

external surface of the cervix he calls the epithelial variety, which may be combined with either epithelial or villous abrasion. Of both the varieties of this complication we have interesting microscopical descriptions, which our readers will do well to study. Numerous other points of importance are elucidated in this paper, with some views perhaps not so well established; but we have no hesitation in saying, that the facts stated by Dr. Smith, if corroborated by further experience, must, to a very great extent, modify our views of the structure and diseases of the cervix uteri. We trust he will extend his researches to the cavity of the uterus, and thus have the credit of illuminating the anatomy and pathology of that organ, upon whose physiological action he has written so admirably.

We should deserve blame if we did not mention, in terms of great praise, the beautifully executed plates which accompany the paper.

Fleetwood Churchill.

REVIEW II.

1. *The Effects of Lead upon the System*: being the subject of the Lumleian Lectures, delivered at the Royal College of Physicians for the session 1852. By JAMES ALDERSON, M.D., F.R.S. ('Lancet,' vol. ii. 1852.)
2. *Some Observations on the Contamination of Water by the Poison of Lead; and its Effects on the Human Body; together with Remarks on some other modes in which Lead may be injurious in Domestic Life.* By JAMES BOWER HARRISON. Fcap. 8vo, pp. 196.

ALTHOUGH the fathers of physic were very familiar with the acute and well-marked effects of lead on the human body, yet it is only in modern time that physicians have become acquainted with the chronic and insidious action of this metal. The former of these effects were observed in those cases where the poison had been administered in the concrete form of minium, ceruse, and litharge, but the latter have resulted from the introduction of the metal into the system in a far more subtle condition, and often in a state of casual admixture with various articles of food. This fact was first noticed about a century ago; and, although it has since been made the subject of several valuable dissertations, yet it is only just beginning to assume its proper importance.

"Colica pictonum," says Dr. Alderson, "considered as a disease depending on the absorption of lead dissolved in cider, was first brought before the medical profession in this country in the year 1767. In that year, Sir George Baker, a physician of great talent and celebrity, read an essay before the College of Physicians on the cause of the endemic colic of Devonshire. The disease had been previously noticed in the same locality by Doctors Musgrave and Huxham, but without suspicion of its real origin—nay, even Citois, from whose accurate observation of the symptoms in the wine-district of Poitou, the malady derived the name whereby it is still known, deemed it only the effect of the unripe, austere wines of the province." (p. 74.)

Ten years, however, before the date just mentioned, Tronchin published a work on the same subject, and proved that the occurrence of lead colic at Amsterdam was due to the employment of lead instead of tiles for the roofing of houses; in consequence of which the water became impregnated with the metal, and acquired poisonous properties. Important as these

facts were, they nevertheless commanded but little public attention. True, they were readily admitted into our standard works on medicine, but beyond this they obtained no serious consideration. A few earnest physicians, whose names will ever be mentioned, in connexion with this subject, with gratitude and respect, Drs. Hunter, Warren, Lambe, Christison, Percival, and Burton, in this country; together with Tanquerel, Merat, Andral, Breschet, Rumbelt, and a few others on the Continent, have, at various times, endeavoured to awaken the public mind to the vast importance of the matter, but unfortunately with little success. Now, however, after the lapse of nearly one hundred years from the time of Tronchin, eighty-five from that of Sir George Baker, and fourteen from the date of Tanquerel's work, we have the whole subject re-discussed, and the facts of it presented to the profession in the form of three brief but powerful discourses, each of which has been brought forward independently of the others. These are the able review of Tanquerel in our contemporary, the 'Edinburgh Journal,' and the two productions whose titles are placed at the head of this article.

Dr. Alderson's lectures are three in number: they are devoted to a general description of the chronic effects of lead, and to an account of the best means of remedying them. It is, perhaps, too much to expect that our author should have brought forward any novelty in the matter, seeing that the labours of Tanquerel, Merat, Christison, and Burton, have been so complete, as to leave hardly anything for their successors to perform: we must therefore be contented with the fact, that he has given us an admirable summary of all that is known of the disease: in addition to which he has invested it with an interest that it did not before possess, by that display of humanity and earnestness of manner with which he presented it to his distinguished auditors.

"The subject of colic and paralysis, the result of the absorption of lead, commends itself," he says, "to the notice of this assembly, by the same peculiarities which have deterred the great body of medical practitioners from bestowing much time and attention upon it. It is, in one form at least, a disease almost exclusively confined to the labouring class, and therefore a fit subject for the benevolent consideration of those who are the true guardians of the public health, and especially of the health of that part of the public who need the protection which they have not the power of obtaining for themselves." (p. 74.)

He likewise reminded his hearers, that, "unhappily, the victims of that poisonous agency, which in days of yore was but suspected or casually remarked, are now numbered by hundreds, nay thousands, in all classes, and especially among the artisans of several trades hereafter to be particularized." (p. 75.)

Dr. Alderson believes that lead may be rendered soluble by any of the secretions of the body; and that it may therefore gain access to the system by the lungs, the alimentary canal, the vagina, the skin, and even by the conjunctiva. He discusses the various ways in which absorption from these surfaces may be effected; and he points to a fact derived from statistical observations—namely, that absorption by the lungs is more productive of deleterious consequences than any other mode of receiving the metal into the system.

He states that the disease manifests itself among all who are engaged in the manufacture or use of lead compounds; that it is not only observed

among painters, lead-smelters, shot-manufacturers, sheet-lead rollers, and the workers in sugar-of-lead, white-lead, litharge, and red-lead, but it is also seen among plumbers, potters, compositors, glass-melters, sealing-wax makers, and the enamellers of German cards. Some idea may be formed of the relative frequency of the disease among these artisans, by consulting the statistics of the Parisian hospitals. We are informed by Merat, that during the years 1776 and 1811, 241 cases of lead colic were admitted into the wards of La Charité. Of these, 148 were painters, 28 plumbers, 16 potters, 15 porcelain-makers, 12 lapidaries, 9 colour-grinders, 3 glass-blowers, 2 glaziers, 2 toymen, 2 shoemakers, 1 printer, 1 lead-miner, 1 leaf-beater, and 1 shot-manufacturer. In 1841, there were 302 cases admitted into the hospitals of Paris; of these 266 were occupied in white-lead factories: and according to the report of MM. Pelouse and Rayer, who were deputed by the Academy of Sciences to inquire into the best means of ameliorating the evil consequences of such occupations, it appears that from the years 1838 to 1847 inclusive, 3142 patients labouring under lead-disease were admitted into La Charité; of which 1898 came from the white-lead manufactories in the department of La Seine alone. Their report further informs us, that during these ten years, the average number of patients had risen from 268—the number in Tanquerel's time—to 314.

“An idea prevails that the women are less frequently affected by the pernicious influence than the men. We can scarcely deny some degree of credit to a popular idea, which can be founded only on observation; but I doubt its truth to any great extent. At least, it is certain that the immunity of the females is so small in extent, that in one of the larger manufactories of this metropolis, where seventy women are employed, the average of attacks is about two in a week. The impression among the workmen is, that the fineness of the pores of the female skin in some way protects them; but I should rather attribute it to their not being employed in the more dangerous branches of labour, such as sifting, packing, &c., and also to their more cleanly habits. Their comparative temperance is also a protective, for it is found that the use of ardent spirits, or anything which tends to debilitate the system, favours an attack; and this is borne out by the French statistics, in which it is shown that a very large proportion of these patients are admitted into ‘La Charité’ early in the week, a time succeeding their usual days for indulgence. Stimulants are also referred to by Dr. Bright, in his Hospital Reports, as an exciting cause. The statistics of ‘La Charité,’ though they state that only fifty-seven women were admitted out of 1200 cases, do not assist us to form any conclusion, as they are defective in a statement of the relative numbers of men and women employed. It has been suggested by a good authority, that the immunity is due to their organization. Tanquerel, however, states, that sooner or later, in France, every individual who works in the lead-manufactories is in turn attacked by the disease. The average time of exposure previous to an attack, as given by him, ranges between three days and six years, the general average being fifty-one days; and this fact, therefore, relieves us at once from the task of descanting on the causes for the alleged immunity of the female sex.” (p. 98.)

As to the question of age at which attacks are most common; this, says Dr. Alderson, is much dwelt on by the French.

“Their tables show that between 30 and 40 years of age is that between which the greater number of cases occur, the next periods being from 40 to 50, and then from 20 to 30, the extremes at either end of the scale being exempt. It is impossible to draw any results, however, from these imperfect statistics, as the duties of the workers employed, as well as the aggregate numbers, should be known, for any argumentative purpose.” (p. 98.)

Of 279 cases of colica pictonum referred to by Merat, 24 were under 20; 113 were between 19 and 30; 66 between 29 and 40; 38 between 39 and 50; 28 between 49 and 60; and 10 above the age of 60.

The mortality from colica pictonum is not very great, for Dr. Christison says, that of Merat's 279 cases 15 died, or 1 in 18·6. In 1833-4-5-6, there were 1541 cases treated in the hospitals of Paris, of which 38 died, or 1 in 39·5; and in 1839-40-41, there were 761 cases, of which 31 died, or 1 in 24·5.

Among the other causes of lead-disease must be mentioned the use of food or drink contaminated with the metal. We have already alluded to this fact in our review of Dr. Normandy's work on the adulterations of food;* but we may here again briefly state, that lead-pigments, so frequently employed for colouring cayenne pepper, cheese, lozenges, snuff, &c., are very likely to produce the disease in question. The fluids which are liable to become charged with lead are, water, wine, cider, vinegar, beer, porter, milk, and, in fact, all sour and saline liquids which are stored or distributed in leaden vessels.

"It is impossible," remarks Dr. Alderson, "to say how many cases of unaccounted for disease may be referred to such remote sources; and in the obscurity which involves the first disturbances of the equilibrium of the functions of the body, it is neither trifling nor unreasonable to search out their causes in the smallest tangible shape." (p. 393.)

Mr. Harrison has discussed with great minuteness the probable modes in which water may become charged with the metal; and, as we shall see hereafter, he looks upon it as one of the commonest sources of lead-disease.

Dr. Alderson has described the symptoms in the order of their occurrence, and has directed attention to the blueness around the edges of the gums, and their liability to hæmorrhage—both of which, he thinks, are among the earliest indications of the malady; then to the waxy tint of the countenance; the emaciated, anxious look; the pooriness of the blood; the quick but feeble pulse; the obstinate constipation; the attacks of twisting colic, which are relieved by gradually increased pressure; the nausea and distress from flatus; the checked secretions from the kidneys and alimentary canal; the wandering rheumatic pains; the weakness of the upper extremities, amounting at last to palsy; the amaurosis; and, finally, the fatal apoplexy. He remarks, however, that

"The effects of the imbibed poison are by no means constant: different individuals are affected in dissimilar ways. In one, colic will be the result; in another, paralysis; in a third, the effect may be merely anomalous pains in the limbs or in the body, which, without the history of the case, might seem obscure in their origin and nature; in a fourth, the morbid influence may be manifest in the form of epilepsy or convulsions, and a modification of the paralysis is sometimes found in the forms of amaurosis and deafness. These several varieties have been separated by the French into distinct forms of disease, for each of which they have elaborated a high-sounding designation, such as 'arthralgia,' 'encephalopatic,' &c.

"All these various results of the action of lead may, however, be set up in different individuals under the same identical circumstances, labouring in the same workshop, and exposed to the same deleterious influences. It is more reasonable, consequently, to regard them as a series of symptoms developed differently, accord-

* See vol. viii. p. 77.

ing to the peculiarity of individual constitution or of the especial mode of absorption of the poison. The classification will be more convenient, as well as more efficient for the purposes of treatment, if we divide the subject into the two leading forms of colic and paralysis. Colic has usually been called the acute, and paralysis the chronic form; but I have considerable doubt of the accuracy of this distinction. There are well-recorded instances of paralysis being set up after a very short period of exposure to the noxious influence, without any intervention of colic; while, on the other hand, long-continued and frequently-repeated attacks of colic occur without paralysis supervening. Colic is undoubtedly the form of most frequent occurrence, and that with which practitioners are most familiar, especially in this country. Happily, also, it is the form which is the most amenable to treatment—indeed, so manageable that it is rarely fatal.” (p. 75.)

He is of opinion, that when lead gains admission into the body through the lungs, it is most likely to occasion paralysis of an acute kind, but that when it enters the system by the alimentary canal it most frequently produces colic. In explanation of the former effect, he hazards a conjecture that it may be owing to the numerous intimate communications between the nerves of respiration and those of the axillary plexus. He says, indeed, that

“Dr. Bright’s observations all lead him to this origin as the point in which to look for the seat of the disease; and here it is that the axillary plexus, the phrenic, and many of the nerves of the mechanical part of respiration, have their rise. It would appear, besides, as if it were possible that the absorbent glands in the axilla might, in some degree, promote the transmission to the trunks of nerves which supply the upper extremities; and there is one remarkable fact, that all the muscles in the forearm affected by this form of paralysis are supplied by one individual nerve.” (p. 392.)

These views are, he thinks, supported by the phenomena witnessed among the workers in quicksilver.

“The paralysis to which these artisans are subject differs entirely from that which affects the workers in lead. Mercurial tremblings are known to arise from the absorption into the blood of the fumes of mercury during respiration. They come on gradually, with an incapacity to direct the arms and hands; and this want of power to direct increases to shaking, and then to trembling, and in time other parts of the body participate.

“Now, we have all seen mercury given to its full constitutional effect, as evidenced by ulceration of the gums and complete salivation, and yet we have no record, that I am aware of, of mercury taken by the mouth having produced these tremblings. As far as we know at present, it would appear that it is requisite that mercury should be received into the blood by absorption through the lungs in the act of respiration, in order to occasion these tremblings.” (p. 212.)

And he afterwards says :

“I do not pretend to offer this as a fully-matured explanation; it may, however, deserve so far as to draw the attention of physiologists to the subject, and to induce them to trace, through this morbid state of the nerves, some hitherto unexplained nervous connexion between the act of respiration and the upper extremities.

“One more point on which I should like to remark is, that the parts paralysed are those which are most especially called into immediate action during the processes which occasion exposure to the metallic influence, whether the paralysis consist in loss of power of motion, or of sensibility—whether in paralysis of the extremities, or in loss of sensibility in an organ of sense, as in amaurosis. Lead-pickers use their fingers and eyes; and the compositors are a stronger instance of both finger-ing lead and straining their sight to discriminate the small types. They are both, especially the latter, subject to paralysis and amaurosis.” (p. 392.)

In those cases where colic is the result, he thinks that the specific seat of the disease is in the large intestine, the circular fibres of which have first become contracted, and then paralysed, by the local action of the lead on the tissues. Indeed, this appears to be the probable cause of the mischief in every case; for it is an ascertained fact, that the metal always exists in the tissues of the paralysed muscles; and with respect to the phenomena witnessed, Dr. Alderson remarks, that—

“The *complete* influence of lead results in the graver forms of paralysis, and the more *partial* influence results in that state of disinclination to act, or of impaired power to act, which is a consequence of the attendant pain. In the extremities there is impairment of muscular power, and there is exalted sensibility: in the bowel there is excruciating pain, with a contracted state of the circular fibre of the muscular coat; in both cases there is the same inability or disinclination to action of the muscular fibre, which is in colic the great cause of constipation. It is the astringent power of lead which in both cases prevents the muscular fibre from performing its due function; consequently colic is the result of an approach to the specific paralysis of lead, developed in the muscular coat of the intestine.” (p. 167.)

As to treatment: Dr. Alderson condemns the empirical practice which is usually adopted in La Charité, and the other hospitals of Paris. He says that it consists merely in an extension of what was the practice of the ancients, as laid down by Nicander and Celsus, who prescribed vomiting and purging as the treatment for poisoning by lead, as well as by other metals, under the erroneous belief that the nature of the disease was entirely referred to spasms. From a consideration of the nature and seat of the disease, he thinks that the great desideratum is, to choose the most certain and, at the same time, least distressing purgative—the action of which is comparatively uninfluenced by combination with opium.

“Calomel alone, or in combination with the compound extract of colocynth of our Pharmacopœia, and with opium, is the aperient which may most safely be relied on in all stages—even during sickness; not, however, omitting to guard against the probability of the constitutional effect taking place, and superseding the purgative. The combination of croton oil prevents such result, by accelerating the action; and as all remedies have their specific effect upon different portions of the canal, we secure our object better by combination. Whenever the above combination has failed to succeed, we have still a resource in the use of croton oil in full dose. Its action in this disease is speedy and safe: a couple of hours scarcely elapses without satisfactory result.

“Castor-oil is a favourite remedy in self-treatment at the manufactories, and, no doubt, is of the greatest value in the earlier symptoms. The women, who are more careful of self-management than the men, have frequent recourse to it in the beginning of indisposition, and in this way perhaps obtain that protection which has been attributed to other causes.” (p. 213.)

The warm bath is another remedy, of which he speaks in favourable terms; and referring to the experience of the late Dr. Pereira at the London Hospital, he says that the addition of four ounces of sulphuret of potassium to thirty gallons of water increases its efficacy. The sulphur of the alkaline salt combines with the lead which may be present on the skin, or immediately below its surface, and forms a dark discoloration. This is observed to occur even after many ablutions, and it is chiefly developed in the axilla, the abdomen, the inside of the thigh, the palms of the hands, the back, and in all those parts where an abundance of hair is met with. Dr. Alderson thinks it probable, that the discoloration is due to the lead

which is mechanically entangled by the hair and sebaceous matter of those parts. Some of it, however, is perhaps dependent on the metal excreted by the skin; for in one of the cases of lead-poisoning mentioned by Dr. De Mussy, the whole of the abdomen became black after a sulphur bath, notwithstanding that the patient had never been exposed to emanations from lead, and could not, therefore, have acquired surface accumulation.

In adverting to the efficacy of these baths, Dr. Alderson has offered a suggestion which is worthy of notice.

"It appears to me that the establishment of baths &c. for the poorer class, which have been lately opened, might be especially available for the artisans engaged in any sort of lead-works, in order to obtain an habitual purification of the skin from the particles of lead which attach themselves to the surface, or exude from the pores. If the benevolent conductors of these institutions would provide the addition of even a small amount of sulphide of potassium for the use of this particular class of mechanics, they might immensely increase the benefit which they already afford." (p. 391.)

Lastly, in the treatment of lead-colic, we are told that the use of opium is indispensable as a means of relieving the distress which occurs during the night, and renders sleep otherwise unattainable.

The cure of paralysis from lead, Dr. Alderson regards as a much more difficult matter, for he says:

In this form of the disease, the change of colour, the impaired muscular power, and the wasting of the paralysed muscles, demonstrate that there is an almost broken constitution to deal with, and one which would fail to endure the trial of very active measures. In colic we find an apparent wasting of the solids, especially indicated in the shrinking of the features; but this seeming emaciation is so soon recovered from, the form so rapidly restored to its usual proportions, and the complexion to a natural hue, that it cannot but be regarded as merely illusory. In paralysis, however, there is not a seeming, but a real, change in the structure of the muscles. There is actual emaciation, and it is one of the symptoms from which, when appearing in excess, we should draw the most unfavourable conclusions as to the prospect of final recovery; for here, indeed, the altered and impoverished condition of the blood is distinctly manifest." (p. 213.)

We have not space to discuss in detail the treatment which he proposes in these cases, but we may state that he recommends immediate removal from the source of the disease, the use of mild purgatives, the employment of the sulphuret-of-potassium bath, and the application of electricity or galvanism to the paralysed limbs. He thinks that the former of these physical agents is most useful in amaurosis, and the latter in palsy. He prefers the latter, because of its low tension and high chemical power; and he has ventured to propose a means of applying it which is somewhat novel.

"Our positive metal we may consider to be the lead in the nerves and muscles and tissues, and our negative metal, plates of copper, which we must attach to the limb itself; a weak solution of acetic acid may form the oxydating and connecting link. I choose acetic acid, because the acetate of lead is soluble, and there is every ground for reasoning that the chemical and galvanic actions set up will cause the lead to be withdrawn from the muscles." (p. 214.)

We hope that this may be so, even in spite of our fears to the contrary. Dr. Alderson is strongly opposed to the practice of administering strychnia in these cases, as will be seen from the following remarks:

"It is usual to give tonics, and in a safe form there can be no doubt of their general efficacy; but of the class of alkaloids, such as strychnia, we must admit that the danger of their use hardly excuses such experimental treatment without the greatest caution. My own recollection of the reputed success of the use of strychnia many years ago in France, coupled with my knowledge, at the same time, that these reports were unsupported by real evidence, makes me very dubious of later statements on this subject." (p. 214.)

Dr. Alderson perceives the necessity for speedily removing the poisonous metal from the system, for he says, "it is obvious that the first step must be to free the nervous and muscular tissue from the offending cause;" nevertheless, he has not mentioned, or even referred to, the plan of treatment recommended by Melsens, notwithstanding that this plan offers the most hopeful means for accomplishing so important an object. We trust that Dr. Budd's translation of M. Melsens' memoir, at page 201 of the present volume, will be read with interest; and we may here, in conclusion, state, that whatever may be the result of the plan in question, when it is put to the test of actual practice, there cannot be a doubt that at first sight it presents the strongest indications of success. Analysis has proved, that in lead-disease the poison is contained in the muscular and nervous tissues of the affected parts. The metal has likewise been found in the blood, in the liver, and in the substance of the brain; from which it is highly probable, that the whole of the phenomena witnessed in these cases are due to the actual presence and chemical reactions of the metal on the tissues of the affected parts. If this be true, what more likely chance is there of restoring health, than that which offers an easy mode of eliminating the poison?

Mr. Harrison's volume is, as its title implies, almost entirely devoted to an examination of the effects produced by water contaminated with lead. It is written in a very earnest and popular style, and is evidently intended as much for general as professional readers. We should judge from the preface, and early portions of the work, that Mr. Harrison had given much attention to this highly-important subject, though it appears, that when he entered on its study he was impressed with a belief, that the mischief arising from so insignificant a source as the trifling contamination of water with lead was comparatively small.

"I supposed," he says, "that it was one of comparatively limited application. I believed that the cases in which people suffered from this cause were few and accidental, and always, in the end, sufficiently apparent to the medical attendant. I now feel convinced that the cases are very numerous, at least in my own neighbourhood, and no doubt also in others. I feel sure that they are often, for a long time, misunderstood and improperly treated, and that deaths arise not unfrequently without the true cause ever being imagined. I know that many persons leave their dwellings under wrong impressions as to the salubrity of their localities, without even conjecturing that bad water is the real source of their disorders." (p. 3.)

As might be expected, our author takes a general view of the facts which have been made out concerning the action of common water on lead. These, however, have been discussed so recently in a former number of this journal,* that we may be excused from entering on them at any length, especially as the author has not advanced any novelty for consideration. It is now, we believe, generally admitted, that rain and snow water, as

* Vol. viii. p. 88.

well as certain kinds of water which contain but a small amount of saline matter (less, for example, than a 12,000th part), as well as those which hold chlorides and nitrates in solution, cannot be stored with safety in leaden vessels. It appears, moreover, from certain cases which have been recorded by Dr. Paris, Dr. Christison, Mr. West, and Dr. De Mussy, that when water containing much saline matter is brought into contact with lead and another metal, as iron, tin, zinc, solder, &c., it is likely to become charged with the poison, in consequence of galvanic action. Acid bodies, alkaline substances, and the products of decomposing vegetable or animal matter, are also said to be a source of metallic impregnation; and finally, it may be mentioned that the so-called insoluble compounds of lead are all slightly attacked by water. Fresenius has shown that the hydrated oxide of lead is soluble in 10,000 parts of water, the sulphate in 22,816 parts, and the carbonate in 50,551. We know that the last of these results is in opposition to a statement made by Professors Graham, Miller, and Hofmann, who were appointed by the government, in the early part of last year, to report on this subject. They assert that "pure water did not dissolve a quantity of carbonate of lead greater than one-sixtieth of a grain to a gallon, or one part of lead in four millions of water; while water, on the other hand, which contained already so much as six grains of oxide of lead dissolved in it to the gallon, had the quantity of metal reduced to one-fifty-seventh of a grain, by free exposure to the atmosphere for twenty-four hours, the lead being deposited as carbonate of lead, in consequence of the absorption of carbonic-acid gas," (Report, p. 33.) But while the matter is open to dispute, we are warranted in adopting the larger amount; and if we do so, there can be no doubt that the proportions named are quite sufficient to occasion disease. In the case of the late ex-king of the French and his suite at Claremont, thirteen persons became affected with lead colic, though the water which they drank did not contain more than one part of lead in 70,000; and Mr. Herapath has reported, that he once witnessed the injurious effects of this metal on the human system, when the water made use of contained only one part of the poison in 500,000. It has, however, been stated by Dr. Smith of Aberdeen, in a paper which he read before the Chemical Society of London, in April, 1851, that though the Dee water, which is supplied to that city, dissolves one part of lead in from two to seven millions of water, yet it did not appear to cause any injurious action on the inhabitants; and he further states as his opinion, that less than the twentieth of a grain of lead in the gallon of water, or one part in 1,400,000 parts, does not produce injury to those who drink it: he believes, in fact, that the limit of danger is somewhere between the tenth and twentieth of a grain to a gallon. This view of the case is supported by another eminent physician of Aberdeen, Dr. Dyce, who says, that during a period of seventeen years he has never known an instance of illness from this cause, and he adds, that the experience of his colleagues is to the same effect. In reply to this, however, Dr. Alderson has very properly remarked, that "the testimony from Aberdeen goes no further than to say, that the effects of lead have not been noticed by the physicians there. Now it is possible that lead-disease may be classed, in reference to their perception, in the same category with many other things; but be that as it may, we are not in a position to weigh negative evidence, while we

have so many fully recorded facts; and many of us have had our own personal knowledge of instances, which bring direct proof of the positive existence of the evil." (p. 417.) To this we may add, that the work of Mr. Harrison abounds with such instances; and that the report of the government chemists, though it is intended to have an opposite tendency, actually demonstrates the fact of the great danger which is likely to arise from the use of soft water. The commissioners show that such water readily attacks lead, and forms, if carbonic acid be not present, the hydrated oxide of the metal. A large portion of this compound is dissolved in the water, and it requires the access of carbonic acid to precipitate the poison, though too much carbonic acid will re-dissolve it. Suppose, however, that the quantity of carbonic acid present is just sufficient to convert the whole of the oxide into an insoluble carbonate; this gradually falls as an impalpable powder to the bottom of the cistern, whence it is very likely to be stirred up by every fresh supply of water, and thus carried forwards into the service-pipes. So that, whether dissolved as the hydrated oxide or the bicarbonate, or suspended as the insoluble carbonate, it is liable to gain admission into the human body, and thus to produce incalculable mischief.

"There is another instance," says Dr. Alderson, "in which the presence of lead, under apparently similar circumstances, may be found to vary. Water running in leaden pipes, or pumped from a leaden pump, *may* show no trace of the metal; but after a delay of twelve hours or more in the pipes, or in the body of the pump, which very often happens, the water will be found to contain it in smaller or greater degree. As an illustration of this, I quote from Dr. Clark's published evidence in the report of the General Board of Health, on the supply in Aberdeen:—'The water is brought from the iron mains in the streets to the houses by means of leaden pipes, and in general without any disadvantage, because the supply from the pipes is constant, and the use of the stop-cock very frequent in a family; but in my class-rooms and laboratory, I find that when the pipe has been out of use for a few days, the water taken from it affords a trace of lead, which disappears when the water has been allowed to run briskly from the stop-cock for a few minutes.' It is curious that Dr. Clark is an Aberdeen M.D., and is thus describing the identical water which is spoken of in the 'Report of the Chemical Commissioners' as perfectly innocuous."

Dr. Christison has shown that the same thing is true of Edinburgh water, which may be kept running over the lead with impunity, though it cannot be left standing in the metal for any length of time without becoming charged with it; and the Board of Health have with much candour acknowledged, that in their opinion "minor injuries from such partial contaminations may occur, and pass unnoticed."

Mr. Harrison, however, believes that these injuries are not of a minor character, and few who read his book will think so either: though, to speak the truth, he appears to be somewhat over-anxious in the matter; for wheresoever he goes he sees the ghastly effects of this metal, and whatsoever he examines he finds is contaminated with it. The kitchen-boiler is the plague of his life, and the very name of soft water is a terror to him. He has no faith in the prudence of servants, and he calculates that whenever the rain-cistern is nearer to the house than the well, mischief will come of it.

"So much, indeed, am I impressed with the importance of this subject, that I recommend those who are located in lodging-houses, or who are in the habit of travelling from place to place, to furnish themselves with the means of testing water, that they may make an inquiry, from time to time, into the nature of

the water brought to table. This may, at any rate, be a desirable caution for those who have already suffered from lead colic, or have dyspeptic symptoms for which they cannot find relief, and are ignorant of the cause. I have chosen to speak particularly of these points, because I conceive that if there be any merit in these pages, it is chiefly in the prominence which I have given to matters apparently so trivial." (p. 23.)

Sulphuretted hydrogen is the test which he employs, and he takes care to examine the water taken from the pump the first thing in the morning, so that the water may have stood in contact with the metal as long as possible. If this precaution is not adopted, the operator may fail to detect the contamination.

But the principal of all points connected with the discovery of the disease is, according to Mr. Harrison, a proper knowledge of the symptoms. These, however, may sometimes embarrass, from the circumstance that lead is an accumulative poison; and hence the effects of it may be suddenly manifested, even after long exposure to the influence of an exciting cause. With a view of elucidating this part of the subject, our author describes the symptoms of the disease with great minuteness. He informs us that in many cases the complaint is so gradually induced that the patient becomes affected without being aware of it, or at least without having that just appreciation of the mischief which he ought to have.

"He considers himself dyspeptic, is troubled with constipation, becomes slightly emaciated, perceives his respiration to be difficult, and feels to have lost his usual elasticity of mind and of body. Pain now begins to be experienced in the epigastrium; the constipation is more troublesome; and aching sensations are felt in the limbs. The complexion gradually assumes a dirty yellow cast, and the margin of the gums has sometimes a bluish appearance, or borders the teeth in places with a deep blue line. This state may be, in part, and for a time, arrested by purgatives and medicines, but especially, and for obvious reasons, by a temporary change of place. The sufferer conceives that his residence is unhealthy, and without suspecting the true cause, blames various circumstances in his locality or dwelling. The muscles now begin to lose their accustomed strength; the patient walks badly, holds his pen with less steadiness, and vomits, apparently without adequate cause;—after a protracted period of ill-health, to which he is become familiar, and perhaps to some extent indifferent, he is suddenly seized with a gripping pain in the stomach. He takes aperient medicine, but it is vomited; he repeats the dose, but without effect: the pain goes on increasing, and at length becomes intolerable and unintermitting; medicine after medicine is rejected. He tosses himself about in extreme and increasing distress; now vomiting green porraceous matter, and now vainly trying by pressure and friction to mitigate his suffering. If this state be not relieved by timely and judicious assistance, convulsions arise and insensibility comes on, and even death may follow. By this time he will be found to have acquired a dirty yellow tinge, and to have a wretched look, with some emaciation and a partially paralysed and wasted state of the muscles. He has probably walked with a shuffling gait, and felt his mind give way, and even his words falter." (p. 41.)

This, he says, is not the invariable train of symptoms, but it is one which is most notable, and, so to say, the type of the disease. Among the irregularities in the effects, he mentions rheumatism, an aching pain at the lower part of the spine, which radiates into the thighs, chronic dysentery, epilepsy, &c. He then discusses the cause, progress, and diagnostic value of each of these symptoms, and concludes in the following words:

“It may be imagined, from what I have said, that so many general symptoms are attributed to the poison of lead, that it is almost impossible to determine when the lead-affection is really present. It must be observed, then, that the more important and characteristic symptoms are in themselves sufficiently distinctive; and that the rest have only a value when found in combination with these, or when the patient is actually known to have subjected himself to the saturnine poison. Many of the symptoms are thus only corroborative of the rest, and if found isolated, would not deserve the same amount of attention.” (p. 86.)

These general remarks are followed by a great number of cases, many of which have occurred in the author's own practice, and the rest are taken from the reports of Drs. Christison, Norris, De Mussy, and James Robertson. We have not space to quote from them, but we may remark, that they fully illustrate the nature of the malady, proving that it is a common affection, and that it operates slowly but surely upon large masses of the community. As an example of the insidious character of its attacks, Mr. Harrison refers to the fact, that Dr. Norris was the subject of lead-disease for several years before he was aware of it, notwithstanding that he had devoted much attention to the matter, and was actually engaged during the whole time in investigating the more acute forms of the malady in other people. He tells us, moreover, that cattle are equally liable to the disease, and that it makes horses restless, and engenders a disposition to kick while they are in the stable. He likewise refers to an interesting paper by Dr. George Wilson, in the ‘*Edinburgh Monthly Journal of Science*’ for May last, wherein it is stated, that within the short space of five months he had to make a series of analyses in connexion with the death of thirteen horses and several cows, which were poisoned by compounds of lead, transferred by the atmosphere, or by water, to the fields in which they pastured.

The treatment which Mr. Harrison recommends is of the routine kind—croton oil, combined with aloes or colocynth, to relieve the constipation, and opium to assuage the pain. He also advises the use of hot fomentations to the abdomen; and he speaks most favourably of the sulphuret-of-potassium bath. Unlike Dr. Alderson, however, he recommends the use of small doses of strychnia, or nux vomica, in combination with aloes, for the purpose of restoring tone to the paralysed muscles; and lastly, he has omitted to mention the treatment proposed by Melsens, unless, indeed, it be referred to in the following paragraph:

“Chemical remedies for the disorders produced by lead have naturally had many advocates, but it is a little singular that the advocacy has been maintained on exactly opposite views. Some have recommended agents which, they imagined, would render the lead more soluble, and thus favour its elimination from the body; others have endeavoured to form insoluble salts of lead, and thus neutralize its deleterious influence. Certain bodies, which may be supposed to operate chemically, have been found useful; but experience, rather than theory, must decide upon their merits.” (p. 158.)

Both of the writers whose works we have reviewed, impress upon us the necessity for a more careful consideration of the chronic effects of lead; and if only a small part of the account given us by Mr. Harrison be based on fact—and we have reason to believe that all of it is—there can be no doubt that the time has arrived for a complete and most careful revision of the whole subject of water-supply. Whatever may be the opinions of chemists, derived from insignificant experiments made with a determinate

object, in the laboratory, if the experience of the medical practitioner points to the fact that lead-disease is a common affection, and that it undoubtedly arises from the use of water contaminated with the metal, there cannot be a question as to the propriety of altogether abolishing the use of lead as a medium of general distribution. And if it should so happen that the government decide on their recently-proposed scheme for the supply of this metropolis with soft water, it must be evident, as Dr. Alderson remarks,

—“*that especial study should be directed towards devising a new mode of distribution; that the use of lead, however facile in its applications, and however sanctioned by a long line of succeeding ages, must be abandoned. It is not for us to repose on the excuse, that a source of evil which has served for nearly a couple of thousand years, may easily be permitted to remain in the present generation. Let us rather be thankful, when a really tangible cause of the too numerous derangements of human health is brought to light; for even better than the healing art is that wise precaution which is sedulous to remove even the smallest germ of yet undeveloped disease.*” (p. 418.)

All the evidence which has been brought forward by the Hon. W. Napier and others of his opinion, does not go to show that lead is not attacked by soft water, but rather to prove that it is affected by hard water also; indeed, their results do not in any way detract from former ones, but they rather add to them, by proving that it is dangerous to bring any kind of water into contact with lead surfaces. Who, therefore, can doubt the propriety of at once abolishing the present mode of employing this dangerous metal? Besides which, we have a number of cheap, durable, harmless, and equally convenient materials ready at hand to take its place. In fact, iron, zinc, slate, porcelain, and gutta percha have again and again been proposed as substitutes for lead; and it is a marvel to all who are acquainted with the subject, that one or other of these materials has not long since been adopted.

Before we quit the subject, we may remind our readers, that the best mode of purifying water from such contamination, is by filtering it through sand and animal charcoal. Relying on the experiments made by Colonel Yorke, Dr. Clarke, Mr. Richard Phillips, and others, we, some years since, contrived an apparatus for filtering water, which performs its duty admirably. It is described at page 91 in vol. viii. of this journal.

In taking our leave of these authors, we cannot but hope that their labours will be appreciated; and that the members of our profession, as well as the community at large, will devote more attention to this important subject, for assuredly it deserves their most serious consideration. It is, indeed, a matter for surprise, that so manifest an evil has not long since met with a remedy; in fact, it will hardly be believed that there is at the present time almost the same apathy and general want of information on this subject, as there was in the days of Dr. Burton, who referred to it in the following language:

“From a careful perusal of the authors before named, as well as from considerable personal experience, I presume to express a strong belief, that the unobserved introduction of lead into the human body is continually taking place to a much greater extent than is usually imagined, and that it has often caused an ambiguous assemblage of morbid symptoms; for although the influence of lead on the system is readily detected when the symptoms are severe, and follow each other in

expected order of succession, yet when they are mild, or do not follow each other in the regular stated order of succession, if the mind of the physician is not awake to their cause, or the cause cannot be ascertained, then the symptoms appear ambiguous, and they may be misinterpreted, without exposing the physician to the imputation of unpardonable ignorance, or of culpable oversight.”*

We are sadly afraid that Dr. Burton's remarks are as applicable now as they ever were.

H. Lethby.

REVIEW III.

1. *Handbuch der allgemeinen pathologischen Anatomie.* Von CARL ROKITANSKY.—Wien, 1846. Band iv.
Manual of General Pathological Anatomy.
2. *Lectures on Nutrition, Hypertrophy, and Atrophy.* By JAMES PAGET, Esq., F.R.S., &c. ('Medical Gazette,' 1847.)
3. *Observations on the Clinical History and Pathology of one form of Fatty Degeneration of the Heart.* By E. L. ORMEROD, M.D. ('Medical Gazette,' 1849.)
4. *On Fatty Degeneration of the Heart.* By RICHARD QUAIN, M.D. ('Medico-Chirurgical Transactions,' vol. xxxiii.)
5. *On Fatty Degeneration of the Small Bloodvessels of the Brain, and its Relation to Apoplexy.* By JAMES PAGET, Esq., F.R.S. ('Medical Gazette,' 1849.)
6. *On Fatty Degeneration of the Placenta, &c.* By ROBERT BARNES, M.D. ('Medico-Chirurgical Transactions,' vol. xxxv.)
7. *On Granular and Fatty Degeneration of the Voluntary Muscles.* By EDWARD MERYON, M.D. ('Medico-Chirurgical Transactions,' vol. xxxv.)

MUCH has been written and said about fatty degeneration, much that is true and sound, and much that is less trustworthy. Of the importance of the change in question and of its reality no doubt can exist; but some minds who love not to be carried away by the fashion of the day, and who long for clear proofs, are rather inclined to suspect that too much is made of fatty degeneration, that it is too often regarded as the essential and primary change to the exclusion of other less manifest alterations, or that it is too confidently pronounced in some instances to exist without its being fully proved that such is the case.

The suspicion, we confess, is justified by some circumstances to which we will allude. One is, that as the visible and the manifest affect our minds always more than that which is not so clearly seen, we are apt to consider the appearance of an unusual quantity of oil in a part as of more importance than other changes which are less prominent. The existence of oil in the hepatic or renal cells is matter of sight, but the presence or absence of sugar in the former is not. Thus we may overlook the more important but less manifest change in a tissue, while our attention is fixed on some more striking phenomenon. We think that we have seen

* Medico-Chirurgical Transactions, vol. i., Second Series, p. 73.