the tide of emigration to augment thitherwards. But regarding the propriety of making such movements we would say finally, that invalids suffering especially from chest maladies may confidently expect to realise as much, if not sometimes even greater benefits, while residing at one of the localities indicated in a previous paragraph, than by hibernating in some objectionable foreign town, however much it is enthusiastically lauded, either by interested local authorities, or admirers of the really attractive physical beauties which characterise the particular spots recommended.

REVIEW V.

Researches on the intimate Structure of the Brain. Second Series. By J. LOCKHART CLARKE, F.R.S., &c. 'Philosophical Transactions,' Part I, 1868.

WE have before us the latest contribution to anatomical science, of Dr. John Lockhart Clarke. A *work*, in the largest sense of the word, full of original observations, and moreover a portion only of an amount of labour that rarely falls to the lot of one man to accomplish, within so short a period as ten years. The date of its predecessor, the author's first paper on the anatomy of the medulla oblongata, was 1858. Within the same period Dr. Clarke has contributed three important papers to the 'Philosophical Transactions,' viz.: 1. "Further researches on the Grey substance of the Spinal Cord," with seven quarto plates. 2. "On the development of the Spinal Cord," with four quarto plates. 3. "On the Brain and Optic Lobes of the Cuttle-fish," with one quarto plate. Besides these, the author has also written numerous papers on pathology of the nervous centres, viz.: on Muscular Atrophy, on Tetanus, on Locomotor Ataxy, and on different forms of paralysis. These papers have added value to the pages of this and several other medical journals. The amount of intense mental application besides manual labour in anatomical and microscopical examinations, demanded for the execution of these tasks can only be appreciated, and that but faintly, by those who have made the attempt to follow the author's demonstrations. For ourselves we honestly avow, that although we have spared no pains in the effort so to do, we feel that we are far from having completely mastered so abstruse a paper: so far, however, as we have succeeded, we shall endeavour to give our readers a brief, and we trust a tolerably intelligible abstract thereof.

In previous numbers of this Journal, Clarke's earlier researches into the minute anatomy of the spinal cord have been noticed. We take up the subject again at the point at which it was then left, and proceed to show the morphological changes by which the nuclei of the medulla oblongata are developed out of the elements of the medulla spinalis.

At the highest point of the spinal cord, *i. e.*, at the level of the first cervical nerves shows increase in extent of both white and grey substances—the cervix cornu stretching outwards and backwards, becomes gradually thinner, while the caput cornu is thrown further outward, and is transformed into the grey tubercle of Rolando. Between the anterior and posterior horns there is seen a beautiful network of vessels, fibres, and cells. From the bottom of the anterior fissure the fibres begin to pass that afterwards constitute the decussation of anterior pyramids. As the caput cornu posterioris is more entirely detached, fibres and vessels mingled with cells extend from the cervix backward, to form the post pyramidal and rectiform ganglion. The grey nucleus of the rectiform body is seen at the extremity of what was the cervix cornu. The nucleus of the upper roots of the spinal accessory now appears in the posterior portion of the enlarged central grey matter, while the nucleus of the hypoglossal represents the anterior cornu, the remains of which is traversed by the nerve roots. Still higher up these nuclei are seen to have enlarged, and nerve roots are observed entering them. Decussating fibres pass round in front of hypoglossal nucleus to form commissural bands of the olivary bodies. In the expanded extremity of the posterior horn is the principal nucleus of the sensitive division of the trigeminus. The fourth ventricle is formed by the opening out of the posterior median fissure. The nuclei of posterior pyramid and rectiform body coalesce. When the spinal accessory nerve ceases, the nucleus of that nerve becomes the vagal nucleus. The nucleus of the motor root of the fifth appears on each side of the central grey matter. Ascending still higher as the posterior structures are thrown outward and assume a lateral position, the vagal and hypoglossal nuclei come to the surface of the fourth ventricle. The grey substance of the posterior pyramid and rectiform body, together with the remains of the vagal nucleus, go to form the double nucleus of the auditory nerve.

Before proceeding to the full exposition, the author puts on record some new and important facts recently ascertained by him with reference to the composition of the anterior pyramids and their decussations.

Clarke observes that subsequent observations, while they

have confirmed the truth of previous statements, have enabled him to make some important additions.

"I had already shown that the decussating fibres from the posterior grey substance proceed out of the post pyramidal nucleus, the rectiform nucleus, and the posterior horn, near its extremity. I have since ascertained, by means of longitudinal sections made at appropriate angles, that some of the decussating fibres of the anterior pyramids, which appear only to cross the antero-lateral grey substance, in their course from the opposite lateral column, do actually arise out of that substance. I have further ascertained that the decussating fibres from both the posterior and anterior grey substances *ascend toward the brain* after they have joined the pyramids. There is another exceedingly interesting structure, which, although it does not share in the formation of the anterior pyramid I shall mention here, because it is mixed up with the decussating fibres of those bodies in the lateral column. Several curved bundles of fibres may be seen proceeding transversely outward to the lateral column, and crossing the fibres of that column which run to the opposite pyramid. These fibres take no share in the formation of the pyramids; and after running outward for a short distance, they turn round and descend the cord obliquely across the longitudinal fibres of the lateral column. At the point where these two sets of fibres bend round (where the former or transverse set descend, and the lateral or longitudinal set become transverse as they cross to the opposite side) there is a very complicated and curved interlacement of bundles. Now, the physiological importance of the former set is evident when we consider that the part of the posterior grey substance from which they arise is precisely that which forms the lower portion of the spinal accessory and vagal nuclei, and with which the lower roots of the spinal accessory are connected. It is, moreover, interesting to observe that in ascending the medulla oblongata above the decussation of the pyramids, a similar system of nerves was found to proceed from the same respiratory centre, and to run down the lateral columns."—P. 272.

The particular parts with which the decussating fibres of the anterior pyramids are shown by Clarke to be associated, are—

“(1), The antero-lateral grey substance; (2), the interior border of the caput cornu, or expanded extremity of the posterior horn; (3), the base of the cervix cornu on each side of the central canal; (4), the continuation of this part of the cervix cornu in the posterior column forming its grey nucleus, and subsequently contributing to form a large portion of the outer nucleus of the auditory nerve; and (5), the side of the spinal-accessory and hypoglossal nuclei.”—P. 310.

From some of these facts, adds Clarke :

“M. Vulpian thinks it not improbable that the anterior pyramids

are to a certain degree sensitive and excito-motory. Their connection, however, with the sensory portions of the medulla oblongata and cord, do not afford sufficient ground for the conclusion that they are sensitive; although it is probable that, by virtue of their connexions, they are excito-motor, probably through the grey substance within the pyramids themselves, the pons Varolii, or both."

By a series of most careful and elaborate descriptions, Clarke shows the connection between the origin of the roots of the spinal accessory nerve and those of the higher spinal nerves—a connection exceedingly interesting in reference to the influence of the will on the respiratory movements. This connection is established through a slender longitudinal column of fibres descending in a plane external to that of the spinal accessory nucleus.

"This slender longitudinal column has the same kind of important connections with the vagal and glosso-pharyngeal nuclei, as those which it has been shown to form with the spinal accessory; but it has, moreover, a direct and especial connection with the glosso-pharyngeal *nerve*. While the spinal-accessory and vagus nerves enter their nuclei on the *inner side* of the slender column, although they are connected with it, many of the fibres of the glosso-pharyngeal nerve pass directly into it."—P. 277.

Clarke having shown the several origins of the spinal accessory nerve, viz. the *upper* roots from the special nucleus behind the canal, and the *lower* roots in the lateral grey substance and anterior cornu of the spinal cord, observes, "It is an interesting fact that the hypoglossal nerve has a similar kind of double origin." Clarke gives representations of the *upper* roots of the hypoglossal a little below the level of the calamus scriptorius, and of its *lower* roots from the upper remains of the anterior cornu. Nerve fibres are shown to pass between the hypoglossal and spinal accessory nuclei. A little higher up, communications are observed to take place between these roots and a group of small cells which begins to appear at this level, and which constitute the lower end of the column of cells and fibres constituting the fasciculus teres, and part of the nucleus of the facial nerve, and "constituting a most interesting communication between the facial nerve and even the *lower* roots of the hypoglossal." An equally important connection has been discovered by Clarke still higher up. Besides this important connexion, adds Clarke,

"Between the two nuclei—the hypoglossal and the spinal accessory—through the medium of their *cells* the spinal accessory

nerve has also a separate origin from the hypoglossal nucleus. Both the vagal and glosso-pharyngeal nerves have each a separate origin from the same source."

These interesting facts, Dr. Clarke further observes, have been fully confirmed by Dr. John Dean, of Boston, U.S. Clarke furthermore illustrates his observations from comparative anatomy.

"In birds, this separate origin of the vagus nerve from the hypoglossal nucleus is so striking, that in well made preparations it may be seen almost at a glance. In fishes, I have recently discovered a beautiful and peculiarly interesting illustration of the same anatomical fact. In these animals there is no *separate* hypoglossal nerve, but the tongue is supplied by a branch of the vagus. Now I was very desirous of knowing what was the nature of the vagal nucleus in these animals, and of ascertaining whether it was a double or compound nucleus, consisting of the vagal and hypoglossal nuclei joined together. On examination, I found that the lower division of the vagus nerve, after proceeding transversely through the lateral part of the medulla, bifurcates into two distinct roots of considerable size; and that while one of these curves backwards to spread into the grey substance behind the canal, the other bends forward into a round or oval nucleus, which in regard both to the character of its cells and its position in front and at the sides of the canal, corresponds exactly to the hypoglossal nucleus in the higher vertebrata."—P. 280.

If space permitted we would have laid before our readers the author's account of the structure of the olivary bodies, but we must content ourselves with the inferences drawn by him as to their uses. They had formerly been regarded as having control over speech, expression, and deglutition. Upon anatomical and pathological grounds he regards them not only as centres through which the different movements are co-ordinated for expressing passions and emotions, but considers that they are the motor centres through which different movements are effected by sudden, violent, or peculiar impressions on the special senses; for they are intimately connected with all the sensory ganglia of the medulla, and have been traced by the author nearly to the perforated space.

In his second chapter the author proceeds to describe the parts found on the floor of the fourth ventricle, with their connections internally, as seen by transverse and longitudinal sections in different planes. The fasciculus teres is seen enlarging as the hypoglossal decreases in size, and finally disappears at the same time that the auditory nucleus enlarges. On a level with the roots of the glosso-pharyngeal nerve, in the central part of each lateral half of the medulla, near the inner

side of the grey tubercle, is a group of multipolar cells, constituting the nucleus of the lesser root of the fifth nerve. Clarke has shown that the descending portion of the larger division of the fifth does not traverse the rectiform body as has been believed, but the grey tubercle of Rolando. Moreover, "that both the vagus and glosso-pharyngeal nerve, on the way to their nuclei, traverse the grey tubercle, and pass through this portion of the fifth nerve," some of the roots terminating in the grey tubercle as one of their centres of origin.

"This intimate connection of the *sensory* division of the fifth nerve with the vagus and glosso-pharyngeal nerves in the grey tubercle, as well as the connection of its *motor* nucleus with the glosso-pharyngeal nucleus, with the returning fibres of the glosso-pharyngeal nerve, and with the fasciculus teres, are facts of uncommon interest."

The author gives a full account of the formation of the fasciculus teres, a longitudinal tract of cells which begins at the lower end of the olivary body, and lies on the inner side of the hypoglossal nucleus, increasing as it ascends, and ultimately constituting the chief portion of the nucleus from which the facial nerve takes its origin.

Of the *striæ medullares*, he states that he has always found them present in a greater or less degree. Sometimes they rise out of the *fasciculus teres*; sometimes out of the posterior nucleus of the auditory nerve, on the floor of the ventricle; but more frequently they sprang from the median sulcus, and from the *fasciculus teres* along its edge. After describing the relations of these adjoining structures the author observes—

"There can be no doubt that many of the *striæ medullares* connect both the *portio mollis* and the auditory nucleus with other parts of the medulla oblongata and brain." (P. 288.)

The *facial nucleus* occupies the greater portion of the convex longitudinal column, which runs along the surface of the fourth ventricle, and which is known to anatomists as the "*fasciculus teres*." Like the rest of the ventricle it is covered with columnar epithelium. Beneath this it consists superficially of nuclei and fibres of connective tissue, and more deeply it is composed of a large and mostly cylindrical column of nerve-cells, constituting its principal portion. These cells are large and multipolar, and resemble those of the hypoglossal nucleus. The connecting fibres of the facial nucleus are so numerous, and their arrangement is so extremely complex, that even if we had space to follow the author's description it could not possibly be understood without the elaborate drawings by which it is accompanied.

The author's account of the origin and course of the roots of the facial nerve differ considerably from that of previous anatomists, in consequence of the different and more varied plan of investigation which he has adopted. By a peculiar method of dissection described by the author, he found that the facial nerve, on reaching its nucleus, bends longitudinally down the medulla oblongata, along the fasciculus teres, and after a very short course, again bends transversely forwards and outwards to form a loop along the side of the median furrow of the ventricle. A *transverse* section of the medulla carried through the summit of this loop will of course present the cut end of a longitudinal column of fibres, which was mistaken by Stilling for what he supposed to be, and called, "the constant root of the trigeminus;" and by Schroeder van der Kolk for the cut end of one of the *striæ medullares*. The lower end of the loop in its course forward and outward, was found by Dr. Clarke to divide like a brush into separate fibres, which plunge into the motor nucleus of the motor root of the trigeminus, and into the superior olivary body. When we consider the physiological relations of the facial and trigeminal nerves, presiding over the movements of the muscles of the face and jaws in the acts of mastication and articulation, the anatomical connections of these two nerves above described must be considered of the highest interest. But we have given only an outline, and a very imperfect one, of the course and connections of these structures; for to enter into the elaborate details as described by the author would be impossible, and even any attempt to render them intelligible would fail without the drawings by which they are illustrated.

Clarke has some pertinent observations on the importance of combining together anatomy, experiment, and pathology, in physiological investigations. Neither of these alone, he remarks, is sufficient for the purposes of the physiologist.

"In attempting to determine the function of a particular part, pathology must be employed with great caution, when other parts of the same complex organ are at the same time affected by disease. The many contradictory results obtained by different experimentalists on the same subject are so frequent, that this method of investigation cannot be trusted alone. But experiment will be more accurate and precise, just in proportion to the accuracy of our knowledge with regard to the structure and relations of the parts on which the experiments are made."

Clarke points out some blunders that have been made from want of this combination of means of research. In illustration of the principles thus propounded, and also that we may show the practical value of Clarke's labours, we would draw

the attention of our readers to his remarks upon a form of paralysis hitherto obscure in its nature, but now seen more clearly by the light of the exact anatomy of the several nuclei, for which we are indebted to the author.

"There is a form of disease which was first distinguished from ordinary facial paralysis, by Duchenne (de Boulogne), and which has been called by Trousseau '*Paralysie glosso-labio-pharyngée*.' It consists of paralysis of the orbicular muscle of the lips, of the tongue, of the velum palati, and of some of the muscles of the larynx. The patient *gradually* loses all power of articulation; he is unable to protrude the tongue; deglutition becomes difficult; the velum palati is insensible to the influence of different kinds of stimulants; the posterior nares can no longer be closed by the velum and muscles of the posterior palatine arch, so that the voice becomes nasal; the mucous membrane of the larynx frequently becomes insensible to irritation, and fits of suffocation ensue. It is evident, therefore, that in this curious disease, the hypoglossal, the spinal-accessory, part of the vagus, and part of the facial, are together more or less injured. The disease is not common, and little is known of its morbid anatomy. In one case only, Trousseau examined with the greatest care, the brain, the cord, and roots of the nerves, but found nothing unusual; nevertheless, something certainly was to be found, and lesions sufficient to produce the symptoms, might very easily exist in the nuclei at the floor of the fourth ventricle without detection, or in the roots of the nerves arising from them. It is probable, however, that in none of these cases the lesion is limited to the medulla. There is sometimes weakness of one side of the body or of one arm; and sometimes, towards the end, the limbs become flaccid on each other and the patient is drawn up in a heap."—P. 318.

In a foot note the author adds,

"Since the above was written, I have read Trousseau's account of the post-mortem examination of a case in which the roots of the vagus were atrophied; the roots of the right hypoglossal were also atrophied to mere filaments; the roots of the spinal-accessory were on both sides small and of a greyish colour. In the neurilemma there was a fatty granular substance. The anterior spinal roots were atrophied especially near the roots of the spinal accessory. Many other anterior spinal roots were diminished in size. The grey substance of the cord was of deeper colour and harder than natural."

Clarke adds a few remarks upon paralysis of the facial and abducens nerves:

"Where paralysis of the facial nerve depends on cerebral lesion, it is frequently associated with paralysis of the abducens. Sometimes both nerves are paralysed on one side, and one of them on the other;

and sometimes, but more rarely, both nerves are paralysed on each side. I have seen two cases of this kind: one of them was in the practice of Dr. Hughlings Jackson. Now, when we consider that both the facial and the abducens nerves are connected with the same nucleus on the floor of the fourth ventricle, it is evident that a tumour pressing on this part, or any morbid process that injured it, would paralyse at the same time both the facial and abducens nerves; and if the lesion or foreign body extended across the ventricle to the other side a bilateral paralysis to a greater or less extent, would be the result. Dr. Wilks had under his care a little girl four years old, with paralysis of the right facial nerve and of both sixth nerves. The child's arms and legs did not appear to be much affected, but the left arm and leg were a little weaker than the right. On post-mortem examination by Dr. Wilks, a tumour about the size of a large walnut was found to occupy the pons Varolii, and more on the right side than on the left. On opening the fourth ventricle, the tumour was seen to project into its cavity, and thus all natural appearances of this part was gone." P. 320.

The seven plates which accompany this essay, include sixty-five illustrative drawings of the various dissections that are described in the text. So distinctly are these drawn, that if they stood alone the morphological changes undergone by the medulla oblongata might almost be traced through them. The descriptions of these, constituting the body of the work, present a notable example of precision in choice of words whereby the intricate relations of most complex structures are put before us with a degree of clearness that is marvellous. In fact, the essays of Dr. Clarke in the 'Philosophical Transactions' may stand as models of style in the exposition of anatomical details.

In an appendix, Clarke enters very fully into a description of his *modus operandi* in rendering transparent sections of brain and cord. Without being thus prepared it is hopeless to get at their true structure. We would advise those of our readers who may desire to see these things for themselves, to consult the directions given by the author. They will find after a little practice, and a good many failures, that they are seeing through their difficulties. We have ourselves not omitted also to practice several other plans that have been put forth for the purpose of rendering these sections transparent, but we have not succeeded with them at all so satisfactorily as with Clarke's method. Possibly, we owe this to that kindly disposition which the author has ever manifested in his readiness to impart to others the details of his process, even to the bestowal of his already over-taxed time, in personally directing their manipulation. The fact that the time given to these profound scientific investigations, and to these genial attentions to his

professional brethren, has to be taken from the calls and cares of the practice of medicine, will we feel sure greatly enhance our readers' estimate of the qualities of the author's mind.¹

REVIEW VI.

1. *A Treatise on Syphilis; Historical and Practical.* By Dr. E. LANCEREAUX, Head of the Clinical Department of the Faculty of Medicine in Paris, &c. In two volumes. Vol. I. Translated by G. WHITLEY, M.D. The New Sydenham Society. London, 1868. Pp. 405.
2. *Syphilis and Local Contagious Disorders.* By BERKELEY HILL, M.B., F.R.C.S., Assistant-Surgeon to University College Hospital, and Surgeon to out-patients at the Lock Hospital. London. 1868. Pp. 505.
3. *The Pathology and Treatment of Syphilis, Chancroid Ulcers, and their complications.* By JOHN K. BARTON, M.D., F.R.C.S.I., Surgeon to the Adelaide Hospital, &c. Dublin. 1868. Pp. 316.
4. *Atlas of Venereal Diseases.* By M. A. CULLERIER, Surgeon to the Hôpital du Midi, &c. Translated from the French, with notes and additions. By FREEMAN J. BUMSTEAD, M.D., Professor of Venereal Diseases in the College of Physicians and Surgeons, New York, &c. Philadelphia. 1868. Pp. 328.

There is perhaps no subject within the range of medical and surgical practice which has made more satisfactory progress during the last half century than that of the venereal diseases. It forms one of the points in our science to which we turn with satisfaction when all seems to be in confusion and uncertainty. Here at any rate we are making substantial progress. Here the tangled web of one class of diseases, and that a very large and important class, seems to be yielding to the patient efforts of a long succession of labourers, and is at length in the fair way to be disentangled and spread out before us as a simple and intelligible line of causes and effects. And it is worth while to notice that our increased knowledge of this subject does not arise from the progress which has been made in any of the subsidiary sciences or in mechanical contrivances. It does not depend upon the advancement of chemistry, or upon the perfection of the microscope. It is true that minute investigation has done much to trace out the visceral lesions which arise

¹ We must not forget to state that the Dublin College of Physicians have conferred upon the author the honour of enrolling his name among those of their members.