

PART II.

REVIEWS AND BIBLIOGRAPHICAL NOTICES.

Diphtheria: its Nature and Treatment, Varieties, and Local Expressions. By MORELL MACKENZIE, M.D., Lond London: J. & A. Churchill. 1879. 8vo. Pp. 104.

THE appearance just at the present time of this review of the history of an affection which has cast so dark a shadow over the entire nation is opportune; but it is doubly so as coming from the pen of one who has had, probably, the largest experience of all forms of laryngeal disease of any physician in this country. And as the labours of the Committee appointed to inquire into the etiology, &c., of diphtheria, have just terminated—the result of the inquiry being embodied in a Report to which we shall presently refer—it is as well that, in following the discussion on that Report, we should have in our hands so complete a *résumé* of the entire subject as that given us by Dr. Morell Mackenzie. The work is divided into eleven chapters, which embrace every point of importance, from the history of the disease to the secondary consequences which attend it in many instances. The definition of the disease, as given by Dr. Mackenzie, is as follows:—

“Diphtheria is a specific communicable disease, occurring epidemically, endemically, and solitarily,* and characterised by more or less inflammation of the mucous membrane of the pharynx, larynx, or air-passages, and by the formation on the surface of those parts—especially on the mucous membrane of the fauces and windpipe—of a layer or layers of lymph or false membrane, generally showing signs of bacteroid mycosis. During an epidemic other mucous surfaces exposed to the air, and wounded surfaces of the common integument occasionally, but less frequently, become covered with a layer of lymph, subsequently to, or independently of, a formation of membrane in the more ordinary situations. The disease is generally of an adynamic character, is often associated with a disturbance

* The author uses this word in preference to the term “sporadic,” which he observes is commonly employed in connexion with diseases supposed to be of spontaneous origin, or, at any rate, is applied to those which it is presumed arise from accidental causes, independently of any contagious influence.

of the renal function (albuminuria), and is frequently followed by lesions of innervation rarely giving rise to permanent paralysis. The symptoms as regards respiration, vocalisation, and deglutition, vary with the site of the disease. By far the larger proportion of fatal cases terminate by gradual apnœa, but a certain percentage sink from asthenia, blood-poisoning, and cardiac thrombosis."

As is well known, the origin of the term diphtheria is associated with the name of Bretonneau, who coined the word "diphtherite"—Greek, *διφθέρα*, a skin or parchment, and *ἵτης*, hasty—to indicate its inflammatory nature. Trousseau, following, used the term "diphthérie;" and hence the word, as used in British nomenclature, "diphtheria." In Chapter I. we find many interesting facts connected with the earlier attempts at a description of this or a similar disease. Dr. Mackenzie quotes from D'hanvantare, an Indian physician, who wrote a systematic work on medicine in Sanskrit, a Latin translation of which by F. Hessler, published at Erlangen in 1844, is in the British Museum. He describes a disease in which "an increase of phlegm and blood causes a swelling in the throat, characterised by panting and pain, destroying the vital organs, and incurable." He also says "a large swelling in the throat, impeding food and drink, and marked by violent feverish symptoms, obstructing the passage of the breath, arising from phlegm combined with blood, is called 'closing of the throat.'" The probability of the recognition of the disease by Hippocrates, the Syriac ulcer of Aretæus, the description of the barking cough and other characteristic features, such as the lividity and subsequent paralytic states, by Cœlius Aurelianus, are referred to.

It would appear as if the Askara of the Talmud was identical with diphtheria. In a footnote we find that—

"The word 'Askara' (אסכרה or אסכרא) means literally 'closure,' and is allied to the word Sakar (סכר), 'to shut up' or 'to close.' Askara is frequently used in the Aramaic dialect of the Babylonian and Jerusalem Rabbins. Its effect is compared to strangulation, and its danger consists in its being communicable to others. Some modern lexicographers translate 'Askara' by 'Croup.' Buxtorf, in the Basle edition of the Talmud (1639), renders it by 'Angina.'"

For the perusal of the interesting sketch which follows, of notices of the disease in Holland in 1557, by Peter Forest and Von Woerd; by Baillou in France, and Villa Real (1611) in Spain; Sgambatus, Severino, and others, in Italy; Patrick Blair and Fothergill at

home; and so down to the period when, in 1765, Home more fully described the disease, we must refer our readers to the sketch, so condensed, and yet so perfect, contained in the first chapter. The earliest American record appears to have come to us in 1789, from Philadelphia, from Dr. Bard, to be followed in 1798 by a paper by Dr. Archer, of the same city. In France the principal names associated with diphtheria are those of Marteau de Grandvilliers and Chomel, in 1749; and later, in connexion with the prize offered by Napoleon I., Albers, Jurine, &c.; to be followed by the memoirs of Bretonneau in 1818 and 1826; and, still later, Trousseau. Previous to this, Cheyne and Cullen, in Edinburgh, distinctly portrayed the features of diphtheria; but all through, and to quite a recent date, the diseases croup and diphtheria were considered by most authors as distinct diseases. The past quarter of a century has seen a mass of literature published on the etiology and pathology of this disease. Most prominent are the descriptions by Ernest Hart, Sir William Jenner, Greenhow, Thursfield, George Johnson, and the perfect account by Lewis Smith, in America, in his work on "Diseases of Children;" and the writings of Rindfleisch, Oertel, Hueter, Nassiloff, Wagner, Eberth, Labadie-Lagrave, and many others on the Continent.

In dealing with the etiology of the disease, and the natural history of the contagium, and subsequently in treating of the pathological changes in the mucous membrane, the views of Laycock, Erfurth, Bühl, Hueter, and others, are discussed. Oertel's name is that best known in connexion with the bacteria theory, which would assign to the presence of the micrococcus, or spherical, and the bacterium termo, or rod-like bacterium, the chief place as a cause of diphtheria, thereby stamping the disease as having, in the first instance, a purely local origin, there being a specific virus acting on the throat. But within the past few years this idea of Oertel's has not been sustained; and though, doubtless, it is true that bacteria are present in numbers on the fauces, on the lips of the tracheal wound after tracheotomy performed for diphtheria—in sores elsewhere than in the throat after surgical wounds—yet their mere presence does not prove Oertel's view. Bacteria, such as those described (*leptothrix buccalis*) on diphtheritic membranes, are found in various forms of simple or specific stomatitis, and in other conditions altogether removed from a suspicion of diphtheritic infection. According to the researches of Dr. Beale, vegetable organisms are present in the tissues of both man and animals even

in health, and may be found in the tongue, and elsewhere in the digestive tract. But, in addition, clinical facts would appear to disprove altogether the exclusive theory of the parasitic origin of diphtheria. Long before any local symptoms are developed, the system has given evidence of general disturbance; nor indeed is it rare to find cases without marked local symptoms from first to last. Such a case we have at present under our care, in which a state of phlegmasia in one leg has supervened on the fever of diphtheria, with no local sign save a few small pustules, general redness of the fauces, and a thin pellicle in a few places on the palate.

Yet the bacteria may circulate in the blood, and there may be no local appearances; but, as a strange coincidence of diphtheritic states, we notice the immunity which the lungs frequently enjoy from the attacks of the specific poison—a fact, as pointed out by Lewis Smith in his admirable work on “*Diseases of Children*,” in the chapter on Diphtheria, which invalidates the theory of the bacterial origin of the disease, as pneumonia, he says, is a rare complication. And we may conclude with Lewis Smith that “the truth regarding the relation of bacteria to diphtheria lies in one of two hypotheses—either that these parasites are the specific virus, and therefore cause the disease, or that the cause is something more subtle not yet discovered, which so alters the tissues and the blood that they become a nidus in which the bacteria are early and quickly developed, so that from being few and innocuous in the system, they occur in myriads.” Dr. Lewis Smith’s investigations into the pathological changes in the diseased membranes lead him to adopt the latter view.

This is hardly in accord with the experience of Dr. Morell Mackenzie, who lays special stress on the exudation changes which occur in the lungs, chiefly of a broncho-pneumonic nature; nor indeed can we say it agrees with our own, as we have frequently found, from the second to the sixth day, extensive lung changes accompanying or preceding the full development of the diphtheritic membrane. Beyond question, as in the interesting case of Dr. Semon in the Tyrol, quoted by Dr. Mackenzie, diphtheria can arise spontaneously. Not long since, in a secluded part of the country, in an isolated house, we were called to a case of diphtheria in a child, without any possible means of contagion that could be traced, and the affection ran through four children, to be followed in three out of the four with nasal signs and paralytic symptoms.

The strange power of inherent vitality which the poison of

diphtheria possesses is clinically shown and recognised by the manner in which it lies dormant in a house or locality for a long time previous to the occurrence of an outbreak. To this dormant period of inactivity it would seem as if there were no appreciable limit. It may be for months, or it may extend to years. This insidious lurking of the poison in the immediate neighbourhood of an outbreak, or its periodically recurring manifestations of activity, is shown in the case of New York, where diphtheria may be said (L. Smith) to be *endemic*. And indeed in this property of latent effusion and mystic contamination of the surrounding atmosphere, we find an explanation of the ready susceptibility with which, in all exanthematic states, the inflamed mucous membranes are attacked by the diphtheritic particles, and of the ready transition of simple catarrhal states of the throat, or of the mucous membranes elsewhere, into diphtheritic.* The practical lesson is obvious. A few years since we had under our care, during a short epidemic of diphtheria, a simple case of granular inflammation of the eyelids, which required gentle topical applications for its cure. Suddenly, after slight exposure, a most alarming attack of diphtheritic conjunctivitis supervened, which for days threatened the safety of the eye.

“The distance,” Dr. Mackenzie says, “at which the contagious principle can operate, as a rule, appears to be more limited than is the case

* In the British Medical Journal of January 4th, 1879, will be found the first part of the report of Dr. Eigenbrodt, embodying the opinion of himself and his colleagues on the causes of the intensity and extension of the epidemic in the Grand Ducal family at Hesse-Darmstadt. It would appear that the diphtheritic membranes were, from the first, of a peculiar type, having a discoloured (ecchymosed) appearance. The poison was transferred by kisses directly. But the important point is the previous predisposition to susceptibility, brought about by frequent attacks of catarrh of the mucous membrane of the pharynx and tonsillitis. Thus, in 1875, and again in 1876, Princess Victoria suffered from follicular tonsillitis; Princess Alice suffered from subacute follicular pharyngitis in the autumn of 1877; Princess Mary had some slight catarrhal attacks, with coryza occasionally, and one of these preceded the diphtheria; Princess Irene suffered from coryza and catarrh in 1876. Prince Ernest was a still more frequent sufferer, and had a constantly hypertrophied state of the tonsils. His Royal Highness the Grand Duke for many years suffered from a chronic catarrhal state of the pharynx, &c. Princess Ella (the only member of the family who escaped the epidemic) had enlargement of the lymphatics of the neck, and subsequent catarrh of the pharynx. Her Royal Highness had not for years suffered from any pharyngeal affection, and her illness commenced with a diphtheritic exudation on the right tonsil, thirty days after Princess Victoria was attacked, and twenty-two days after the beginning of the last case of disease in the family.

Dr. Thorne Thorne has, in the past year, strikingly proved, in the Local Government inquiries, the relationship which diphtheria maintains to simple sore throat.

in typhus or smallpox. Thus I have known an instance in which seven children were affected in a house which had a residence on each side of it, and a third opposite at a distance of only twenty-four feet. Although in all these buildings there were young children, no other case of diphtheria occurred. Other similar illustrations of this fact are on record. Under certain circumstances, however, the diffusive powers are increased, and, as appears to be the case in epidemics of influenza, the poison may be wafted over extensive tracts of country."

In fact, so numerous are the channels by which the poison may enter the system, that it would appear as if diphtheria in this respect almost exceeded, in its contagious qualities, other morbid poisons of a zymotic character. These instances narrated by Dr. Mackenzie are striking:—

"The remarkable case related by Dr. Paterson has an important bearing on the question of inoculation with diphtheritic membrane:—A man put his finger down the throat of a child suffering from diphtheria. The finger had a wound upon it at the time, which shortly after became ulcerated. All the constitutional symptoms of diphtheria subsequently appeared, and were followed by general paralysis of the extremities."

The spread of the poison by means of milk was last year proved by Mr. W. H. Power.

"In illustration of the first-named fact, the following case, which came under my own observation, may be cited:—A girl, aged six, who had been absent from home for five weeks, returned one afternoon at four o'clock. Her young brother, aged four, had shown symptoms of sore throat the same morning, but no suspicion was entertained that the disease was diphtheritic. These two children remained together till bedtime, but did not sleep in the same room. The next morning both of them had marked diphtheria, with an abundance of false membrane. The little girl had not been subjected to any infection before reaching her home. On the other hand, I have known one instance in which the disease occurred fifteen days after exposure to contagion:—A young lady, aged eighteen, insisted, contrary to the advice of her friends, in paying a visit to her cousins living in London, who were convalescent from diphtheria. She spent about two hours in their society, and then returned to her home in the country. Fifteen days after her visit she was attacked with diphtheria."

"Next in importance to age as a predisposing cause would seem to come *family susceptibility*. The liability of diphtheria to attack the members of certain families is well proved. Sir William Jenner lays

great stress upon family constitution as being ‘one of the most important elements favouring the development of the disease and determining its progress.’”

“Some remarkable instances of family susceptibility have come under my own notice. In one case a poor woman had three children of her own, and took care of two others in no way related to herself; her own children were attacked by the disease, and one of them died. The other two children—not her own, who were constantly in the same room with the little patients, never suffered from the disease. In another case four families occupied a house near Woodford, in Essex. In all of them there were several children. Two of the families were related, the mothers being sisters. All the children who were related to each other had diphtheria severely, whilst the children of the other two families escaped entirely. During the progress of the disease no attempt at isolation was made, the healthy children frequently entering the rooms of the patients.”

With regard to the protective influence of an attack of diphtheria, there is no question that it does afford, as in other affections of a kindred nature, protection from future attacks. But this rule has its exceptions.

“That the disease does sometimes recur I am well aware, for I have myself known three instances in which children have died from the second attack.”

“In my own case, I saw a child aged four with pharyngeal diphtheria in May, 1874, who died of laryngeal diphtheria under my care in July, 1875. I have seen the disease occur, in a mild form, three times in the same individual, at intervals of five months, a year, and two years.”

As regards the symptoms of the disease there is little new to offer. Classifying the disease according to its constitutional forms, Dr. Mackenzie thus divides it :—(1) *The typical form*; (2) *the mild, or catarrhal, form*; (3) *the inflammatory form*; (4) *the malignant form*; (5) *the gangrenous form*; (6) *the chronic form.*”

As to *site*, he is satisfied with the division into nasal diphtheria and laryngeal diphtheria, or croup.

The evening elevation of temperature, and the fall, as noticed by Faralli, on the fourth to the fifth day, and the presence of albumen in the urine, as well as the relation existing between these two symptoms and the development and progress of the disease, and the formation of the false membrane, are specially dwelt on—the albuminuria denoting, it should always be remembered, the danger of grave changes occurring in the kidney at the time, and, as a

consequence, a variety of brain symptoms, or, it may be, convulsions.

But we would direct special attention, in the chapter on Symptoms, to the remarks appertaining to what is rather ambiguously, as we conceive, termed "*catarrhal diphtheria*." The danger of our overlooking the simplest case of diphtheria is manifest. It is alike serious for the friends of the patient and the reputation of the practitioner. These milder forms of diphtheritic inflammation are those which most frequently perplex the physician by the obstinacy of the sequelæ. The description is so characteristic that the perusal, as detailed by Dr. Mackenzie, will amply repay any practitioner who will give to this chapter on "Symptoms" a critical study. The slight constitutional disturbance, the mildness of the local trouble, the supervention suddenly of the paralysis, are the most marked features of these frequently occurring cases. But in the chapter on Diagnosis the most likely sources of error, on the part of the practitioner, are carefully defined. It is better in these cases to err on the side of too great caution than on that of careless apathy. Nor is it requisite to alarm, or create unnecessary fear, by speaking of a "diphtheritic throat," or of a given case as one of diphtheria, until we are justified in cautioning friends, in order to conscientiously discharge our duty by a close watch on the progress and symptoms of any particular case of "*sore throat*."

Dr. Mackenzie devotes special chapters to the consideration of "Paralysis," "Diagnosis," and "Prognosis." We might have wished that the two latter points were more fully entered on—in fact, this is, we conceive, the only weak point in this admirable treatise. But, though the chapter on prognosis is short, the directions are concise and to the point, as, for instance, in this paragraph:—

"It must also be borne in mind that in certain families diphtheria has an exceptional tendency towards a fatal result. With regard to the *special* symptoms on which to found a prognosis, the following considerations chiefly deserve attention:—High temperature, extreme prostration, hæmorrhages, or urgent vomiting at the commencement of an attack, are signs indicative of extensive general infection, and must, therefore, be looked upon as of very serious prognostic import. Valuable information may be gained from the character and extent of the false membrane. *Ceteris paribus*, the prognosis is serious in proportion to the thickness and extent of the exudation."

Reading, as we did, anxiously, the chapter on Treatment, we

can candidly say that, as this is the portion of any new work on this subject which will be most eagerly scanned by a practitioner, so are the various plans of treatment done full justice to by Dr. Mackenzie. Every matter of detail in relation to the general support of the patient—the advisability of depletion, recuperative agents, such as iron and quinine; specific remedies, as mercury, sulphide of potassium, bromine, and balsams; the various antiseptics, notably the iron salts, salicylic acid, carbolic acid—is noticed. So, also, is the local treatment.

For our own part, we cannot say that, once the diphtheritic membrane has been formed to any extent on the fauces or throat, much benefit has been derived from any of the vaunted specifics—and all have been tried. Of all such we prefer the chlorate of potash with boracic acid in glycerine, alternately with perchloride of iron (3ss. ad. ʒi.) dissolved in glycerine, or the lactic acid; but often we are forced to try, in many cases, a new remedy, having failed with those we placed most reliance on; and thus permanganate of potash, chlorinated soda, syrup of chloral, sulphur, &c., &c.—all have their advocates. Dr. Mackenzie advises, as varnishes, the gums, benzoin, tolu, mastic dissolved in rectified spirit or in ether (1 in 5); and, the membrane having been dried with blotting-paper, a coating of the varnish is applied.

Remarks on the use of the introduction of steam, the value of the “portable croup tent,” and the general precautionary measures to be adopted in a suspicious case, as also the prophylactic rules, complete a chapter replete with information. The remarks on tracheotomy and the indications for the operation, as also the statistics, are reserved for the chapter on Laryngo-tracheal Diphtheria, or Croup.

On the 22nd of October the Report of the scientific committee appointed to examine into the relation existing between the diseases commonly known, respectively, as Membranous Croup and Diphtheria, was presented to the Royal Medical and Chirurgical Society. The complete Report of the committee has not yet been given to the profession, nor has the Report been fully discussed. The practical result of the labours of the committee might be summarised as follows:—

1. The causes of membranous inflammation of either larynx or pharynx are various, and may be briefly classified as those of Diphtheritic Infection, Zymotic, and accompanying the Exanthemata, Accidental or Traumatic, Catarrhal.

2. Membranous laryngitis may pass into or impart the pharyngeal affection.

3. It is not practicable to show an absolute line of demarcation between the laryngeal and tracheal inflammations, either from the nature of the causes, the presence of albuminuria, or the anatomical lesion present.

4. The only marked division observed being between membranous and non-membranous laryngitis, the distinction hitherto drawn by many between Croup and Diphtheria cannot be preserved, and the committee propose to use the term “ ‘Croup’ as a clinical definition implying laryngeal obstruction occurring with febrile symptoms in children,” while they regard “ ‘Diphtheria’ as the anatomical definition of a zymotic disease which may or may not be attended with croup.”

Dr. Mackenzie devotes Chapter IX. of the work to Laryngo-tracheal Diphtheria or *Croup*. Tracing the first use of the word “croops,” or “croup,” to Dr. Patrick Blair, in 1713, and subsequently to Home, he gives the synonyms which express this peculiar breathing or vocal sound in Dutch, *Geroop*; Icelandic, *Hrøpa*; Anglo-Saxon, *Hreopan*; Gothic, *Hropjan*; Old German, *Hrof*; Modern German, *Ruf*; or “it may be derived from the Gaelic, *Crup*, signifying a contraction—i.e., a contraction of the throat. Tracing the various views which have prevailed from time to time on the distinct nature or the identity of the two diseases, the author declares his conviction that “the pathological differentiation of the phenomena must be abandoned.” This proposition has been amply substantiated in all the cases we have seen, in which the naked-eye appearances after death have been observed, nor during life has any practical difference been detected when the membrane has been fully developed. The microscopical observations of Wagner and Rindfleisch confirm this opinion. Yet we can hardly feel justified in asserting that clinically the two diseases are one and the same. Broad as our views may be, and clearly as we may recognise the fact that we cannot define an *anatomical* distinction, still, beyond question, there is sufficient of difference in the localisation of the disease, in the glandular complications, in the frequent renal mischief, in the adynamic fever, in the characteristic sequelæ, and the dreaded epidemic type of the poison, and its contagious nature, to warrant a *clinical* differentiation. Nor, indeed, would we consider it wise that this clinical contrast should be forgotten by the practitioner. That there are forms of membranous croup, or,

if we consider the term more accurate, laryngo-tracheal diphtheria, which require a method of treatment widely different from the one we have to follow in typical diphtheria—which, commencing in the pharynx, gradually involves the larynx—is unquestionable. Nor can we quite agree with Dr. Mackenzie that “cases of sthenic croup are rare.” We have seen many such in which the prompt use of the lancet saved life; and when we find an advocate for the complete identity of the two diseases forced to devote a separate chapter to the “etiology,” “symptoms,” “diagnosis,” “pathology,” “prognosis,” and “treatment” of a so-called variety of the affection he is discussing, we may safely conclude that the special form has sufficient distinctive features to warrant our regarding it in a special light, and as anatomically and clinically differing. Most important is the caution during the first stage of the disease to examine the sputa.

“Children very often do not expectorate at all, but anything that is brought up must be put into a glass vessel and gently shaken with a little pure water. The mucus dissolves, and flocculi or small shreds of false membrane, if present, become visible.”

Thoroughly do we agree with the statement that, though a certain risk of the loosened membrane obstructing the larynx has to be run in the case of emetics—

“This risk must be incurred, though valuable time should never be wasted on the use of emetics, when the only alternative is the performance of tracheotomy. Tickling the fauces will occasionally be sufficient to excite the desired action, but as a rule it is necessary to resort to drugs. Cardiac depression is so common an accompaniment of diphtheria that it is unwise to employ any emetic by which it is likely to be increased. Tartar emetic must, therefore, be especially avoided.”

Sufficient stress is hardly laid on the early use of the emetic, ipecacuanha, and the great danger of the late employment of such a depressant. The early and free use of hippo, the judicious and timely employment of the warm bath, the securing of a proper temperature, and the administration of small doses of calomel, though old remedies, have nevertheless saved many lives in croup. We notice that nothing is said of the use of calomel in croup. As to the value of the steam atomiser, we can thoroughly endorse all that is said in its favour. Dr. Mackenzie advises ice to the neck, in the first stage of the disease, in an ice-bag. This plan, however,

we have of late relinquished for the simple warm dressing of lint with protective; and we can testify to the benefit which we have often seen follow in the earlier stages of croup from the light touching of the skin over the first few rings of the trachea with the liq. epispasticus, the mild blister thus produced being covered with the warm dressing. Dr. Mackenzie uses a squirrel-tail brush, with the hairs on the laryngeal portion of the brush directed upwards to remove any false membrane loose in the larynx—the common laryngeal brush and insufflator we employ for the application of solutions or powders. We would have desired greater detail in the portion of the work devoted to Tracheotomy and the methods of operating, as also the author's own statistics and personal experience of results. Of 5,922 cases occurring in the practice of Trousseau, the Hôpital des Enfants Malades, Hôpital Sainte Eugénie, the Hospital for Sick Children, Professor Langenbeck, Dr. Solis Cohen, there have been 1,542 absolute cures.

Unfortunately we cannot ourselves speak favourably of the ultimate results of the operation. In five cases of pure diphtheria, in two of which the operation was performed as a *dernier ressort* in the later stages, and in three when apnoea was almost approaching—though the first recovery was marvellous in all, lasting in four out of the five for from two to three days, the patients ultimately succumbed to pneumonia and extension of the membrane. We think it of extreme importance to draw attention to the caution given by Dr. Mackenzie, “immediately after the operation to draw out any loose false membrane either with the croup brush or with an aspirator accurately applied to the mouth of the cannula.” In the paper by Mr. Parker, read before the Royal Medical and Chirurgical Society in November last, the same step is strongly urged, whether it be membrane or mucus, and he enunciated the following dictum:—“The presence of membrane in the trachea in a fatal case of membranous laryngitis after tracheotomy, must be regarded as evidence of the want of due care on the part of the surgeon in charge, just as much as would the presence of a piece of gut in the inguinal canal after herniotomy, or a calculus in the bladder after the operation of lithotomy.” In seventeen cases of tracheotomy in membranous laryngitis at the Great Ormond-street Hospital, there had been eight deaths—an unusually successful result.

We congratulate Dr. Mackenzie on this addition to the literature of diphtheria. The work is full of practical hints, and being written

in his well-known lucid style, can be perused by the busy physician with pleasure. It is a book which should find its way into the hands of every practitioner.

H. MACNAUGHTON JONES.

On the Photo-chemistry of the Retina and on Visual Purple. Translated from the German of Dr. W. KÜHNE, Professor of Physiology in the University of Heidelberg. Edited, with Notes, by MICHAEL FOSTER, M.D., F.R.S.; Fellow and Prælector, Trinity College, Cambridge. London: Macmillan & Co. 1878.

THIS translation of Kühne's valuable monograph has been made, as Dr. Foster informs us in the preface, by Mrs. Foster, and we can well believe she "found the task of converting Prof. Kühne's somewhat idiomatic German into readable English not free from difficulty." Dr. Foster himself went carefully over the whole of it, and he has added some valuable notes to it in the form of an appendix.

The whole subject is one so full of interest, and the investigations of Prof. Kühne have added so much to our previous knowledge of it, that we venture to think a brief epitome of these researches may not prove unacceptable.

Kühne has, it seems, been reproached by some for having made use of Boll's well-known discovery of the sensitive purple colour of the retina, but, as Dr. Foster points out in a note to his preface—

"To Boll must undoubtedly be given the credit of the discovery that the retinae of many animals possess a sensitive purple colour (for the mention of it by previous observers does not amount to a discovery), and he therefore will rightly share in all the fame belonging to the subsequent development of that discovery. At the same time the study of Boll's writings can leave no doubt on the mind of the candid reader that at first Boll did not realise that the visual purple undergoes changes through the action of light after the death of the animal; he attributed the bleaching after death to *post mortem* decomposition. It was Kühne who was the first to observe that light bleaches the visual purple after death."

Prof. Kühne has bestowed great pains on his researches, and, though in the main agreeing with most of Boll's statements, he, nevertheless, in some important respects, differs from his conclusions. One of the first points to which he directs attention is, that the haste in the removal of the eye and the taking out of the retina,

which Boll considered so essential for the exhibition of the visual purple, is after all not at all necessary. He states that the retina may be quite leisurely spread out under the light of a good gas-lamp, and yet the colour will last from twenty to thirty minutes.

He made experiments with various reagents for the purpose of determining their effect upon the colouring and sensibility to light of the retina. He found that the colouring was destroyed by heating to 100° C., by alcohol, by glacial acetic acid, and by both concentrated and 10 per cent. solutions of soda. Various other reagents, on the contrary, had no effect—*e. g.*, a 0.5 per cent. solution of chloride of sodium, solutions of alum and of acetate of lead, 2 per cent. solution of tannic acid, strong ammonia, &c. Indeed the action of the latter appeared to be to intensify the colour. Once the colour was thoroughly bleached it never returned. In the case of the pig he found that it is unnecessary to keep it in the dark immediately previous to the removal of the retina, and he accounts for Boll's failure in demonstrating the colour, on one occasion, to exposure of the retina to light during the operation of removal, for, as we shall see further on, he proves by various experiments (p. 7) that so long as the retina remains in the eye, lying upon the choroid, the colour is restored. Long-continued exposure to direct sunlight can, and does, nevertheless, destroy it. It may legitimately be conceived—and, indeed, Boll expresses some such opinion—that the visual purple in the living eye is being constantly destroyed and as constantly renewed. The experiments which Kühne undertook with the view of elucidating this problem are very beautiful and ingenious. "The oculist," he says, "led by experience would immediately seek for the process of regeneration in the nourishment brought by the circulating blood; for this is a favourite way of accounting for most of these kinds of events." This explanation, however, at once falls to the ground, "since an eye, when taken out and opened, exhibits the same apparent indifference to light as when connected with the whole body and the nutritive currents." An idea immediately suggests itself that the pigment acts as a species of screen, preventing the greater intensity of light which would naturally be present had the retina a white background to rest on. Removing the retina and spreading it out upon a black surface, with the rods downwards, was not, however, found to have much effect upon the time of bleaching. The following experiments seem to prove almost exclusively that it is the choroid, including the retinal epithelium, which alone possesses the property of protecting

the purple from bleaching in light. The first experiment consists in removing the retina in such a manner that shreds of choroid still remain adherent to it. This can be accomplished by cutting out the bulb so as to leave a hole at the entrance of the optic nerve. By this means the spot which offers the chief resistance to the removal of the membrane is got rid of. The retina is now spread out smoothly, and exposed to the light until bleached. If the dark strips of choroid are now removed, the parts lying under them will be found deeply coloured.

Again, by slightly tearing the membrane in a bisected bulb, so as to make some folds in it, then allowing the light to shine upon it, and afterwards quickly pulling out the whole retina, it will be seen that where the folds were there are white stripes, whereas the rest remains red.

Another very interesting experiment consisted in raising up a considerable portion of the retina and inserting under it a piece of porcelain, then exposing the whole to light until bleaching took place, after which the part was allowed to sink slowly back on to the choroid, where it remained for some minutes. On now removing the entire retina it was found to be uniformly red all over, nor could any line be detected marking off the portion which had been raised. This proves that the retina may recover its purple colour again by simple contact with its natural support. Kühne has gone even a step further, and cut out a flap of the retina, bleached it on a plate, and then laid it back again upon the exposed pigment. This also regained its colour. So frequently, indeed, did this succeed that he was led to try whether pieces of tissue paper, inserted in the same way, would not also become coloured, thinking it might be due to some red secretion. They came out, however, quite colourless.

In the closing paragraph of Part I. Professor Kühne throws out the suggestion that the portion of the choroid which serves to regenerate the purple "is to be sought not so much in the dermic layer of the choroid as in the epithelium in which the rods are embedded, and which has been rightly considered as part of the retina. 'The retina,' he continues, "so long as it is maintained in its natural connexions with this epithelium, resembles not so much a photographic plate as a whole photographic workshop, in which the operator, by bringing new sensitive material, is always renewing the plates, and at the same time washing out the old image."

The second part of the monograph opens with an account of the literature of the subject, which shows that "the red colour of the retina had been seen by many observers long before it had obtained so great an interest through Boll's communications." Krohn and Hensen, in 1839 and 1842, both recognised it in the retina of the Cephalopoda. In 1851 and 1857 Heinrich Müller and Leydig both spoke of its occurrence in the frog; and in 1866 the matter was again mentioned by Max Schultze.

Kühne evidently does not participate in the rather premature expectation of many who seem to imagine that from the recent discoveries of the existence and behaviour of this visual purple "we are now in a position to understand tolerably well how the excitation of the optic nerve is brought about by the action of light." For while admitting "that the various decomposition products of the visual purple—namely, the orange, the yellow, and in particular the colourless substances, serve as chemical stimuli for the ends of the optic nerve, while the original visual purple serves as an inert medium having no effect upon them," he nevertheless adds the caution "that the visual purple must not be looked upon as the only substance in the retina which is sensitive to light."

For many years the transformation of the movements of the luminous ether into chemical processes has had considerable currency, but there was nothing to justify the assumption that any of the substances necessary for such action could be recognised by their colour—that one of them has been so Kühne regards as very fortunate.

Proof is still wanting that all visual organs are furnished with this purple, or that when it is bleached, blindness ensues. Closely connected with the physiological part of the question we find an anatomical one of considerable interest and importance—namely, the mode of termination of the optic nerve-fibres. If it is supposed that the terminal fibres "embrace the refractive bodies in the inner limbs of the rods and spread out in the red outer limb, in that case the final terminations—which might continue to be considered similar to the fibres of the optic trunk and indeed to all genuine nerves in respect to structure, composition, and irritability—would be in the most simple manner stimulated, through the medium in which they lie becoming loaded by photo-chemical action with some caustic agent." If this be so it might be reasonable to expect that if the posterior surface of the retina were applied to an exten-

sive section of a motor nerve of a frog, and then illuminated, the stimulus would be conveyed to the latter. Such an experiment Kühne states he has frequently tried, but hitherto with negative results. He says, however, that he does not consider the hypothesis so disproved, as many and obvious objections may be raised against the experiment.

Another hypothesis which he considers it right to mention—namely, that the visual purple may be the result, and not the cause, of an irritation of specific nervous elements by light, is clearly contradicted by the sensitiveness to light of all dead retinas. Before, however, being aware of this, Kühne had not omitted testing fresh retinas of frogs in the dark with every kind of electric stimulus, but always with negative results.

To find out whether all the other sensitive elements of the retina contained this purple was the next task Kühne set himself to investigate. He had already been struck by the fact that he had never seen any trace of it in the cones of the frog, and further examination failed to discover it there. The evidence of its existence in the retina of some birds (pigeons and fowls) which contain a large number of cones also proved fruitless; and this, it should be noted, is contrary to the experience of Boll, who maintains that it is present in the retina of pigeons.

Kühne examined the eyes of two owls of different species; in the one he found the purple colour spread uniformly over the centre of the posterior of the retina, and in the other it was less so. In a tower falcon he found the colour in stripes and spots, and confined to those places where there were few cones. In the bat the retina was colourless. In the badger the colour was present, as also in the eel and loach. In the eel the colour was more intense than in any other animal he examined, with the exception of the owl. The eel has no cones in its retina.

As regards the human eye, Kühne says he has only been able to examine one pair of eyes "which were in any way in a condition in which they could be of any use." Even in this case the examination was not made till two days after death. Special precautions, however, had been taken that light should be excluded. About half a minute before death light was excluded, and a dark covering was afterwards laid over the head and eyes of the corpse. As far as could be judged without absolute certainty, on account of the number of hours which elapsed after death, the examination seemed to show that the portions of the retina which were rich in cones

possessed very little purple, and the parts consisting entirely of them—viz., the macula lutea and fovea—had none. In the carefully prepared Appendix which Dr. Foster has added to this translation there is a note from which we learn that Kühne has since had opportunities of extending and corroborating the above statements. "He finds that the purple is present in the rods only, being entirely absent from the cones."

The examination of the eyes of apes was confirmatory of these observations; and the eyes of snakes, in which the rods are absent, showed no purple colour, nor could any be detected in the eyes of lizards. This had also been noticed by Boll.

In the retina of the carp the difference between the purple rods and the uncoloured cones was very marked.

It is a point worthy of note that Kühne found the retina of a foetal calf quite clearly coloured purple—"the colour, when exposed to light, first passed into yellow, and then entirely disappeared; in this case the rods were clearly recognisable under the microscope as delicate short palisades."

The next question which suggested itself to our author was the possibility of isolating the purple colour. This, after numerous experiments, he succeeded in accomplishing by means of a solution of bile. For the details of the method we must refer the reader, who is anxious to investigate the matter more deeply, to the work itself. Having obtained the colour in an isolated condition, Kühne then proceeded to test its capacity of absorption of light of different wave-lengths. He speaks of the failure which had attended all his previous efforts "to become acquainted with the absorption spectrum of the retina, by holding the glass-plate on which it had been spread out before the slit of the spectrum apparatus; either the absorption was too weak or there were so many horizontal shadows and stripes in the image that nothing could be made out clearly." We can bear testimony to the same difficulties, having experienced them when trying some similar experiments about six years ago with the assistance of Mr. C. F. Burton.*

The results Kühne arrived at are briefly as follows:—He found "the absorption begins in the yellow, being very weak in the yellow of the D line, increases to E, the rise being very rapid at the beginning of the green, and a further increase at the junction of the green-blue and blue, and decreases again towards the violet."

His next research was the determination of the absorption power

* Late Assistant at the Astronomical Observatory, Dunsink.

of the visual purple in its natural position in the retina, by means of the objective spectrum—for by that he hoped to get rid of “the dispersion in the retinal membrane which interfered with all experiments in which the retina was placed between the source of light and the prism”—and this hope was realised as soon as he “placed the frog’s retina, laid on a slip of milky glass, in the spectrum of a Drummond light.” He sums up the action of monochromatic light on visual purple as follows:—

“(1.) Monochromatic light decolourises and bleaches visual purple as white light does, only considerably more slowly, corresponding to its lesser intensity.

“(2.) Of all kinds of monochromatic lights the following act with decreasing rapidity:—greenish-yellow, yellowish-green, green, bluish-green, greenish-blue, cyanic blue, indigo blue, violet, later pure yellow and orange, still later ultra-violet and red. The extreme red and ultra-violet rays are not entirely without action, but the commencement of the ultra-violet is more active than that of the visible red.

“(3.) The transitional stages of visual purple as it passes to white—namely, the products of bleaching—orange, chamois, and pale yellow—are least resistant to monochromatic light in indigo and violet, are more so at the beginning of ultra-violet than in the range from cyanic blue to orange, and are more resistant in pure red.”

Kühne’s next experiments were on impure coloured lights. Coloured glass he found did not answer for these experiments, “owing to the small choice they offered and to the difficulty of obtaining intermediate tints.” By means of solutions of carminic acid and picric acid, cupric oxide, and cupric sulphate and picric acid, he was able to get a very good red-green and blue-violet. The following is the result of the bleaching action of the retina he obtained in these experiments:—In a blue, which seemed to his eye so deep that he was unable to manipulate in it much better than in the dark, the purple bleached in two to three hours; while in the green, which appeared very luminous, it took from three to four hours. In a brilliant red “the action first became distinct after the lapse of sixteen hours, and it was not till twenty-four hours that all traces of colour vanished from the retina.”

Experiments on the purple of the living eye were those which next engaged Kühne’s attention, and in recounting them he again reasserts both the statements he previously made with regard to the influence of the choroidal epithelium in restoring the purple colour in a removed and bleached retina, when the latter is

reapplied to its surface. The visual purple during life, however, is very durable, and the prolonged exposure which is necessary in order to destroy it, would seem also to have the effect of removing this regenerative property from the epithelium. This appears to be placed beyond a doubt by the following experiments:—

“The retina is removed carefully from the eye and exposed until it has become bleached. The fundus of the eye is now exposed to intense light for 20 to 30 minutes, the retina meanwhile being put back into the dark. If the retina is now carefully replaced upon its old support, the red colour will scarcely, or not at all, return, even though the rods be allowed to remain for hours in contact with the epithelium.”

That this is not due to decomposition or death of the epithelium, but simply to the action of the light, is proved by the fact that—

“An equally long exposure of the uncovered epithelium in the dark scarcely at all affects its power of regeneration, as may be shown by the positive result of an experiment the reverse of the above, in which the retina only is exposed to daylight.”

The experiments on the living retina with coloured lights, though on the whole confirmatory of those made on the removed retina, did not satisfy our author, and he says:—

“After some positive results in the midst of a very large number of negative ones, I was about to give up the whole arrangement, had I not accidentally made the following observation. One of the frogs placed in the blue light had kept his eye steadily fixed on the flame, and I found in the retina, although it had been exposed to the light for only fourteen hours, a most beautiful image of the gaslight standing out perfectly colourless on the deep red ground of the bacillary mosaic. The retina came out of the eye wonderfully smooth, without any merit due to me, and lay spread out completely flat on the cover-glass, every rod standing upright with its pigment-face end uppermost.”

He goes on to say:—

“This suggested a simple means of obtaining at pleasure photographs on the retina. It is only necessary to render the frog motionless with urari, and having cut away the nictitating membrane, and having caused the eyes to project somewhat, by stuffing a ball of paper into the mouth, to expose the animal for about two hours before a flame. The best distance is about 35 to 40 cms.”

Kühne, in conclusion, gives a most interesting account of his experiments and method of obtaining what he terms optograms, or

photographs upon the retina. After numerous failures, he at length, partly by accident, succeeded in obtaining very beautiful optograms. His method, as perfected, may be briefly described as follows:—The eye is opened and thoroughly freed from the vitreous humour, and immediately after receiving the image it is placed in a solution (4 per cent.) of alum, which has the effect of hardening the retina. In this it remains, in the dark, for twenty-four hours. It is then taken out and placed upon a leaden support, under water. Upon this leaden support the optic entrance is punched out, and the membrane is then seized at a point above the optic disc. "If the operation is carried out without a mistake, the retina can often, with a slight jerk, be pulled out of the solid sclerotic cup like a delicate shell, without its collapsing or creasing at all." A small porcelain capsule, hardly bigger than half a rabbit's eye, is now brought, upside down, under the water, and upon this the retina is allowed to sink slowly. By means of a suitably-bent strip of lead, which has been slipped under the capsule, the latter can be raised into a horizontal position.

Kühne has also found a method of fixing these optograms by drying the retina in a sulphuric acid desiccator.

In an epitome such as this, several subjects of the greatest interest and various important details have necessarily been passed over. It is chiefly intended for those who have not the leisure or opportunity of consulting the original. To those who take a deeper interest in the matter, we most cordially recommend this valuable monograph. The subject is one of absorbing interest, and though it may never add much to ophthalmology in general, it will doubtlessly enrich that branch of it which relates to physiological optics.

C. E. FITZGERALD.

The Sight and how to Preserve it. By HENRY C. ANGELL, M.D.;
Professor of Ophthalmology at Boston University. Pp. 63.
London: Hardwicke & Bogue. 1878.

WE wish we could believe that the publication of popular works such as this really does any good. The object, no doubt, is excellent, yet it is impossible to shut our eyes to a danger which it seems must inevitably follow the widespread distribution of such books; and it is this—that the laity, relying upon the general principles enunciated in these treatises, will consider themselves competent to

prescribe for the disorders which they and their friends suffer from, and to play the part of amateur ophthalmologists. The number of people who *dabble* in scientific subjects is now-a-days greatly on the increase, and at no time was it more urgently needed to proclaim aloud that "a little learning is a dangerous thing" than in this age of primers and concentrated sketch-books on matters relating to science, literature, and art.

It should not be forgotten that to acquire a proficiency in the science of ophthalmology demands a special training, and that the particular branch of it which relates to the anomalies of the accommodation and refraction is one involving some of the most difficult problems that the specialist is called upon to solve. Consequently, books purporting to treat such matters in a popular manner should not be lightly taken in hand. Above all things, if we must have these books, it is of the utmost importance that they should be extremely accurate in every statement they contain, especially when it comes to such a question as the treatment of a delicate organ like the eye.

Though, in the main, we have no cause to complain of the very popular and lucid description Dr. Angell gives of the eye and its anomalies, there are, nevertheless, one or two points to which we would take exception. In speaking of the use of eye-glasses in weak sight (asthenopia), after very properly advising those who suffer from this affection to consult a competent oculist, he adds (p. 17):—

"For the benefit of such as are unable to get proper advice, it may be as well to say that the convex glasses will probably require to be about 48-inch focus, and that they are to be worn only in reading, sewing, and such occupations as require the accommodative apparatus of the eye to be brought into use."

Of course he is here merely speaking of cases of accommodative and muscular asthenopia not depending on any anomaly of refraction (myopia, hypermetropia, or astigmatism); but, as he subsequently points out, weak sight, or asthenopia, is of very frequent occurrence in myopia (p. 30). We need scarcely say that the use of convex glasses in such cases would be highly injurious; yet we can quite conceive a patient so affected, and relying on the advice given above, persevering in their use, because Dr. Angell says (and very truly, be it noted) that "to accustom the eyes to the help of glasses may require some days or weeks and considerable patience."

Dr. Angell may say, "There is no danger of such a mistake,

because at p. 31 I give the methods of testing for near-sight (myopia)." But we answer that the tests he gives are valueless unless controlled by an ophthalmoscopic examination. The fact that test-type "No. 20 cannot be seen at twenty feet, nor No. 50 at fifty feet," is no positive proof of the existence of myopia, as the same may occur when hypermetropia is present. Nor is it a "more certain mode of detecting near-sight to put a pair of weak concave glasses before the eyes," for it is not at all uncommon to find the same proceeding in hypermetropia frequently "improves the vision for distance" to a most remarkable extent. It is easy to see to what serious complications advice like this may lead; and though, as we said at first, in the main agreeing with most of what the author states—and, indeed, highly commending some admirably practical remarks of his on progressive myopia in children—we are, nevertheless, totally opposed to the idea of suggesting that people, under any circumstances, should, on general principles, undertake for themselves such an important and delicate task as the selection of suitable spectacles.

Notes on Physiology. By HENRY ASHBY, M.B.; formerly Demonstrator of Physiology, Liverpool School of Medicine. Pp. 238. London: Longmans, Green, & Co.

THE notes are compiled for the use of students preparing for examination, and, consequently, they are not free from the imputation of being really a final "cram." To give a bird's-eye view of such a subject as physiology is a difficult, if not an impossible, undertaking, and Dr. Ashby's condensation, if not a success, is at least not inferior to any of the same limited size. The opening chapter, on Physiological Chemistry, is meagre—Peptones, for instance, being dismissed in a single sentence. The histological notes are fuller than the physiological, and the chapters on the Nervous System are as complete as the space at the author's command will admit of. Dr. Ashby has certainly epitomised a great number of facts into his 238 small pages; but we fear that note-books of this kind will lead the careless student to trust to his recollection of details, rather than to follow out the processes by which the details are reached.