, et voce connecteretur.

§ LI. " Vidimus igitur hucusque, animalibus famulari imprimis actionibus septimum par; si quis vero objiciat, involuntario motui præesse in aure interna, *consulat, quæ diximus de quinto;* insuper animadvertat, ibi *ganglíolum efformare*, ut in nervis ciliariis occurrit; sed cum et parotidi insignes juxta nonnullos det ramos, semper stabit difficultas, ipsum

et involuntariis, et organicæ vitæ alicubi inservire. Præterea certe inservit vitæ organicæ, quum cellulis mastoideis, membranæ tympani, longiori incudis cruri, circa foramen jugulare, musculis tubæ eustachianæ insertis filamenta elargitur. Animadvertam vero, *non ut unicum nervum* habendum esse septimum par, sed *duplici constare portione*, majori scilicet, et minori a Wrisbergio detecta, quæ *distinctam habet originem*, et *structuram*, iter quoque sejunctum a majori ipsius nervi portione. *Suspicarer igitur*, paucas involuntarias, quas exequitur actiones septimum par, *ab hac minori portione pendêre; quod melius fortasse innotesceret, si ipsius distributiones quoque notæ essent.* Revera, cognita minoris quinti portionis distributione, diversis a majori portione actionibus famulari demonstravimus; *voluntatis enim minor obedit imperio, non ita major.* Insuper, minorem nervi facialis portionem famulari organicis functionibus, *conjectura quadantenus assequi possumus;* ipsius enim filamenta partim a substantia pontis, partim vero ex corporibus olivaribus prope originem glosso-pharyngei enasci videntur; diximus vero superius, nos opinari, inservire vitæ organicæ nervea filamenta, quæ a corporibus olivaribus oriuntur. Quemadmodum igitur portio major quinti paris, meo quidem judicio, inservit vitæ organicæ, minor vero ipsius portio vitæ animali dicatur; ita, contraria ratione, *portio major septimi vitæ animali, minor autem portio vitæ organicæ* famulatur: quo admisso, dabo etiam et per filamenta minoris portionis nervi facialis moveri musculos internæ auris. *Quum igitur diversa sit origo, et structura, diversum quoque officium portionis minoris quinti, et septimi paris a majori utriusque portione, merito utramque portionem distinctum nervorum par constituere puto.*

§ LII. " Concludimus igitur, nervum facialem voluntarios fere omnes in capite exequi motus, sensui animali in facie, et collo præesse, risum producere, simulata exprimere animi pathemata, animales absolvere sympathias; hinc etiam animadvertimus, cur tam frequentibus anastomosibus, plexibusque rami inter se, cumque vicinis nervis connectantur, ut in anatome vidimus. Agere in masticatione, deglutitione, voce, loquela, et cantu, et quinti adinstar aliquam omnium sensuum organorum partem constituere; internis scilicet, externisque auribus ramos tribuit, per palpebras tutatur oculos, ingreditur inferiores nares, linguam insigni ramo ditat, animalem tactum in cute absolvit, et ubique in hisce partibus inservit functionibus vitæ animalis.

" Dixi, et sistam, longius quidem pro ingenii viribus, breviter si admirandum Creatoris opus spectemus; hac enim ratione nunquam esset sermoni finis."

Thus ends the Third Part of Bellingeri's Dissertatio, which contains principally the physiology of the fifth and seventh pairs of nerves. My next shall be the concluding article.

Concluding Remarks.

From what has been published in the preceding pages, on the physiology both of the fifth and seventh pairs of cerebral nerves, enough, I believe, of Bellingeri's Dissertatio Inauguralis has been laid before the public to exhibit a full and accurate idea of the Italian physiologist's doctrine on the functions of those nerves. Let him now be judged impartially, but only after his own words and opinions, and not through the highly improper and erroneous statements of incompetent critics.

Before, however, leaving this question, I must direct the attention of the medical profession to some other important points, so forcibly insisted upon by Mr. Alexander Shaw, in his already well-known article. " The fundamental principle," he says, " which pervades every sentence of Sir Charles Bell's works, is this (and it was announced in the unpublished tract.....printed in 1811)—that a single nerve cannot bestow both motion and sensation.....; whenever they are combined, it is a sign that the nerve is compound—that it originates by two distinct roots from the brain, or spinal marrow."—" It is not to be supposed that this principle.....rested altogether upon the experiments on the nerves of the face. It was not with these nerves that Sir Charles Bell began his investigations. It is well known that he commenced by experiments on the spinal nerves. It was after having ascertained by experiments (first made so far back as 1811, and *repeated in March* 1821), that the two roots of these spinal nerves possess distinct endowments, *that he was led to examine the*

functions of the fifth pair, and to classify it with the spinal nerves."—"When we speak, therefore, of the validity of the proofs by which he established that the fifth is a double nerve—the nerve of sensation and mastication—we must not omit to take into consideration the *experiments on the spinal nerves, which corroborated his conclusions.*"

Now Sir Charles Bell, in his unpublished tract, printed in 1811, says:—"The spinal nerves being double, and having their roots in the spinal marrow, of which a portion comes from the *cerebrum*, and a portion from the *cerebellum*, they convey the attributes of both grand divisions of the brain to every part.....But the nerves which come directly from the brain, come from parts of the brain which vary in operation; and in order to bestow different qualities on the parts to which the nerves are distributed, two or more nerves must be united in their course, or at their final destination. Hence it is that the first nerve must have branches from the fifth united with it: hence the *portio dura* of the seventh pervades every where the bones of the cranium, to unite with the extended branches of the fifth: hence the union of the third and fifth in the orbit: hence the ninth and fifth are both sent to the tongue: hence it is, in short, that no part is sufficiently supplied by *one single nerve, unless that nerve be a nerve of the spinal marrow, and have a double root*—a connexion (however remotely) with both the *cerebrum* and *cerebellum**."

Thence it is evident, that although Sir Charles Bell had assigned particular functions to each of the double nerves of the spinal marrow, and performed experiments to ascertain this position, yet, in 1811, he considered still the fifth, together with the other cerebral nerves, as a simple nerve, entirely distinct from those of the spine: and when the English physiologist *repeated* those experiments, *in March* 1821, and was led to examine the functions of the fifth pair, and to classify it with the spinal nerves, the Italian physiologist had already published, in 1818, his classical Dissertatio, which he publicly defended in the 9th day of May of the same year, before the Royal College of Medicine in Turin.

Now let us consider with what degree of anatomical evidence the fifth pair of cerebral nerves was, by Sir Charles Bell, classified with the symmetrical nerves of the spine.

In the sixth edition of his "Anatomy and Physiology of the Human Body," printed in 1826, he expresses himself, on that point, in the following terms:—"Pursuing the subject, and still directed by the anatomy, the next matter of inquiry was to ascertain how far the fifth nerve of the encephalon corresponded with the spinal nerves. It was discovered that the fifth nerve bestowed sensibility on the cavities and surfaces of the head and face. . . . . In short, in regard to their property of bestowing sensibility, the fifth and spinal nerves were identified.

"But was the fifth nerve, in *other essential circumstances*, similar to the spinal nerves? On recurring to anatomy, and comparing the fifth nerve of the encephalon with a spinal nerve, the resemblance, both in man and brutes, was very remarkable. In both nerves we see the double roots: the anterior root passing the ganglion, and the posterior root falling into it, or forming it. On following back the anterior root, we may perceive that it comes out betwixt the *funes* of the *pons varolii, and, in fact, from the crus of the cerebrum.*

"Observing that there was a portion of the fifth nerve which did not enter the ganglion of that nerve, and being assured of this fact by the concurring testimony of anatomists, I conceived that the fifth nerve was, in fact, the uppermost nerve of the spine—that is to say, the uppermost, or most anterior, of those nerves which order the motion, and bestow sensibility, in its extended sense, on the frame of the body.

"One circumstance I may notice in passing: the origin of the fifth nerve being above, or anterior to, the termination of the column of the spinal marrow for respiration, *it can receive no roots from it.*"—Pages 386, 387.

Then, according to these *essential circumstances of similarity*—"The arrangement (says he) of this symmetrical system of nerves is this: there is an obvious division of the *medulla spinalis*, corresponding to the *cerebrum* and *cerebellum; every regular nerve has two roots—one from the anterior of these columns, the other from the posterior: such are the fifth pair*," &c.—P. 390. Therefore we must expect to find out the origin of the larger portion of the

* Page 23.

fifth entirely from the *cerebellum*, and that of the smaller one solely from the *cerebrum: from it* (in fact) *all the nerves which are agents of the will pass out.*" So Sir Charles Bell said, in his unpublished tract, 1811, at p. 27.

Now let us see how the origin of those two portions of the fifth has been made out in the anatomical part of Bellingeri's Dissertatio.

" *De Quinto Nervorum Pari, sive de Nervo Trifaciali.*

§ III. " Emergit iste nervus e latere externo mediae fere prominentiae annularis, atque ex interna facie extremitatum pedunculorum cerebelli, ubi sese supra dictam protuberantiam extenduntur.

" Neque tamen ibi vera est nervi origo; loquentem audiamus Santorini: ' Non eam originem voco, quâ ex annulari protuberantia, seu Varolii ponte nervus iste in fasciculum collectus prodit, verum eam unde ejus plurimae, ac diversae fibrae primo exoriuntur *.' Sed in assignando hoc exortu plurimi insudarunt Anatomici, neque omnino inter se consentientes sunt. Triplicem indicavit originem ipsemet Santorini, nimirum et a cruribus cerebelli, et a prominentia annulari, et inter olivaria, atque corpora pyramidalia. Winslowius Santorino assentitur circa fibrarum exortum inter olivaria, et restiformia corpora. Negavit contra Malacarne hunc e corporibus olivaribus fibrarum exortum, sicuti etiam et a prominentia annulari, et unice a cerebelli pedunculis in integrum exoriri tradidit†. Verum inter corpora olivaria, et restiformia exorientes tribus fasciculis collectas fibras, et descripsit, et in propria tabula V. litt. i k egregie delineavit Gall; quodque dubium jampridem Santorino erat, an scilicet ex ipsismet corporibus olivaribus ortum ducerent fibrae, comparatam anatomem considerando, solvit. Animadvertit scilicet Gall, in piscibus, ganglion, a quo nervus iste procedit, omnino sejunctum esse, et filamenta nervea etiam in propria origine e communi massa segregata esse ‡.

" Duplex igitur prae primis constituitur fibrarum quinti paris exordium; scilicet et a pedunculis cerebelli, et a corporibus olivaribus. Nullas autem a propria prominentiae annularis substantia exoriri fibras, et ipsemet Santorini posterioribus laboribus comprobavit, et laudabili studio confirmavit Girardi *. Addit Soëmmerringius, se orientem nervum quinti paris a medullosis cerebri processubus in ipso fere pariete inferiori ventriculi quarti conspexisse†. Quae ibi de ultimo extremo quinti paris in ipso fere pariete ventriculi quinti traduntur, an typographi error sit, mihi dubium.

§ IV. " Multiplices fibrae quinti paris diversis e locis promanantes colliguntur, et unicum truncum, in duos tamen fasciculos in ipsomet exitu ex encephali substantia divisum, constituunt, itaut ex duplici portione truncus quinti paris manifesto constet. Prodeuntem nervum quinti paris ex encephali substantia, et bina distinctum portione egregie delineatum habemus a Scarpa‡. Duplicem hujusce paris portionem, vel duplicem distinctum ramum aliquando adesse, et in ipso nervi exitu, jam innotuerat Willis§, atque Vieussenio ||; quam quidem duplicem portionem exacte descripsit Santorini, fusiusque explicavit Girardi ¶. Merito inde Palletta duos a quinto pari distinctos nervos ex minori portione constituit**; et ego sejunctim de utraque portione loquar. Una ex istis anterior, et superior in sua origine, eaque minor est; altera posterior, inferior, et major; unaquaeque multis, et distinctis fasciculis composita, ab invicem in suo initio sejunctae, vel per textum cellularem, vel per vasa sanguinea, vel per laminam medullarem: posterior, et major portio ea est, quae proprie trunco quinto paris, vel nervi trifacialis respondet.

" *De Portione Majori Quinto Paris.*

§ V. " Portio major quinti paris, ubi e cerebelli pedunculis prodit, tuberculum, vel papillam medullarem praesefert, consistentiâ trunco quinti paris multo molliorem, a Bichat primum, et minutissime descriptam††. Huic papillae nervea filamenta undequaque adhaerent, quae quidem multa, et distincta apparent, itaut trigintaquatuor, quadra-

* Observationes Anatomicae, p. 65.
† Nevro-encefalotomia, p. 192.
‡ Anatom. et Physiol. du système nerv. en génér., et du cerv. en partic. p. 77.

* Tabul. septemdec. Santorini, p. 17.
† De corp. human. fabric. t. 4, p. 212.
‡ Anatomic. disquit. de audit. et olfact. tab. viii. fig. 5.
§ Opera Medica et Physica, t. i. p. 355.
|| Vid. Mangeti Bibliotheca Anatomica, p. 633.
¶ Op. cit. p. 17 et 19.
** De Nervo Crotaphitico, et buccinatorio.
†† Traité d'Anatomie descriptive, t. iii. p. 62.

gintaquinque, usque ad quinquaginta filamenta nervea in hac portione enumeraverit Wrisberg*. Hi fasciculi crassitie sunt inaequales a sua origine usque ad plexum semilunarem; neque paralelle, sed multimode inter se intertexti, et concatenati per transverse progredientes fibras nervosas conspiciuntur. Quae quidem fibrarum conjunctio a Willisio, Vieussenio, Hallero, et Zinnio in propriis tabulis praetervisa, a Prochaska vero observata, et ad naturalem depicta in tabul. ii. fig. iv. et v.† Neque tantum in trunco portionis majoris quinti paris iste fibrarum intertextus conspicitur; sed et in ramis ex ipso prodeuntibus, ut in ipsis figuris Prochaska apparet, meritoque animadvertit Bichat.

§ VI. " Fasciculi autem isti colliguntur in unicum truncum, qui a pia matre involutus, una cum portione minori quinti paris, quae ibi tunc inferius posita, fertur ad latera processus clinoidei posterioris, recipiturque in sulco a dura matre efformato, qui sulcus ipsi nervo proprius est, et a sinu cavernoso disjunctus ut recte contra Vieussenium, et Winslowium ostendit Mecklius‡. Ibi plexum semilunarem a figura dictum, et jam Vieussenio cognitum, constituit, et sexies volumine augetur truncus ipse. Circumdatur autem plexus semilunaris a cellulari textu valde stipato, et denso, quem armillam dixit Malacarne, et multis sanguineis vasis divitem esse ostendit Hallerus §. Improprie autem hunc plexum Hirsch ganglion Gasserianum vocavit in memoriam praeceptoris sui‖. Namque verum ganglion non est, uti ex descriptione a Moscati, et Malacarne tradita manifesto conspicitur¶. Filamenta autem in isto plexu, licet admodum inter se mixta, non tamen omnino confusa, ut ipsorum iter prosequi nequeat, quin potius attente observando ista filamenta insectatos esse, et memorati testantur auctores, et Palletta, et Wrisbergius**. Internâ igitur structurâ plexubus, externâ vero gangliis quadantenus aemulatur.

" *De Portione Minori Quinti Paris.*

§ XLV. " Primam igitur exactam minoris portionis quinti paris descriptionem Italo Santorino debemus, qui originem, structuram, et irer a majori quinti portione diversum ita diligenter est prosecutus, ut vix aliquid addi posse videatur. Propriis etiam observatis minorem hanc portionem illustravit Girardi *. Accedunt observationes Wrisbergii, qui et minorem quinti paris portionem attente investigavit †. Posteriores tandem anatomici Prochaska, Soëmmering, Scarpa, Bichat, e duabus portionibus quintum par constare, uno ore tradiderunt. Bichat quoque credidit, distinctum a tritrifaciali nervum minorem portionem constituere ‡. Palletta vero, triplicem in quinto pari portionem adesse, docuit: communem scilicet truucum quinti paris, vel portionem majorem; nervum crotaphiticum, qui cum portione minori reliquorum anatomicorum convenit; et nervum buccinatorium §; quos quidem duos distinctos nervos, quum parum admodum origine, itinere, structurâ, et usibus differant, sub unico nomine portionis minoris quinti paris comprehendo, et describo.

§ XLVI. " Portio minor quinti paris duplici oritur funiculo ex intima parte crurum cerebelli; unus quidem, qui volumine major, superior, et magis internus est, prodit, et oritur a pedunculis cerebelli, ubi sese in annuralem prominentiam insinuant, et cerebri cruribus approximantur‖. Ex quinque, aut sex filamentis constat, in unicum truncum collectis; emergit ipse ex cruribus cerebelli, superius, et anterius positus trunco communi quinti paris; fertur dein paullo infra ipsum, et ad internum ipsius latus incedit ad anteriora; nullam cum portione majori in hoc itinere connexionem habet; et per foramen ovatum e cranio egreditur una cum alio fasciculo portionis minoris quinti paris, et ramo maxillari inferiori, ad quorum partem anteriorem, et paullo internam ibi situs est¶. Respondet fasciculus iste nervo crotaphitaco Palletta; et egressus e cranio, in tres ramos dispertitur inferius describendos.

Alter vero fasciculus, vel radix, eaque minor, et externa, oritur ex intimis pedunculi cerebelli penetralibus, et versus ipsius cerebelli lobos **; ex pedunculis

* Vid. Nov. Comment. Societat. Gotting. t. vii. p. 46.
† De structura nervorum, p. 106.
‡ De quinto pari nervorum cerebri, p. 22.
§ De corporis humani fabrica, t. 8, p. 337.
‖ De quinto pari nervorum encephali. Vid. Sandifort. Thesaurus dissertationum, t. 3.
¶ Neuro-encefalotomia, p. 190 et 191.
** Vid. Novi comment. Societatis Gottingensis, t. vii. p. 52.

* De quinto pari p. 20.
† Vid. Nov. Comment. Societ Gotting. t.vii,p. 45
‡ Op. cit. T. III, p. 163.
§ De Nervo Crotaphit., et Buccinat.
‖ Vid. Palletta Fig. I, II, et III, p. XV.
¶ Vid. Palletta Fig. III, N. 3.
** Vid. Palletta Fig. II et III, p. XIX.

emergit communi hiatu cum trunco portionis majoris: constat ista radix, vel fasciculus, juxta Palletta, ut plurimum ex octo filamentis *, in unicum fasciculum collectis, qui fertur ad anteriora una cum trunco communi quinti paris, ad latus ipsius externum, et paullo medium positus; egreditur e cranio per foramen ovatum, medius fere quoque locatus, sed magis internus, inter nervum crotaphiticum, et maxillarem inferiorem, et respondet nervo buccinatorio Palletta.

§ XLVII. Portio minor quinti paris a majori differt, et per distinctam utriusque originem, et per sejunctum uniuscujusque iter, et praecipue ex eo, quod neque plexum semilunarem, ganglion Gasseri dictum, ingrediatur, neque armillâ a Malacarne vocata nllo modo circumdetur, ut jam Santorini, et Girardi probe noverunt†. Surculos tamen interdum ad plexum semilunarem mittere, post Girardi scripsit Soëmmerring‡. Differt quoque structurâ; filamenta enim, ex quibus componitur portio minor quinti paris, candidiora sunt, crassa etiam magis, atque robusta filamentis portionis majoris ipsius quinti paris: praecipue vero differt, quod cum Bichat adnotare praestat, quia portio minor communem aliorum nervorum habet adspectum §."

After this very minute and apparently accurate description of the real origins of the fifth, and more particularly of its smaller portion, supported by many classical authorities,—nay, so much in accordance with Mr. Mayo's beautiful drawing of the origin of the cerebral nerves, published in his Outlines of Human Physiology,—it may appear not unreasonable to entertain some doubt about Sir Charles Bell's deductions, both of the similarity of the fifth to the spinal nerve, as well as the functions of the *cerebrum* and *cerebellum*, and their anterior and posterior continuations down the columns of the spinal marrow.

Mr. Alexander Shaw, taking, however, no notice of these trifles, and always ready to censure Bellingeri for the supposed faults of his anonymous reviewer, goes on stating, "The confident tone of the reviewer.....would lead us to expect the most complete coincidence in the statements of the two physiologists—that they pursued the same method in conducting their inquiries, viz., first by examining the anatomy, and then by performing experiments; and that the results of their combined observations and experiments were the same."

"The reader will find, on the contrary, in Bellingeri, (?) a direct opposition to the principle which I have stated—a totally different mode of pursuing the investigation — a signal clashing of opinions and statements with those of Sir Charles Bell; and he will inquire in vain for any single point of harmony or concurrence on which to make out a case of anticipation."

Now I may, with more confidence, cry out with him, "The public—the intelligent public—especially the medical public, will not fail to look upon these exhibitions in their true light*."

Whatever may be the result, or the opinions entertained by the learned medical profession in this country about the importance and correctness of Bellingeri's physiological doctrines on this as well as on any other subject connected with the nervous system, that is a matter which is entirely unconnected with the present question, and which I have nothing to do with. I did not write, indeed, in support of any principle laid down by my learned countryman, but only to defend him against

* P. XXI.

† Op. cit. p. 17.

‡ Op. cit. T. IV, p. 214.

§ The reader may now compare the above with the following description given by Sir Charles Bell in his already mentioned work on Anatomy, page 473. "The fifth nerve of the brain arises from the fore and lowest part of the crura cerebelli, where they unite with the pons varolii. The origin of this nerve may be divided into two portions; an anterior is small, and somewhat elevated above the other. The posterior part of this origin takes its rise a little lower than the anterior part, and is broader and flatter. These two origins of the nerve are connected by a cellular membrane, and have betwixt them a little groove, in which, not unfrequently, an artery creeps. According to Santorini the anterior of these divisions is formed by the transverse fibres of the pons varolii, and the posterior by the crura cerebelli, [Here the author directs the readers to two wood engravings at pp. 387 and 388, which, he says, exhibit the exact origins of the fifth pair.] Vicq d'Azyr could never, except in one dissection, perceive that any of its fibres arose from the pons varolii. This fifth nerve, the largest of the skull, passing forwards and downwards, slips in betwixt the lamina of the dura mater, opposite to the point of the part petrosa of the temporal bone. It is here firmly attached to the dura mater, and forms a flat irregular ganglion. This ganglion is formed entirely by the posterior portion of the nerve; the anterior portion passes the ganglion, and enters the foramen ovale. From this great nerve there pass out three branches, hence the term trigeminus is given to the fifth."

* See Mr. Shaw's article.

the misrepresentations of others: this I considered a sacred duty due to truth, to my country, and to the honour of Italian physiology.

The principal objects I had in view, therefore, were to prove—

1st. That Mr. A. Shaw had not, when writing his article, read Bellingeri's Dissertatio; or, if he had read it, had not understood its contents properly; and thus has declared himself incompetent to give an opinion on such a physiological question. *He* is then to be considered "the *unlucky* foreigner, on any of whose 'assertions' we (and I fear all other persons) "must decline placing confidence."

2nd. Whatever may be Sir Charles Bell's claims, either on this or any other subject connected with the physiology of the nervous system, the 'Italian physiologist' had published, in 1818, a far more elaborate and accurate account both of the anatomy and physiology of the fifth and seventh pairs of nerves, than any published by the 'English physiologist,' from his first paper, read before the Royal Society, in July 1821, to the last one, read in May 1829: or, if Mr. A. Shaw like better, from the *unpublished tract* printed in 1811, where the fifth is yet considered as a single nerve, to the last work on the nervous system, published in 1830, which "must be supposed to present Sir Charles Bell's matured opinions on that subject."

3rd. When Bellingeri was writing his opinions in 1818, or even before, on the physiology of the fifth and seventh pairs of nerves, and by performing *experiments* in living animals, drew the first correct conclusion on the function of the seventh, he could not have derived any information from what had not yet formed a subject of examination in Sir Charles Bell's mind. Bellingeri had a nearer source of instruction and excitement for such inquiries, in the professor of anatomy to the University of Turin, the celebrated Rolando, one of the most distinguished modern inquirers into the structure of the brain, whose death, together with that of Scarpa and Palletta, Italy had lately to deplore.

4th. Although Bellingeri went through the natural intricacy of the nerves of the face from their origin to their last terminations, he deduced their functions both from anatomy and physiology, as well as from pathology, and experiments on animals, without increasing their "*pristine confusion*" by the introduction of hypothetical superadded system of nerves. Their source of action was always referred to distinct points of origin from the encephalon, and their various functions explained either by the influence of a simple or of a compound nerve.

At last, the Italian physiologist has published his opinions on the functions of the fifth and seventh pairs of cerebral nerves, as mere deductions—nay, as *more probable conjectures*, derived by his extensive researches into the history, as well as patient inquiries into the anatomy and physiology, of those two nerves, and did not proclaim them to the world as his own discoveries.

I shall, then, conclude with the following quotation, so very aptly introduced by Mr. Swan, in his article on the merits of Willis and many others, regarding the functions of nerves.

"Oro miserere laborum
Tantorum, miserere animæ non digna ferentis."

GAETANO NEGRI, M.D.

London, Oct. 27, 1834.

ERRATA.

Page 4, col. 1, l. 25, *for* "Sunt, quæ sensui obediunt voluntario," *read* "Sunt, quæ sensui et motui," &c.; l. 35, *for* "motus," *read* "motui"; col. 2, l. 21, *for* "anatomis," *read* "anatomicis"; p. 6, col. 1, l. 41, *for* "tantusque quinto," *read* "tantasque a quinto;" next line, *for* "demonstravimus," *read* "demonstraverimus"; p. 9, col. 2, l. 11, *for* "voluntatem," *read* "voluptatem"; l. 32, *for* "nulla," *read* "nonnulla"; p. 10, col. 1, l. 40, *for* "deducendis," *read* "traducendis;" p. 11, col. 1, l. 2, *for* "deveniamus," *read* "devenimus"; l. 6, *for* "physiologia," *read* "physiologica"; col. 2, l. 51, *after* "Hæc," *insert* "ipsa"; p. 12, col. 2, l. 14, *for* "Quam," *read* "Quum"; l. 18, *for* "quodantenus," *read* "quadantenus"; p. 20, col. 2, *for* "cæpiosiores," *read* "copiosiores"; p. 24, col. 2, lines 41 and 43, *for* "quinto," *read* "quinti."

W. WILSON, PRINTER, 57, SKINNER-STREET, LONDON.